Enhancing identified circular economic benefits related to the deployment of Solrød biogas plant

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KKU – IENC2016
"Engineering and Technology for Better Living"
August 3 – 5, 2016
Pullman Khon Kaen Raja Orchid Hotel, Khon Kaen, Thailand

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Welcome Message from KKU President

Since 1964, Khon Kaen University (KKU) was established as the major university in the Northeastern part of Thailand and has developed itself to become one of the top universities in Thailand which produces high quality students to serve our community.

As its vision to become a leading world –class university, KKU has established more research working bodies to collaborate with organizations outside the university, both public and private organizations.

The 6th KKU International Engineering Conference 2016 (KKU-IENC2016) is a great encouragement to share and exchange new knowledge to create new innovation for country development. Also, this event will be the venue for us to create linkages among the participants around the world for mutual benefits.

On behalf of Khon Kaen University, I would like to thank all keynote speakers, all invited speakers, organizing team and staff who made this conference possible and successful. Furthermore, I would cordially like to extend my warmest welcome to all participants of the 6th KKU International Engineering Conference 2016 (KKU-IENC2016).

Associate Professor Kittichai Triratanasirichai, Ph.D.
President of Khon Kaen University

Welcome Message from Dean

Nowadays, technology has become a vital part of our life. We have to use our technical knowledge to improve lives, preserve resources and the environment at the same time. Till then we can have a sustainable environment, a sustainable Earth, a sustainable development and finally, a sustainable living. For us as engineers and scientists, this is a demanding challenge.

To organize a venue for exchanging knowledge and experience, the Faculty of Engineering, Khon Kaen University (KKU) holds the KKU International Engineering Conference (KKU-IENC) every other year. The upcoming KKU-IENC2016 is the sixth in the series of conference previously known as Technology and Innovation for Sustainable Development (TISD) which has the first conference in 2006. The conference is renamed to indicate affiliation with and to honor, the Faculty of Engineering, Khon Kaen University.

There are nine main topics of KKU-IENC2016 including;

Topic A: Civil Engineering and Construction Technology
Topic B: Electrical Engineering and Telecommunication
Topic C: Agricultural Engineering and Food Technology
Topic D: Industrial Engineering, Logistics and Supply Chain
Topic E: Energy Technology, Thermal Systems and Applied Mechanics
Topic F: Environmental Engineering and Management
Topic G: Chemical Engineering
Topic H: Computer and Information Technology
Topic I: Materials Science and Engineering

We are truly honored to have 2 keynote lectures given by the most prominent figures in their respective fields. This conference also features 17 invited speakers, 203 oral presentations and 39 poster presentations from 10 countries around the world.

On behalf of the Faculty of Engineering, KKU, I would like express my appreciation to the financial support of our sponsors. This conference would not be possible without them. Also, I must thank all the reviewers for their diligent comments that help improve papers, every member of the organizing committee for their dedication to the success of this conference.

Finally, I thank all the participants and welcome all of you to attend KKU-IENC2016. I wish you all every success in this conference and in life.

Professor Apirat Siritaratiwat, Ph.D.,
Dean of the Faculty of Engineering
Khon Kaen University

Topic A: Civil Engineering and Construction Technology

- Construction Materials Technology
- Water Resources Management
- Structural Engineering, Structural Design/Optimization
- Highway, Transportation, Traffic and Logistics Engineering
- Geotechnical Engineering
- Surveying Engineering and Geographic Information System (GIS)
- Natural Disaster
- Others

Topic B: Electrical Engineering and Telecommunication

- Electrical Power Systems/Power Grids
- Power Electronics
- Circuit and Systems
- Instruments and Control Systems
- Power Electronics and Industrial Application
- Electromagnetic and Microwave Engineering
- Communication Systems
- Wireless/Mobile Communication and Devices
- Semiconductors and Biosensors
- Magnetic Recording and Data Storage Technology
- Coding and Signal Processing
- Optical Communications
- Others

Topic C: Agricultural Engineering and Food Technology

- Agro Technology and Precision Farming
- Postharvest Technology, Bio-technology and Food Engineering
- Food Safety and Food Security
- Soil and Water Engineering
- Agricultural Machinery
- Others

Topic D: Industrial Engineering, Logistics and Supply Chain

- Production and Operations Management
- Quality Engineering
- Engineering Management
- Logistics and Supply Chain Management
- Safety Engineering and Ergonomics
- Operations Research
- Materials and Manufacturing Engineering
- Others

Topic E: Energy Technology, Thermal Systems and Applied Mechanics

- Aerospace and Marine Engineering
- Alternative Energy
- Combustion Technology
- Applied Mechanics, Materials and Manufacturing
- Energy Technology and Management
- Biomass and Bio-energy
- Biomechanics
- Computation and Simulation Techniques
- Thermal Systems and Fluid Mechanics
- Dynamic Systems, Robotics and Control
- Others

Topics of Conference

Topic F: Environmental Engineering and Management

- Climate Change and Clean Development Mechanism
- Environmental Policy and Management
- Solid/Hazardous Waste Management
- Air Pollution Control and Management
- Wastewater Treatment and Reclamation
- Water Supply and Water Treatment Technology
- Fate of Emerging Pollutants and Site Remediation
- Environmental Health and Safety
- Others

Topic G: Chemical Engineering

- Clean Technology
- Catalysts and Petrochemical Technology
- Polymer and Composites
- Advanced Materials and Nanotechnology
- Industrial Process Simulation and Control
- Separation Process
- Biochemical Technology
- Biomedical Engineering and Technology
- Others

Topic H: Computer and Information Technology

- Algorithms and Computation Theory
- Computer Architecture
- Embedded Systems
- Software Application and Development
- Information Systems and Technology
- High Performance Computing
- Image/Signal Processing and Multimedia Computing
- Intelligent Systems
- Computer Networks, Computer Security and Data Communication
- Mobile and Wireless Communications
- Social Network Systems
- Others

Topic I: Materials Science and Engineering

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Sittha Jaensirisak	Ubon Ratchathani	Thailand
Siva Achariyaviriya	Chiangmai University	Thailand
Siwadol Kanyakam	Rajabhat Maha Sarakham University	Thailand
Somboon Shaingchin	University of Phayao	Thailand
Somchai Chuan-Udom	Khon Kaen University	Thailand
Somchai Wongwises	King Mongkut's University of Technology Thonburi	Thailand
Somchart Chantasiriwan	Thammasat University	Thailand
Somchart Soponronnarit	King Mongkut's University of Technology Thonburi, Thailand	Thailand
Somjai Kajoncheppungram	Khon Kaen University	Thailand
Somjai karnchanawong	Chiang Mai University	Thailand

Name	Affiliation	Country
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Somphinith Muangthong	Rajamangala University of Technology Isan	Thailand
Sompop Jarungthammachote	Kasetsart University	Thailand
Somsak Chaiyapinunt	Chulalongkorn University	Thailand
Somying Thainimit	Kasetsart University	Thailand
Songkeart Phattarapattamawong	King Mongkut's University of Technology Thonburi	Thailand
Srijidtra Charoenlarpnopparut	Kasetsart University	Thailand
Srilert Chotpantarat	Chulalongkorn University	Thailand
Suchada Tantisatirapong	Srinakharinwirot University	Thailand
Sudathip Chantorn	Thammasat University	Thailand
Sujin Bureerat	Khon Kaen University	Thailand
Sukangkana Talangkun	Khonkaen university	Thailand
Sukanya Wannasit	Khon Kaen University	Thailand
Sukritthira Ratanawilai	Prince of Songkla University	Thailand
Suksun Horpibulsuk	Suranaree University of Technology	Thailand
Sumana Ratpukdi	Khon Kaen University	Thailand
Sumate Naetiladdanon	King Mongkut's University of Technology Thonburi	Thailand
Sumrerng Jugjai	King Mongkut's University of Technology Thonburi	Thailand
Sunantha Kingpaiboon	Khon Kaen University	Thailand
Sunate Surbkar	Maejo University	Thailand
Sunsern Cheamanunkul	Mahidol Universit	Thailand
Supachai Pathumnakul	Khon Kaen University	Thailand
Supakit Rooppakhun	Suranaree University ofTechnology	Thailand
Supan Yodyingyong	Mahidol University	Thailand
Supasit Konyai	Khon Kaen University	Thailand
Supatpong Mattaraj	Ubon ratchathani University	Thailand
Supawan Tirawanichakul	Prince of Songkla University	Thailand
Supawan Vichaphund	National Metal and Materials Technology Center	Thailand
Suphawut Malaikrisanachalee	Kasetsart University	Thailand
Suppakorn Chinvanno	Chulalongkorn University	Thailand
Supree Pinitsoontorn	Khon Kaen University	Thailand
Surames Piriyawat	Burapha University	Thailand
Suraphong Wattanachira	Chiang Mai University	Thailand
Surapol Padungthon	Khon Kaen University	Thailand

Name	Affiliation	Country
Surapol Raadnui	King Mongkut's University of Technology North Bangkok	Thailand
Surasak Sanguanpong	Kasetsart University	Thailand
Surasith Piyasin	Khon Kaen University	Thailand
Surat Pramualsakdikul	Khon Kaen University	Thailand
Suriyah Thongmunee	Chiang Mai University	Thailand
Suriyon Prempramote	Kasetsart University	Thailand
Sutasinee Neramittagapong	Khon Kaen University	Thailand
Sutha Khaodhiar	Chulalongkorn University	Thailand
Sutham Sukmanee	Prince of Songkla University	Thailand
Sutheera Puntheeranuark	King Mongkut's Institute of Technology Ladkrabang	Thailand
Suthep Butdee	King Mongkut's University of Technology North Bangkok	Thailand
Suvimol Sujjavanich	Kasetsart University	Thailand
Suwasa Kantawanichkul	Chiang Mai University	Thailand
Suwat Pattaramalai	King Mongkut's University of Technology Thonburi	Thailand
Suwin Saleesongsom	ChiangRai University	Thailand
Tajul A Yang	Universiti Sains Malaysia	Malaysia
Tanapon Phenrat	Naresaun University	Thailand
Tanongkiat Kiatsiriroat	Chiang Mai University	Thailand
Tanyada Pannachet	Khon Kaen University	Thailand
Tasanee Chayavanich	King Mongkut's University of Technology Thonburi	Thailand
Tawatchai Tanchaisawat	Chiang Mai University	Thailand
Tawee Tunkasiri	Chiangmai University	Thailand
Teerapong Leelanupab	King Mongkut's Institute of Technology Ladkrabang	Thailand
Teerawat Laonapakul	Khon Kaen University	Thailand
Teetut Dolwichai	Suranaree University of Technology	Thailand
Thana Radpukdee	Khon Kaen University	Thailand
Thanakom Soontornchainacksaeng	King Mongkut's University of Technology North Bangkok	Thailand
Thanakorn Methatham	Metropolitan Waterworks Authority	Thailand
Thananya Wasusri	King Mongkut's University of Technology Thonburi	Thailand
Thanapon Thaveevouthti	Ubon Ratchathani University	Thailand
Thanawath Niyamosoth	Khon Kaen University	Thailand
Thaned Satiennam	Khon Kaen University	Thailand
Thanet Urit	Nakhon Sawan Rajabhat University	Thailand

Scientific Committee

Name	Affiliation	Country
Thanida Sunarak	Mahanakorn University of Technology	Thailand
Thawee Nakrachata-amon	Khon Kaen University	Thailand
Theerayut Thongkrau	Khon Kaen University	Thailand
Thidarat Bunsri	King Mongkut's University of Technology Thonburi	Thailand
Thitisak Boonpramote	Chulalongkorn University	Thailand
Thunyalux Ratpukdi	Khon Kaen University	Thailand
Tossabhorn Chamsai	Kalasin University	Thailand
Umarin Pintoptang	Naresuan University	Thailand
Uraiwan Pongsa	Rajamangala University of Technology Rattanakosin	Thailand
Vanchai Sata	Khon Kaen University	Thailand
Varameth Vichiensan	Kasetsart University	Thailand
Varangrat Juntasaro	Kasetsart University	Thailand
Varinrumpai Seithtanabutara	Khon Kaen University	Thailand
Vasu Udompetaikul	King Mongkut's Institute of Technology Ladkrabang	Thailand
Vejapong Juttijudata	Kasetsart University	Thailand
Viboon Changrue	Chiang Mai University	Thailand
Vichian Plermkamon	Khon Kaen University	Thailand
Virasit Imtawil	Khon Kaen University	Thailand
Visanu Tanboonchuy	Khon Kaen University	Thailand
Vo Ngoc Dieu	Ho Chi Minh City University Of Technology	Viet Nam
Vute Sirivivatnanon	University of Technology, Sydney	Australia
WAEL A Y SALAH	Palestine Technical University - Kadoorie	Palestinian Territory
Wanchai Asvapoositkul	King Mongkut's University of Technology Thonburi	Thailand
Wanpen Wirojanagud	Khon Kaen University	Thailand
Wan Rosmiza Zana Binti Wan Dagang	Universiti Teknologi Malaysia	Malaysia
Warat Kongkitkul	King Mongkut's University of Technology Thonburi	Thailand
Wassanai Wattanutchariya	Chiang Mai University	Thailand
Wattanavadee Sriwattanapongse	Chiang Mai University	Thailand
Weerasak Somkhuthot	Loei Rajabhat University	Thailand
Werapon Chiracharit	King Mongkut's University of Technology Thonburi	Thailand
Wichuda Satiennam	Khon Kaen University	Thailand
Wimol San-Um	MET	Thailand

Name	Affiliation	Country
Winai Liengcharernsit	Kasetsart University	Thailand
Wipada Sanongrat	Ubon Ratchtani University	Thailand
Witcha Feungchan	Khon Kaen University	Thailand
Worrasid Trutassanawin	Mahidol University	Thailand
Wudhichai Assawinchaichote	King Mongkut's University of Technology Thonburi	Thailand
Wuthichai Wongthatsanekorn	Thammasat University	Thailand
Yaneeporn Patcharavorachot	King Mongkut's Institute of Technology Ladkrabang	Thailand
Yong-Taek Im	Korea Advanced Institute of Science and Technology	Korea
Yupaporn Ruksakulpiwat	Suranaree University of Technology	Thailand
Yuvarat Ngernyen	Khon Kaen University	Thailand
Yuwadee Zaetang	Kasetsart University	Thailand

KKU-IENC2016 Program

August 3 - 5, 2016

Pullman Khon Kaen Raja Orchid Hotel, Khon Kaen, Thailand

Wednesday 3 August 2016	
Room	Orchid Ballrom
14.00 - 18.00	Registration
18.00 - 19.00	Welcome Reception (Room: Saigon Vietnamese Cuisine)

Thursday 4 August 2016									
Room	Orchid Ballrom								
08.00 - 08.50	Registration								
08.50 - 09.45	Parallel Session 1								
Room	Erawan 1	Erawan 2	Iyara	Chattan 1	Chattan 2	Fahmui 2	Fahmui 3	Fahmui 4	Fahmui 5
Topic	A: Civil Eng. & Construction Technology	B: Electrical Eng. & Telecommunication	C: Agricultural Eng. & Food Technology	D: Industrial Eng., Logistics & Supply Chain	E: Energy Technology, Thermal Systems & Applied Mechanics	F: Environmental Eng. & Management	G: Chemical Eng.	H: Computer & Information Technology	I: Materials Science and Eng.
08.50 - 09.00	4	42	33	290	25	20	101	38	195
09.00 - 09.15	36	186	104	340	49	89	109	150	39
09.15 - 09.30	9	234	118	14	72	11	115	47	77
09.30 - 09.45	21	58	161	326	231	16	124	206	64
09.45 - 10.00	Coffer Break 1 (AM)								

10.00-10.30	VIP Registration								
	Opening Ceremony 10.30-12.20 (Room: Orchid Ballrom 3)								
10.30 - 10.45	Welcome Speech by Prof. Dr. Apirat Siritaratiwat Dean, Faculty of Engineering, Khon Kaen University								
10.45 - 11.00	Opening Speech by Assoc. Prof. Dr. Kittichai Trirattanasirichai President, Khon Kaen University								
11.00 - 11.40	Keynote Speaker I: Prof. Masaharu IMAI "VLSI Technology for Embedded Systems in the Post Moore Era- Focusing on Medical/Healthcare Applications-"								
11.40 - 12.20	Keynote Speaker II: Dr. Jiraporn Sirikum "Thailand Energy Strategy on Power Development Plan to cope with the ASEAN Economic Community"								
12.20 - 13.30	Lunch 1 (Room: Pavilion Café Restaurant)								
13.30 - 14.30	Parallel Session 2								
Room	Erawan 1	Erawan 2	Iyara	Chattan 1	Chattan 2	Fahmui 2	Fahmui 3	Fahmui 4	Fahmui 5
Topic	A: Civil Eng. & Construction Technology	B: Electrical Eng. & Telecommunication	C: Agricultural Eng. & Food Technology	D: Industrial Eng., Logistics & Supply Chain	E: Energy Technology, Thermal Systems & Applied Mechanics	F: Environmental Eng. & Management	G: Chemical Eng.	H: Computer & Information	I: Materials Science and Eng.
13.30 - 13.45	Invited Speaker: Prof. Chalermchon Satirapod	Invited Speaker: Prof. Dr. Steven H. Voldman	Invited Speaker: Prof. Masami Ueno	Invited Speaker: Prof. Dr.Shunichi Ohmori	53	Invited Speaker: Assoc. Prof. Dr. Rikke Lybaek	155	185	284
13.45 - 13.50	57	105	315	92	91	62	229	128	180
14.00 - 14.15	68	126	271	100	95	63	233	141	292
14.15 - 14.30	107	143	222	103	132	80	294	285	299

	Poster Session and Coffee Break 1 (PM) (Room: Orchid Ballroom 2)								
	B: Electrical Eng. & Telecommunication	C: Agricultural Eng. & Food Technology		E: Energy Technology, Thermal Systems & Applied Mechanics	F: Environmental Eng. & Management	G: Chemical Eng.		H: Computer and Information Technology	I: Materials Science and Eng.
14.30 - 15.30	164	27	76	30	88	35	157	213	37
	255	43	78	34	177	108	191	264	160
		50	79	116	194	114	242	300	162
		61	235	175	350	119	134		179
		75	259	197		125			210
				280					

15.30 - 17.30	Parallel Session 3								
Room	Erawan 1	Erawan 2	Iyara	Chattan 1	Chattan 2	Fahmui 2	Fahmui 3	Fahmui 4	Fahmui 5
Topic	A: Civil Eng. & Construction Technology	B: Electrical Eng. & Telecommunication	C: Agricultural Eng. & Food Technology	D: Industrial Eng., Logistics & Supply Chain	E: Energy Technology, Thermal Systems & Applied Mechanics	F: Environmental Eng. & Management	G: Chemical Eng.	H: Computer & Information Technology	I: Materials Science and Eng.
15.30 - 15.45	Invited Speaker: Prof. Nakamura Fumihiko	Invited Speaker: Assoc. Prof. Dr. Vo Ngoc Dieu	Invited Speaker: Assoc. Prof. EIZO TAIRA	59	83	Invited Speaker: Prof. Dr.Tim C. Keener	Invited Speaker: Dr. Medhat Mohammed	137	217
15.45 - 16.00	71	261	236	84	142	121	196	209	313
16.00 - 16.15	85	286	22	166	112	1	314	214	319
16.15 - 16.30	86	291	70	45	220	2	110	221	55
16.30 - 16.45	329	297	308	46	318	10	216	165	56
16.45 - 17.00	331	293		336	311	330	266	262	149
17.00 - 17.15	332	322		26	312	359	324	335	333
17.15 - 17.30	258								
18.00 - 21.00	Grand Banquet (Orchid Ballrom)								

Friday 5 August 2016									
Room	Orchid Ballrom								
08.00 - 08.30	Regsitration								
08.30 - 10.00	Parallel Session 4								
Room	Erawan 1	Erawan 2	Iyara	Chattan 1	Chattan 2	Fahmui 2	Fahmui 3	Fahmui 4	Fahmui 5
Topic	A: Civil Eng. & Construction Technology	B: Electrical Eng. & Telecommunication	C: Agricultural Eng. & Food Technology	D: Industrial Eng., Logistics & Supply Chain	E: Energy Technology, Thermal Systems & Applied Mechanics	F: Environmental Eng. & Management	G: Chemical Eng.	H: Computer & Information Technology	I: Materials Science and Eng.
08.30 - 08.45	Invited Speaker: Prof. Dr. Atsushi Fukuda	Invited Speaker: Assoc. Prof. Dr. Nantakan Wongkasem	Invited Speaker: Prof. Dr. Donald Slack	349	147	Invited Speaker: Prof. Dr. Chih-Hsiang Liao	60	304	Invited Speaker: Dr.Tuenjai Fukuda
08.45 - 09.00	140		316	327	218	90	67	337	243
09.00 - 09.15	176	148	321	248	219	295	82	338	246
09.15 - 09.30	249	187	323	174	65	129	320	347	260
09.30 - 09.45	302	199	325	182	146	189	341	224	282
09.45 - 10.00	303	204	138	188	193	127	342	225	281
10.00 - 10.30	Coffer Break 2 (AM)								

10.30 - 11.45	Parallel Session 5								
Room	Iyara	Chattan 1	Chattan 2	Fahmui 2	Fahmui 3	Fahmui 4	Fahmui 5	Erawan 1	Erawan 2
Topic	A: Civil Eng. & Construction Technology	A: Civil Eng. & Construction Technology	B: Electrical Eng. & Telecommunication	D: Industrial Eng., Logistics & Supply Chain	E: Energy Technology, Thermal Systems & Applied Mechanics	E: Energy Technology, Thermal Systems & Applied Mechanics	F: Environmental Eng. & Management	Research Program in Hazardous Substance Management in Agricultural	MOU Signing Ceremony between The Faculty of Engineering, Khon Kaen University, Thailand and The Faculty of Engineering , Universitas 17 Agustus 1945 Surabaya, Indonesia
10.30 - 10.45	357	Invited Speaker: Prof. Dr. Noriyuki Yasufuku	207	223	273	212	Invited Speaker: Prof.Dr. Jr-Ping Wang		
10.45 - 11.00	358	287	215	252	274	247	202		
11.00 - 11.15	305	289	226	253	309	263	254		
11.15 - 11.30	310	296	241	169	198	203	355		
11.30 - 11.45	201	301	328	230			168		
11.45 - 13.00	Lunch 2 (Room: Pavilion Café Restaurant)								

Prof. Dr. Masaharu Imai

Department of Information Systems Engineering
Graduate School of Information Science and Technology
Osaka University, Osaka, Japan

VLSI Technology for Embedded Systems in the Post Moore Era - Focusing on Medical/Healthcare Applications-

Abstract

Moore's law is approaching to the end due to the physical limitation of semiconductor fabrication technology. One of the most promising directions of VLSI technologies in the "Post Moore Era" is "More than Moore" rather than "More Moore." Typical components in VLSIs in the Post Moore Era would include heterogeneous components such as digital circuits, analog circuits, radio frequency (RF) circuits, high voltage (HV) circuits, sensors and actuators such as MEMS (Micro Electronic Mechanical Systems). Such VLSIs enable us to develop various highly value-added smart embedded systems, including medical and healthcare equipment and devices, which will work as smart IoT nodes in Cyber Physical Systems (CPS). In this presentation, examples of requirements for smart medical and healthcare equipment and devices are introduced. Then possible solutions to satisfy these requiremertnts are proposed using VLSI technologies. Finally, future directions and issues in the design technology of VLSI and embedded systems in the Post Moore Era are discussed.

Keywords: Moore's Law, Embedded Systems, IoT, CPS, System Design Technology, Medical Applications, Healthcare Applications

Dr. Jiraporn Sirikum

Assistant Director, System Planning Division – GenerationElectricity Generating Authority of Thailand (EGAT)

Thailand Energy Strategy on Power Development Plan to cope with the ASEAN Economic Community

Abstract

Energy is one area of the ASEAN Economic Community (AEC) on the theme of "Connectivity"; that will enhance the potential of energy security, the opportunity of access to energy resources and of energy business. In 2015, the Ministry of Energy of Thailand (MOEN) has launched a set of long-term energy master plan or "Thailand Integrated Energy Blueprint" (TIEB) to help the country reach the desirable goal of energy security, economic prosperity and ecological sustainability in the long-run, focusing to develop a consistent set of strategies for Thailand's future energy needs, including 5 energy related plans as 1) Thailand Power Development Plan or PDP 2015 2) Energy Efficiency Plan or EEP 3) Alternative Energy Development Plan or AEDP 4) Gas plan and 5) Oil Plan.

Thailand Power Development Plan (PDP 2015) as a strategic planwas drafted in line with the energy policy and framework of the Royal Thai government by MOEN and the Electricity Generating Authority of Thailand (EGAT), with the 3E's principles as follows:

1. **Energy Security**:enhancing power system security and reliability, and focusing on fuel diversification to lessen natural gas dependency
2. **Economy**: maintaining reasonable cost of power generation
3. **Ecology**: alleviating environmental and social impacts for sustainable development

According to the direction of PDP 2015 emphasizing on increasing the share of coal and renewables to lessen the share of natural gas, generation mix will be changed. By the year 2036, natural gas share will be reduced to 37%, coal andlignite share will be increased to 23%, and renewables share will be

increased to 20%. For import power and nuclear share is about 15%, and 5% respectively. Moreover, the electricity tariff should also be appropriate and affordable.

Inter alia, Thailand is a net energy import country, fossil fuels imported for power generation, and another option for the future Thailand power supply is to import more power from neighboring countries; that will maximize the benefits of the regions as a whole on energy resources sharing by joint development on power plant projects and transmission system expansion projects as the ASEAN Power Grid (APG). APG aims at not only technical and economic aspects, but also cooperation and good relationship among the ASEAN member countries.

Moreover, for power system security and reliability, it is considered the development of not only power plants, but also transmission lines to connect and transfer power back and forth between regions. Thus, several projects of transmission system development are planned and implemented. The transmission system projects aim to interconnect as Grid to Grid between Thailand and neighboring countries at the new and existing interconnection points that are expected to be expanded or renovated in the future for accommodating APG and improving the stability and reliability of the power system of the country finally.

Keywords: Thailand Power Development Plan, PDP 2015, Thailand Power System, ASEAN Power Grid, ASEAN Economic Community

Prof. Dr. Steven H. Voldman

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Electrostatic Discharge (ESD) and Electrical Overstress (EOS): The State of the Art in Components to Systems

Abstract

Electrostatic Discharge (ESD), Electrical Overstress (EOS) and electromagnetic compatibility (EMC) continue to impact semiconductor manufacturing, semiconductor components and systems as technologies scale from micro- to nano-electronics. This lecture addresses the state of the art of electrostatic discharge (ESD) and electrical overstress (EOS) in today's electronic components and systems. The tutorial provides a clear picture of ESD, EOS and EMC phenomena, sources, physics, failure mechanisms, testing and qualification of chips and systems.

Keywords: Electrostatic discharge, Electrical overstress, Electromagnetic compatibility, Electrical over-voltage, Electrical over-current

Assoc. Prof. Dr. Vo Ngoc Dieu

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Ho Chi Minh City Univetsity of Technology, Vietnam

The Applications of Cuckoo Search Algorithms in Hydrothermal Scheduling Problems

Abstract

Cuckoo search, a recently new meta-heuristic algorithm which is inspired from the intelligent behavior of cuckoo bird, has been known as a powerful method with few control parameters for solving optimization problems. This is a new meta-heuristic algorithm inspired from the obligate brood parasitism of some cuckoo species by laying their eggs in the nests of other host birds of other species for solving optimization problems. The cuckoo search algorithm (CSA) has been widely and successfully applied to many optimization problems in electrical engineering field and hydrothermal scheduling problems in power system engineering. The hydrothermal scheduling problem (HTS) is to to minimize electricity generation fuel cost of thermal plants while all constraints from the thermal plants, hydropower plants and power balance constraint from the system must be exactly met. The challenge of the HTS problem is the large-scale problem with complex constraints. We introduce the applications of CSA and its variants to short-term HTS problems. The CSA methods have been tested on different systems to verify their efficiency for dealing with HTS problems. The obtained results have indicated the effectiveness and robustness of the CSA methods for the HTS problems.

Keywords: Adaptive cuckoo search algorithm, Fixed head, Hydrothermal scheduling, Nonconvex fuel cost function, Reservoir volume constraint

Professor Dr. Chih-Hsiang Liao

Department of Environmental Resources Management,
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Impact of population and economic growth on carbon emission in Taiwan using an analytic tool STIRPAT

Abstract

Carbon emission has increasingly become a serious issue of concern because of global climate change. Unfortunately, Taiwan is listed as top 20 countries of carbon emission in 2014. In order to provide appropriate measures to control carbon emission, it appears that there's urgent need to address how such factors as population and economic growth impact the emission of carbon dioxide in any developing countries. In addition to total population, both the percentages of population living in urban area (i.e., urbanization percentage), and non-dependent population may also serve as limiting factors. On the other hand, the total energy-driven gross domestic production (GDP) and the percentage of GDP generated by the manufacturing industries are assessed to see their respective degree of impact on carbon emission. Therefore, based on the past national data in the period of 1994-2014 in Taiwan, an analytic tool of Stochastic Impacts by Regression on Population, Affluence and Technology (STIRPAT) was employed to see how well those aforementioned factors can describe their individual impact on global warming potential, which is measured by the amount of total carbon emission into the atmosphere. Seven scenarios of STIRPAT model were proposed and tested statistically for the significance of each proposed model. As a result, 2 models were suggested to illustrate and, on the other hand, predict the impact of carbon emission due to population and economic growth.

Keywords: IPAT, STIRPAT, GDP, Abundance elasticity of impact, Carbon emission, Global warming potential

Dr. Medhat Mohammed

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Al Azhar University, Egypt

Cation Modified Silicates for Catalytic Production of Phenol from Benzene

Abstract

In this work we tried to produce phenol from benzene directly using Silicates modified with Al and Fe. The preparation of Al and Fe-Silicate have been carried out at 373 K by the mixing of silicate solution with Al and Fe sources and the obtained material were dried at 373 K overnight and calcined at 823 K. The calcined materials were characterized using XRD, IR, SEEM and SBET. The oxidative properties of obtained solids (Al and Fe-Silicates) have been tested in the catalytic oxidation of benzene to phenol at different temperatures. The oxidation processes were followed up using HPLC and UV-Vis Spectrophotometer.

Keywords: Fe and Al Cation modified Silicates, Benzene oxidation, H_2O_2, Phenol

Prof. Dr. Chalermchon Satirapod

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Mean Atmospheric Temperature Model Estimation for GNSS Meteorology Using AIRS and AMSU data

Abstract

In this paper, the problem of modeling the relationshipbetween the mean atmospheric and air surface temperaturesis addressed. Particularly, the major goal is to estimate themodel parameter for regional scale i.e., Thailand. To formulatethe relationship between the mean atmospheric and air surfacetemperatures, the triply modulated cosine was adopted to modelthe surface temperature as a periodic function. The surfacetemperature is then converted to mean atmospheric temperatureby a linear function. The parameters of the model is estimatedusing extended Kalman filter. Traditionally, the radiosonde datais used as measurement. In this paper, the satellite data fromatmospheric infrared sounder, and advanced microwave soundingunit sensors was used because it is free of charge and has globalcoverage and high temporal resolution. The performance of theproposed model was tested against that of a global model via an accuracy assessment of the computed GNSS-derived PWV.

Keywords: Precipitable Water Vapour (PWV), Global NavigationSatellite System (GNSS), Mean atmospheric temperature, Atmospheric Infrared Sounder (AIRS), Advanced MicrowaveSounding Unit (AMSU)

Prof. Dr. Donald Slack

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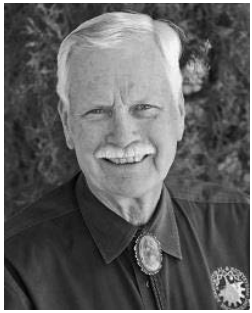

Subsurface Drip Irrigation: A Technology for Safer Irrigation of Vegetable Crops

Abstract

A number of recent outbreaks of food borne illnesses in the US have been traced to contaminated water either used in washing vegetables or in irrigating them. While it is readily apparent that such foods as leafy green vegetables or crops such as melons which touch the soil surface or come in contact with irrigation water can become contaminated by irrigation water containing pathogens, there is strong evidence in the literature that such crops do not become contaminated so longas the edible portions of the plant do not come in contact with irrigation water or a wetted soil surface. Thus we undertook a modeling study utilizing the well-known software HYDRUS-2D to determine minimum depths of placement of irrigation tubing for subsurface irrigation which would ensure that the soil surface would not become contaminated. We choose to model a cropping system commonly used for lettuce production in Arizona where the crop is nearly always irrigated using furrow irrigation. Lettuce is usually grown in Arizona in the fall and winter months when maximum crop ET is about 4.9mm per day. We used an application efficiency of 95% for subsurface drip irrigation on two different soil types, sandy clay loam and loam. Assuming that we would irrigate daily for two hours to apply the 5.2mm of water required, we found water would wet the soil to a distance of 16 cm above the drip emitter in the both the clay loam and clay soils. Thus it would appear that, in these soils a drip tube placed 20 cm below the surface should avoid soil surface wetting. However, given the great spatial variability in such soil parameters as bulk density and hydraulic conductivity, we would recommend a minimum design depth of 30cm to avoid soil surface wetting.

Keywords: Subsurface drip irrigation, Simulation, Crop contamination, HYDRUS 2D

Assoc. Prof. Dr. Rikke Lybaek

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Enhancing identified Circular Economic benefits related to the deployment of Solrød biogas plant

Abstract

This paper investigates how experiences from the deployment of Solrød biogas plant in Denmark - a large scale centralized biogas plant - can assist future biogas technologies in achieving Circular Economic benefits. Departing from a theoretical understanding of Circular Economy provided by Ellen MacArthur Foundation, the paper analysis three areas being; 1) Biogas production, 2) Nitrogen, Phosphor & GHG, 3) Re-cycle/cascade materials, and consequently elaborate on the environmental benefits obtained, as far as CO_2 emission reductions from biogas production substituting fossil fuels, improved water quality and hence reduced Green House Gas (GHG) emissions due to lower nitrogen spills, and re-cycling of nutrient on farmland recovering finite resources and improving crop yield. Economic spin-off effects are presented, as far as new jobs created in the local community. Learning from Solrød Biogas, this paper further proposes to include the following activities when planning for future biogas plants: Waste-stream identification and coupling in the local community; Measuring the value of digestate as fertilizer; Short distance to farmers delivering manure; and Plant design according to local energy market.

Finally, the paper suggests how to qualify the Circular Economic concept based on the finding from Solrød biogas plant. It is here concluded, that emphasis should be on cascading energy from the biogas production by means of Combined Heat and Power (CHP), district heating or process heat to industry. Besides this, cascades in the manufacturing chain must also be intensified, allowing a more efficient materials and energy utilization and re-cycling in this part of the product chain. This will consequently reduce the total quantity of waste being generated by manufacturing industries, and thus benefit re-cycling strategies that only capture, and seek to re-use, a limited fraction of the waste being generated from industry.

Keywords: Circular Economy, Cascading, Biogas, Solrød biogas plant, Denmark

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Turbidity removal by centrifugal microfiltration

Abstract

Water turbidity is an important characteristic of surface waters and wastewater treatment plant effluents and is a key test of water quality. Turbidity is the lack of clarity of water caused by microalgae and other particles that attenuate light, and the cost of clarifying water can be high. This is primarily due to the physical and chemical steps that must be taken to remove the extremely small entrained particles and colloidal material that cause high turbidity, and the large amounts of water that generally must be dealt with for such small masses of entrained material.This paper discusses the results of a series of experiments of a potentially new method of clarifying water by incorporating microfiltration through a high throughput filter operating under a centrifugal force. The results have shown that significant reductions in turbidity can be achieved at relatively high water flux values through the commercially available filter indicating the potential of the technology as a water clarifying method by means of this low energy separation device

Keywords: Turbidity removal, Water clarification, Microfiltration, Centrifuge, Centrifugal force, Pollution prevention

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Design of the plant factory suitable for Okinawa

Abstract

"Plant factory" is one of the advanced facilities for vegetables cultivation under the artificially controlled environments, i.e., temperature, humidity and CO2 content. Recently, it becomes popular in Japan, USA, China and others. However, there are some problems to overcome for wide spread. A project to develop a specific plant factory, "Okinawa-type plant factory", adjusting to the severe environmental and social conditions has been carried out by special fund of Okinawa prefecture. The main target of the project was to reduce 30% of energy consumption. To achieve it, three methods were investigated using the solar energy and LED lamp, that the designed plant factory is basically the artificial lighting type. Forty feet reefer container was employed for the cultivation room, and insulated panels are partially used. Solar energy is used for lighting and air-conditioning. Solar energy is converted using the heat collecting panels to thermal energy for air-conditioning. Hot water with 75-85 degree-C obtained by the collector is used to produce cool water using the adsorption chiller. Sunlight is introduced in the cultivation room from the skylight windows. DC to DC system was also employed for PV utilization. The use of solar energy and LED lamp are effective to reduce the energy consumption.

Keywords: Okinawa-type plant factory, Energy saving, Solar energy

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Development of nondestructive measurement system for mango fruit using near infrared spectroscopy

Abstract

Near infrared spectroscopy has been widely used for the evaluation of chemical component in food and agricultural products. In this study, a portable near infrared (NIR) spectrometer was developed to evaluate internal and external quality, simultaneously. Mango fruit are grown in southern part of Japan, and the dealing is conducted with high price. Sorting facilities has been introduced to the area to check the internal quality of each fruits. However, most of mango fruit sells directly to consumer by farmer using postal package. Therefore it is difficult to check the quality of mango fruit in this case. In order to evaluate internal and external quality, portable NIR instrument, which is affordable and available for farmer, has been developed. SSC (soluble solid content) and skin color of mango fruits (*Irwin*) were investigated using a developed portable NIR instrument. Calibration equations for the SSC and skin color were developed using a partial least squares (PLS) regression. The accuracy of the calibrations were satisfactory with correlation coefficient of 0.90 – 0.95 in the range 580–970nm wavelength. It is concluded that the portable NIR instrument is a useful and effective tool for the nondestructive analyses of sugar content, skin color for mango fruits.

Keywords: Mango fruits, Near infrared spectroscopy, Portable NIR instrument

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Three-dimensional Omega-net microwave len

Abstract

Straight forward design for three-dimensional microwave lens operating from X- to K-band is proposed. Two-dimensional Omega-net structures proved to have near-zero refractive index with low loss are used as a startup design, and later are optimized and implemented to construct a three-dimensional near-zero refractive index structure. A 3D single-shell Omega-net lens can generate dual near-zero refractive index bands, 9.16GHz-10.32GHz or 5.32% BW and 11.36GHz- 12.62GHz or 5.25% BW. Other two candidates, i.e., 3D double-shell Omega-net and 3D diamond double-shell Omega-net lenses are also introduced.

Keywords: Microwave, Lens, 3D, Refractive Index, Near-zero, Metamaterials

Metamaterial-based microwave sensors

Abstract

Significant resonance shift is found in both reflection and transmission coefficients from both parallel and perpendicular excitations in a helical structure. The responses from the perpendicular excitation show better sensitivity than those from the parallel excitation at 480MHz-560MHz for 0.2 circumference difference.Additional electromagnetic properties of a helical structure, such as chirality, optical rotatory dispersion and circular dichroism can also further combine to enhance the sensing performance.

Keywords: Metamaterials, Helical, Sensors, Microwave

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Impact on fuel consumption reduction of introducing hybrid car in Bangkok central area by using probe information and mobile fuel consumption measurement

Abstract

Since a hybrid car consumes less gasoline, especially under traffic congestion situation, it is expected to reduce fuel consumption from vehicles in a city. Thus, amount of fuel consumption reduction by introducing hybrid car should be estimated to understand its impacts. However, fuel consumption rate is deeply depend on driving situations which are locally fluctuate and unstable. Therefore, estimation method using probe data which can reflect local traffic condition should be applied. In this study, the method to estimate fuel consumption from both ordinary and hybrid vehicle was proposed based on probe information and mobile fuel consumption measurement. Then, it was applied for traffic at the central area of Bangkok. To represent local traffic situation, the approach to utilize four driving different modes based on probe data from around 10,000 taxis was employed. Also, to represent fuel consumption under different driving modes, fuel consumptions of hybrid cars were measured by using tested vehicles in Bangkok. As a result, 15 to 50 present of fuel can be saved by replace all passenger vehicles to hybrid vehicles in the central area of Bangkok. Reduction during morning and evening peak, especially on cruising mode (vehicles run steadily), are significant.

Keywords: Fuel Consumption, Hybrid Car, Probe Data, Driving Modes Measurement of National Transportation Improvement Benefit Using Dynamic Spatial Computable General Equilibrium Model

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Secretary – General of Asian Transportation Research Society (ATRANS)

Utilization of technological device for development of accident database applicable to public use in Thailand

Abstract

The severity of road accidents in Thailand has been in critical stage for decades. Many studies show that accident statistical records collected from various sources indicate different number of occurred accidents, injuries and fatalities, particularly inaccurate accident occurred locations and inaccessibility of data leading to a difficulty in mitigating the problems. This paper presents a development of user-friendly mobile application so called "ATRANS Safety Map Applica" in two different versions: one is for Hospital Emergency Room (ER) Use and another is for Public Use (including local authorities, municipalities, universities, schools and general public). This ATRANS Safety Map Applica functions as a tool for collecting road accident data. While ATRANS Safety Map Applicafor ER Use versioninputs data from hospital emergency room (ER), called Injury Surveillance Information System (ISIS), it will calculate the severity index of each road segments. The severity index can be shown to municipalities and the Provincial Administration suggestive for reactive improvement of road safety in their jurisdictions. Whereas the ATRANS Safety Map Applicafor Public Use version is more open to public access and easy-to-understand concept, it allows any individuals to locate the potential hazardous spots and black spot information based upon their actual incidental and accidental experiences on the application. This will encourage participation in identification of potential hazardous spot and black spot locations in the communities which automatically generates road safety awareness in Thai Society particularly in rural areas where accidents most frequently occurred and utilize those data to calculate the severity index of each road segment applicable for further improvement.

Keywords: Road safety, Accident database, Potential hazardous spots and black spots, ATRANS Safety Map Application

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Application of right green washing fluids on soil washing process for dioxins contaminated soils treatment

Abstract

High contamination of dioxin found in soil possesses significant environmental challenges in our planet. Soil washing is one of a successful remediation process which primarily used to treat coarse soils. Several literatures have applied various kind of chemical washing liquids to remove dioxins from the soil though secondary environmental effects are concerned. This study intends to develop environmental friendly soil washing methods to meet an effective removal efficiency and acceptable remedial cost. Sugarcane wine, compost leachate, and grinded fish broth were chosen to probe the feasibility. Each washing liquids were analyzed for both semivolatile organic compounds (SVOCs) and volatile organic compounds (VOCs) components to investigate bio-surfactant contents. Various identified compounds revealed these fluids can help to remove dioxins from the contaminated soil. In the experiments, high removal efficiency were observed for up to 70%~95% after five to six washes. Although effective removal was observed, but significant amount of wastewater were produced and problems were not completely resolved. Thus, the optimal washing conditions are necessary to examine to minimize the overall cost while improving the effectiveness. Moreover, an appropriate treatment method is required for those washed dioxin containing wastewaters.

Keywords: Hazardous waste treatment, Green remediation, Sustainable remediation, Green and sustainable remediation, Soil washing, Dioxins contaminated soil

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Perspective on Urban Transportation Strategy with BRT for developingCities

Abstract

Bus Rapid Transit (BRT) system is one of the best alternatives for urban transportation strategy especially in developing cities mainly because of its cost-efficiency. Starting from Curitiba, Brazil in 1974, including Bogota, Colombia in 1999, many cities in Latin American Countries have applied BRT system. In almost all cases, BRT systems are working as reliable service with higher-capacity. In some special cases, BRT systems are well coordinated with urban transportation strategy framework and/or with urban planning strategy framework, taking other transportation modes and land use into account. On the other hand, there have been very few cases of BRT systems in Southeast Asian Countries. Many cities have been considering BRT introduction, most of which, however, do not look to have sufficient consideration either with urban transportation strategy or with urban planning strategy such as Transit Oriented Development (TOD).

This paper reviews the history of BRT systems in the world. Curitiba and Bogota are reviewed more deeply with fruitful results of field surveys, mainly from urban transportation strategy and urban planning strategy points of view. Multi-modal and Inter-modal aspects are well discussed. Relationship with regular buses, balance between private car usage and parking policies are also well discussed. The framework of urban bus planning, management and operation is considered with roles of public sectors and private ones. In terms of urban planning strategies, reviewing the original and applied concepts of TOD, the authors discuss how TOD strategy could work with BRT systems.

In conclusion, the authors address the conditional possibilities and limitation of BRT systems especially in case of developing cities. More specific implication is also mentioned in case of medium-sized cities in Southeast Asian countries.

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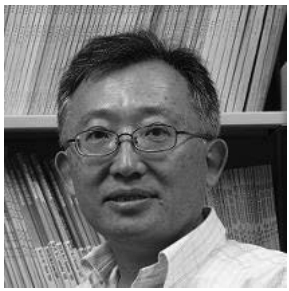

A new technology for improving deep soft soil ground by floating type mixing wall and its application in Japan

Abstract

Areas where soft soil is deeply and widely deposited exist not only in Japan but also widely spread in Southeast Asia. One of the typical soft soil areas in Japan is in the Ariake Sea coastal areas which is located in western part of Kyuhsu island. The Ariake clay is well known as a very sensitive and compressible soil. Thus in the case of constructing a high-standard road considering a high embankment in such area, it is necessary to overcome various technical problems of soft soil characteristics.

A high – standard road is planned to be constructed in Kumamoto – Uto area, which is located to the south of Ariake Sea coast. In this area, soft clayey soil layers with some sand layers is deeply deposited extending vertically around 40m in average. A geotechnical technology for improving deep soft soil ground by floating type mixing wall is considered in this study as one of the soft ground control technologies suitable for the ground conditions of the region. Its effectiveness has been investigated through the results of embankments testing and numerical analysis. In this paper, the characteristics of the wall type improved technology is first introduced through the results of embankments tests. In addition, the concept of settlement prediction of the ground due to the soil improvement by the float type deep mixing wall is newly presented together with explaining the effect of the method on the embankment settlement control in the case of Kumamoto-Uto road.

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Recent challenges in Japanese Supply Chain Management

Abstract

This research presents recent challenges and progress in Japanese supply chain management. We address renent changes arising in Japanese supply chain management, including supply chain portfolio management, supply chain risk management, supply chain flexibility planning, omni-channel management and distribution strategy. We discuss strength and weakness of Japanese supply chain management on the statistical point of view, and suggest possible new directions for Japanese companies to stay competitive.

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Topic A: Civil Engineering and Construction Technology **ID 4**

Application of production scheduling technique for dispatching ready- mixed concrete

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Keywords: Schedule, Dispatching, Earliest Due Date, First Come First Serve, Ready-Mixed Concrete

Abstract. Nowadays, ready-mixed concrete so called RMC industry has an important role in construction work projects since it becomes as one of mechanism in construction works and has widely been used comparing with previous day. Increasing efficiency is focuses in order to be competitiveness of the business. Therefore, this study aims to increase efficiency of delivery management system by using the modeling of production planning and management of daily scheduling and dispatching of ready-mixed concrete trucks in order to solve the bottleneck problem of production affecting consequent RMC delivery process .In fact, A capacity of concrete machines seems to be capacity limitation concrete can be mixed for one vehicle at a time. Earliest Due Date (EDD) and First Come First Served (FCFS) are two techniques of priority rules using for RMC scheduling to providing more precision and accuracy of related inputs which can in order improve efficiency of entire RMC process. In the model, factor affecting RMC delivery process such as distances, travel speed and travel times are determined by using GIS – Geographic Information Systems software (ArcGIS) and has also input construction sites data, then builds a model base on priority rules to find the production and dispatching schedule. Preliminary results from the model showed that delivery delays and also reduce daily scheduling and planning time can be reduced. Moreover, the model was applied to a concrete truck freight management company that has one manufacturing machine and delivers to several construction sites (Single Machine-Multiple Sites) in urban areas. By improving efficiency by optimizing delivery times and reducing the cost of waiting time at sites, this could cut operating costs and increase companies' revenue because there will be time for more orders.

Spatial Analysis of Flood Susceptible Areas in Iligan City Using Geographic Information System (GIS)

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Keywords: Flood Susceptibility, GIS, Iligan City, Spatial Analysis of Floods

Abstract. A spatial analysis is conducted to determine flood susceptible areas in Iligan City using GIS technology. The analysis results are compared with the flooding maps, generated through actual survey of the areas and mapping the affected areas using GIS during the tropical storm "Sendong" (International codename "Washi") on December 17, 2011 by the Mines and Geosciences Bureau (MGB) and by the Iligan City Planning and Development Office (ICPDO). The criteria used in the study include slope, the land cover, the stream networks and the rainfall data of Iligan City. The rank sum method was used to categorize the criteria from the most important to the least important one. Weights were assigned to each rank and normalized weights were determined to serve as basis for overlaying the criteria to generate the flood susceptibility map of the City. The study reveals that for a total land area of approximately 64.4 hectares coverage for Iligan City from the PhilGIS data, 21.8 hectares (34%) is classified as having low susceptibility to flooding, 37.5 hectares (58%) as having moderate susceptibility, and 5.1 hectares (8%) as having high susceptibility to flooding. The areas with high susceptibility includes the high built-up and densely populated areas of Iligan City. The extent of flooding during the tropical storm "Sendong" of the different areas in Iligan City from the spatial analysis are overlain to and compared with the maps generated from MGB and ICPDO as a way of validating the results of the study. The results are approximately eighty percent (80%) in agreement with the map generated by the MGB and approximately seventy five percent (75%) in agreement with the map generated by the ICPDO.

Topic A: Civil Engineering and Construction Technology **ID 21**

Development of High Performance Concrete containing High Calcium Fly Ash

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Keywords: High performance concrete, Mechanical properties, Fly ash, Workability

Abstract. High performance concrete is a kind of concrete with compressive strength at 28 days over 50 MPa, high slump of 20 cm, and large flow of 50 cm without segregation. Low water to cement ratio is a usual practice to achieve the required high compressive strength. The amount of free water is decreased and often more cement is added into the system. However, Portland cement is relatively expensive and if used in large quantities, it can cause heat from reaction and fast setting of concrete, which lead to undesirable fresh concrete properties. This research is aimed to decrease the amount of cement and re-adjust mix proportion of high performance concrete to economize production cost and be able to use high performance concrete with the same quality. In this research, the researcher re-adjusted the water to cement ratio to control slump and flow value to be more than 20 cm and 50 cm respectively. The test revealed that when 2.5% of super plasticizer by cement weight was added to the proportion, the compressive strength at 28 days reached 58 MPa with 30% cement reduction by weight. Moreover, when high calcium fly ash was mixed into the system, its work ability further improved, water to cement ratio decreased, and compressive strength increased. The result showed that it largely helped to decrease the use of cement and production cost, and the properties of high performance concrete remained satisfactory.

Use of recycled concrete aggregate in high-calcium fly ash geopolymer concrete

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Keywords: Geopolymer concrete, Bonding strength, Thermal conductivity, Ultra pulse velocity, Recycled aggregate

Abstract. The comparison results of using crushed limestone (NA) and recycled concrete aggregates (RCA) as coarse aggregates in high-calcium fly ash geopolymer concrete with and without temperature curing are presented. Local river sand with a fineness modulus of 2.1, sodium hydroxide solution concentrations of 8, 12, and 16 Molar, and sodium silicate were used to produce geopolymer concrete (GC). The curing was separated in two conditions: the first was cured at ambient temperature (AT) and another was cured at temperature of 60°C for 48 hrs. (CT). The compressive strength, thermal conductivity, and ultra pulse velocity of GC were investigated at age 7 days. The results found that RCA could be use as coarse aggregate in GC. The thermal conductivity increased with the increasing of compressive strength. Curing at 60°C yielded compressive strength about 3 times higher than that of AT. However, both AT and CT curing, GC containing RCA had thermal conductivity and ultra pulse velocity lower than those of containing NA.

Topic A: Civil Engineering and Construction Technology **ID 57**

The impact of transport infrastructure development on modal shift: case study of rubber goods in the southern Thailand

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Keywords: Modal shift, Transport infrastructure, Rubber goods, Southern Thailand.

Abstract. Thailand is a major agricultural production country in the Southeast Asia. The government has promoted developments of transport infrastructure to increase the value of agricultural goods and reduce the transportation costs. However, such developments are still in strategic plans of all products, not by product. This paper studies the impact of transport infrastructure development on a modal shift for rubber product transport in the southern Thailand. The multimodal transport model was developed to evaluate the impact. The results show that if all government projects, including the improvement and expansion of major roads to have at least four lanes along with the development of rail and water transports, are implemented; the transport time and cost could be reduced. However, there are a few modal shifts because the development of rail and water transports is insufficient to make the rail and water transports more convenient than the road transport. Therefore, more rail and water transport facilities, e.g. transfer points between truck and train (and port) as well as road network connecting the center of cargo transshipment and port, should be improved to enhance the capability of transport infrastructure in Thailand and interregional trade.

Topic A: Civil Engineering and Construction Technology **ID 68**

Utilisation of discarded motorcycle inner tubes as the reinforcement for embankments

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Keywords: Embankment, Slop failure, Motorcycle inner tube, 1-G condition

Abstract. This study attempted to address the two problems of embankment stability and a growing number of discarded tyres and their associated parts such as motorcycle inner tubes. It was done by introducing woven motorcycle inner tube as reinforcement in an embankment with the aims at reducing the construction cost as well as conserving the environment. To achieve the purposes of this research the loading tests on model embankments having various configurations of reinforcement constructed under 1-G condition were conducted. The loading test results revealed that the plain embankment has the highest displacement as initially predicted. When one-layer of woven inner tubes was introduced, however, the stability was evidently improved. Furthermore, the stability was even better when two-layer of woven motorcycle inner tubes was included. Nonetheless, when three-layer of motorcycle woven inner tubes was included the displacements were very similar to those of the embankment reinforced with two-layer of woven inner tubes. This suggests that the three-layer of reinforcement is no better than those of the two-layer of reinforcement. From the test results and analyses, it may be concluded that woven motorcycle inner tubes could be employed as reinforcement to increase the stability of an embankment thereby reducing the overall construction cost as well improving the environment.

Topic A: Civil Engineering and Construction Technology **ID 71**

Physical and thermal properties of fired clay bricks mixed withrice husk ash and fly ash

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Keywords: Clay brick, Thermal properties, Physical properties, Rice husk ash, Fly ash

Abstract. Thailand is located in a tropical region, with high intensity of sunlight, high temperature and humidity. Thus, preventing heat transfer into the building is required in order to save electrical energy for air-conditioning systems. This study aims to investigate the physical and thermal properties of construction bricks in order to increase their effectiveness of heat prevention. An attempt is made to increase discontinuous voids in fired clay bricks. Rice Husk Ash (RHA; 0-30 % by weight) and Fly Ash (FA; 0-30 % by weight) were added in brick mixture to increase those voids. Compressive strength and water absorption of bricks were tested. The testing results showed that compressive strength decreased and water absorption increased when RHA and FA were added. The thermal conductivity coefficient of bricks were also investigated. The results confirmed that the higher amount of RHA added, the higher thermal resistance of bricks. Similar results were found for FA. Increasing an amount of FA also increased thermal resistance of bricks. Thermal time-lag behavior was also tested. The results showed that RHA hollow bricks took the longest time in heating and took the shortest time in cooling. These properties are good for heat prevention. These bricks which were developed and tested in this research are conformed to the Thai Industrial Standard. Finally, it can be concluded that because of its thermal behavior, RHA hollow brick is a suitable energy-saving brick for hot and humid climates.

Fragility curves of reinforced-concrete buildings damaged by the 2004 tsunami

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Keywords: Tsunami fragility curves, 2004 Indian Ocean tsunami, Reinforced-concrete building

Abstract. The December 26th, 2004 Indian Ocean tsunami caused damage to many buildings and killed many people in the South of Thailand. It is important to mitigate the damage by tsunamis in the future. Fragility curves are key parameters for the tsunami risk assessment. The fragility curves are developed by the data of observed building damage in the December 26th, 2004 Indian Ocean tsunami. In this study, the fragility curves are established using a maximum likelihood method and describe the damage probability corresponding to a specific damage level for different inundation heights. Four different damage levels are defined ranging from no structural damage to collapse. The fragility curves for reinforced-concrete buildings are classified into two types: one-story buildings and buildings taller than one story. For one-story buildings under the inundation height of 4 m, the probability of exceeding the damage in primary members is 90%. For buildings taller than one story under the same inundation height, the probability of exceeding the damage in primary members is only about 25%.

Tsunami risk assessment of the 2004 Indian Ocean tsunami in Kamala beach Phuket

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Keywords: Tsunami risk assessment, Fragility curves, Reinforced-concrete building

Abstract. The December 26th, 2004 Indian Ocean tsunami caused damage to many buildings and killed many people in Indian Ocean countries. Regarding the 2011 Tohoku Japan tsunami, the devastating tsunami ravaged the eastern coast of Japan. It is important to mitigate the damage by tsunamis in the future. These events emphasize the need of tsunami risk assessment for evacuation planning, estimation of loss and estimating residential damage from tsunami hazard. The residential damage in Kamala Beach, Phuket is evaluated by the proposed tsunami fragility curves. The proposed tsunami fragility curves are considered only reinforced-concrete buildings and classified into two types: one-story buildings and buildings taller than one story.Building inventory is surveyed and classified into 5 zones. The tsunami inundation heights in each zone are averaged from the observed damage data. The results of evaluated buildings damage are compared with actual observed damage. Most one-story buildings are damaged in primary members and for buildings taller than one story are damaged in secondary members only. The damage probability for observed buildings of each area agrees well with the evaluated damage of buildings.

Maximum temperature prediction for concrete sections during cooling phase

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Keywords: Concrete section, Cooling phase, Energy based method, Maximum temperature

Abstract. Maximum temperatures at each location within a concrete cross section exposed to fire during both heating and cooling phases are required to evaluate residual strength of RC members. Available methods for predicting the maximum temperature have been limited to complicated numerical methods. Therefore, this study proposed a simplified equation to predict the maximum temperature by using a parametric study based on a validated finite element (FE) model. One dimensional heat transfer analysis under a standard fire curve was a scope of this study. Investigated parameters were section thicknesses, fire durations and cooling durations. Based on the parametric study and an energy based method, simplified equations to evaluate the maximum temperature during the cooling duration of 4 h were proposed. The equations were formulated as functions of an effective thickness, a temperature at the non-fire exposed surface and an exponent of temperature profiles at the end of the heating phase. Comparing with those of the FE results, the predicted maximum temperatures agree well and have the coefficient of determination of 0.9737.

Driving parameter influencing of fuel consumption and emissions of motorcycle driving on signalized urbancollector

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Keywords Onboard measurement system, On-road driving data, Fuel consumption, Exhaust emissions, Motorcycle

Abstract. This study aims to find the driving parameter influencing fuel consumption and emissions of motorcycle driving on signalized urban collector. The motorcycle onboard measurement system was developed to measure instantaneously and continuously record the on road driving data, including speed-time profile, emissions and fuel consumption, by second. The testing motorcycle was driven by 30 sampling motorcyclists on signalized street in Khon Kaen City, Thailand to collect their on-road driving behavior during the morning peak period. The cluster analysis was applied to find out the driving parameter categorizing the collected data into three groups of low, medium and high fuel consumption and emissions. The result reveals thatproportion of idle time significantly influencedto the fuel consumption and emissions of motorcycle driving on signalized urban corridor but the acceleration and running speed did not.

Outsourcing decision factors of building operation and maintenance servicesin hospital business

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Keywords: Outsource, Decision factor, Building operation and maintenance, Hospital

Abstract. Building Operation and Maintenance (BOM) is the important activities which can help hospital to get the advantage over competitors. Outsourcing is an approach exists of the BOM to perform the service for customers instead of businesses. The objectives of this paper are to identify, prioritize, and categorize the decision factors of hospital managers for outsourcing the BOM services. From the literature review, the set of 56 factors believed to affect the decision which can group into 6 groups namely: strategic, management, technological, economical, quality, and function-characteristics. The 35 of biggest hospitals in Bangkok, Thailand were surveyed by using the questionnaires and analyzed with Relative Importance Index (RII) and Factor Analysis (FA). There are 35 respondents include: 31 BOM managers, 3 BOM deputy/assistant managers, and 1 BOM supervisor. All the respondents have considerable experience, e.g. 77% respondents have more than 10 years. The RII results indicate that the quality, management, technological, strategic, function-characteristics, and economical in first to sixth position of factors. After that, the 3 factor groups were classified from the top 10 factors with using FA method include: responsiveness, management, and quality. These findings can understand the respect of managers in hospital business.

Finite element modeling of concrete specimens confined with metal sheet strips

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Keywords: Finite element analysis, Concrete, Column, Confinement, Metal sheet

Abstract. This paper introduces a nonlinear finite element model using Msc.MARC to study behavior of concrete columns partially confined with metal sheet strips subjected to uni-axial compression. The columns in this study have circular cross sections with the diameter of 15 cm and the height of 75 cm, wrapped around by 5 cm metal sheet strips. The results from 3D finite element modelling are analyzed for internally induced stresses and strains. It is revealed that the predicted column behavior is compatible with observed experimental data.

Psychological factors influencing speeding intentions of car drivers and motorcycle riders on urban road environment in Khon Kaen City, Thailand

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Keywords: Theory of Planned Behaviour, Attitude, Perceived Behavioural Control, Intention, Speeding

Abstract. The aim of this study was to examine and compare psychological factors influencing the riders' and drivers' speeding behaviour, using the theory of planned behaviour (TPB). Traffic psychology modules including attitude (AT), subjective norm (SN), perceived behavioural control (PBC) are used to determine speeding intentions in urban environment. A sample of 188 car drivers and 174 motorcycle riders were collected from the two universities within Khon Kaen Province, Thailand. The Structural Equation Model (SEM) was used to examine and explain speeding intentions. The results indicated that the TPB could explain 33% and 41% of the variance in drivers' and riders' intentions, respectively. Maximum influence on drivers' speeding intention was attitude (AT) while riders' intention was perceived behavioural control (PBC). Therefore, Khon Kaen's authorities should to determinate safety policies that these policies can change driver's attitude and rider's perceived behavioural control. The outcome of this study help to understand drivers and riders behavior and can be useful for safety measures development. As a suggested results for the practical policy for the speed enforcement, Khon Kaen' s authorities should determine the speed control measurement such that drivers should be enhancing speeding knowledge while riders should be social campaigns related speed and concern from family, police surveillance, changing physical of road environment for control speed.

Cross-cultural differences in speeding intentions of drivers on urban road environment in Asian developing countries

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Keywords: Intention, Urban Speeding, Theory of Planned Behaviour, Asian Developing countries

Abstract. The aim of this study was to examine and compare the psychological factors influencing driver speeding behavior in 3 cities of Asian, focusing on developing counties, using the Theory of Planned Behaviour (TPB). Data was collected from 570 respondents in the urban areas of Khon Kaen, Thailand, Vientiane, Laos and Phnom Penh, Cambodia. The psychology factors of TPB include three factors including attitude (AT), subjective norm (SN) and perceived behavioral control (PBC). These factors were employed to explain speeding intentions in urban road environments. The Structural Equation Models (SEM) was used to examine and explain speeding intentions. The results indicated that the TPB could explain the variance by intentions of drivers in Khon Kaen, Vientiane and Phnom Penh at 33%, 46% and 84%, respectively. The most significant of the psychological factors for Khon Kaen drivers was determined by attitude (AT), while the speeding intentions of Vientiane drivers and Phnom Penh drivers were determined by perceived behavioral control (PBC). The authorities of each city should create and implement safety policies that can improve these psychological factors, which could have a positive effect on drivers speeding intentions in urban road environments. The outcome of this study could prove useful for understanding the speeding attitudes of drivers in three different countries and would be beneficial for the development and introduction of preventative safety measures in the countries as well.

User Perception of Paratransit in Thailand: Case study of Journey to Work in Khon Kaen City

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Keywords: Paratransit, Songtaew, Journey to work, Satisfaction, Khon Kaen

Abstract. Studies regarding paratransit in Thailand are mainly concerned with issues such as the role of paratransit focusing on the supply side like service characteristics and service quality. However, the study on Songtaew service in Thailand have not yet well understood. This study is the attempt to focus on the demand side of Songtaew service in the medium-sized cities in Thailand, including Khon Kaen City by examining the use of Songtaew from the commuters' point of view by their participation in rating the condition of Songtaew and loyalty to it. Its main objectives are to investigate the workers' motivations for using or not using Songtaew, and to understand which factors influence workers in Khon Kaen City to use Songtaew.Based on the analysis, the cost and the convenient have strongly a positive impact on the decision to commute by Songtaew and the users want to keep using it in the future.

Topic A: Civil Engineering and Construction Technology **ID 258**

Strength and Behaviour of Small-Scale Reinforced High Calcium Fly Ash Geopolymer Concrete Beam with Short Shear Span

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Keywords: Geopolymer concrete, High calcium fly ash, Shear capacity, Flexural capacity

Abstract. The small-scale reinforced high calcium fly ash geopolymer concrete beams with short shear span were studied in this research. Reinforced concrete beams with 150x150 mm^2 cross-section and 530 mm in length were used for tests. Conventional reinforced Portland cement concrete beams (RC) with designed concrete compressive strengths of 35, 45 and 55 MPa and high-calcium fly ash geopolymer reinforced concrete beams with similar strength were tested. The geopolymer concretes (GC) were designed with alkaline liquid to fly ash ratio (L/A) of 0.5, sodium silicate to sodium hydroxide (S/H) ratio of 1.0 and two sodium hydroxide (NaOH) concentrations of 10M and 15M. Two temperatures of 23 and 60 °C were used for curing geopolymer reinforced concrete (GRC) beams for 24 hr, while RC beams were moist cured at 23 °C. The maximum sustained moment and shear were compared with the predicted values from the RC-design standard. The results showed that the failure patterns of small GRC beams were different to that of normal RC beam. The small GRC beams failed in flexure whereas the similar small RC beams failed in shear. However, the GRC beams were able to sustain higher shear and moment than the values obtained from the design code. The different in failure mechanism was probably due to the different in modulus of elasticity of geopolymer concrete and normal concrete.

Production and characterization of porous insulating fired clay bricks with corn cobs admixture

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Keywords: Thermal Conductivity, Porosity, Insulating Brick, Ceramic

Abstract. This research studies physical, mechanical and thermal properties of fired clay bricks. Three different sizes of corn cobs were used as an additional material in production process; large (L) between 2 and 1.7 mm, medium (M) between 1.6 to 1.4 mm and small (S) less than 0.5 mm. Then, they were added into the specimen in an amount of 0, 5, 10, 15, 20, 25 and 30 %wt of the total weight. All samples were fired at 950-1150^{o}C and were tested by using universal testing machine (UTM), scanning electron microscopy (SEM), specific surface area (BET) and thermal conductivity(heat flow meter). The results indicated that the compressive strength of fired samples clay bricks decreased because of the percentage of corn cobs added in the mixture. However, the specimens with 10 %of large corn cobs which were fired at 1150^{o}C provided a good result of thermal conductivity. The results also meet the Thai Industrial standard (TIS 77-2545).

Influence of clay content on permeability of compacted lateritic soil

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Keywords: Compacted soil, Laterite, Permeability, Clay content

Abstract. This research studied the permeability of compacted lateritic soil in vertical and horizontal directions. The instrument for measuring the coefficient of permeability was performed in cubic mold shape. The soil samples were compacted by static compaction method. The relationship between the coefficient permeability in vertical (K_v) and horizontal (K_h) directions were investigated. The influence of clay content on permeability of compacted laterite soil is studied. The results showed that the K_v and the K_h values sharply decrease when the dry density increases until the maximum dry density. Then they are nearly constant at the relative compaction less than 85% with the water content higher than optimum water content. The K_v/K_h decreases when the water content of the compacted soil increases. The K_v/K_h is in the range of 2-7 when the water content is higher than the optimum water content. The higher clay content is mixed, the lower K value is showed. The increasing in the clay content is especially subject to decrease in the K value by 80 percent.

Effect of brick types on compressive strength of masonry prisms

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Keywords: Compressive stress, Effect of brick type, Masonry prism

Abstract. This study investigates bricks and masonry prisms under compression loading according to ASTM C1314–14 to be basis parameters for evaluating lateral resistance of masonry infill wall and to compare the compressive strength among of various brick types. The lateral resistance capacity of masonry infill wall model depends on the compressive stress of masonry prism, and the lateral deformation of masonry infill wall model depends on the strain at the maximum stress of masonry prism. Eight types of brick are considered which are hollow brick, lightweight block and six types of clay brick. From the test results, the behavior of masonry prism under compression loading is ductile that undergoes further deformation. The masonry prisms made of solid clay brick show the best performance with the largest average compressive stress of 10.8 MPa and largest cumulative energy dissipation of 444 kN/mm, but their behavior is inductile. The compressive stress of lightweight block is the weakest with the average compressive stress of 2.62 MPa. The compressive strengths of masonry prisms made of all clay brick types are higher than the compressive stresses of those made of hollow brick and lightweight block.

Topic A: Civil Engineering and Construction Technology **ID 287**

Ranking of important knowledge areas and measurement of competency levels of construction project managers in Cambodia

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Keywords: Knowledge, Competency, Construction, Project Managers, Cambodia

Abstract. The objectives of this paper are to rank the important knowledge and measure competency levels of construction Project Managers (PMs) in Cambodia. The important knowledge areas of construction PMs were analyzed and ranked by Analytic Hierarchy Process (AHP) method and competency levels were measured by Relative Level Index (RLI) from perception of main stakeholders such as contractors, consultants, and project owners. The results of ranking showed that time, quality, cost, and safety management are the main important knowledge areas for construction project managers in Cambodia, respectively. However, the ranking of important knowledge of contractor PMs is different among each stakeholder's perception. Moreover, the result of competency level measurement presented that competency level of contractor PMs in Cambodia is in medium level. However, in perception of contractors, competency level of construction PMs in Cambodia is higher than competency level of contractor PMs in perception of consultants and project owners.

Road safety index development for multi-lane highways in Thailand

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Keywords: Road Safety Index, Crash Modification Factors, Accident Risk Factors, Road Assessment Program

Abstract. Each year, almost 1.24 million people died as a result of the road traffic accidents [1], despite the provision of safety systems within the vehicle and environment. Most of road traffic deaths and injuries took place in low income and middle income countries. Similarly, road traffic accidents in Thailand have been one of the major causes of injuries and loss of lives since Thailand was ranked the third in the list of countries having highest road traffic deaths worldwide with 38.1 road fatalities per 100,000 inhabitants per year in 2010 [1]. Thus, this research proposes to study the international practices in road safety, such as the iRAP [2] and other Road Safety Index (RSI) development studies to develop the RSI evaluation tool that appropriates for the road and traffic conditions in Thailand. The results of this study provide further evidence of the contributions to the fields of road safety evaluation.

Topic A: Civil Engineering and Construction Technology **ID 296**

Analysis of historical changes in rainfall in Huai Luang watershed, Thailand

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Keywords: Rainfall analysis, Climate change, Huai luang, Mekong

Abstract. This study aims to investigate changes in rainfall in terms of trends, variability, spatial and temporal distributions, and extremes in the Huai Luang watershed. The trend analysis was applied to the time series of rainfall data for 32 years from 1982-2013. Changes in spatial and temporal rainfall distributions and extremes were investigated by comparing the 2 periods of the rainfall data between 1982-1997 and 1998-2013. Frequency analysis of annual maximum daily rainfall was applied to determine changes in extreme rainfall for different return periods at three stations located upstream, middle and downstream of the watershed. The results of this work show increasing trends in annual rainfall, spatial variations and extreme rainfall in the Huai Luang watershed. Spatial and temporal rainfall distributions are also changing. Understanding historical changes in rainfall is important for water resources management, urban planning and agriculture development in the Huai Luang watershed to assess current and potential impacts, and prepare strategies for adaptation.

The effects of foam beads and kaolin on physical and thermal properties of concrete blocks

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Keywords: Concrete blocks, Thermal properties, Physical properties, Foam beads, Kaolin

Abstract. Thailand is located in a tropical zone with relatively high temperatures all year round, with high intensity of sunlight, high temperature and humidity. In order to save electrical energy for air-conditioning systems, preventing heat transfer into the building is required. This study aims to investigate the physical and thermal properties of concrete blocks in order to increase their effectiveness of heat prevention. An attempt is made to increase heat resistance of concrete blocks. Foam beads (0-0.30 % by weight) and kaolin (0-70 % by weight) were added in concrete block mixture to increase discontinuous voids in concrete. Compressive strength and water absorption of concrete blocks were tested. The testing results showed that compressive strength decreased when foam beads and kaolin were added. Water absorption increased when foam beads were added. In contrast, the more kaolin added the less water absorption. The thermal conductivity coefficient of concrete blocks were also investigated. The results confirmed that the higher amount of foam beads or kaolin added, the higher thermal resistance of concrete blocks. Thermal time-lag behavior was also investigated. The results showed that concrete block with kaolin took the longest time in heating and took the shortest time in cooling. These properties are good for heat prevention in hot climate regions. These concrete blocks which were developed and tested in this research are conformed to the Thai Industrial Standard. Finally, it can be concluded that because of its thermal behavior, concrete block with kaolin is a suitable energy-saving concrete block for hot and humid climates.

Topic A: Civil Engineering and Construction Technology **ID 302**

Drought severity assessment in the lower Nam Phong River Basin, Thailand

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Keywords: Drought intensity, SPI index, WEAP model, Water scarcity, Water demand

Abstract. Drought is a normal, recurring and disastrous-triggering agent that exacerbates environmental services and socio-economic conditions. Considering the impacts of climate change and deficiency of rainfall over an extended period of time, the need for a systematic way to understand drought is extremely meaningful and necessary. Thus, this research proposes to carry out an assessment of the drought severity in the lower Nam Phong River Basin, Thailand. The Standardize Precipitation Index (SPI) was calculated and employed to define the impacts of drought to agriculture. Geographic Information System (GIS) was also employed to present a spatial view of drought prone areas under SPI3, SPI6 and SPI12 indices. Moreover, to validate the results of the SPI indices in terms of water demands, the Water Evaluation And Planning (WEAP) model was selected in this study. The findings demonstrated that there are consistent results between the SPI index and WEAP model in determining the impacts of drought severity in the lower Nam Phong River Basin. The results also highlighted that drought will usually occur during the period of February to April. The outcomes of this study can be useful for water resources planning as well as drought severity management in other parts of Thailand.

Climate change vulnerability mapping for Greater Mekong Sub-region

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Keywords: Climate change, Human Development Index, Exposure, Sensitivity, Adaptive capacity

Abstract. It is well recognized that the impacts of climate change pose a serious threat to socio-economic development, environment, and people's livelihoods, especially those in developing countries where severe natural disasters are common. In this sense, there is no debate that adaptation strategies and mitigation responses for the region's most vulnerable people are needed. Therefore, addressing to the vulnerability and the possible impacts of climate change at the sub-regional level is a major concern of this research. Within this context, this study aims to identify the most vulnerable areas to climate change and climate-induced water problems in the Mekong countries. The study also used the framework of the Intergovernmental Panel on Climate Change (IPCC) in 2001, by looking at the exposure, sensitivity, and the ability of the system to adapt or recover from the effects of hazardous conditions. The results showed that Mekong countries would adversely be affected by major natural hazards including the tropical cyclones, floods and droughts. It also indicated that Thailand has a high adaptive capacity to climate change among the Mekong countries, whereas the western coastline of Myanmar and the Cambodian Mekong lowland region were identified as the most vulnerable areas in the sub-region. The outcomes of this study would be valuable in ensuring the sustainable adaptation to climate change for the Mekong countries.

Development of cement boards from coconut shell ash for energy and environment conservation

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Keywords: Cement board, Coconut shell ash, Thermal insulation, Environment

Abstract. This research aims to develop the cement board from coconut shell ash. The Portland cement type1: fine sand: tap water ratio is equal to 1: 0.4: 0.33 by weight. The 5 ratios of Portland cement type1: coconut shell ash include 1: 0.12, 1: 0.13, 1: 0.14, 1: 0.15 and 1: 0.16 by weight. The cement board production uses the pressure casting in normal temperature (30 – 35 degree of Celsius) and controls the 0.75 g/cm^3 of density, then test the properties of cement-bonded fiberboard follow TIS 878-2537 standard (cement bonded particle board: high density). From the results, 1: 0.12 is the most suitable ratio of cement board from coconut shell ash. This developed cement boards can reduce the quantity of coconut shell ash waste and have the good thermal insulation.

Deterministic seismic hazard analysis of Thailand using active fault data

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Keywords: Deterministic seismic hazard assessment, Active faults, Seismic hazard map of Thailand

Abstract. Thailand is in the low level seismic hazard region, however, in recently years, earthquakes had occurred frequently in the North of Thailand. To prevent and reduce damage due to earthquake in the future, the seismic hazard is needed. This research proposes deterministic seismic hazard map evaluated from 19 active faults affecting in Thailand region. 2 types of active faults are considered, which are an active fault in subduction zone and a crustal fault. The seismic hazard is evaluated by using a ground motion prediction equation (GMPEs). 4 GMPEs are weighted equally for seismic crustal fault, and 2 GMPEs are weighted equally for seismic subduction zone. The hypocentral distance is used to evaluate the seismic hazard for all ground motion prediction equations. The Northern part and the Western part of Thailand are high seismic hazard regions, because there are active faults with the large possibility maximum magnitude. The seismic hazards in Northern, Western and Northeast of Thailand are about of 0.60g. The seismic hazard in Bangkok is about of 0.25g due to Three Pagoda fault and Sri Sawat fault. The seismic hazard in the Southern of Thailand is about 0.40g.

Utilization of cassava trunk waste mixed with cement to particle board wall for thermal resistance in building

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Keywords: Cement bonded particle board, Cassava trunk waste, Wood grinder, Thermal insulation

Abstract. This research aims to study the properties of cement bonded particle boards mixed with cassava trunk wastes. The Portland cement type1: fine sand: tap water ratio was equal to 1: 0.5: 0.416 by weight. The ratios of cassava trunk waste to cement were added following: 0.05, 0.06, 0.07, 0.08, 0.09, and 0.10 by weight. The cassava trunk wastes were crushed by the wood grinder with sieve no.4. The casting of particle board walls used the compression machine in room temperature (30 – 35 degree of Celsius) and control 0.75 g/cm^3 of density. The TIS 878-2537 standard (cement bonded particle board: high density) was cited to the property tests of cement bonded particle boards. Resulting, the ratio 0.08 of cement board mixed with cassava trunk can use as the particle board walls which have good thermal insulation property.

Topic A: Civil Engineering and Construction Technology **ID 331**

An assessment of flood hazard and risk zoning in the lower Nam Phong River Basin, Thailand

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Keywords: Flood hazard, Flood Hazard Rating, Vulnerability, HEC-HMS, HEC-RAS

Abstract. Rapid socio-economic development along with exceptional rainfall can potentially exacerbate risk of flood damage to life and property in the lower Nam Phong River Basin. In relation to this, the non-structural measures including risk-based zoning could be considered as an effective solution in mitigating the flood threat in the future. Thus, a coupling of the hydrological model HEC – HMS and hydrodynamic model HEC – RAS, which increased the robustness and predictability to the overall findings, was applied to assess flood hazards in this study. The outcomes highlighted that the applications of the HEC – HMS and HEC – RAS models are suitable for the study area with the Nash-Sutcliffe Efficiency (E_{NS}) varied between 0.75 to 0.87 and the coefficient of determination (R^2) ranged between 0.81 to 0.92. Moreover, the flood zone mapping was also carried out based on the Flood Hazard Rating (FHR) analysis. As a result, the flood hazard areas were determined which covers about 16.5% of the total river basin areas, and it was classified into four zones, i.e. extreme (18.79% of inundated area), high (46.33% of inundated area), moderate (18.24% of inundated area), and low (16.64% of inundated area), respectively. The obtained findings can be useful as the adaptation guideline for water resources planning and flood management in the lower Nam Phong River Basin and other parts of Thailand.

A Correlation ofTraffic Accident Fatalities and Speed Law Enforcement of Thailand and its Cross-border Countries

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Keywords: Traffic Accident Fatalities, Speed Law Enforcement, Gross Nation Incomes

Abstract. Currently, ASEAN Community has opened, it results in more development of road network connecting between member countries. The drivers are more convenient to drive crossing the-border. However, the difference in speed law and enforcement may cause the driver intentionally violating the law in each country, which leads to arisk of accident. The research aimed to determine the statistical correlation between the traffic accident fatality, the speed law enforcement and gross nation incomes of Thailand and its cross-border countries. The results found that those countries with higher gross national incomes and more performance of speed law enforcement have lower rate of traffic accident fatality.

Topic A: Civil Engineering and Construction Technology **ID 333**

Preliminary study of pressed lightweight geopolymer block using fly ash, Portland cement and recycled lightweight concrete

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Keywords: Pressed lightweight concrete, Recycled lightweight aggregate, Compressive strength, NaOH

Abstract. In this research, the properties of pressed lightweight fly ash geopolymer concrete block containing Portland cement and recycled lightweight concrete aggregate. The recycled lightweight concrete aggregate (RLCA) was crushed and classified as coarse aggregate (CA), medium aggregate (MA) and fine aggregate (FA). The RLCA with CA : MA : FA of 30 : 30 : 40 by weight was used to reduce the weight of concrete block. Lightweight geopolymer concrete block was produced from lignite fly ash, NaOH, Na_2SiO_3, RCLA and PC. The lightweight geopolymer concrete blocks with 28-day compressive strengths between 2.0 and 14.1 MPa and densities between 1130 and 1370 kg/m^3 were obtained.

Development of An Knowledge-Based Expert System Prototype Recommending AppropriateSpeed Limits of the Main Road: A Khon KaenCase Study, Thailand

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Keywords: Knowledge Based Expert System, Speed Limit, Speed Management, Logic Programming Associates (LPA)

Abstract. This paper describes the application of the Knowledge–Based Expert System (KBES) technology to set up and recommend appropriate speed limits for a number of segments of a main road in Khon Kaen city, Thailand. The KBES prototype was developed by applying an expert system shell namely, Logic Programming Associates (LPA). The rule-based approach was adopted as the knowledge representation and a backward chaining technique was employed as an inference engine to search for appropriate speed limits from sets of decision rules. Three key knowledge bases sources, namely, Highway Capacity Manual (2000), Illinois Department of Transport (2011) and Bellalite (2013), and VICROADS (2013) were selected and utilized as the Knowledge based component. After the suitable verification, the KBES prototype was applied to determine the appropriate speed limits of several road segments along the National Highway No. 2 and to validate its accuracy and ensure its applicability. The results revealed that the KBES prototype is reasonably well matched with the proposed speed limits to be implemented along the deteriined road sections.

Road Safety Status and Analysis in Asian Countries

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Keywords: Road Accidents, Road Safety Analysis, Road Traffic Fatalities, Road Accident Rates

Abstract. Road safety has been one of the most critical problems of Thailand. Based on the estimated Road Traffic Fatalities (RTFs) per 100,000 population in 2013 (WHO, 2015), Thailand was the 1st rank (with the RTFs rate of 36.2) among other Asian countries and the 2nd rank in the world. This research examined and analyzed a number of road safety characteristics based on the road traffic accidents and other related data reported in WHO (2015) for 47 Asian countries. It was found that RTFs per 100,000 populations showed relatively low correlation with Gross National Incomes (GNIs) per capita, while the RTFs per 1,000 registered vehicles revealed reasonably strong correlation with number of vehicles per 1,000 populations. In addition, as vehicles per 1,000 population rise, the RTFs per 1,000 vehicles tend to decline. The 2- and 3- wheelers were the key contributor to RTFs in Asian countries. While the proportion of 2/3 wheelers in Asian countries increase, the proportion of RTFs caused by these vehicles will also enhance. As the GNIs of any Asian countries enhance, the practical enforcement of national road safety laws was commonly upgraded. Based on the lesson learned from the road safety status and analysis, the urgent road safety action plans for Thailand were consequently introduced.

Topic B

Electrical Engineering and Communication

Grounded Series RL-Type Lossy Inductance Simulator Using G_m-C

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Keywords: Transconductance cell (G_m-cell), Grounded lossy inductance, RL circuit, Impedance simulator

Abstract. This paper presents the resistorless simulation of a grounded RL-type lossy inductor using only transconductance cells (G_m cells). The proposed circuit is created using eight MOS transistors and only one external grounded capacitor, resulting in a simple and compact structure as well as attractive for integration. The equivalent resistance value (R_{eq}) and equivalent inductance value (L_{eq}) can be adjusted separately by means of the external bias currents. Simulation results based on TSMC 0.35-μm CMOS process parameters are given to verify the theory and their operations.

Development of Low Cost Heart Rate Device For Contribution Rural Local Medical in Nakhonphanom Province Thailand

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Keywords: Heart rate detection, Average of heart rate, Finger sensor, Microcontroller

Abstract. The shortage of medical devices in rural Thailand, because a budgetto limit and constrain.Therefore, a development of low cost medical tools as one of the solution. This paper proposes an improvement of low cost heart rate device and application in the local medical in Nakhonphanom province Thailand. The hardware circuit, using the circuit instrument amplifier, low pass filter, auto adjust zero and the microcontroller, real time acquisition of the parameter of heart rate, first step , detect the heart rate per pulse and count the pulses for one minute to get the beats per minute detection pulse via a finger and measure the intensity of light. The pulse signal will be amplified and modification of signal to the microcontroller inputs. The count value of pulses per minute and show heart rate in bpm. The results have been compared with the experimental and medical criterion, the average error results approximate 1.31%, it is confirmed that the low cost device could be used in the target areas.

Hybrid of Scattering Matrix Method and Wave Iterative Algorithm for Waveguide Cascaded Irises

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Keywords: Scattering matric method, Wave iterative algorithm, Waveguide cascaded irises

Abstract. In this paper, the application of the wave scattering matrix method of two domains using wave iterative algorithm is presented in order to obtain the incident wave, reflected wave and transmitted wave parameters of the waveguide iris. Traditionally, the conversion of the wave scattering matrix to the frequency response and electromagnetics characterization has been used in order to perform the cascaded connection in waveguide filters. The numerical results of waveguide bandpass filter using the wave scattering parameters integrated with wave iterative procedures, were reported as efficient examples.

Study on Factor of the Quenching Performance on the Polymer Material Characteristics of an Air Circuit Breaker

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Keywords: Ablation gasses, Arc, Circuit breaker, Polymer materials

Abstract. Usage of polymer materials in a quenching chamber is one of the most effective methods of improving performance of an air circuit breaker [1, 2]. During a high current interruption in the air circuit breaker, an arc discharge touches the insulator, and ablation gasses are emitted [3]. It is considered that the quenching performance and an arc characteristic are affected by this ablation gasses. In order to clarify the quenching performance of each polymer material, we are conducting the experiments. With these experiments, the relationships of the ablation gasses among the number of arcing cycles, arcing peak voltage, arcing conductances, and the pressure rise will be discussed with four kinds of polymer materials.

Topic B: Electrical Engineering and Communication **ID 143**

Hybrid forecast models for PM-10 prediction: A case study of Chiang Mai city of Thailand during high season

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Keywords: PM-10, ARIMA, Neural networks, Hybrid ARIMA-NNs, Hybrid NNs-ARIMA

Abstract. In this study, the forecast models including to ARIMA, NNs, hybrid of ARIMA-NNs and hybrid of NNs-ARIMA model are employed to predict the PM-10 level during the high season in Chiang Mai, in the province of northern Thailand. The *k*-folds cross validation technique is used in the experimental design in order to prevent the over-fitting which is generally existed with strong impact on the forecast model. The historical PM-10 data are taken as the input of the forecast model. The statistics test and parameter designed experiments are used to optimize the linear models while the back-propagation (BP) learning algorithm is used to train the neural networks. The average of root mean squared error (RMSE) and mean absolute error (MAE) are used to indicate their performances. The results indicate that the hybrid NNs-ARIMA model is highly able to predict the PM-10 over the rest.

Improvement of reliability in distribution system by optimal location and size of solar PV system and economic analysis

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Keywords: Future performance prediction, Loss of load probability, SAIDI, SAIFI, Photovoltaic (PV) system

Abstract. This paper proposed the methodology to improve reliability of distribution system by using Photovoltaic (PV) system. The system reliability was evaluated by using 1) the future performance prediction 2) the loss of load probability for optimal location and size of PV systems .The optimal condition considered from two distribution reliability indices were SAIFI and SAIDI. Addionally, the economic value was calculated to compare to each size and location of PV system. In this paper, PV system was assumedly connected to the distribution systems at all buses of the IEEE 13 bus test systems and implemented to comprehensive technical considerations, including solar radiation data, patterns of load demand, possible failures of PV units and PV output power. The results showed that the PV system could improve reliability of the distribution system. Moreover, location and size of PV also affected reliability of distribution system and economic value, which were useful factors for defining the size and location of the PV system.

Topic B: Electrical Engineering and Communication **ID 164**

The design of an efficient wind direction measurement using digital positioning method for smart house

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Keywords: Wind direction, Measurement, Digital positioning method, Smart house.

Abstract. The main purpose of this wind direction design is to produce the low price efficient wind direction measurement by using waste conductive material for smart house. We found that the input and output bit size is not necessary to equal the number of directions and it is able to be minimized and use simple electric circuit instead of integrated circuit. It is also reliable and easy maintenance. This paper shows the design of eight-direction design of measuring the wind direction by using 4-bit input and output which is consists of two plates, one is at the top plate and another one is at the bottom plate. The results are shown that 8 directions get different 8 values from 4-bit input which indicate different directions.

Controllers for Balancing Two Wheeled Inverted Pendulum Robot with PI feedback control

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Keywords: Two-wheeled inverted pendulum, PI controller, Lagrange Equation, Manual Tuning

Abstract. Two-wheeled inverted pendulum (TWIP) robot has been widely investigated because the system is nonlinear and unstable. The purpose of this study is to control the balance of TWIP. The PI control is employed because the limitation of hardware. To obtain the PI gain, actual TWIP has been implemented, where K_p = 50 and. K_i = 4. The results show that the balance of TWIP can achieved with an error of 0.32° .

Topic B: Electrical Engineering and Communication **ID 187**

Multi-hop network localization in unit disk graph model under noisy measurement using tree-search algorithm with graph-properties-assist traversing selection

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Keywords: Localization, Unit disk graph, Tree-search, Multi-hop network

Abstract. This paper proposes a heuristic approach to efficiently traverse through search space in wireless localization in unit disk graph model. The main idea is to accommodate graph characteristics as metrics for branch selection. Selecting appropriate branching order eliminates infeasible branches quicker than random selection. We show that graph properties such as connectivity, measured distances, and shortest paths to anchor nodes (nodes with known-locations), can drastically reduce the number of iterations (branching) required to traverse thru the possible realization of the wireless network. A normalized weight-sum function of those parameters is used as an evaluation function in selecting branching direction. We extensively perform experiments to find good weights for evaluation function of those graph characteristics. Additionally, we apply this algorithm in a more realistic environment where noise is observed during the measurement of distances. We use a modified version of our algorithm by relaxing feasible constraints to tolerate more discrepancy allowing error within a threshold. A tradeoff between complexity and the probability of finding the feasible solution is shown. The results show that the adding error does increase the complexity while maintaining the ability to find solution within a timely manner.

Automatic measurement of low-frequency loudspeaker electro-mechanical parameters

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Keywords: Loudspeaker parameters, Automatic measurement system, Displacement laser sensor, Diaphragm velocity, Sine sweep

Abstract. This work is to present a system for automatic measurement of low-frequency loudspeaker electro-mechanical parameters. The proposed system is of virtual characteristics, consisting of a personal computer, dynamic data acquisition, displacement laser sensor, and voltage and current probes. A computer programming was coded to control sine-sweep generation that was fed to a loudspeaker and to process electrical signals from a displacement laser sensor and electric probes. The analysis was done in frequency domain to yield loudspeaker parameters, such as mechanical quality factor (Q_{MS}), total quality factor (Q_{TS}), electrical quality factor (Q_{ES}), force factor (Bl), voice coil's electrical resistance (R_E), and mechanical mass (M_{MS}), resistance (R_{MS}), compliance (C_{MS}) and stiffness (K_{MS}). The constructed system was tested for measuring the parameters of 8-inch and 12-inch loudspeakers, and results were compared to that utilizing a traditional mass-adding technique. It was found that the automated system was capable to complete the measurement in the frequency ranges of 20 Hz – 220 Hz within 3.34 minutes, much faster than that using the traditional approach that normally consumed time of 30-45 minutes. Most of the measured parameters from both the automated system and the traditional approach were similar, but some were quite different due to successive calculation and cumulative error. However, further work could be done to reduce such the error.

Blind 2D signal direction for limited-sensor space using maximum likelihood estimation

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Keywords: Sound source direction, Blind stereo estimation, Time – delay estimation

Abstract. A proposed blind 2 dimensional (2D) signal direction using two recording sensors is developed under a limited space between the sensors in noise free environment. The proposed 2D source direction method is based on the time – delay estimation using maximum likelihood estimation by forming a histogram of power weighted spectrum corresponding to attenuation and time-delay index. The histogram - boundary method is also proposed which relates to a distance of the two microphones. In addition, the fine-tuned number of time-index bins were investigated to figure out the proper number of bins for the histogram. Given by a narrow space i.e. 3.2 centimeters, the proposed method can acceptably direct the sound-source position. In experimental testing on real-audio sources, the proposed method has demonstrated a higher level of directional performance compared with an existing method.

Effects of Different Ohmic Contact Widths and Distances on the Absolute Sensitivity of Two-dimensional Hall Sensor

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Keywords: Hall effect, 2D Hall, Hall structure, Width space, Sensitivity

Abstract. This research has investigated the effect of different ohmic contact widths and spacing (distances) on the perpendicular- and parallel-directional absolute sensitivity of silicon-based two-dimensional (2D) Hall sensors. The experimental sensors were of two configurations. The first configuration was of 100µm and 40µm in width (W) and spacing (S), while the other configuration was of 300µm in W and 60µm in S. The sensors were fabricated on a 20-30Ω.cm-resistivity p-type silicon substrate with five etched aluminum (Al) ohmic contacts. In the experiment, the perpendicular and parallel absolute sensitivity of the sensors were tested by varying the magnetic flux density from -5000 to 5000 Gauss (G). The findings revealed that the proposed sensors were capable of magnetic sensing in both perpendicular and parallel directions. Specifically, the perpendicular absolute sensitivity of the sensor with the 300µm contact width was 2.08 times higher than that with 100µm width. Meanwhile, the parallel absolute sensitivity characteristics associated with the two different contact distances (i.e. 40µm and 60µm) were similar. Thus, the ohmic contact width plays a more crucial role in the sensitivity enhancement of the Hall sensors.

Reuse of sensor chip using UV/ozone method for surface plasmon resonance biosensor

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Keywords: Reused SPR chip, Surface plasmon resonance (SPR), Blood group typing, Carboxyl methylate dextran (CMD)

Abstract. This work presents a novel method to reuse the gold (Au) sensor chip for surface plasmon resonance (SPR) spectroscopy. The SPR chip, used in ABO blood group typing, was regenerated with a functional layer and biomolecule layer on the SPR surface by UV/ozone method. The layer of used SPR consisted of a functional layer of carboxyl methylate dextran (CMD) and a layer of biomolecules (antibody and red blood cell (RBC)). After regenerating, the reused SPR chip was monitored by the SPR imager, including SPR image and SPR curve. The ability of the reused SPR chip was again tested in ABO blood typing and compared to that of the new SPR chip. For the construction of the blood group typing biosensor, the antibodies—anti-A and anti-B—were covalently immobilized on the CMD surface of the reused or new SPR chip. The RBCs—RBC A, RBC B, RBC AB, and RBC O—were passed over the immobilized antibodies' surface for analyzing blood types. The result of the SPR curve shifted left and equaled to that of the new SPR chip, and the obtained SPR images from the used/new SPR chip were similar. The SPR signal obtained from the reused SPR chip for blood typing was correctly grouped, same with the new SPR chip. Thus, this method is feasible to regenerate the surface of the SPR chip for its prolonged reuse.

Frequency Domain Identification of Volterra Model for Separating Ultraharmonic using the Technique of Half-frequency of the Input Signal

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Keywords: Volterra filter, Nonlinear ultrasound signal, Ultraharmonicimaging

Abstract. This paper presents a method for the identification of ultraharmonic component withVolterra kernels from a simulated ultrasound echo signal. Due to the fact that using a Volterra series cannot respond to the ultraharmonic component, the purpose of the paper is to develop the identification method for the ultraharmonic using the excitation technique of half-frequency of the input signal. In addition, the model can still be held at subharmonic component. Finally the identifications of Volterra system were studied in frequency domain. Application of this method is to separate only the ultraharmonic component or ultra-subharmonic components for improving contrast-to-tissue ratio (CTR) of ultrasound imaging.

Topic B: Electrical Engineering and Communication **ID 234**

The exploration characteristic of long flashover arrestor (LFA) with different ring's breadth by using 1.2/50 microsecond positive and negative impulse voltage

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Keywords: Arching, Breakdown voltage, Lightning arrestor, Surface flashing, Surge protection

Abstract. This paper presents the estimation and comparison characteristics of long flashover arrestor (LFA) by varying the breadth of ring components under the 1.2/50 microsecond positive and negative impulse voltages. The breadth of the ring was various sizes at 0.25cm, 0.5cm, 0.75cm, 1.0cm, 1.2cm5 and 1.5cm. The gap space for specimen was fixed at 0.5cm with a diameter of 2.2cm. When applied the 1.2/50 microsecond positive and negative impulse voltage to 9kV to 150 kV. The results showed that at the level of 0kV to 60kV the LFA with different ring's breadth have the same flashover length. The flashover length of LFA under 1.2/50 micro positive impulse voltage was longer than negative impulse voltage when adjusted the applied voltage level more than 81kV and the explicit difference of flashover lengths increased when increased the positive and negative impulse voltage to 130kV.

New amplitude controllable current-mode quadrature oscillator using DO-CDTAs

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Keywords: Current-mode, Quadrature oscillator, Amplitude controllable, DO-CDTA

Abstract. This article presents new amplitude controllable sinusoidal quadrature oscillator circuit using dual-output CDTAs which able to give four quadrature output current signals. The condition of oscillation (CO) is able to be orthogonally tuned from the frequency of oscillation (FO) by handling the external current biasing. The output ports of proposed circuit have high impedance reasonable for connecting with current-mode circuit and use only grounded component very neat for development into an integrated circuit (IC). Moreover, the QO can adjust amplitude of signals without effect from the CO and FO. The PSPICE simulation program uses for proving the theoretical analysis.

Design and Development of a Low Cost Electrode Puller for Electrophysiology Research in Thailand

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Keywords: Bipolar-stimulating electrode, Electrophysiology, Electrode puller, Vertical electrode puller, Stimulating electrode, Adjustable pulling force

Abstract. This work presents the initial design and development of a local glass capillary puller to serve electrophysiology research in Thailand. This model was specifically designed for fabricating bipolar-stimulating electrodes from two-barreled borosilicate glass capillaries. The main systems include the heating and the pulling components, which were designed to be operated in adjustable manner by users. The heat and pulling force were governed by the controlling current. The design was validated through experimental results. Appling 19A heater current for 60-90 seconds onto Kanthal-heating filament was sufficient to melt the glass. The electrode feature was acceptable for performing *in vitro* experiment in human blood vessels. However, similar studies in rodent's vessels with smaller vessel size require a sharper-tipped electrode. Limitations of the prototype model were also addressed for further model improvement. We anticipate that the invention of sophisticated life-science instrument could enhance multidisciplinary research collaborations in order to reduce overall investment on research instrument for our nation, and may help open a new avenue of production industry of sophisticated instrument in Thailand.

Non-invasive human activity recognition using Wi-Fi signal

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Keywords: Activity recognition, Passive sensor, Wi-Fi, Signal strength, Machine learning

Abstract. This paper presents the study of human activity recognition using Wi-Fi signal. The aim is to employ the abundant Wi-Fi signals which are available in most buildings. While humans are doing activities, Wi-Fi signal strength is collected in a non-invasive manner by using standard Wi-Fi devices. Four different activities are performed in the experiment. The numbers of Wi-Fi access points with different arrangement are varied. Patterns of Wi-Fi signal strength are analyzed by using machine learning algorithms. The result shows that activities with high movement can be predicted with higher accuracy.Furthermore, the increased number of Wi-Fi access points increases the accuracy of activity prediction.

Topic B: Electrical Engineering and Communication **ID 286**

Study of induced voltage 115 kV in Lao P.D.R parallel transmission lines caused by electric field induction

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Keywords: Induced voltage, Transmission lines

Abstract. The induced voltage generated in the transmission lines has been a significant factor for the power system because it can impact the stability and cause the work hazard to the system. This paper purposes the investigation of induced voltage occurring in 115 kV parallel transmission lines caused by electric filed induction. The dependence of induced voltage on the distance between the parallel transmission lines and conductor diameter are examined. The induced voltage is analyzed by Gauss Jordan method using MABLAB program. It was found that the induced voltage is decreased when the distance between the transmission lines are increased. For the impact of conductor diameter on the induced voltage, it was seen that the induced voltage can be reduced by decreasing the conductor diameter. Hence, the induced voltage generated in the transmission line and conductor diameter becomes the important factors, which is needed to be optimized in order to achieve the high stability power system.

The Time Derivative of Flux-Linkage Dependence on Flux-Linkage with Partitioned-Stator Doubly-Salient Permanent-Magnet Generator structure

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Keywords: Time derivative, Flux-linkage, Partitioned-stator, Number of pole, Circulation

Abstract. The time derivative of flux-linkage, dΨ/d$t$dependence on flux-linkage of partitioned-stator doubly-salient permanent-magnet generator (PS-DSPG) structure with varying the number of poles is proposed. The analysis is based on finite element method using COMSOL software. The result shows that the flux-linkage is reduced with an increasing of the number of poles. Nevertheless, the dΨ/dt is enhanced when the number of poles is increased. This is because the dΨ/dt and the flux-linkage do not only depend on the number of poles but it also depends on the flux-linkage circulation.

Topic B: Electrical Engineering and Communication **ID 293**

Comparative Performance of Multiobjective Evolutionary Algorithms for Solving Multiobjective Optimal Reactive Power Dispatch Problems

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Keywords: Multiobjective optimal reactive power dispatch, Non-dominated solution, Multiobjective evolutionary algorithms, Pareto dominance

Abstract. In this paper, comparative performance of multiobjective evolutionary algorithms (MOEAs) for solving multiobjective optimal reactive power dispatch (MOORPD) problems has been studied. The standard IEEE 30-bus and 57-bus power systems are posed to optimize active power loss and voltage deviation. Design variables include generator bus voltages, tap setting transformers, and shunt reactive power sources whereas design constraints are lower and upper bounds of the variables. A number of MOEAs are implemented to solve the test problems and their performances are compared statistically. It is shown that multiobjective gray wolf optimizer (MOGWO) is superior to other MOEAs based upon the hypervolume indicator. The results can be set as the baseline for performance testing of MOEAs for such optimization problems.

Combined rogowski coil for the detection of partial discharge

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Keywords: Partial discharge, Rogowski coil, Printed circuit Board, Optimization

Abstract. The design and optimization of Combined Rogowski coil (CBRC) for the Partial discharge (PD) detection is proposed. The designed CBRC have shown to resolve the limitation of traditional Rogowski coil and Printed circuit board Rogowski coil (PCBRC). The electrical parameters that affected the performance of coil were controlled by the geometric variables and optimized by multi-objective genetic algorithm to achieve the optimum design of coil. The CBRC has upper frequency (f_h) of 219.67 MHz and mutual inductance (M) of 96.747 nH, while PCBRC has f_h of 200.63 MHz and M of 29.215 nH. The experimental results showed that the CBRC was able to measure the simulated of PD signal which is in nanosecond and current magnitude range of milli ampere. Itsoutput signal has achieved better signal integrity and was able to eliminate the oscillation of detected signal output.

A Novel Detection for LDPC Coded QAM Systems in Presence of Angular Skew

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Keywords: Detection, LDPC Codes, QAM Systems, Angular Skew

Abstract. Angular skew, caused by imperfect biasing of the transmitter, is considered to be a source of performance degradation for communication systems that employs QAM modulation. In this article, a novel detection for LDPC coded QAM system in the presence of angular skew is presented. The main idea of the proposed detection is to use a *multiplicative factor* deriving from the noise-free case at the receiver side. The LDPC coded QAM systems that utilize the proposed detection outperform such systems with well-known skew detection, especially at high order QAM and large degree of skew, e.g., 32degrees.

Tail-Biting LDPC Convolutional Codes over Power Line Communication System

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Keywords: LDPC convolutional codes, Tail-biting, Power line communications

Abstract. A study of low-complexity tail-biting LDPC convolutional code to power line communications has not been reported. The performance of this code is investigated under various channel and code conditions. Results show that the application of tail-biting LDPC convolutional code to power line channel is excellent. Moreover, tail-biting LDPC convolutional code can provide the identical performance comparing to LDPC block code over power line channel.

Topic B: Electrical Engineering and Communication **ID 335**

Construction of High Rate TB-LDPC Convolutional Codes from LDPC Codes

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Keywords: High rate TB-LDPCCCs, LDPCCCs

Abstract. High data rate is fundamental requirement for modern digital communications. In this paper, high rate Tail-Biting LDPC convolutional codes (TB codes) that can support high data rate are considered. The construction of high rate TB codes from short length LDPC codes is thoroughly described. Simulations show that high rate TB codes can achieved excellent performance. Moreover, TB codes with memory of 125 derived from simple LDPC codes can provide identical performance comparing to standard LDPC block code.

Topic C

Agricultural Engineering, Postharvest and Food Technology

Apply Image Processing to Measure the Moisture Content of Rice Kernel

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Keywords: Rice kernel, Image processing, Moisture content, Rough rice

Abstract. The moisture content of rice is importance before storage, because the water content has directed affect to rice damage (when store in high moisture content) and the piece is decease. The sample of this study was used Thai Hom Mali 105 long grain rough rice, were condition moisture content six levels 11-21 MC% (wet basis). For measurement the moisture content of rice, which is direct and indirect method, the standard method is hot air oven but time consuming. In this study aims to apply the image processing to determine the moisture content of rice kernel, the image processing is nondestructive and fast methods for measuring. The color extracting of rice kernel by RGB, HSV and L*a*b* color, then calculate color, classify with correlation between color and MC%. The result shows that L* and G color were high correlation with R^2 =0.95, and 0.94, that mean the image processing method can apply to measure the moisture content of rice kernel.

Researching the existence of a number of harmful microorganisms in biological padding for raising pigs used in livestock of Vietnam

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Keywords: Fermented bed technology, Biological preparation, BALASA.No1, Vietnam National University of Agriculture

Abstract. The research aims to determine the fluctuation of the number of some kinds of harmful microorganisms in pig bed after 5 months using biological preparation. We also compared the inhibition harmful microorganism of biogical preparation producted by Vietnam National University of Agriculture (VNUA) with commercial preparation BALASA.No1. BALASA.No1 preparation was researched and judged in the paper "Evaluating the effect of applying in fermented technology for raising pig in small farm" by Do Quang Dai Master, 2011. So we assessed the effect of VNUA biogical preparation by comparing the microbiological criterias between experimential group (using VNUA preparation) and control group (using BALASA.no1). The results shows that fermenting pig bed by these preparation both intibited the growth of *Salmonella* and constrained the growth of *Coliform* and *E.coli.* Based on this study it could be conclude that using VNUA bio preparation to ferment pig bed can prevent the disease from *Salmonella* and *Coliform*.

Analysis of Electrical Energy Consumption of Rice Mills in Northeastern Thailand

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Keywords: Rice mills, Electrical energy consumption, Tooling process

Abstract. Modern rice mills have increased in size and now operate with improved technological milling systems. This analysis of the electrical energy consumption (EEC) of rice mills can be used as a guideline to determine the EEC and cost of each individual operational section. Ten rice mills in Northeastern Thailand were studied. The results showed that each rice mill required on average a maximum EEC at 362 kW, EEC usage at 1,183,271 kWh/yr, and an energy usage per production volume of 19.50 kWh/T. The average annual cost for EEC was 4,901,301 THB, and the electrical energy cost was 82.19 THB per ton of rice production. This EEC was dependent on rice quality, production quantity, and the wattage of the electrical machines operated in the rice mills. The whitening polishing process used the highest EEC at 33.17%, with 21.60% EEC used for mist polishing. Removing the bran, tooling operations, suction (aspirated), hulling, husk separation, meal separation, and the sieve separator consumed energy percentages of 11.68, 8.86, 6.67, 6.54, 5.72, 4.75, and 1.01%, respectively. The improvement of the EEC in rice mills must focus on the tooling operations which have the highest energy consumption. There are many areas where energy can be saved in rice mills, including the power supply systems, the motor systems, and the compressed air operation systems that can be reduced average cost 64,579.66, 104,929.38 and 23,192.85 THB per year, respectively.

Bio-butanol production from sugarcane juice by *Clostridium beijerinckii* TISTR 1461

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Keywords: Acetone-butanol-ethanol fermentation, Sugarcane juice, *Clostridium beijerinckii*

Abstract. Bio-butanol production from sugarcane juice by *Clostridium beijerinckii* TISTR 1461 in a 2-L fermenter was investigated. In this study, butyric acid was added in fermentation broth. Both sugarcane juice and butyric acid were used as substrates for butanol production. The results showed that the maximum concentrations of acetone, butanol and ethanol were 3.76 g/L, 11.77 g/L and 0.77 g/L, respectively. Total ABE and butanol productivity were 16.30 g/L and 0.10 g/L·h, respectively. The process shows promising alternative for butanol production by solvent fermentation from agricultural product using *C. beijerinckii* TISTR 1461.The results from this study may become an attractive process for the industrial production of bio-butanol from sugarcane juice in the future.

Texture and antioxidant properties of puffed pounded-unripe rice coated by marigold extract as affected by fluidized-bed coating conditions

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Keywords: Spray granulation, Ready-to-eat, Young puffed rice, Encapsulation, Breakfast cereal

Abstract. We investigated the effects of fluidized-bed coating parameters on texture and antioxidant properties of puffed pounded-unripe rice (PPUR) coated by marigold extract with variations of inlet air temperature of 50, 60 and 70°C and coating solution feed rate of 5, 7.5 and 10 ml/min. The results showed that increasing inlet air temperature tended to reduce the hardness of coated PPUR, while the adverse effect was found with increasing feed rate. Both parameters did not significantly affect the crispiness. We also found that fluidizing air temperature and feed rate significantly affected total phenolic content (TPC), total flavonoid content (TFC) and their antioxidant activities. Higher feed rate slightly increased TPC and antioxidant activities as determined by DPPH and FRAP assays, but not for TFC. As mostly found in medicinal plants, all antioxidant properties decreased when temperature increased. Based on the amount of TPC and TFC and their antioxidant activities, we recommend low inlet air temperature and high feed rate to improve health benefits of puffed pounded-unripe rice as a breakfast cereal. However, agglomeration must be concerned when using high feed rate.

Effect of steaming condition varying in time and temperature on the quality of dark parboiled rice with germination

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Keywords: Dark parboiled rice, Steaming, Maillard reaction, Quality

Abstract. In this research, steaming time and steaming temperature were investigated on their effects on reducing sugar, textural property after cooking, head rice yield and color. The steaming time and steaming temperature influenced all considered qualities of GDPR. When the GDPR sample was steamed at times and temperatures, the average reducing sugar value was decreased to 228.32±8.1 mg/100 g when the steaming time or the steaming temperature increased. It was used in the Maillard reaction to generate the color, leading to the decrease of whiteness value in the ranges of 23.33-25.06. Moreover, the increase of steaming time and steaming temperature provided the higher gelatinization, leading to increase in strength of rice and resulting in the higher hardness from 120.95±6.56 to 167.74±13.22 N and head rice yield from 69.92±0.28 to 72.18±0.29%.

Effect of spent wash liquor on soil pH, electrical conductivity, organic matter, extractable calcium and magnesium of coarse-textured and fine-textured soils

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Key words: Spent wash liquor, Soil pH, EC, OM, Ca and Mg, Soil texture

Abstract. Two sets of completely randomized designs with 4 replications to investigate some changes of soil properties after applying 7 rates of spent wash liquor (0, 45, 90, 140, 190, 380, and 560 ton/ha) were performed on course-textured and fine-textured soils. Daily irrigation depending on annual rainfall distribution of 2015 was supplied into each experimental unit. After applying treatments for a year, it was found that spent wash liquor significantly improved soil pH value, electrical conductivity (EC), and organic matter content of both course-textured and fine-textured soils. However, this effect was clearly shown in topsoil in that pH and EC were higher than that in subsoil. Regarding soil fertility, this research study also revealed that spent wash liquor significantly improved the availability of secondary nutrient elements (Ca and Mg), particularly in topsoil.

The effect of mixture and size of fish food on the fish food qualities producing from the waste of agriculture and fishery

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Keywords: Pellet fish food, Compression ratio, Pellet durability, Pelleting efficiency

Abstract. The remnant of fish and the bran are the waste in the community that earns one's living from the fishery in net cages. These wastes cause the cost of management and the pollution. Hence, this research studied the fish food production from the waste in the community using the pellet fish food (PFF) producing machine. The water content in fish food at the amount of 140, 160 and 180 g, the diameter size of 4 and 6 mm and the compression ratio (CR) of 2.5 and 3, and including the drying kinetic of PFF at drying temperature of 50°C were also studied. The PFF qualities were estimated with the pellet durability index (PDI), the pelleting efficiency and the weight loss of PFF in water. Study results showed that the decreased trend of PDI value with the increment of the water content for every pellet size and the CR. The PDI value at the same pellet size increased with the enhanced CR due to the improvement of density within the pellet. The pellet size of 4 and 6 mm should be produced at the CR of 2.5 with the water content of 140 g and the CR of 3 with the water content of 160 g. Under the previous condition, the maximum value of pelleting efficiency was about 92-93%. For the CR in the range of 2.5 to 3, the percentage of weight loss of PFF was 14-27% and 16-26% for the pellet size of 4 mmand 6 mm, respectively. The PFF in this study spent the drying time around 3-6 hours for the moisture reduction approached the commercial pellet fish food.

Cost evaluation of the modified medium for xylanase production by substituted nitrogen and carbon sources with agricultural residues

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Keywords: Xylanase, *Bacillus subtilis*, Corncob dust, Soybean meal extract, Medium cost

Abstract. To reduce the production cost of xylanase, the culture medium for *Bacillus subtilis* J12 was modified using corncob dust as a sole carbon source. The highest xylanase activity was obtained from 2% (w/v) corncob dust in a mineral medium. Three different nitrogen sources were screened using soybean meal extract, sodium nitrate and ammonium sulphate. The highest xylanase activity was obtained from 1.6% (w/v) soybean meal extract. The xylanase production in the modified mineral medium was increased 3 folds compared to that fermented in modified nutrient broth. The medium cost per unit of enzyme productionin the modified mineral medium compared with the modified nutrient broth was 4.98×10^{-3} and 7.54×10^{-3} USD/U, respectively. Therefore, the newly modified mineral medium could save for 34 % of the medium investment. This study revealed the success of using the modified medium for higher xylanase production with economic benefits.

Direct butanol production from sugarcane bagasse by cellulolytic clotridia

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Keywords: Butanol, Clostridia, Cellulolytic activity, 16S rDNA

Abstract. Cellulolytic clostridia isolated from soil (S32-KKU and S33-KKU), compost (CP23-KKU and CP33-KKU), cow dung (C23-KKU and C32-KKU), buffalo dung (B12-KKU and B31-KKU) and elephant dung (E11-KKU and E33-KKU) in Thailand were used for direct butanol production from sugarcane bagasse. In this study, batch fermentation was carried out in a 1-L screw-capped bottle. The results showed that the isolate E11-KKU from elephant dung exhibited the highest potential and achieved the highest butanol concentration of 2.41 g/L. Phylogenetic analysis of the 16S rDNA nucleotide sequence of the isolate E11-KKU showed that the closest phylogenetic relative was *Clostridium beijerinckii* with 99.99% similarity.

Fuzzy analytical modeling for sensory evaluation of Water Meal (*Wolffia arrhiza* (L.) Wimm.)- Rice Cracker

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Keywords: Fuzzy logic, Sensory evaluation, Rice cracker, Water meal, Scilab program

Abstract. The sensory attributes (color, odor, flavor, crack and overall acceptance) of the developed water meal-rice cracker product with water meal at 1.5, 3, 5, 7 and 10% of rice were evaluated. The sensory evaluation data were analyzed with the fuzzy analytical modeling. The major steps were: (1) calculation sensory scores in the form of *Triplets Sensory Scales*; (2) determination of *Overall Sensory Score* for all quality characteristics of each samples in the form of triplets; and (3) computation of *Similarity Values* on standard fuzzy scale and ranking the samples. The results of fuzzy analysis showed that the sample 2 (3% water meal) was the best quality of water meal-rice cracker.

Effect of drying methods on property of Thai rice cracker

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Keywords: Dehydration, Food processing, Food quality, Snack

Abstract. Fried glutinous rice cracker is a popular snack for local Thais. One of the production steps usually requires drying. Method of drying is an important process affecting products' shelf life and quality. In this research study, quality of rice cracker obtained from various drying methods (direct solar radiation, solar dome, and hot air drying oven) was investigated and compared. Properties of the rice cracker being analyzed were shrinkage ratio, expansion ratio, color, hardness and crispness. The rice cracker samples were in rectangular slap. Experimental results showed that the final moisture content of the rice cracker was in the range of about 8-10% wet basis. Direct solar drying gave minimum shrinkage ratio of 1.34 and maximum expansion ratio of 4.99. The color of dried rice cracker was given as L* a* b* color space. The highest hardness of the rice cracker (2,200 g) can be reached by hot air drying, and the best crispness (18,000 g.s) was obtained by direct solar drying.

Combined Effect of Air Temperature and Velocity on Drying of Thai Rice Cracker

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Keywords: Food processing, Khaotan, Drying time, Regression analysis, Hot air drying

Abstract. Fried glutinous rice cracker or "Khaotan" is a traditional snack of local Thai communities. Drying is one of the important steps in production of rice cracker. Hot air drying is an alternative method to direct solar drying used to reduce moisture of the rice cracker during rainy season. In this work, effect of air temperature (40, 50, and 60°C) and velocity (0.5, 1, and 1.5 m/s) in a hot air dryer was investigated. Full factorial and central composite designs of experiments were adopted. The results indicated that air temperature and velocity affected the drying time. The relationship was in second order polynomial with high correlation coefficient R^2 of 0.8719. Moderately good agreement in predicting drying time between experiments and the regression model was reported.

Evaluate efficiency of slope-farming at Nghia Dan district, Nghe An province, Vietnam

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Keywords: Agricultural, Slope-farming, Land use type, Cultivation

Abstract. Cultivation on slopes not only has brought income to mountain people but also protect environmental, to reduce the soil erosion and surface runoff. Nghia Dan district located in the northwest of Nghe An - one of Vietnam's central provinces that over 66.16% of natural land is sloping (slope grade from 3 to over 25 degree). In this project, we study and analyze the patterns of cultivation on slopes being applied in Nghia Dan, thereby select ones bringing the highest economic efficiency, effective social impact and environmental effectiveness of each slope - farming. Initial results show that, there are up to 11 land use types (LUTs). Land with slopes 3 – 8 degree is suitable for cultivating LUT spring-summer rice and winter corn-soybeans. At slopes 8-15 degree, the most efficient LUT is medium sugarcane. At slopes 15-20 degree, it's a good choice to apply the growing orange.

Topic C: Agricultural Engineering, Postharvest and Food Technology **ID 161**

A low-cost sensor for measuring and mapping chlorophyll content in cassava leaves

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Keywords: Cassava, Chlorophyll, Color sensor, SPAD-502, GPS positioning

Abstract. A crop health monitoring system associated with field positioning is required for site-specific nutrient management. The amount of chlorophyll in a plant leaf as quantified by leaf greenness index is a parameter reflecting the plant health. The present research aimed at developing a low-cost sensor (LCS) for assisting a cassava farmer to estimating and mapping the chlorophyll content in cassava leaves. The device consists of a color sensor which gives frequency responses to red (R), green (G), and blue (B) chromatics. The color sensor was calibrated to convert the frequency outputs to R, G, and B values. Accuracy in color measurement has been evaluated by comparing the three chromatic values with those obtained from a commercial color analyzer. The LCS was further calibrated for chlorophyll measurement by correlating greenness index of cassava leaf samples with the values measured by a standard chlorophyll meter SPAD-502. Validation of the LCS has been done by comparing leaf greenness with the readings of SPAD-502 using a different set of leaf samples. A GPS receiver was installed in the device for simultaneous recording of the field position. The results showed that the LCS provided close measurements to the actual R, G and B. The color difference expressed in terms of Euclidean distance ranging from 1.61 to 63.31 with an average of 17.62 which is acceptable. Analysis of linear correlation for R, G, and B resulted in the coefficients of determination (R^2) of 0.9493, 0.9704 and 0.9849 respectively. Evaluation of leaf greenness with the SPAD-502 meter yielded a root mean square error (RMSE) of 0.9688 and an R^2 of 0.97, suggesting satisfactory accuracy. Using the LCS developed, spatial variation of chlorophyll content in cassava plants across a planting area could be observed.

Evaluation of the water footprint of sugarcane in eastern Thailand

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Keywords: Water footprint, Water stress, Crop water requirement, Sugarcane

Abstract. This paper aims to present the three kinds of sugarcane in eastern Thailand. The water footprints of sugarcane were assessed as the volume of yield in water per product unit (m^3/ton). Because of, sugarcane is an important crop in Thailand. The residue left from sugarcane can develop into useful products include fuel to produce electricity organic fertilizers, pulp and scientific material. In present, area for sugarcane is likely to add more acreage. The cultivated area would affect the use of water resources. Therefore, the study the water footprint of sugarcane is an important crop.

The result for the water footprint of sugarcane for the period 2013-1014 in eastern Thailand is 178.32 m^3/ton (129.60 m^3/ton of green, 17.61 m^3/ton of blue and 31.11 m^3/ton of grey). The water footprint are 186.79 m^3/ton for Prachinburi, 174.73 m^3/ton for Sa Kaeo, 181.23 m^3/ton for Chachoengsao, 158.90 m^3/ton for Chonburi, 185.94 m^3/ton for Rayong and 182.32 m^3/ton for Chanthaburi. The highest and lowest water footprint are at Prachinburi and Chonburi respectively. The water footprint in the eastern Thailand for sugarcane is lower than the global average. The green and blue water footprint are lowers than the global average but the grey water footprint is about 3 times higher than the global average. This is mainly because of the differences in the yield of sugarcane.Another one, the water footprint can be using prediction implement of yield of sugarcane.

Distribution of ^{210}Po in some marine biota of a Samut-Sakhon region: evaluation of dose to consumers

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Keywords: ^{210}Po, Marine biota, Activity concentration, Effective dose, Samut-Sakhon

Abstract. The determination of ^{210}Po in some marine organisms i.e., krill, mussel, shrimp, thread fin fish and mullet collected during 2013-2014 from Samut-Sakhon region were performed. This study aimed to investigate background information on the ^{210}Po activity and annual dose due to seafood consumption in the region. Concentrations of ^{210}Po ranged from low values of krill < mussel < shrimp < mullet < thread fin fish with a common pattern of exoskeleton of shrimp accumulated higher content than soft tissues of all samples. The feeding habit and transfer factor in the trophic level between species caused the different concentrations of ^{210}Po accumulation. The effective dose levels of marine organisms in the studied area were varied from 1.178 to 177.309 $Sv.y^{-1}$. These values are considered radiological safe for human consumption.

Public Participation in Erosion Monitoring on Mekong Mainstream

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Keywords: Erosion Monitoring, Public participatory, Mekong mainstream, Songkram confluence

Abstract. The erosion along the Mekong mainstream is one of the major factor that causes the problems to people beside the river. So, two main objectives of this study are to observe and develop the erosion monitoring procedure with public sector collaborations. Four row of 6-inches wooden pegs was install in 2 pilot study areas, two rows on upstream and the others two on downstream of Songkram confluence on Mekong mainstream in Chaiburi sub-district, Tha Uthen district, Nakhon Phanom Province. The researchers, local people and public sector are collaborate, arrange meeting and participate to form a group of monitoring team, in order to find out where is the suitably locations for the pilot study areas and suitably procedure for monitoring based on public benefit. The survey has executed totally 5 times within 6 months in order to monitor the Mekong river bank erosion. At the end of monsoon period, it is found that some of wooden pegs are above the water level of Mekong River and some are still flooded due to the end up of the rainy season. The level of Mekong River is going draw down day by day, which are obviously appeared to see the ripple mark of water level that shown along the specific pilot study areas. The vertical height of wooden pegs appears both shorter and longer that is mean the eroding and depositing are occurred on the Mekong river bank. Additional, the lowest wooden peg that close to water level is tilting about 30 degree from vertical, and the height of this wooden peg is about 700 millimeters vertically from existing ground level and the team has concluded that this is the highest risk case of erosion in this study.

Topic C: Agricultural Engineering, Postharvest and Food Technology **ID 259**

Production and characterization of sophorolipids produced by *Candida bombicola* using sugarcane molasses and coconut oil

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Keywords: *Candida bombicola*, Sophorolipids, Sugarcane molasses, Coconut oil, Biosurfactant

Abstract. Sophorolipids (SLs) are type of biosurfactants belong to glycolipids group which have a lot of application in many field. They have been producing to replace chemical surfactants due to their excellent properties as higher biodegradability, lower toxicity and environmentally friendly. However, in order to compete with a cheaper chemical surfactant, it is important to use suitable low cost materials for sophorolipids production. In this study, we produced SLs by *Candida bombicola* using sugarcane molasses and coconut oil. The results showed that the optimal conditions for SLs production were 10% (w/v) sugarcane molasses, 10% (v/v) coconut oil, 25^{o}C, pH 6 and 7 days of cultivation. SLs exhibited the ability to resistant *E. coli* NRRL B-409, *P. aeruginosa* NRRL B-14781, *S. aureus* NRRL B-313and *B. subtilis* NRRL B-354. It also showed the ability of free radical scavenging the dose dependent manner with EC_{50} = 0.35 mg/ml and exhibited the emulsification activity. These results showed that sugarcane molasses and coconut oil could be used for SLs production for reducing substrate costs.

The Distribution and some Ecological Characteristics, and essential oil of Cunninghamia konishii Hayata in Pu Hoat Nature Reserve, Nghe An Province, Vietnam

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Keywords: Pu Hoat Nature Reserve, Vietnam, Cunninghamia konishii, Distribution, β-eudesmol

Abstract. In Pu Hoat Nature Reserve, Nghe An Province, Vietnam, Cunninghamia konishii Hayata is normally found on a number of mountainous ranges along part of the border between Lao PDR and Vietnam. They are mainly distributes in 4 communes: Tri Le, Hach Dich, Nam Giai and Thong Thu. This species distributes at altitudinal range from 1,180 – 2,320 m a.s.l and on high slope from 35^0 - 45^0, grows in scattered form or becomes concentrated to form the nearly pure population, the average density of population is 8.5 trees / ha with an area of approximately 96.5 ha of natural forest with the reserves totaling 10,448.8 m^3. This species is distributed in mixed broadleaf trees - conifer moist evergreen subtropical forest and predominately found in the emergent layer. Regenerated forms of streaks or voids, canopy regeneration of the poor under the forest. Cunninghamia konishii Hayata grows in Ferralic Acrisols (Xha) and Humic Acrisols (Xfa). Twenty-six components have been identified accounting for more than 97.07% of the root oil yield. The major constituents of this oil are α-cedrol (29.18%), β-eudesmol (24.21%), γ-eudesmol (9.34%), thujopsene (6.37%) and α-cedrene (4.28%). β-eudesmol and thujopsene of samples are much more than the samples reported.

Topic C: Agricultural Engineering, Postharvest and Food Technology **ID 308**

Some Physical and Mechanical Properties of Paradise Tree Seed (Simarouba glauca)

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Keywords: Paradise Tree, Simarouba glauca, Physical properties, Mechanical properties

Abstract. The main objective of this study was to study the physical and mechanical properties of Paradise Tree seed for the development of postharvest equipment. The seed moisture content of 67.40% (w.b.) was used. In this test, seeds with different sizes: small, medium and large were selected. The results from testing showed that the average arithmetic mean diameters for small, medium and large sizes were 12.95 ± 0.52, 12.98 ± 0.57 and 13.90 ± 0.61 mm, respectively, and the average geometrical mean diameters for small, medium and large sizes were 12.47 ± 0.47, 12.50 ± 0.52 and 13.51 ± 0.60 mm, respectively. The average densities of seeds (small, medium and large sizes) were 446.69 ± 7.07, 427.01 ± 8.19 and 424.18 ± 6.87 kg/m^3 respectively. The angles of repose of Paradise Tree seeds (small, medium and large size) were 0.87 ± 0.04°, 0.86 ± 0.03° and 0.83 ± 0.04°, respectively. The mean coefficients of static friction of grains on different surfaces, namely, wood, zinc, steel, stainless steel and rubber sheets were determined. These values for seeds having transverse movement were higher than those for seeds having longitudinal movement. The maximum compressive loads (N) on Paradise Tree seeds for all compression speeds (0.83, 3.13, and 7.08 mm/sec) occurredunder the condition of compression on large seeds and across length.

Development of a real-time weight measurement system for sugarcane harvesting

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Keywords: Chassis, Weight monitoring, Calibration, Truck

Abstract. This paper examined the development of a real-time weight measurement system for sugarcane harvesting. Finite element simulation of the behavior of the load of harvested sugarcane in the binbox acting on the truck chassis was established. The position of the weight sensors was determined using stress distribution results, and the weight sensors were then designed and constructed. A testing unit representing the truck chassis was constructed for the calibration of the weight sensors. The results showed that sensors should be installed for weight measurements at the center of the frame on the rear truck wheel axle, where the maximum stress was 7.64 MPa. The designed weight sensor consisted of four strain gauges attached to the end of two 30 mm diameter bolts. All strain gauges were wired into a Wheatstone bridge circuit (full bridge). From the calibration results, the linear relationship between the produced signals from sensor (X) and weight (Y) was determined at $Y = 6036.4X - 12565$, and $R^2 = 0.9061$.

Topic C: Agricultural Engineering, Postharvest and Food Technology **ID 316**

The Study of the Soil Texture Parameter in the Upland of Khon Kaen Province; Thailand

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Keywords: Soil Texture Parameter, Loamy Sand, Draft force

Abstract. This study investigated the soil texture parameter in the upland of Khon Kaen Province; Thailand. The testing of primary tillage was conducted using general farming equipment consisting of three types of machinery as a 3-disk plow, 7-disk harrow, and a trash eliminated disk plow. The field test size was 2 0 x1 5 0 m, and testing was replicated three times with each piece of equipment. Soil properties and primary tillage data were measured using the draft force of the equipment, the width and depth of the plow, average speed, and work efficiency. The soil texture parameters were evaluated using an empirical model developed by the American Society of Agricultural and Biological Engineers (ASABE Standard D497.5, 2006).The results showed that the soil texture was a loamy sand. It was in dual classification of coarse texture and medium texture soil. The soil texture parameter (Fi) were calculated and founded between 1.4-1.5. It was greater than the soil texture parameter guidelines of the American Society of Agricultural and Biological Engineers which guided 0.45-0.70. It seemed to be a specific case of soil texture parameter (Fi). Thus, the study would be carried on in the future to clarify this phenomenon.

A Study on Size Reduction of Eucalyptus Bark from the Processing Industry for Producing Biomass Pellets

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Keyword: Eucalyptus bark, Biomass, Hammer mill

Abstract. The size reduction of eucalyptus bark from the processing industry for producing biomass pellets, using hammer mill together with three sieve sizes of 3, 4 and 5 mm, was studied. The speeds of the sieves were 900, 1000, 1100 and 1200 rpm respectively with the feed rate of 80 kg/h. Test results showed that the sieve size of 3 mm with the speed of 1100 rpm gave a capacity of 35.24 kg/h, an average particle size of 0.023 mm and a specific energy consumption of 19.49 watt-hour/kg. The sieve size of 4 mm with the speed of 1200 rpm gave a capacity of 37.89 kg/h, an average particle size of 0.091 mm and a specific energy consumption of 16.36 watt-hour/kg. The sieve size of 5 mm with the speed of 900 rpm gave a capacity of 51.39 kg/h, an average particle size of 0.152 mm and a specific energy consumption of 12.69 watt-hour/kg. It could finally be concluded that the 5mm sieve size with the 900 rpm speed gave the best operating condition for this study in offering the highest capacity and lowest specific energy consumption, while the average particle size was an acceptable value.

Some Physical Properties of Napier Grass before and after Chopping for Producing Biomass Pellets

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Keywords: Physical properties, Napier grass, Biomass, Pellets

Abstract. The objective of this research was to study some physical properties, before and after chopping of Pak Chong 1 Napier grassto produce biomass pellets. The experimental results of Napier grass before chopping were 39.67±26.68 leaves per stalk, 22.42±6.92 internodes per stem, weight per stalk of 0.64±0.24 kg,weight per stemof 0.53±0.19 kg,lengthsof stalk, stem, apex and leaf were 429. 5±52. 58, 257. 40±35. 01, 172. 04±36. 96 and 70. 42±15. 33 cm respectively. Stem diameters at lower, middle and upper sections 19. 42±2. 43, 18. 31±2. 84 and 14. 08±2. 71 mm respectively. The lower and upper apical diameters were 10. 83±1. 55 and 6. 25±1. 21 mm respectively. Thicknesses of leafatlower, middle and upper portions were 0. 13±0. 04, 0. 14±0. 05, and 0. 19±0. 67 mm respectively while widths of leafatlower, middle and upper portions were 28. 01±4. 14, 34. 88±4. 71, and 29. 01±4. 94 mm respectively. The heating values of all parts of Napier grass were not significantly different. On the other hand, the experimental results of Napier grass after chopping indicatedonoptimum moisture content of 11.78 % w.b.by sun drying to produce biomass pellets. The coefficients of static friction on ply wood,rubber,mild steel and stainless steel plates were 0.78 0.69 0.79 and 0.62 respectively. Angle of reposewas 57. 54 degreeswhilebulk density was 39. 46 kg/ m^3. Averageparticle size was 2. 4 7±1. 1 3 mm. Thepercent through sieve by using a size through a resolution sieve of 2. 00 to 0. 85 mm was 72. 53 % andthemaximum heating value at moisture content of 8.37 % w.b. was maximumat 3606.33 cal/g.

Effect of mixing ratio and pelleting speed on some physical and mechanical properties of biomass pellets from sugarcane trash

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Keywords: Sugarcane, Trash, Pellet, Physical properties, Mechanical properties

Abstract. The physical and mechanical properties of sugarcane trash pellet were necessary for the design consideration of the relating storage, handling and processing equipment. The mixing ratios of ground sugarcane trash: cassava starch: water content (1.0: 0.25: 0.85 and 1.0: 0.25: 1.40 by weight) and pelleting speeds (100, 120, 140 and 160 rpm) were considered to determine their effects on bulk density, true density, porosity, durability and compressive strength. The result shown that the mixing ratio by weight of 1.0: 0.25: 0.85 and pelleting speed of 120 to 140 rpm were optimum for producing the sugarcane trash pellet. At the moisture content of 12.01% (w.b.), the bulk density, true density, durability and compressive strength of biomass pellets were in the range of 330.93 to 365.00 kg/m3, 860.38 to 918.43 kg/m3, 99.34 to 99.46 % and 5.15 to 6.43 MPa, respectively.

Topic D

Industrial Engineering, Logistics and supply Chain

Opportunities for improvement in five groups of SMEs by a new lean assessment tool

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Keywords: Lean Assessment, Lean tools, MBNQA, ALF, SMEs

Abstract. The object of this research was to evaluate the implement of lean manufacturing for Small and Medium Enterprises of five industries in the Northeast, Thailand. The five industries were Machinery Industry, Food industry, Rubber Industry, Packaging industry, Garment Industry. The instruments used were applying lean assessment tool. There were five steps. The first was a lean assessment item providing a baseline by 14 items of lean perspective. The 14 items were Kanban system, Visual management, Supplier responsibility, 5s, Operation base layout, Line balancing, Quick changeover, Multi-skill, Standard operation procedure, Poka-yoke, Total preventive maintenance, Policy deployment, Awareness of 7 waste, and Kaizen. The second steps were the Malcolm Baldrige National Quality Award for process evaluation of each in Approach Deployment Learning and Integration (ADLI). The ADLI for each was performance evaluation item classified 0 - 4 for evaluation in depth reflecting level of operations. The last steps were selecting a case study, visiting the SME plants, and data analysis. The finding of lean assessment were amazingly at a high level of leanness in garment industry in all case. Rubber industry was lowest.

The Analysis of Transportation and Distribution Network for Exporting Thailand's Ethanol to Southern China

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Keywords: Ethanol, Transportation, Distribution, Transportation Network, Multimodal Transportation, The Analytic Hierarchy Process

Abstract. This research aimed to analyze and select the transportation and distribution network for exporting Thailand's ethanol to China by determining the departure point of transport in Khon Kaen, Thailand to the destination point in Guangxi Zhuang Autonomous Region, Southern China through the selection of one of the best four alternative transportation networks. With the literature review that provides various forms of transportations such as road, rail and sea, and a decision to choose the best alternative transportation network through considering each of its quantitative factors (time, distance and transportation costs), the result gives choices that are different in each factor. There are also many factors that influence such decision. To obtain the best alternative transportation network, a multi criteria selection *The Analytic Hierarchy Process: AHP* has been used. A decision in selecting the best alternative transportation network is the route that has a departure point of transport in KhonKaen (Thailand) through Thakhek (Lao PDR), and Hatinh Province (Vietnam) and then change the mode of transport at VungAng Port, and the destination point is at Qinzhou Port (Guangxi, China) with an appropriate value of route is 26.8%, a distance of 1,144 kilometers, a total of 41 hours for transporting and the transportation costs of 2.43 baht per liter.

Group decision for strategies formulation through hybrid aggregation: A case study of Thailand's sugar industry

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Keywords: Strategy formulation, Group decision, SWOT, AHP, TOPSIS, Sugar industry

Abstract. In strategy formulation, multiple criteria alternative ranking through group decision is well accepted but the process to aggregate the individual decisions into group judgement is complicated and challenging. The traditional geometric mean aggregation method might ignore the variation among experts' decision. This paper proposed an aggregation algorithm that the following features were considered: 1) agreement among the individuals' decision; 2) influence of persons who had greater preferential difference; 3) the ranks of alternatives for each expert; and 4) the group decision be closest to the best alternative but farthest from the worst one. The case study of Thailand's sugar industry was provided as numerical example.

Comparison of group decision techniques between GMM and TOPSIS for quantification of A'WOT: A case study of Thailand's sugar industry

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Keywords: Group decision, AHP, TOPSIS, A'WOT, Sugar industry

Abstract. Group decision is well accepted especially for an importance decision issue. The challenging raised up when the group decision involved in SWOT-AHP (A'WOT) analysis due to its hierarchy's complexity. The traditional aggregation by GMM alone may ignore variation among experts' opinions. Preferential difference and preferential rank weight are added in the decision model by Huang et.al [4] and Huang and Li [3] with the use of GMM and TOPSIS as an aggregation technique respectively. In this study, the two aggregation techniques used in conjunction with preferential difference and preferential rank were compared using the case study of strategy formulation of Thailand's sugar industry. In order to encourage the willingness of the decision makers to participate in further implementation, the expert satisfactory levels of the final obtained group decision were confirmed through the satisfactory index. The two aggregation methods were compared using the satisfactory index to identify the most appropriate technique for A'WOT. The result revealed that using the GMM method through out every levels of hierarchy is more suitable for A'WOT due to its early and frequent aggregation concept.

Development of Computer-Aided Design Module for Automatic Gemstone Setting on Halo Ring

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Keywords: Geometry tolerance, Jewelry design, Automatic design, Computer-aided design, Volumetric shrinkage

Abstract. This paper proposes computer-aided design modules for automatic setting and arranging of gemstones and diamonds on the head of a halo ring. These modules are able to automatically set the center stone, side stones, and accent stones by using a set of inputs from user. To develop the mentioned modules, the authors have studied several key parameters: sizes and cuts of center stones, side stones, and accent stones, distances between stones, sizes and shapes of prongs, including shrinkages and metal loss during production process. Those parameters were taken into account to derive their relationships in terms of mathematic models. These mathematic models were further used in the development of the computer-aided design modules based on RhinoScript Platform in the Computer-Aided Design (CAD) software named Rhinoceros. The module was developed for assisting CAD designers to automatically generate gemstone rings and to set and arrange center stone, side stones, and accent stones on parts of the rings. It was developed using data and information about jewelry ring design from jewelry designers and a manufacturer, as well as, collaborating with the manufacturer for testing the developed module. The proposed module can help CAD designer to reduce gem setting and arrangement time by about 67-70% in comparison to the manual method. The results and details of the development of the module and the development of the proposed generative design system were included in this paper.

Suitable Forming Condition of Hydroxyapatite and Bioactive Glass Composites for a Bone Fixation Plate Using Taguchi Experimental Design

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Keywords: Hydroxyapatite, Bioactive glass (45S5), Taguchi methods, Compressive Strength

Abstract. Biomaterials have been recently implemented in medical applications such as devices for orthopedic and dental surgery. Biomaterials, such as Hydroxyapatite (HA) and Bioactive glasses (BG) have common chemical components which are similar to those found in a human bone. These biomaterials can be synthesized from natural resources with the calcium as the main component. Therefore, this paper emphasizes on investigating in suitable forming conditions of the mentioned biomaterials for fabricating a new proposed biocompatible bone plate for damaged bone treatment. In this study, HA powder was synthesized from bovine bones, while BG (45S5) was prepared from mollusk shell through chemical reactions. The materials were grounded and mixed using high speed ball milling machine in order to reduce and to thoroughly mix those composites prior to forming of the proposed materials. In addition, the formed composites were compressed by a hydraulic pressing machine. Design of experiment based on Taguchi method was implemented for evaluating the effect of forming conditions, including of mixing ratio, compression force, holding time for pressing and sintering temperature. Consequently, the formed compacts were compressed into a specimen with a diameter of 10 mm, height of 20 mm for compressive strength testing. Then, an appropriate condition was evaluated based on compressive strength as the response. The results showed that the optimal condition was found from the specimen with the ratio of BG:HA equal to 30:70 wt%, compacting pressure of 30 MPa, sintered at 1,500 ˚C and holding time has no significant effect to the compressive strength. At this appropriate condition, the compressive strength of HA-BG composite was 249.46 MPa.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 59**

Comparison of rank-based weighting methods for multi-criteria decision making

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Keywords: Multiple criteria decision making, Criteria weights, Multiattribute decisions, Rank-order weights, Rank-based weighting, Decision analysis

Abstract. In engineering and management science, decision makings are always influenced by several criteria. In addition, degrees of contribution, or the weights, which each criterion makes to the decisions are generally not equal. Among various weighting methods suggested in the decision literature, rank-based methods which convert a criteria priority into numerical weights have been claimed as a good compromise choice between ease of implementation and quality of the decision result. While previous studies compared quality of several rank-based methods through computer simulations, this study conducts an empirical experiment using actual decision data in order to validate theoretical conclusions. Four weighting methods are compared based upon the hit percentage and the rank-order conformity. The results support previous studies that rank order centroid (ROC) method tends to perform the best due to its steepness and non-linear function of the weights which are likely to be mostly consistent with decision makers' behaviour.

Application of value stream mapping for analysis and performance improvement of black glutinous rice supply chain

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Keywords: Black glutinous rice, Value stream mapping, ECRS technique, Supply chain

Abstract. Thailand has the largest area of glutinous rice plantation in ASEAN and is the top glutinous rice exporting country in the world. This research was aimed to investigate, analyze and propose improvement of a black glutinous rice supply chain. Value stream mapping analysis (VSM) was used to identify and categorize activities in the chain. ECRS technique (Eliminate, Combine, Rearrange and Simplify technique) was then used to improve performance of the supply chain. From the results obtained, it was shown that some activities might be eliminated, and total cycle time could be reduced by 20% and 7% , respectively.ECRS proved to be useful in shortening storage and delivery times, hence, cost reduction in the black glutinous rice supply chain. Farmers, rice milling operators, and rice cooperatives will gain several benefits and become more responsive in future customer demands.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 92**

A Mixed-Integer Linear Program for Supply Chain Management Problem: Case Study of Dairy Department, the Thai Vet Army School

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Keywords: Supply Chain, Optimization, Integer Program, Lot-Sizing

Abstract. This study focuses on a mathematical model for a supply chain management problem, which consists of production planning, inventory control, and transportation problems. In this paper, milk supply chain optimization problems are formulated as a mixed-integer linear programming problem considering production lot-sizing and inventory design with a discrete time finite horizon (multi-time periods). The proposed method seeks to maximize system-wide profits while satisfying demand for milk from multiple consumers. The milk supply chain problem of the dairy department in the Thai Vet Army School are considered as a case study.

Performance analysis of Riceberry rice supply chain in northern Thailand

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Keywords: Riceberry rice, Logistic performance index, Supply Chain Management

Abstract. Riceberry rice is one of the most popular rice species and has a high nutritional value. Since consumers have become more health-conscious in the recent years, the demand for Riceberry rice has also increased. Therefore, this research aimed to evaluate the performance of the Riceberry rice supply chain by the producer (farmer), rice mill or cooperative, and the end seller in the Northern region of Thailand, using data collected from site visits, observation, and interviews. The Logistic Performance Index (LPI) was also applied to evaluate the supply chain. The 5 indexes of LPI used for evaluation of cooperatives and sellers were: Inventory Holding Cost per Sales (IHCPS), Transportation Cost per Sales (TCPS), Average Inventory Day (AID), Forecast Accuracy Rate (FAR), Rate of Return Goods (RRG). 4 additional LPI indexes applied to evaluate farmers were: Warehousing Cost per Sales (WCPS), Average Order Cycle Time (AOCT), Average Delivery Cycle Time (ADCT), and Transportation DIFOT Rate (TDIFOT). The key factors which enhanced the performance and sales volume of Riceberry rice supply chain were market expansion, product processing, transportation plan, warehouse management and customer demand forecasting. The market expansion and product processing can increase the sales volume of Riceberry rice. Good transportation plan and warehouse management can reduce the total cost and enhance the performance of the supply chain. In addition, the accuracy of customer demand forecasting can also reduce total cost and increase customer satisfaction. The study acts as a guideline for improvement as well as describing best practices for the Riceberry rice supply chain.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 103**

Integration of value engineering and Theory of Inventive Problem Solving (TRIZ) for increasing the value of industrial products: case study of air-conditioner

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Keywords: Value engineering, TRIZ, Product design, Cost reduction, Air-conditioner

Abstract. Increasing the product value and decreasing the production cost are important factors for the success of manufacturing industries. This research aims to propose a systematic approach for product design and development by applying value engineering technique and Theory of Inventive Problem Solving (TRIZ). Air conditioning manufacturing industry was used as a case study in this research. The research methodology consisted of the selection of parts to be analyzed, data collection of parts to be designed, function analysis, idea creation and the application of TRIZ. Results from product analysis showed that the major part of air conditioning was the Electric Box Assembly which was composed of several minor parts. One of them was the Electronic box plate which was an important part and suitable as a sample part for the study of increasing the product value and decreasing the production cost. From the steps of idea creation and application of TRIZ, a systematic approach for designing the Electronic box plate was generated. This approach can reduce the amount of material used to manufacture this part more than 30% and also increase its value. This was because it can be designed to have a common function with a Partition plate, thus, the value of the Electronic box plate was increased.

Mechanical properties of a hot rolled stainless steel sheet

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The first and second authors contributed equally to this work.

Keywords: TIS 1999-2543, Hot rolled stainless steel, Tensile test, Mechanical Properties

Abstract. This research investigated the difference between the mechanical properties of TIS 1999-2543 hot rolled stainless steel in rolled and transverse directions. Testing specimens were prepared according to ASTM E8 standard. Mechanical properties under consideration included elastic modulus, yield strength, ultimate tensile strength, and elongation at the break. All mechanical properties, with the exception of the elongation at the break, presented statistically significant difference at *p-value* less than 0.05, having greater values in rolled direction.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 166**

A solution approach for solving the location routing problem of the central rubber market

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Keywords: Tabu search, Central rubber market, Location routing problem, Office of rubber replanting aid fund (ORRAF)

Abstract. At present, the central rubber market system is still inefficient, especially when it comes to aspects of the difficulty of transportation for certain rubber sellers moving their wares to the central rubber market, because their plantations are far from the central market, and in addition, rubber selling prices are unfair. Therefore, the researchers have designed an algorithm by applying Tabu Search to find the solution to solving location selection problems of rubber purchasing depots replacing the central rubber market and managing vehicle routes from it to the rubber purchasing depot, where the owner must be a member of the Office of Rubber Replanting Aid Fund (ORRAF) or of the Rubber Plantation Fund Cooperative. The capacity of the purchasing location is divided into three types, small size (10 tons), medium size (25 tons) and large size (50 tons), with truck capacities of two sizes, namely, 20 tons maximum and 25.5 tons maximum. The testing results found that the selection of appropriate purchasing depots and the management of appropriate vehicle routes consist of establishing purchasing depots at seven points, along with vehicle capacity of less than 25 tons, leading to a minimum cost of 58,110.58 baht/day.

Forecasting cultivation areas for sugarcane and competitive crops using neural network ensemble model (NNE) based on analytical network process (ANP)

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Keywords: Forecasting, Neural network ensemble model (NNE), Analytic network process (ANP), Back propagation neuron network (MLP-BP), Radian basic function (RBF)

Abstract. This paper presents cultivation area forecasting of four competitive crops; sugarcane, cassava, irrigated rice and rainfed rice in Kalasin province, Thailand by using neural network ensemble models (NNE) based on analytic network process (ANP). Normally, crop switching of these four crops can be conducted in the same area. It causes crops' unstable supply. This forecasting assists the mill to plan the quantity of raw material and to monitor possible problems from inadequate supply or over supply.NNE model was designed by using two neuron networks; multilayer perception with back propagation (MLP-BP) and radian basic function (RBF) and trained by the priority values from ANP. Their solutions were combined by the simple averaging (SA) and median (ME) methods. The result showed that the ME method provided lower forecasting error. Thus NNE from this ensemble method should be used for new forecasting and it assists to reduce from a group decision to a single decision.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 174**

The Development of Logical Root Cause Analysis in Manufacturing Process for Mitigation Loss and Waste

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Keywords: Manufacturing Process, Root Cause Analysis, Process Control, Problem Solving

Abstract. This paper aims to develop an approach for identifying root causes of loss and waste in manufacturing process by reducing human judgments. The newly development of root cause analysis is the Logical Root Cause Analysis (LRCA) which has two elements as the Input, Material, Process, Product and Output Chart (IMPPO) and the Cause of Symptom Identification Method (CSIM). IMPPO is applied for characterizing manufacturing process while the other is for identifying the origin of root cause and symptom. Both methods have been tested with the industrial case. It is found that the root cause analysis (RCA) activity is achieved while human judgment isrequired less than the existing approach.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 182**

Robust goal programming approach to an intermodal routing decision problem

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Keywords: Transportation, Intermodal Transportation, Goal programming, Robust Optimization

Abstract. Under fierce competition for today business, it is very important for companies to reduce their logistic cost. Intermodal transport can exploit transportation cost structure and gain service response. Selecting transportation routes under various factors such as minimum transportation cost, just-in-time commitment, and transit time variability is a crucial decision. Unlike traditional model assumption, uncertainty for data collection in each parameter is presented. In this paper, the intermodal transportation problem is formulated as a robust goal programming to address data uncertainty in transit time variability. The numerical result was tested against tapioca transportation network in Thailand.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 188**

The influence of environmental value and attitude on student's intention to participate in a take back program

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Keyword: Environmental value, Environmental attitude, Student's intention, Take back program, Structural Equation Modeling (SEM)

Abstract. One of a take back program goals is to preserve the environment. Participation of the consumers in a take back program will succeed the collection process as the first step in reverse logistics. This research studied the intention of consumers, especially university students to participate in the mobile phone take back program based on the influence of their environmental value and attitude, using structural equation modeling. The survey was conducted on 184 university students in Indonesia. The results showed that the environmental value had positive and significant effect on the environmental attitude, but the environmental attitudes did not give significant effect on the student's intention to participate in the mobile phone take back program. These results can be used as a reference for mobile phone companies to implement a suitable take back program especially for university students.

Utilization of Pottery Stone as a Replacing Material for Vitreous Ceramic Sanitary Ware Production: A Case Study in Khon Kaen, Thailand

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Keywords: Materials replacement, Firing temperature, Energy fuel, Production cost

Abstract. The aim of this work was to determine the properties of vitreous ceramic sanitary ware bodies according to the production of Khon Kaen ceramic sanitary ware industry, Thailand. Pottery stone was used as a replacing material in the commercial ceramic sanitary ware body formulation. The cast slurry of seven formulations was prepared by wet milling. The rheological properties (density and torsion viscosity) were investigated before slip casting. The test pieces were fired at 1175, 1200 and 1225° C and the physical-mechanical properties (firing shrinkage, flexural strength, and water absorption) were compared. As a result, pottery stone shows a possibility to replace quartz in the production. It could enhance all of the good properties at lower firing temperature. Using of pottery stone could reduce production cost in term of energy fuel by 4.45% when compared with commercial formulation.

50 Ton Tubular Ice Factory Production Optimization

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Keywords: Industrial, Optimization, Research, Ice, Consumable, Insulation

Abstract. The consumable ice industry is one of the most important consumable industry in Thailand due to the hot climate. There are two types of consumable ice in Thailand which are the tubular ice and the block ice. As there are over 1,500 ice production facility in Thailand according to the Ministry of Energy, large amount of power consumption had been made towards producing the product. Most of the factories are still not considerate about optimizing the production scheme or the machines they used. This leads to the considerations about determining a method to optimize the production process in terms of energy conservation and production efficiency. This research would be a piloted experiment towards an actual 50 ton capacity factory optimization process which the results proved that the five methods used had proved to reduce production time as well as lowering power consumption. The methods included machine maintenance, installation of insulating materials in lower tank, installation of VSD pump, and roof shielding for storage tank. Economically, the process would reached the payback point within two years and this could become a guideline for other production facilities that are interested towards operation research and optimization.

An Artificial Bee Colony Algorithm with Local Search for Vehicle Routing Problem with Backhauls and Time Windows

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Keywords: Artificial Bee Colony Algorithm, Vehicle Routing Problem, Backhauls, Time Windows, Local Search

Abstract. This paper presents an artificial bee colony algorithm to solve the vehicle routing problem with backhauls and time windows (VRPBTW). This problem is a combination of the vehicle routing problem with backhauls (VRPB) and the vehicle routing problem with time windows (VRPTW). In VRPBTW, a homogenous fleet of vehicles are utilized to deliver goods to customers in linehaul set and then to pick up goods from customers in backhaul set. Vehicle capacity, backhaul and time windows are the major constraints for this problem. The objective of VRPBTW is to minimize the sum of route distance that satisfy all constraints. An artificial bee colony (ABC) algorithm with local search procedures are proposed to solve the modified Solomon's VRPTW benchmark problems. The results of computational experiments reveal that the performance of the proposed ABC algorithm is comparable to the other metaheuristics in terms of the quality of solution.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 252**

A Genetic Algorithm with Local Search for Multi-Product Inventory Routing Problem with a Fleet of Multi-Compartment Vehicles

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Keywords: Inventory routing problem, Genetic algorithm, Multi-product, Multi-compartment vehicle, Optimization

Abstract. This paper presents a genetic algorithm (GA) with local search method to determine the solution for the inventory routing problem (IRP) with a homogeneous fleet of multi-compartment vehicles. The objective is to minimize the total cost including the rental cost, the travelling cost, and the inventory cost. Each customer is allowed to have multiple visits by vehicles. The multi-product with known demands and limited tank capacities at customers are in our consideration. The mathematical model for this IRP is presented and classified as the mixed integer programming. Since the IRP is considered as the NP-hard problem, GA is developed to deal with the large-scale problem. The proposed GA with local search method is utilized to determine both the order quantities and routes for distribution. The chromosome representation, GA operators, and GA parameters are described in this paper. The numerical examples reveal that, for the problems having high complexity, the proposed GA can yield better quality of solutions than the solutions of the optimization software namely CPLEX 12.4. Moreover, the computational time of the proposed GA is significantly lower than that of CPLEX 12.4 for the large-size problem.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 253**

Using generalized linear models and time series models to forecast gasohol consumption in Thailand

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Keywords: Alternative energy, Gasohol, Generalized linear models, Time series model

Abstract. This paper proposed two methods in statistical modeling to forecast gasohol consumption as alternative energy in Thailand. The generalized linear models (GLMs) and time series models were applied. The first method was used to investigate the factors that impact response variables, consumption of gasohol 91, gasohol 95, gasohol E20, and gasohol E85. Also, the first method was to take among of factors to forecast all of response variables. The second method was used to forecast gasohol consumption in the further. The important results were ethanol price impacting to all of response variables: higher ethanol price making smaller consumption of gasohol 91 and gasohol 95. On the other hand, higher ethanol price making higher consumption of gasohol E20 and gasohol E85. However, it has been found in this study that forecast precision in terms of MAPE of GLMs models were less than time series models.

Production lot sizing problem with sudden obsolescence and machine breakdowns

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Keywords: Production lot size, Inventory control, Maintenance, Product obsolescence

Abstract. In this paper, an unreliable production system that produces a particular product subject to sudden obsolescence is studied. The purpose of this work is to develop an integrated product obsolescence and machine breakdowns inventory model for determining the optimal lot size that minimizes operating costs during product lifetime. Assuming that both machine failure and product obsolescence occur according to an exponential distribution, the expression for the cost function is offered. The numerical results show that both failure rate and product lifetime have significant impact in determining the optimal lot size of the integrated model.

Performance evaluation of Large and Medium Scale Manufacturing Industry Cluster in East Java Province Indonesia

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Keywords: Performance evaluation, LMSMI, Industry cluster, DEA-based malmquist productivity index

Abstract. East Java Province Indonesia is the center of Eastern Indonesia Region, and has a fairly high economic significance, which contributed 14.85% to the national Gross Domestic Product. The role of Large and Medium Scale Manufacturing Industry (LMSMI) Cluster in this province is very important and strategic to be one of the main drivers for the economic progress and as part of efforts to improve the lives of society. Therefore, it is necessary to evaluate the performance of LMSMI Cluster continuously. The purpose of this study was to investigate the productivity changes of LMSMI Cluster in East Java Province, Indonesia, therefore they will be able to survive, grow and compete in facing the global competition. The method used in this study is the method of DEA-based Malmquist Productivity Index. The result of this study indicates that 50% of Large and Medium Scale Manufacturing Industry (LMSMI) Clusters in East Java Province are in the category of Improved Productivity and the remaining are in the category of Productivity Declined.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 327**

English proficiency requirements for engineering graduates at private organizations in Thailand

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Keywords: English proficiency, Engineering English, Proficiency requirement, English for Science and Technology (EST)

Abstract. A primary goal of world class universities is teaching and producing talented graduates who exceed the expectations of their chosen industry. English proficiency is one of the most important requirements for global companies as it is the common medium for international communication in any industries. The purpose of this research is to investigate English proficiency skills required for engineering graduates to communicate and work with private industrial organizations in Thailand. A questionnaire was developed in order to investigate requirements of private engineering companies based upon four English skills including listening, speaking, reading, and writing. The questionnaire was also used to evaluate the levels of satisfaction on English proficiency of engineering graduates who have been working in their organizations. At the end of the survey period, 129 questionnaires were returned (46% response rate from 280 delivered questionnaires) from various industries covering Thai and international companies located in Thailand. Results indicate that the employers have different requirement levels on each English skill. The four skills can be ranked from the most to least important as reading, listening, writing, and speaking, respectively. The results also show that the proficiency in the four English skills of Thai engineering graduates has not met the employers' requirements. The results of this research can be used to develop English courses for Thai engineering students in response to their lack of English skills.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 336**

The factors affecting on consumption of some petroleum product in Thailand using generallinear model and generalized linear model

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Keywords: Alternative energy products, Consumption of petroleum product, General linear models, Generalized linear models, Gamma distribution, Factor analysis

Abstract. The objective of this research was to investigate forecasting consumption of some petroleum products in Thailand. Two methods of statistical modeling, general linear models (GLM) and generalized linear model (GLMs) were applied. The GLM compared with GLMs in which response variables are the consumption of gasohol 95, gasohol 91, gasohol E20, and gasohol E85. The explanatory variables were gasoline 95 price, gasohol 91 price, gasohol 95 price, LPG price, NGV price, ethanol price, exchange rates, and world crude oil prices. The secondary data from many resources in the time period Jan 2010 to Dec 2015 were collected for analysis. The factor analysis was applied to reduce some-covariate variables that are high relationship. The study found that the GLMs with gamma distribution was more appropriate than GLM when response variable is not normality. In case of the response variable is normally distributed both of them give well the same result.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 340**

Vehicle routing problem for freight forwarding

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Keywords: VRP, Subcontracting, Transportation planning, Multi-transportation modes, SA

Abstract. This paper reveals a current business situation where several types of subcontracting transportation are used for delivery services in forwarding companies. Each subcontracting option contains different cost structure and constraint set that make more complex in transportation planning. This problem comprises new aspects which extend the traditional vehicle routing problem (VRP). A simulated annealing (SA) technique is proposed for simultaneously solving the combination of optimization problems in vehicle routing and scheduling.

Topic D: Industrial Engineering, Logistics and Supply Chain **ID 349**

Mathematical model and simulation study of a closed poultry house environment

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Keywords: Livestock building, Broiler house, Poultry house model, Tunnel ventilation, Evaporative cooling, Temperature and humidity control

Abstract. The temperature and humidity inside the poultry houses are highly coupled through nonlinear psychrometric processes, and the limitation of actuators makes this type of system difficult to control. For understanding the dynamics of such systemsand further to design a suitable controller, in this study, the mathematical model for closed poultry house was derived from the governing equations of the various components related to the house, including of the energy and mass balance and the psychrometric correlations of the moist air. The model was simulated and the simulation result was compared tothe data collected experimentally for model verification and control gains estimation. Under the assumptions of 70 percent Active Mixing Volume (AMV) with the constant maximum ventilation rate of the case study, the temperature and the relative humidity simulated results were in the good agreement with the real plant data. At the front, the middle and the rear part of the house, the root-mean-square error (RMSE) obtained for temperature are 1.17 °C, 0.68 °C, and 0.46 °C , respectively. And those for the relative humidity are 4.31 %, 8.07 %, and 53.54 % respectively.

Topic E

Energy Technology, Thermal Systems and Applied Mechanics

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 25**

The behavior of Lewis number in fined-tube cooling coils under highly moist inlet air conditions

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Keywords: Lewis number, Cooling coils, Dehumidifying process, Moist air

Abstract. The objective of this research was to study the effects of inlet air conditions such as temperature, relative humidity, and frontal air velocity on the value of Lewis number in cooling and dehumidifying process of air. A cooling coil was tested under ranges of temperature, relative humidity and frontal velocity. It was found that the Lewis number varied in the range of 0.92-1.62 and that the increase in inlet air relative humidity tends to decrease the Lewis number. Based on the experimental data a correlation for predicting the Lewis number was also purposed in this article. The correlation has the mean absolute error(MAE) of 3.04% and cover 98.07% of the data, and a discrepancy of ±10%.

Whiteness index prediction of para rubber sheet during hot air drying

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Keywords: Para rubber sheet, Whiteness index, Hot air drying, Response Surface

Abstract. This research's objective was to study the color change by analyzing whiteness index (WI) of unsmoked sheet (USS) during hot air drying at different temperatures compared with reference USS dried by sun drying. Result data then was used to develop the equation to predict the WI change by response surface methodology (RSM). The times to dry the raw para rubber sheet (RPRS) at initial moisture content of 25.0±2.0 % dry basis (d.b.) with hot air temperature of 50, 60 and 70˚C to final moisture content of 3.0±1.0 % d.b. were 68, 44 and 16 hr, respectively. At the final moisture content, WI values of the dried USS were 48.8, 50.1 and 54.5, respectively, whereas that value of reference USS was 43.3. Consequently, the brown color of dried USS by hot air was not darker than the reference USS and regarded good quality color. In addition between the first and second degree models of WI prediction, it was found the second degree model was better with a mean of coefficient of determination (R^2) of 0.9424.

Ethanol production by co-fermentation of molasses and oil palm empty fruit bunch hydrolysate

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Keywords: Oil palm empty fruit bunch, Steam explosion, Ethanol, Co-fermentation, Cane molasses

Abstract. Maximum ethanol production by co-fermentation of molasses (22%, w/v total sugar) and oil palm empty fruit bunch (OPEFB) hydrolysate was 61.60 g/l (0.38 g/g sugar) at 72 h, while maximum ethanol produced from the molasses was 53.89 g/l (0.34 g/g sugar). OPEFB slurry (the OPEFB hydrolysate which contained solid residue of pretreated OPEFB) gave maximum ethanol 68.77 g/l (0.44 g/g sugar) when it was co-fermented with the molasses. After fermentation, scanning electron micrograph of pretreated OPEFB in the OPEFB slurry revealed yeast cells adsorped to the pretreated OPEFB. The results indicated that ethanol production by co-fermentation of molasses and OPEFB hydrolysate was cumulative sum of ethanol produced from each raw material, and pretreated OPEFB suspended in OPEFB hydrolysate increased ethanol production in the co-fermentation of molasses and OPEFB hydrolysate.

Characterization of bio-oils from jatropha residues and mixtures of model compounds

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Keywords: Biomass, Fast pyrolysis, Model compounds, Renewable energy

Abstract. In this work, compositions of real bio-oils from fast pyrolysis of jatropha cake were analyzed against those of woods obtained from literature. Model bio-oils were subsequently prepared accordingly. Main components of bio-oils were found to consist of organic acids, phenols, ketones and alcohols which were modeled using acetic acid, phenol, acetone and ethanol, respectively. Properties of both real and model bio-oils were characterized. It was found that chemical and physical characteristics of these bio-oils vary widely. Acids were the main component, accounting for over 70% which were long chain acids such as oleic and palmitic acids. Real bio-oils appeared to have higher energetic content, density, viscosity acidity, flash and pour points than the model oils. This was due to variety of large and heavy molecules in real bio-oils, and use of light compounds in the model oils.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 53**

Effect of Moisture Content on Physical Properties of Cassava Stalk Pellets

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Keywords: Agricultural residues, Moisture content, Physical Property, Pellet

Abstract. Cassava stalk residues are abandoned after the harvesting period. One of the possible ways to manage cassava stalk residues is by converting them into biomass energy by pelletization. The pelletization was started with the cassava stalks were milled and sieved to make them uniform. The moisture content was defined as percentage of water adding by mass of raw material. The pelletization was performed using conventional pelletizer. The physical properties of Cassava pellets (particle density, bulk density, porosity and durability) were evaluated. The best condition to pelletize Cassava stalk pellets was at water adding 10% by mass of raw material. The range of pellet's particle density, bulk density and durability are between 1062.56 to 1262.57 kg m^{-3}, 311.89 to 718.18 kg m^{-3} and 78.46% to 98.14%, respectively.

Experimental investigation of thermal performance enhancement in tubular heat exchanger fitted with rectangular-winglet-tape vortex generators

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Keywords: Heat exchanger, Heat transfer, Rectangular winglet tape, Thermal performance, Vortex generator

Abstract. The article presents an experimental study on thermal characteristics in a constant heat-fluxed circular tube fitted with rectangular-winglet tape (RWT) vortex generators. Air was employed as the working fluid based on Reynolds numbers (Re) in the turbulent regime between 4100 and 26,000. The effect of the RWT insert on heat transfer rate and friction loss was experimentally investigated. The RWT parametric study includes five winglet-to-tube height ratios or blockage ratios (b/D=BR= 0.15, 0.2, 0.25, and 0.3) at a single winglet inclination angle (θ= 45°) and a pitch ratio (P/D=PR=2). The experimental results show that the heat transfer and friction loss for the RWT insert increase with the increment of BR. The Nu for the inserted tube was approximately 3.7–4.3 times higher than that for the smooth tube, while the f was approximately 19.4–45 times greater. For the studied BR ranges, the highest thermal enhancement factor (η) of 1.46 is obtained for BR = 0.2 at lower Re.

Densification of corn cobs using algae as a binder

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Keywords: Agricultural residues, Biomass, Pelletization, Renewable energy

Abstract. Corn residues are abundantly available, but utilization of this potential biomass energy source was limited by their low density and non-uniform physical characters. Densification may be used to solve this problem. Many research works used high temperature and high pressure to compress biomass into pellets, as well as expensive additives for higher quality pellets. In this work, locally available algae (*Spirogyra sp.* and *Chara sp*.) were used as binding agent for densification of corn cobs. Compaction was carried out at a fixed die temperature of 30°C. Effects of pressure (100-200 MPa) and algae to biomass ratio (10-40% w/w) on pellet characteristics were examined. It was found that algae can be successfully used as binder for densification of biomass. Use at below 20% w/w, density of the pellets was improved by 4-11%, compared to pure corn cob pellets, without significant reduction in energy content.

Biogas Simulation with mixed gas free on Metal Cutting

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Keywords: Cutting, Oxy - Fuel, Cutting Process, Flame cutting

Abstract. This study aimed to study the biogas simulation with mixed gas free on metal cutting by using oxy-fuel to cut AISI 1045 metal size 50 mm. X 50 mm. X 6 mm. with automatic cutter model KT 5 NX. In general biogas was composed of methane, carbon dioxide, hydrogen sulfide and oxygen. However, this study employed only 67% methane and 26.3% carbon dioxide using Biogas 5000 as a measuring instrument. The results showed that the average surface roughness was 4.94 micrometer measured by Mitutoyo SURFTEST SJ-301 with the heat measured by SEM JS-5410 LV at 1000 magnification. The cut was divided into 4 sections i.e. the highest flame-cutting part, unequal heat radiation parts and less heat part. Heat was analyzed qualitatively by EDS Link ISIS300 to find changed elements. From 4 areas there were 9 elements, among these iron, carbon and manganese were necessary elements. After cutting, average carbon was higher at 0:42-00:50 while normal was 0.73%. Iron was below average at 76.35% from 98.51-98.98 whereas manganese was 0.58% which was similar to normal at 0.60-0.90%.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 91**

The Strength Analysis of an Agriculture Truck Chassis using Finite Element Method

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Keywords: Agriculture Truck, Chassis, Structural Strength Analysis, Finite Element Analysis

Abstract. The objective of this research was to analyze structural strength of agriculture truck based on basic global load case using finite element (FE) analysis software. The chassis of an agriculture truck made from Anan Karn Chang Agriculture Truck in Chatturat district, Chaiyaphum province, Thailand, was chosen for the study. The three-dimensional beam element type was applied in the study. The analysis was simplified based on static load and linear elastic material behavior assumption. There are four types of basic load behavior consisted of bending, torsion, longitudinal, and lateral loads considered. The results of maximum stress and deformations including construction stiffness were used as main parameters to evaluate the structural strength among load case. Regarding the results, it was found that the maximum stress occurred in torsion load was 164.57 MPa. The stress of bending load, longitudinal load and lateral load was 131.49 MPa, 147.08 MPa and 152.78 MPa, respectively. Furthermore, the bending and torsion stiffness of chassis were 7,399 N/mm and 6,415 N-m/degree, respectively.

Experimental investigation on convection heat transfer in solar air heater with perforated-winglet vortex generators

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Keywords: Solar air heater, Absorber plate, Vortex generator, Thermal performance

Abstract. An experimental investigation on thermal and flow friction characteristics of turbulent flow in a solar air heater duct with perforated rectangular winglet (PRW) vortex generators placed repeatedly on the absorber plate has been carried out. The experimental work is performed by varying the airflow rate in the form of Reynolds number from 5300 to 23,000. The PRW elements are mounted repeatedly with four perforated-winglets having punched hole diameters, (d=1.5, 3, 5 and 8 mm) at a single attack angle (α=45^o), pitch ratio (PR=2) and blockage ratio (BR=0.4). Influences of the PRW parameters on heat transfer characteristics in terms of Nusselt number (Nu) and friction factor (f) are investigated. The obtained result reveals that the employ of PRW elements provides much higher heat transfer and friction loss than using the duct alone. Although the non-perforated rectangular winglet, RW (without holes) gives the maximum heat transfer and friction loss but the highest thermal performance is found for the PRW with punched hole diameter of 5 mm.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 112**

Effect of various dimensions of cyclone combustor to burn raw producer gas

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Keywords: Cyclone combustor, Raw producer gas, Numerical simulation

Abstract. A cyclone combustor is designed for syngas combustion has been stated in this paper. The syngas from biomass gasification is burned in cyclone combustor as a fuel. The objective of this research is to investigate the effects of various dimension of cyclone chamber including different diameters and different lengths of cyclone combustion chamber. The tangential velocity and exhaust gas quality are compared in various dimension of cyclone chamber. The result shows that the small diameter and long chamber of combustor cause high burning efficiency; the combustor can produce high CO2, low O2 and high exhaust gas temperature. To produce strongly cyclonic flow, the combustor should have large diameter and short length.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 116**

Inhibitor formation during glucose and xylose production from corncob hydrolysate and the effect to bioethanol production

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Keywords: Inhibitor, Corncob dust, Glucose, Xylose, Hydrolysis

Abstract. Corncob dust was potentially used as an alternative carbon source for ethanol production due to the fermentable sugars derived from acid hydrolysis. Under the optimum condition, glucose and xylose were the major sugars obtained from the hydrolysate with less than 0.4 g/l furfural and 5-hydroxymethyl furfural (5-HMF) also found. The corncob dust hydrolysate was examined for ethanol production by the xylose – fermenting yeast, *Candida shehatae* TISTR5843. The results revealed that the inhibitors might affect cell growth due to the slow change of biomass observed at the early stage cultivation. Glucose was gradually consumed, while xylose was utilized by yeast during the ethanol production. Therefore, the corncob dust hydrolysate was potentially used for cell mass and ethanol production by *Candida shehatae* TISTR5843.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 132**

Application of conductive polymeric binder in non-sintered thermoelectric materials

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Keywords: Thermoelectric, Conducting polymer, PEDOT:PSS, Sodium cobalt oxide

Abstract. Polymeric binders are general employed in consolidation of ceramic powder to a desired shape. However, the electrical insulation property of binders may significantly deteriorate the performance of non-sintered thermoelectric ceramics. This study aims to report a simple preparation of a consolidated gamma-sodium cobalt oxide bulk material assisted by utilization of poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PDOT:PSS), a mixture of conductive polymers, as binder. Addition of tiny amount of PDOT:PSS resulted in an enhanced electrical conductivity of the consolidated oxide sample. Effects of compressive pressure (24 and 344 MPa) on the thermoelectric properties of the oxide material were investigated, and a maximum power factor of 0.11 $\mu W/mK^2$ was observed from the sample consolidated under the elevated pressure.

Effect of nozzle position on water ejector efficiency

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Keywords: Water ejector, Nozzle position, Efficiency

Abstract. The aim of this experimental is to investigate the efficiency water ejector. The effect of nozzle position on its efficiency was investigated. Nozzle position varied the ratio of nozzle-to-throat spacing to throat diameter (X = L/D) with values of 0, 0.5, 1, 2 and 3 respectively. The maximum water ejector efficiency obtains for nozzle-to-throat spacing to throat diameter ratio is approximate14 %. The experimental results were found in good agreement with the ESDU design guide.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 146**

The effects of aquatic weeds pretreatment on biogas production with cow dung in batch fermentation process

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Keywords: Biogas, Steam pretreatment, Autoclave pretreatment, Alkaline pretreatment, Aquatic weeds, Cow dung

Abstract. Pretreatment of plant lignocellulosic wastes is one of the mostcrucial stepsfor biogas production. To investigate the effect of this important process, the biogas productionsusing different pretreated aquatic weeds (water hyacinth, water lettuce, and cattail) was performed in 1: 4 mix ratiowithcow dung. Thebatch digestion of each pretreated plant was done in 0.25 L of total ferment materialsat 33°C for 39 days. The C/N ratio ofwater hyacinth, water lettuce, and cattailwere 17.96:1, 15.0:1 and 20.5:1, respectively. The results showed that all pretreatment effected on the structure and chemical compositions of aquatic weeds. The biogas production of water lettuce and cattail showed the highest cumulative biogas of 249 and 239 ml in autoclave pretreated water lettuce and autoclave combined with alkali pretreated cattail, which greater than untreated of 23.69and 38.36% . Methane content of pretreated water lettuce and cattail were 33. 07% and 30.28% , which greater than untreated of 27.43 and 36.69%.Moreover, the removal efficiency of the total volatile solid (TVS) were 27.37 and 30.61%, average pH were 7.00 and 6.27, respectively. Our finding indicated that the pretreatment can improve biogas yield. Using of aquatic weeds as an alternative material for efficient biogas productionmight be the sustainable way to reform energy and reduce the water pollution at the same time.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 147**

Using CFD to find the best placement of HDD production machinery for major renovation of factory clean room

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Keywords: Computational Fluid Dynamics, CFD, Clean Room, Airflow, Particle Contamination

Abstract. HDD production needs to be done in a clean room that keeps particulate contamination to the minimum. In planning a renovation of a clean room in an HDD factory in Thailand, a question came up whether to put components of HDD production machinery on raised platforms or keep them on the floor level in order to better minimize contamination. This study was conducted to find the answer using computational fluid dynamics (CFD) simulation software, Ansys Fluent, combined with the real ventilation conditions planned for the clean zone. The simulated results showed that keeping the machinery in the same level with the floor is more effective.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 175**

Determination of Linke turbidity factor from the precipitable water vaporand visibility data

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Keywords: Linke turbidity factor, Precipitable water vapor, Visibility, Direct solar radiation

Abstract. The Linke turbidity factor (T_L) is calculated from of direct solar radiation in a clear day. The data between years 2011-2013 from three measurement stations including Chiang Mai, Ubon Ratchathani and Songkhla were used in the calculation. The relationship between T_L with the precipitable water vapor and visibility in a mathematical model was investigated. The results showed that the relationship has a relatively high of reliability. The model was validated using independent data do not take modeling, found that predominantly high correlations and relatively high coefficients of variation were obtained for the linear relationships at whole dataset. T_L models were used to calculate nationwide, found that the Linke turbidity factor is high in the dry season (November-April), and decrease in the rainy season (May-October).

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 193**

Performance study of solar panels with cooling systems at low ambient temperature

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Keywords: Solar panel, Cooling system, Ambient temperature

Abstract. Solar panel temperature affects its conversion performance, which decreasing at high panel temperature. A water cooling system was designed and tested during winter at Maha Sarakham, Thailand when the ambient temperature was approximately 25°C in February. It was found that the front panel cooling system with the lowest panel temperature led to the best overall performance. Interestingly, even though the no cooling system had the highest panel temperature, it performed better than the back panel cooling system. Reduction of panel temperature increased output voltage but conversely reduced output current. In conclusion, the cooling system had little effect at ~25 °C ambient temperature and ~1000W/m^2 solar radiation. Even though the ambient temperature is low, solar panel temperature still affects the output voltage in a way that consequently reduces the overall solar panel performance**.**

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 197**

Co-sensitized ruthenium(II) for dye-sensitized solar cells (DSSCs)

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Keywords: Dye-sensitized solar cell (DSSC), Ruthenium complex, Co-sensitization, Co-dye

Abstract. The co-sensitized dyesof the ruthenium complexes which are P2+N719 and YN07+N719 were synthesized and studied for dye-sensitized solar cells (DSSCs).The mixed solutions showed the complementary absorption spectra which gave a larger molar extinction coefficient and longer MLCT absorptions than the pure complexes. However, the DSSCs gave the low power conversion efficiency (PCE) at 2.37% and 1.59%, compared with 5.17% of N719.The results concluded thatthe molecular size and unsuitable HOMO of the ruthenium complexes can be a responsible.

Controller Design and Simulation of a One-Degree-of-Freedom Power Assist System for Lifting Objects

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Keywords: Power assist robot, Force sensor less, Disturbance observer, Feedback control

Abstract. This paper presents a controller design and simulation of a one-degree-of-freedom power assist robot for lifting objects. The research is conducted through a simulation of the control system of power assist devices, without determining friction of the system, but allowing for time delay at 150 μs. To this end, a force sensor-less method, a calculation of the disturbance torque from the actual weight of an object which can be estimated from a disturbance observer in place of a force sensor is employed. The disturbance torque obtained is then converted to force signal and reference motion to control the power assist system. Both, force signal and reference motion are generated by the PID controller, which is designed for the power assist system to maintain its stability. From the simulation, the controller enables the robot to efficiently lift an object with ease of use; the operator perceives a load applied 10 times lighter than the actual weight (assist ratio, $\alpha = 10$). In practice, however, there might be other limitations to be taken into account: for example, strength of the power assist robot's structure which has to be suitable for a certain task.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 203**

Energy saving of cooling tower replacement by a mathematical model

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Keywords: Cooling tower, Chiller, Mathematic model, Cooling tower base line, Energy saving

Abstract. The cooling tower replacement of chiller system is effected to energy saving of chiller because of condenser's heat transferring was improved. The evaluation of energy saving from replacement the new cooling tower could be low accuracy because the old cooling tower has been rejected. This research was study the relativity between old 1,250 ton of cooling tower and 1,000 Ton of chiller by mathematic model to use as base line. When replace new cooling tower could be measuring the energy saving because the base line of old system in mathematic model so that would be more accuracy in energy saving evaluation. The result of mathematic model creation for old system found accurate 2.7 of CVRMS. The mathematic model equation could be predicted the energy saving when replace new cooling tower, the potential energy saving was 693,863 kWh/year.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 212**

Thermal resistance of a rotating closed-loop pulsating heat pipe: Effects of working fluids and internal diameters

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Keywords: Rotating closed-loop pulsating heat pipe, Centrifugal acceleration, Working fluid, Internal diameter, Thermal resistance

Abstract. Objective of this study is to experimentally investigate the effects of working fluids, and internal diameters on thermal resistance of the rotating closed-loop pulsating heat pipe (RCLPHP). The RCLPHPs were made of a copper tube with internal diameter of 1.50 and 1.78 mm and bent into flower's petal-shape and arranged into a circle with 11 turns. The evaporator section located at the outer end of the tube bundle. R123, ethanol, and water was filled as working fluid. The RCLPHP was rotated at the centrifugal acceleration of 0.5, 1, 3, 5, 10, and 20 times of the gravitational acceleration considering at the connection between the evaporator and condenser section. Heat input was varied from 30 to 50, 100, 150, and 200 W. It can be concluded that when the latent heat of evaporation increases, the pressure difference between the evaporator and condenser section decreases, the thermal resistance increases. Moreover, when the internal diameter increases, the driving force increases and the frictional force proportionally decreases, or the Karman number increases, the thermal resistance decreases.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 218**

Experimental Water to Air Thermoelectric Cooling Application in Automobile

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Keywords: Thermoelectric, Cooling, Automotive, Heat Exchanger, Peltier Effect

Abstract. In the present, HVAC in automotive application is a compulsory feature. It is to cool or heat a compartment or space for the comfort of users or preserving items. This will rely on a compressor driven system using compressed refrigerants. The system is however, requiring maintenance, space consuming, and drawing out a significant amount of valuable power from the engine in order to supply the system in case of automobiles. This research provides the feasibility test of a thermoelectric air conditioner in order to avoid the demerits of a HVAC system. Peltier effect was selected as the operating principle in the heat transfer process instead of the HVAC system. The benefit of a Peltier cooler is the compactness of the packaging as well as being maintenance free while offering reasonable cooling performance. Thermoelectric plates are connected with a water box then connected outside with a heat exchanger and radiator and fans. The module will be tested against the factory installed climate control system. The system could provide cooling effect by adjusting the electrical current path. This research will focus on the ambient temperature before and after the thermoelectric plates were switched on. The outcomes were that the system could not immediately cool the vehicle as good as the factory air conditioner due to poor ventilation system as well as the stability of the power supply that could be improved. The results proved that the thermoelectric principle itself could work and be used in applications, only it requires more optimization on the system.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 219**

Flow Rate Analysis Experiment on Thermoelectric Cooling

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Keywords: Flow Rate, Thermoelectric Cooling, Peltier Effect, Water Cooling

Abstract . Currently, common cooling methods are related with refrigerants such as R-134a which are considered not totally environmentally friendly, so thermoelectric cooling had become a solution to the issue as it is a refrigerant free system. Thermoelectric cooling is based on the Peltier Effect takes place in the cooling or heating phase. Thermoelectric cooler module varies in type, some are made in an air to air configuration, and later types proved water cooled system to be more efficient. This experiment is about analyzing the effect of cooling water flow rate towards temperature drop in refrigeration compartment. The apparatus involved an insulated foam box with a water cooled thermoelectric module attached to the side. Water flow was regulated at different rates and temperature recordings were made to compare. The results shows that water flow rate have great effect onto the cooling performance. Further details had shown that there is a threshold of water flow rate which the thermoelectric module would start cooling down. This research is a guideline for other works that require the optimization of thermoelectric cooling system.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 220**

High Output Water Cooled Thermoelectric Refrigerator

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Keywords: High Output, Thermoelectric, Cooling, Flow Rate, Heat Sink

Abstract. Thermoelectric cooling had been an alternative cooling method to vapor compression system. This is due to the lack of harmful refrigerant, packaging, as well as the low noise operation. Currently, there are application of a thermoelectric refrigerator. Most of the existing products are usually made in small size and lack the ability to quickly cool down the space or withstand external heat source such as having hot items being placed within the refrigerator. This research was an experiment regarding to the application of high output thermoelectric refrigerator. It involved a 720 watt water to air thermoelectric module placed through a 40 liter insulated cabin and temperature data are collected to determine the possibility of overcoming the demerits of thermoelectric refrigerators. The water flow rate had been regulated at 400, 500 and at the system's maximum limit of 600 liters per hour. The results were the system reached below the freezing temperature within 30 minutes under no load condition. Therefore the feasibility of high output thermoelectric cooler application is a compact and possible approach towards initiating a cooling scheme in closed area within a short time.

Effect of engine speeds and duty cycle percentages of fuel injection on actual fuel injection rate

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Keywords: Fuel Injection Rate, Injector Duty Cycle, Injector Characteristic, Fuel Consumption, Fuel Injector Pulse Signal

Abstract. This research has been conducted to study the effect of engine speeds and effect of duty cycle of fuel injection on actual fuel injection rate. The 600 cc/min, 2011 Mitsubishi Triton fuel injector was used to be considered and a function generator was used to create the control fuel injector signal. After that, the weight of fuel injected in a specified time was measured by digital balance. Then, it was converted to fuel injection rate at the engine speed of 1,000 2,000 3,000 4,000, and 5,000 rpm, at the percentage of to the duty cycle equaled to 10.5, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, and 80 of total time period between adjacent injection. The pressure differences between the fuel pressure and the ambient pressure of 3.5, 4.0, 4.5, and 5.0 bar were studied. The results from experiment showed that, the fuel injection rate increased when the engine speed and percentage of duty cycle increased. However, the fuel injection rate had discrepancy from the ideal rate that significantly depended on the engine speed and percentage of the duty cycle.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 247**

Numerical investigation of the influences of nozzle convergence angle on the water ejector efficiency

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Keywords: Water ejector, Nozzle convergence angle, Efficiency, Numerical simulation

Abstract. Numerical investigations have been carried out on water ejector employing water as a working fluid. The effect of the convergence nozzle angle on its efficiency was investigated. The nozzle convergence angle in this study was varied as 12°, 14°, 16°, 18°, and 20°. Validation is achieved on selected test cases by the comparison between numerical simulations results and experimental measurements. The numerical results were found in good agreement with the experimental results. The water ejector with the nozzle convergence angle of 12° has the maximum efficiency.

Freezing time of the impingement tunnel freezer enhancement

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Keywords: Impingement freezer, Computational Fluid Dynamic (CFD), Uniformity of air velocity, Pressured chamber, Vortexes

Abstract. The quality of frozen foods which have been frozen from the impingement tunnel freezer is not only depending on the fastest freezing time but also the uniformity of the product core temperature along the conveying belt width of the freezer. In this study, the modification of pressured-chamber of the impingement tunnel freezer can enhance the uniformity of the air velocity by changing the wind entry channel. The results of all models which have been analyzed by CFD have vortexes in pressured chamber. The vortexes bring the negative impact on the uniformity of the air velocity along the conveying belt width which can create the over freezing problem. To minimized the over freezing of food product, the author propose to use mix models to use 2 of Existing with DI237 model that can increase the minimum average air velocity 4.3% with better uniformity 14.72%.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 273**

Modeling of output power of electricity generation system in Phoenix by regression method

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Keywords: Power generator, Electricity generation, Regression model, Power optimization

Abstract. At present, industrial packaging has highly expanded its effectiveness in the competitive market so operation costs are very important in the business. Phoenix pulp & paper PCL (PPPC) has 3 generators: turbine generator (TG)-PUC of 12.025 MVA, TG-2 of 26.5 MVA, TG-3 of 36.71 MVA and buys them from Provincial Electricity Authority (PEA). According to operation data in 2014, TG-3 has an average maximum energy generation of 16,019,937 kWh/month about 52% of total self-generation. Therefore, the output power of TG-3 is modeled by regression method in this work. The expected factors that have an effect on the output of TG-3 are selected. Such factors are high pressure (HP) steam temp, HP steam flow, HP steam pressure, medium pressure (MP) steam pressure, MP steam temp, MP steam flow, low pressure (LP) steam pressure, LP steam temp, LP steam flow, bleed 2 LP pressure and bleed 2 LP temp. The relationship between power generation output of TG-3 and a factor affecting it is analyzed by regression analysis (significant level of 0.05). The results show the relationship between the TG-3 output (in MW) and the factors of HP steam flow, HP steam pressure, MP steam pressure, LP steam pressure and bleed 2 LP temp. This factor is used for forecasting the power generation output of TG-3. When we input the performance guarantee of parameter into the final model, we get the result of the power generation (28.965 MW). This equation is nearly designed condition value.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 274**

Study of mirror uses on electricity generation of solar cell

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Keywords: Solar cell, Light intensity, Mirror, Light reflection

Abstract. The electricity generation of solar cell with increasing light intensity by using the mirror is investigated in this work. In this experiment, there are two cases: the electricity generation of solar cell with and without the mirror. The solar cells install at lifted angle of 15° with the horizontal plane and turned on the south. In the 2nd case, the mirror can increase the light intensity by light reflection from the mirror only in low intensity period. The results show that the light intensity and the current of solar cell with the mirror increase about 22.6 and 14 %, respectively. However, the voltage of solar cell with and without mirror is almost the same value. In addition, the efficiency of solar cell with and without mirror is 21.47 and 18.97 %, respectively.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 280**

Effect of Air Injection on the Loop Seal Recycle Chamber Side Wall on Solid Circulating Rate of a Circulating Fluidized Bed System

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Keywords: Loop seal, Air injection, CFB, Solid circulating rate

Abstract. Effect of air injection on the side wall of a loop seal recycle chamber on solid circulating rate was investigated experimentally in a cold model circulating fluidized bed system. Local sand was used as bed material. The results showed that the circulating rate increased continuously when the air injection, supplying air and recycling air were supplied simultaneously. There were limits of the circulating rate in case of without supplying air.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 309**

Optimum radii and heights of U-shape baffles in a square duct heat exchanger using surrogate-assisted optimization

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Keyword: Square duct heat exchanger, Optimization design, Surrogate models, U-shape baffles, Differential evolutio

Abstract. In this paper, optimum U-shape baffles in a square channel heat exchanger using air as a working fluid was obtained from using surrogate-assisted optimizations. The design problem is set to maximize heat transfer performance and simultaneously minimize pressure loss across the channel. Design variables determine radii and heights of the baffles whereas the optimization problem is treated as box-constrained optimization. The work in this paper is aimed at finding an appropriate surrogate model for designing such a heat exchanger system. Function evaluations are performed by means of computational fluid dynamics (CFD). The computations are based on the finite volume method and are carried out with Raynolds number being 4000. It has been found that the use of U-shape baffles as heat transfer enhancement devices improves the thermal performance of the heat exchanger. Comparative results reveal that the Kriging model is the most accurate surrogate model, however, the surrogate model giving the best result is support vector regression.

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 311**

Solving inverse kinematics of robot manipulators by means of meta-heuristic optimisation

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Keyword: Inverse kinematics, Meta-heuristic algorithm

Abstract. This paper presents a comparative study of meta-heuristic algorithms (MHs) for solving inverse kinematics of robot manipulators based on using forward kinematic. Design variables are joint angular displacements used to move a robot end-effector to the target in Cartesian space while the design problem is posed to minimize error between target points and the positions of the robot end-effector. The problem is said to be a dynamic problem as the target points always changed by a robot user. Several well established MHs are used to solve the problem and the results obtained from using different meta-heuristics are compared based on the end-effector error and searching speed of the algorithms. From the study, the best performer will be obtained for setting as the baseline for future development of MH-based inverse kinematic solving.

Vibration suppression of a walking tractor handlebar through many-objective optimization

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Keyword: Many-objective optimisation, Natural frequency, Walking tractor handlebar, Structural stiffness, Vibration suppression

Abstract. In this work, a comparative study of many objective meta-heuristics (MnMHs) for optimum design of a walking tractor handlebar is conducted in order to reduce the structural mass, and increase structural static and dynamic stiffness. The design problem has objective functions as maximizing structural natural frequencies, minimizing structural mass, bending deflection and torsional deflection with stress constraints. The problem is classified as many-objective optimization since there are more than three objectives. Design variables are structural shape and sizes. Several well established multiobjective optimizers are employed to solve the proposed many objective optimization problem of the walking tractor handlebar. The results are compared whereas optimum design solutions of the walking tractor handlebar are illustrated.

MultiobjectiveSimultaneous Topology, Shape and Sizing Optimization of Trusses Using Evolutionary Optimizers

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Keywords: Two-Dimensional Truss, Multiobjective Evolutionary Algorithms, Pareto dominance, Automate design of truss

Abstract. This paper presents design oftwo-dimensional (2D) trusses to achieve their simultaneously optimal topology, shape and size. Theoptimization problems are posed to searchfor structuraltopology, shape and sizing such that multiobjectivefunctions consisting of mass and compliance are minimized while stresses and displacementsare assigned as design constraints. The design approach is based on a ground structure approach meaning that a structure having all possible truss element connection is initiated. Design variables determine how to remove or maintain those elements and at the same time nodal potions are varied. Two truss optimization problems are assigned whereas anumber of multiobjective evolutionaryalgorithms (MOEAs) are implementedto solve the problems. The results obtained from the various optimizers show that the best performeris Differential Evolution for Multiobjective Optimization (DEMO).

Topic E: Energy Technology, Thermal Systems and Applied Mechanics **ID 324**

The bioconversion of sugarcane (*Saccharum officinarum*) leaves for ethanol production using separate hydrolysis and fermentation process

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Keywords: Acid hydrolysis, Bioethanol, *Candida shehatae*, *Pichia stipitis*, SHF process

Abstract. The leaves of sugarcane (*Saccharum officinarum*) are agricultural wastes which could be converted to bioethanol by the separate hydrolysis and fermentation (SHF) process. The acid hydrolysis was carried out with a 1:10 weight to volume ratio of sugarcane leaves to sulphuric acid. The hydrolysis process was operated in an autoclave at a temperature of 120 °C for 60 mins. The hydrolysate yielded sugar monomers of ca. 14.48 g/L xylose and 4.03 g/L glucose which was neutralized before fermentation and the fermentation process was carried out using a shaking and non-shaking stages. The fermentation was maintained at a temperature of 30 °C with the shaking stage at 150 rpm for 24 h, after which the system was operated in a non-shaking stage. The growth rate of both strains showed a short of lag phase duration before an exponential and stationary phase were started. *Pichia stipitis* TISTR 5843 consumed only glucose before xylose while *Candida shehatae* consumed the both of sugars in the exponential phase.The aggregation of cells was found in *P. stipitis* TISTR 5843 on the stationary phase. The maximum ethanol yield was obtained to 0.21 g and 0.20 g $_{\text{Ethanol}}$/g $_{\text{Sugar consumptions}}$ for *C. shehatae* TISTR 5843 and *P. stipitis* BCC 15191, respectively. This study demonstrates potential value of agricultural waste as a useful feedstock for the biological generation of bioethanol.

Topic F

Environmental Engineering and Management

Topic F: Environmental Engineering and Management **ID 1**

Trends in Temperature in Thailand from 1964 to 2013

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Keywords: Climate change, Thailand, Temperature series, EM method, Mann-Kendall test

Abstract. Globally, minimum temperatures are increasing at a faster rate than maximum ones. In this study, Thailand's trends in daily maximum surface air temperature (Tmax), minimum surface air temperature (Tmin), and the diurnal temperature range (DTR) from 1964 to 2013 were observed and interpolated. Our results were compared with other studies and demonstrate that the trends in Tmax and Tmin are increasing, whereas the DTR is most often decreasing due to the increase of Tmin at a faster rate than that of Tmax. As temperature changes are indicators of climate change, our findings show that Easter, Central and West Thailand appear to be the most temperature sensitive areas in Thailand over the past 50 years (1964-2013). To further understand the changes in Thailand's climate, trends in precipitation intensities and the dependence of climate variables on the seasons should be evaluated.

Trends in Precipitation in Thailand from 1964 to 2012

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Keywords: Precipitation trend, Indices, Thailand, Mann-Kendall, Theil-Sen's estimator

Abstract. In the present study, trends in 6 annual precipitation indices (CDD, CWD, R10, R20, RX1, and SDII) to observe long term trends in precipitation have been investigated for 48 stations over Thailand from 1964 to 2012. Trends were estimated using Mann-Kendall Test and Theil-Sen's estimator. In general, the number of dry days is increasing, while the number of wet days is decreasing. The number of days with precipitation amounts above 10 and 20 mm showed opposite trends with no spatial coherence, which could be attributed to the relatively low station density. However, the slight majority of these trends is increasing. The maximum 1-day precipitation amount index showed a non-significant, spatial coherent increase in the central-west of North Thailand. Applying the simple daily intensity index, the majority of trends is increasing, whereas no spatial coherence was found. According to the spatial mapping, Central Thailand and its vicinity can be considered as the most threatened area of Thailand regarding extreme precipitation events.

Coal Power Development by Electricity Generating Authority of Thailand (EGAT) for Clean Energy

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Keywords: EGAT, Coal-fired power plant, Clean Coal Technology, Emission control

Abstract. In this work, KRABI clean coal power plant project is studied and reviewed for the development of coal power in Thailand by Electricity Generating Authority of Thailand (EGAT). This plant will use the state-of-the-practice technology with the high efficiency for emissions control such as (1) Ultra Super-Critical (USC) Boiler for less coal consumption and CO_2 mitigation, (2) Selective Catalytic Reduction (SCR) for NO_x control, (3) Activated Carbon Injection (ACI) for Mercury (Hg) capture, (4) Electrostatic Precipitator (ESP) for Particulate capture, (5) Flue Gas Desulphurization (FGD) for SO2 treatment, and (6) Continuous Emission Monitoring System (CEMS) for near real-time stack detector and on-line monitoring report. In addition to the Birth, Jetty, and Coal Handling System with the underground tunnel are well-designed under the concept of closing and sealing system for dust control. The future of coal power projects (e.g., Thepa site) will be further implemented in the similar or better technology for guaranteed the good air quality in the area. By using Carbon Capture and Storage/Sequestration (CCS) to mitigate global warming and oceanic acidification may be considered to apply for commercial applications in the future.

Marine ecosystem impact assessments of offshore petroleum production in the EIA process of Thailand: principles, practices, and suggestions for improving effectiveness

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Keywords: Aquatic conservation, Ecological monitor, Energy industry, Gas and oil, Transboundary pollution

Abstract. An Environmental Impact Assessment (EIA) is a formaltool used in controlling, preventing, and reducing the environmental effects caused by any project operation. Field experience reveals that such report always largely varied in scope and quality of implementing. Offshore petroleum production is becoming an increasingly crucial part of global energy development. The principles and suggestions for improving effectiveness the practice in current marine ecosystem impact assessments, in the EIA process in Thailand were analyzed. Marine ecosystems are highly fragile, complex and diverse. Investigation of existing abiotic and biotic components of ecosystem, human use value, and quality of life value, together with measures to prevent and mitigation of adverse impacts then to compensate for the damage incurred, are assigned in Thailand's law. Key potential marine ecosystem, environmental impact issues to be prioritized are proposed. The insufficiency of site–specific baseline information and ineffective of follow–up monitoring are major current issues. Challenging issues in the procedure of EIA system are also discussed. Precise and updated information shared by multidisciplinary networking are necessary. Thus, the development of guidelines for the Best Professional Practices for marine environmental risk assessments and for public participation is strongly recommended.

Economic Value Evaluation of Mekong River's Flooding Alert System Using Contingent Valuation Method

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Keywords: Economic Value Evaluation, Willingness to pay, Mekong River, Flooding Alert System, Contingent Valuation Method

Abstract. This research focus on the application of the contingent valuation method to the Mekong River's flooding warning system. The study area were 32 villages located in 8 provinces including Chiangrai, Nongkhai, Loei, Bungkan, Nakhonphanom, Mukdahan, Ubonratchathani and Amnartcharoen, Thailand, which have the Mekong River flow through the city. The objective of this research was analyzing willingness to pay for Mekong River's flooding alert fee by elicitation 648 households in 8 provinces located alongside of the river. The study area were 32 villages located in 8 provinces including Chiangrai, Nongkhai, Loei, Bungkan, Nakhonphanom, Mukdahan, Ubonratchathani and Amnartcharoen which have the Mekong River flow through the city. The data was analyzed by using single bounded closed- ended CVM question, Non-parametric Model and Logistic Regression Model.The result showed that the willingness to pay by means of the Non-Parametric Model was 219.14 Bath per household per year (6.10 Us/hh/y) and its total value was 8,429,230.80 Bath per year (234,539.46 Us/y). This finding also revealed that the negative correlation of household's willingness to pay include the occupation (Beta = -0.884, sig = 0.001) and the distance between home to Mekong River (Beta = -0.329, sig = 0.003).

Profenofos Pesticide Biodegradation under Presence of Natural Organic Carbon

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Keywords: Biodegradation, Humic acid, Natural organic carbon, Profenofos

Abstract. This study was aimed to investigate influence of natural organic carbon on profenofos (PF) pesticide removal contaminated in environment. Microorganism used in this study was *Pseudomonas aeruginosa* PF2 (PF2) and humic acid was chosen as a model of the natural organic carbon. Initial profenofos concentrations of 20-120 mg/L and initial microbial cell of 10^4 CFU/mL were applied. Each experiment was performed in a batch test for 7 days. The result showed that PF2 grew from 10^4 to 10^8 CFU/mL. Profenofos removed for 23-45% and 30-58% during the tests with humic acid of 0 (control) and 10 mg/L, respectively. The profenofos removal was the integration of adsorption and biodegradation processes. Based on the result, it was found that natural organic carbon reduced the profenofos biodegradation. Nonetheless, overall profenofos removal increased due to adsorption by organic matter.

Single and Combined Chemical Coagulants for *Oscillatoria sp.* removal in Raw Water for Water Treatment Plant

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Keywords: *Oscillatoria sp*., Coagulant, Coagulation, Algae removal, Chlorophyll A

Abstract. Chemical coagulation for *Oscillatoria sp.* removal using coagulants of Alum, Polyaluminum chloride (PACl), combined PACl/Alum and combined PACl/Ferric chloride ($FeCl_3$) are evaluated by the jar test method to optimize the coagulant type and dosage. The synthetic water at 15 million cells/L of the concentration of algae cells is used as the raw water. The experiments conduct on a single coagulant and combined coagulant in terms of the turbidity and chlorophyll A removal performances. The results can be concluded that the maximum removal of turbidity (97.14%) and chlorophyll A (99.67%) is achieved from the combined PACl/Alum dosage (ratio 3:1 or 60:20 mg/L). The combined coagulant provides the best *Oscillatoria sp.* removal in comparison to its single coagulant counterpart.

Effect of elevation to accuracy in water pipeline network simulation

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Keywords: Hydraulics simulation, EPANET, Water distribution network, Pipeline network model

Abstract. EPANET is hydraulic (pressure and flow) and water quality behavior (chlorine disinfectant) simulation software, developed by Lewis A. Rossman United States Environmental Protection Agency (EPA). Using "Gradient Method" as defined by Todini and Pilati (1987) to solve the flow continuity and head loss equation. It is kind of open-source, which can be developed further. Therefore, Metropolitan Waterworks Authority (MWA) of Thailand would like to use this software for pressure management of main pipeline network. MWA's service area covers over 3 provinces; Bangkok, Nonthaburi, and Samut Prakarn. Each area has a different elevation. Recently, the pipe network model has used only two horizontal coordinates while without vertical coordinate or elevation. Thus, the error from model computation is still high. In this study the elevation of pumping station is changed using as-built drawing data that reference from Mean Sea Level (MSL). The elevation has been changed using estimation as each road surface level from Royal Thai Survey Department's map. The improved model has accuracy about 88.76% higher than the existing model, about 17.92 %. Eventually this study is to show how important the elevation is in EPANET model.

Topic F: Environmental Engineering and Management **ID 80**

Characterization and elemental composition of lignite and rubber wood sawdust pellets

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Keywords: Lignite, Rubber wood sawdust, Lignite/rubber wood sawdust-blend pellets, Heavy metals, Greenhouse gas

Abstract. To meet the environmentally-friendly and sustainable global energy-sharing, lignite and rubber wood sawdust could be combined into a cylindrical pellet in order to reduce the amount of lignite used. In this study, the lignite/rubber wood sawdust-blend pellet properties are studied. The properties include the ultimate analysis, the proximate analysis, the calorific value, the elemental composition, and the particle size distribution, the density and the compressive resistance. The results show that combining 50%wt. of rubber wood sawdust and lignite leads to the decreasing of ash content by 50 %, the decreasing of N and S contents to 0.8 and 1.8 % (daf.), respectively. The calorific value is 17 MJ/kg (db.) with 0.71 g/cm^3 of pellet density and 4,162 kN/m^2 of compressive resistance. The combination of lignite and sawdust as a pellet is an interesting approach for a long term extension of fossil fuel utilization and the reduction of greenhouse gas as well as the reduction of the heavy metals.

Measurement and Analysis of Radium 226 in Drinking water at Amphoe Muang KhonKaen via Manganese Fibers using Gamma-spectrometry

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Keyword: Radium 266, Gamma spectrometry, Drinking water, KhonKaen

Abstract. Measurement and Analysis of Raduim 226 concentration in 111 water samples at Amphoe Muang KhonKaen were determined by measuring activity of Radium 226 via Manganese Fibers using gamma spectrometry. The average of Radium 226 was found to be 0.03 Bq/l, range 0 – 0.105 Bq/l. The average risk of Annual Equivalent Dose was found to be 0.018 mSv/y, range 0 – 0.064 mSv/y. This study show that Radium 226 in drinking water at Amphoe Muang KhonKaen is not more than 0.11 Bq/l which is the standard value of the United States Environmental Protection Agency, and its Annual Equivalent Dosenot exceed 0.1 mSv/y, which is the maximum for the public drinking water. Therefore, drinking water at Amphoe Muang KhonKaen is safe for drinking.

Trace lead removal in drinking water using high capacity polymeric supported hydrated iron oxide nanoparticles

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Keywords: Lead, Drinking water, Adsorbent, Ferric oxide, Nanoparticles

Abstract. Ferric oxide nanoparticles are environmentally benign and can be selective toward lead, especially in neutral to mildly alkaline pH of groundwater. However, due to very fine particles and low mechanical strength, it prevents these materials to apply in point of use filter or large scale fixed-bed adsorption. In this study, polymeric gel cation exchanger, Purolite C100, supported ferric oxide nanoparticles, C100-Fe, was synthesized, characterized, and tested with challenging water according to NSF standards 53. From SEM-EDX studies, it can imply that high concentration of iron can be doped and distributed within the gel phase structure of the C100 approximately 22% by mass. The TEM micrographs confirm the size of hydrated ferric oxide fall into the nanometer range about 10-60 mm. The fixed-bed adsorption experiments demonstrated that C100-Fe can remove lead below the stringent standard of 0.05 mg/L up to 15,000 BVs, whereas the GAC, GAC-Fe, and C100 can treat the same test water only 1200, 1700, and 3500 BVs, respectively. The results confirm that C100-Fe can be efficiently substituted to the traditional GAC for lead removal in drinking water.

Topic F: Environmental Engineering and Management **ID 90**

Synthesis, characterization and performance validation of hybrid cation exchanger containing hydrated ferric oxide nanoparticles (HCIX-Fe) for lead removal from battery manufacturing wastewater

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Keywords: Lead, Ferric-Oxide, Adsorbent, Nanoparticles, Granular Activated Carbon

Abstract. This study is aimed to synthesize, characterize and validate the performance of a novel hybrid nano-adsorbent for selective removal of lead from a battery manufacturing wastewater. The hybrid nano-sorbent, named as HCIX-Fe, was prepared by impregnating hydrated Fe (III) oxide (HFO) nanoparticles inside polymeric cation exchange resin containing negatively charged sulfonic acid ($-SO_3^-$) fixed functional groups. HCIX-Fe was characterized by SEM-EDX and XRD to confirm the distribution and determination of phase of HFO dispersed inside the hybrid nano-sorbent. Fixed-bed column runs with HCIX-Fe beads were carried out using wastewater from a battery manufacturing plant. The wastewater had a pH of 1.8 and contained of 3.5 mg/L of Pb^{2+} coexisted with 250 mg/L Ca^{2+} ions. The results have shown that HCIX-Fe column could treat lead-contaminated water up to 6,500 bed volumes (BVs) before the occurrence of breakthrough concentration of 0.2 mg/L Pb^{2+} resulting in a removal capacity of 6.85 mg Pb^{2+}/ml of the HCIX-Fe bed. Under similar condition, adsorbent columns with cation exchange resin (C100), granulated activated carbon (GAC) and granulated activated carbon impregnated with HFO (GAC-Fe), could treat the same wastewater only until 400, 900 and 1,500 BVs, respectively. When compared withthe parent adsorbents, impregnation by HFO greatly enhanced the Pb^{2+} removal capacity of C100 and GAC by 1,625% and 167%, respectively. Both HFO and high density of sulfonic acid ($-SO_3^-$) in the host cation exchanger are individually capable of selective removal of Pb^{2+} ions; however the hybrid material demonstrated a synergistic effect for Pb^{2+} removal through the Donnan Membrane effect. Due to amphoteric behavior of HFO, the HCIX-Fe could be regenerated and reused with 10 BVs of 2% HNO_3 and 1% $FeCl_3 \cdot 6H_2O$ solution.

Topic F: Environmental Engineering and Management **ID 121**

Development of Daily Temperature Prediction Model for Northeastern Thailand using Artificial Neural Networks

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Keywords: Artificial Neural Networks, Temperature Prediction, Northeastern Thailand

Abstract. The aims of this study was to develop the daily temperature prediction models for Northeastern Thailand. Data of 23 northeastern meteorological stations from 1980-2011 were employed for models training with 10,000 data patterns while a 1-year observation of 2014 was left out for performance comparison purpose. The performance of models were calculated by the forecast accuracy on the set of previously selected days. The developed model of daily maximum temperature forecast (T_{max} models) and daily minimum temperature forecast (T_{min} models) forecast ahead 24-72 hours. As a result, MAE was in range of 0.85-1.95 for T_{min} and 0.85-2.68 for T_{max} while RMSE varied 1.16-2.32 and 1.51-3.19, respectively. R-square, moreover, showed good relationship between predicted temperature and actual temperature. Therefore, the 24-hour forecast model is better correlation than 48 hours and 72 hours, respectively.

Stability of alginate encapsulation beads for microalgae cultivation

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Keywords: Algae, Wastewater from anaerobic digester, Growth rate, Calciumalginate, Cell encapsulation technique

Abstract. This research investigated the preparation of calcium alginate beads by encapsulation technique for algae cultivation for biofuel. The effects of calcium chloride ($CaCl_2$) to sodium alginate ratios of 3:0.5, 4:0.5, and 5:0.5 were tested for physical, chemical and biological stabilities. Solutions at pH of 2, 4, 7, 9, and, 11 were tested. The effects of different medium including tap water, fertilizer water (FER), effluent anaerobic digestor 5% dilution (EAD5) and 10% dilution (EAD10) with tap water, a raw domestic sewage (RSW) were evaluated. The results show that the bead can withstandmost tested conditions except for biological stability test that use effluent from anaerobic digestor (60-80% stable). Further study on algae growth in those conditions ($CaCl_2$:SA ratio) is required.

Removable Pb(II) from Aqueous Solutions by Adsorption onto Natural and Modified Leonardite

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Keywords: Adsorption, Natural leonardite, Modified leonardite, Lead, Manganese

Abstract. Natural leonardite was modified with manganese nitrate. The chemical composition, physical properties and adsorption efficient of natural and modified leonardite were investigated. The chemical composition was characterized by X–ray fluorescence spectroscopy (XRF) and energy dispersive X–ray spectrometry (EDXS). Physical properties, morphology and surface area were investigated by scanning electron microscopy (SEM) and Brunauer–Emmett–Teller analyzer (BET). The adsorptions of Pb(II) onto natural and modified leonardite was determined by atomic absorption spectroscopy (AAS). The results of XRF and EDXS were showed that silicon was major element. The surface area of natural leonardite was 22.90 $m^2 \cdot g^{-1}$ which less that the surface area of modified leonardite, 31.02 $m^2 \cdot g^{-1}$. The Pb(II) adsorption data of natural and modified leonardite was fit well with the Langmuir isotherm equation. The maximummonolayer adsorption capacity of Pb(II) onto natural and modified leonardite was found to be 3.098 $mg \cdot g^{-1}$ and 7.062 $mg \cdot g^{-1}$ respectively. It was presented that the percentage of maximum adsorption capacity increase to 127.95.

Topic F: Environmental Engineering and Management **ID 168**

Contribution of Income Generation Space (IGS) in Row-type Housing for Sustainable Housing Enhancement

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Keywords: Income Generation Space (IGS), Row-type housing, Self-customization, Spatial utilization, Strategy

Abstract. Housing has a major function for a residing purpose. At the same time, it can be utilized for other purposes to suit the dwellers practical demand. Space where supports dwellers' income generation activities to generate income for the users apart from acting as a residing function named Income Generation Space (IGS) or Space for Creating Income (SCI). This space has played an imperative role helping its user to gain income. Row-type housing in Khon Kaen as well, IGS has been found to play significant role. It can be majorly categorized into two kinds of row-type housing project in Khon Kaen, governmental row-type housing project and the private sector provision. Tawanmai community housing has been utilized as representative of government provided row-type housing. Project under the supervision of Community Organizations Development Institute (CODI). Together with middle income row-house near Khon Kaen University area, has been selected as a case to be analyzed. It was explored that, IGS was found popularity to be used for both of those two projects. Self-customization has been explored as a tool to achieve IGS. Another outlook such as lighting design for efficient in relation to architectural aesthetic for IGS has also been described. Natural lighting can be utilized for a front approach of each row-house but it is inconvenient to be utilized for an inner function/ space of row-house. Therefore, lighting design should be designed to gain plenty of light and can be answered the architectural aesthetic demand. About one third of the BMP row-house in the research area employed IGS strategy. Additionally, about three fourths found IGS to be utilized for row-house for middle income row-house. It therefore IGS should be the essential issue to be implemented for sustainable strategy for the row-type housing both for housing policy and design outlook, particularly for Thailand context.

Seasonal biodiversity of adult insects in relation to environmental factorsat the irrigation system based on light trap collection

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Keywords: Adult insects, Air temperature, Wind speed, Precipitation, Relative humidity

Abstract. The aim of this study was to determine the biodiversity of adult insects collected by black light traps. The effects of environmental factors on its biodiversity were also evaluated for monitoring of environmental change in the future. The samples were collected monthly near an irrigation pond outlet at Kasetsart University, Kamphang Saen Campus from January to December 2014. A total of 319,160 individuals representing 13 orders were identified. Trichoptera (80.66%) was the highest number of individuals, followed by Diptera (6.94%), Ephemeroptera (4.67%), Hymenoptera (4.06%), and Coleoptera (2.13%). The eight least abundant orders (i.e., Lepidoptera, Orthoptera, Hemiptera, Isopters, Embiidina, Blattodea, Mantodea, Dermaptera) represented only 1.42%. Canonical Correspondence Analysis (CCA) indicated that the air temperature, precipitation, wind speed and relative humidity were factors that affected the biodiversity of adult insects. The study provides baseline information about phonological patterns of insect abundance and permits evaluation of this group as a resource for various food chains and different trophic levels.

Topic F: Environmental Engineering and Management **ID 189**

Removal of Color, Turbidity, UV_{254} in treated wastewater of sugar factory by aluminum and iron based coagulants

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Keywords: Coagulation, Color, Sugar factory, Treated effluent, UV_{254}

Abstract. This study aimed to compare of four coagulants (alum, polyalumina chloride (PACl), ferric chloride ($FeCl_3$), and ferric sulfate ($Fe_2(SO_4)_3$)) efficiency for removing turbidity, color, and ultraviolet absorbance at 254 nm (UV_{254}) of treated wastewater of sugar. Effect of pH (5, 6, 7, 8, and 9) was investigated under coagulants dose of 500 mg/L. The result showed that pH of 6 is appropriate for coagulation. $FeCl_3$ was the best coagulant effectively removed turbidity, color, UV_{254} by 66%, 63%, and 70%, respectively (pH 6). PACl provided lowest removal and was not effective for UV_{254} removal.

A simple colorimetric method for the determination of aromatic amines

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Keywords: Aromatic amines, Colorimetric, Spectrophotometer, Sensor

Abstract. A simple colorimetric of aromatic amines was developed by using sodium nitrate in acid medium for the determination offive aromatic amines including diphenylamine (DPA), 2-aminodiphenyl (2-ADP), 4-aminodiphenyl (4-ADP), *p*-phenylenediamine (*p*-PDA) and *o*-phenylenediamine (*o*-PDA). The effect of various factors such as type and concentration of acid, sodium nitrate concentration and reaction temperature were inspected. Upon the optimized condition, the reaction colors of DPA, 2-ADP, 4-ADP, *p*-PDAand *o*-PDA gave blue, dark pink, red, light pink and brown, respectively. The linear range concentration of DPA, 2-ADP, 4-ADP, *p*-PDAand *o*-PDA were obtained at 1-50, 1-170, 1-20, 1-100 and 1-150 $mg.L^{-1}$ whereas the detection limit were found at 0.052, 0.081, 0.054, 0.001 and 0.009 $mg.L^{-1}$, respectively.

Investigation of Average Optical Density and Degree of Liquids Saturation in Sand by Image Analysis Method

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Keywords: LANPLs, Diesel, Saturation, Image Analysis Method

Abstract. This research aims to apply the image analysis technique to investigate the liquids saturation and Average Optical Density (AOD) relationships in four different porous media (i.e., Ottawa#3820, Ottawa#3821, Toyoura, and Chonburi sands). Water and diesel were used as liquids. Twenty tested samples including 10 samples of air-water two-phase system and 10 samples of air-diesel two-phase system with variation of diesel and water saturation were prepared for each porous medium. All samples were compacted into cylindrical container then image of each sample was taken by two digital cameras fitted with different band-pass filters. The pictures were analyzed by an in-house program to obtain the average optical density for each spectral band. AOD and liquids saturation relationships were prepared for each porous media. The results indicated that AOD were linearly proportion to degree of water and diesel saturation for all porous media in both spectral bandsexcepted Chonburi sand.

Topic F: Environmental Engineering and Management **ID 216**

Binary Fe and Mn oxide nanoparticle supported polymeric anion exchanger for arsenic adsorption: role of oxides, supported materials, and preparation solvent

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Keywords: Arsenic, Adsorption, Nanoparticles, Fe-Mn binary oxides

Abstract. In this work, binary Fe/Mn oxide nanoparticles were incorporated onto the matrix of anion exchange resin, resulting in hybrid polymeric/inorganic nanoadsorbent named as A502P-Fe/Mn. During synthesis process, effects of various types of metal oxides, preparation solvent, supporting materials, and loading cycles were also investigated. To reduce the charge repulsion force between cationic Fe^{3+} and Mn^{4+} ions and fixed-positively charged quaternary amine (R_4N^+) functional groups of the anion exchange support, mixed solution containingDI/ethanol was introduced to dissolve metal salts during the preparation process. The data obtained by equilibrium batch test indicated that the A502P-Fe/Mn prepared from mixed 50:50 of DI and ethanol exhibited the highest As(V) sorption capacity. The synthesized materials was further characterized by using scanning electron microscope (SEM) equipped with energy dispersive X ray spectroscopy (EDX) to verify the existence and distribution of elemental Fe, Mn, and As inside the polymeric beads. Equilibrium As(V) sorption isotherm, effect of solution pH, and point of zero charge of material were also evaluated. This A502P-Fe/Mn can have a promising potential for arsenic removal applications.

Characteristics of the stable isotopes ($\delta^{18}O$ and δD) composition in precipitation from Bangkok, KamPhaeng-Phet and Suphanburi, Thailand

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Keywords: Stable isotope ($\delta^{18}O$ and δD), D-excess, Precipitation, Average annual rainfall

Abstract. The stable isotopic ($\delta^{18}O$ and δD) and water chemical compositions of the precipitation collected from Bangkok (BKK), Kamphaeng-Phet (KPP) and Suphanburi (SPB) in 2015 were performed. All water samples were weakly alkaline and the major ion (Cl^-, SO_4^{-2}, Na^{+1}, K^+) were the same magnitude with low values. The results of isotopic measurements for BKK, KPP, and SPB shown a wide magnitude of variations ranging between -12.22 to 0.51 ,-11.78 to 5.45 and -15.50 to 0.73, in $\delta^{18}O$ (‰) and between -114.49 to 1.43, -86.41 to 27.29, and -81.74 to 2.79, in δD (‰), respectively. Both $\delta^{18}O$ and δD decreased significantly from BKK to SPB and KPP and from cold to warm season because of the evaporation-induced isotopic enrichments. The results of this study revealed the exact relationship between $\delta^{18}O$ and δD of precipitation changes from geographical region to region which depending on local climatic conditions. The average annual rainfall of $\delta^{18}O$ and δD for BKK, KPP and SPB were indicated the same derived source of precipitations. These isotopic data provide important baseline information of the regional characteristics of $\delta^{18}O$ and δD of meteoric water including produce maps of mean annual isotopic values of precipitation in the country.

Topic F: Environmental Engineering and Management **ID 295**

The Utilization of boiler fly ash for treatment of wastewater color by adsorption process: Case Study for Pulp and Paper Industry

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Keywords: Fly ash, Adsorption, Wastewater color, Pulp and paper industry

Abstract. This research aimed to investigate the possibility of utilizing coal fly ash and eucalyptus fly ash from boilers in pulp and paper industry as adsorbents for color removal of biological treated wastewater. The physical properties of fly ash such as pore properties (surface area, pore volume and average pore size), thermal degradation and functional group were analyzed. The results showed that both types of fly ash were mesopore adsorbents. The percentage of color removal increased with the increasing of amount of adsorbent. The maximum percentage of color removal for amount of adsorbent at 0.5, 1, 1.5 and 2 g are 76%, 86%, 90% and 94%, respectively. The adsorption reaches equilibrium at 48 hours for all experiments. The adsorbents were reused and the experiments showed that the adsorbent can be reused twice without any regeneration before the percentage of color removal went below the target number of industry at 58%. The scale up of adsorption process was also studied. The experimental results showed that increasing amount of adsorbent and adsorbate 2 to 10 times do not have any significant effect on the percentage of color removal. The coal fly ash yielded higher percentage of color removal (90%) than eucalyptus fly ash (82%).

Assessment of Environmental flow in the Phong River using SWAT and MIKE11

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Keywords: MIKE 11, SWAT, River model, Hydrodynamic model, Environmental flow

Abstract. The Phong River is one of the major river in Northeastern Thailand, located in intensive agriculture production area. In winter, dissolved oxygen (DO) was below 1 mg/L causing occasionally fish dead. Good planning strategies was required in order to prevent the pollution incident in the future. In this research, environmental flow for reservoir operation of the Phong River was determined using SWAT integrated with MIKE11. The daily flow simulation correlated with the observed flow with "good prediction" where all of the NSE and R^2 values were higher than 0.7. In model simulation, the amount water releases simulation for maintain aquatic ecosystem of the Phong River was 40 MCM/s.

Topic F: Environmental Engineering and Management **ID 350**

The efficiency of anaerobic baffled reactor (ABR) for wastewater prepared from chicken manure

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Keywords: Anaerobic baffle reactor (ABR), COD removal, Chicken manure

Abstract. This research aimed to examine the effectiveness of anaerobic baffled reactor (ABR) for treating wastewater prepared from chicken manure. The biodegradable ability (BOD_5/COD) of synthetic wastewater which was prepared from chicken manure was 0.55, this implied that the synthetic wastewaterwas fairly high biodegradable. The COD removal efficiency was in the range of 87.56-92.79 %. The ABR also treated some physical characteristics i.e., color and turbidity.

Topic F: Environmental Engineering and Management **ID 355**

An Environmental Friendly Approach to Bio-remediate Dioxins Contaminated Soil

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Keywords: Aerobic bioremediation, Green remediation, Sustainable remediation, Dioxins contaminated soil, Themophilic fermentation

Abstract. This study is aim to apply the bioremediation technology on the dioxins contaminated soil. Aerobic biodegradation has been proved effective for dioxins removal in several aerobic composting studies. Primary results of this study have shown dioxins degradation in contaminated soil which performed in the special designed reactor are relatively promising. In this study only nutrients richen organic wastes (fish, meats, intestine, and entrails) were selected to support the microorganism activities to deal with dioxins contaminated soil. Mature composts were mixed to effectively increase microorganism populations. The contaminated soils were mixed homogenously with the mixtures in the ratio 3:7 of contaminated soil and food waste ingredients. The dioxins contaminated soil with initial concentration of 16,004 ng-TEQ/kg dioxins dry weight was remediated in the special designed aerobic reactor with an adjustable aeration rate. We found that high reacting temperature in the themophilic phase and the high initial dioxin concentration did not inhibit bioactivities of the composting microorganisms. At 35 days, the dioxins removal efficiency of 63% was detected. Significant amount of dioxins were also observed in screened composts but dioxins were rarely present in screening wastewater. Whether the dioxins would be degraded in the screened compost is another important issue for future study to verify. In our study, we intend to apply the aerobic composting approaches as the bioremediation process of dioxins contaminated soil treatment. Optimistic results are anticipated from the ongoing experiments.

Topic G
Chemical Engineering

A Computational Study of Adsorption of Divalent Metal Ions on Graphene Oxide

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Keywords: Graphene Oxide, Divalent Metal, Binding Energy

Abstract. Adsorption of divalent metal ions (Pb^{2+},Cd^{2+}, Zn^{2+},Cu^{2+}) on graphene oxide (GO) was studied using density functional theory (DFT). Adsorption geometries and energies, as well as the nature of the binding energy, were calculated for the interaction of divalent metal ions with oxygen-containing groups on the surface of GO. The configurations of the complexes were modeled by placing the divalent metal ions above the center and perpendicular to the surface. The calculated results show good agreement with experimental observations, and provide useful information for environmental pollution cleanup.

Adsorption of Cu(II) from Synthetic Wastewater Employing Chicken Eggshell

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Keywords: Hydroxyapatite, Adsorption Isotherm, Kinetic, Eggshell, Pellet

Abstract. Adsorption of Cu(II) on Hydroxyapatite (HAp) derived from chicken eggshell by chemical precipitation method with H_3PO_4 was studied. Effective determinants of equilibrium contact time, initial concentration, and thermodynamic parameters to understand the nature of adsorption were investigated. Equilibrium contact time was found to be 210 min at an initial Cu(II) concentration of 200 mg/L, yielding an adsorption capacity of 32.19 mg/g. Freundlich, Langmuir and Temkin isotherms were used to fit the experiment data and the adsorption was best explained by the Freundlich isotherm. The Pseudo-second order kinetics model performed at 25°C and pH 6 was found to be more suitable than that of the first order. Eggshell HAp pellet adsorption capacity was finally compared with eggshell HAp powder and other commercial HAps; the best adsorption capacity at 115.9 mg/g was derived from eggshell HAp powder. Eggshell HAp pellet hence needs be further investigated on how to improve its adsorption capacity because of its requirement for convenience operations.

Optimum Conditions for the Formation of Glycidyl Nitrate from 1,3-Dinitroglycerin

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Keywords: Glycidyl nitrate, Cyclization, 1,3-Dinitroglycerine, Optimum Condition

Abstract. One of the utilization of glycerol as byproduct of the biodiesel industry is to produce polyglycidyl nitrate, the most energetic polymer. The synthesize of polyglycidil nitrate from glycerol includes three steps: nitration, cyclization and polymerization. The aim of this study is to obtain the optimum conditions of cyclization. The cyclization was carried out in a 5 ml reactor and equipped with Hickman distillation head and nitrogen purge with the variables are mole ratio of sodium hydroxide/glycerol of 1/1 to 1.5/1, reaction temperature of 283.15 to 293.15 K and sodium hydroxide concentration of 15%. Each sample was analyzed by gas chromatography to determine the composition of products. The optimum conditions are temperature of 288.15 K and the mole ratio of sodium hydroxide /glycerol of 1.5.

Topic G: Chemical Engineering **ID 82**

Aluminum alginate as a solid catalyst for esterification of lactic acid with 1-butanol

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Keywords: Esterification, Kinetic, Lactic acid, 1-butanol, Sodium alginate

Abstract. Aluminum-alginate (ALA) was used as a solid catalyst for esterification of lactic acid with 1-butanol at different temperature in a range of 55 to 85°C. Conversion of lactic acid was found to increase with increasing reaction temperature with the maximum conversion of 81.18% after 6 h of reaction at 85°C with 1-butanol to lactic acid molar ratio of 5 and 1%w/v of catalyst loading. The result was comparedwith the system using Amberlyst-15 under the same reaction condition. It was observed that ALA has a higher catalytic activity than Amberlyst-15. Experimental kinetic data were correlated by using pseudo-homogeneous model with an assumption of ideal behavior. The kinetics of this reaction could be described using this model with minor errors. The activation energy for ALA-catalyzed esterification of lactic acid with 1-butanol was found to be 61.16 k J/mol.

Topic G: Chemical Engineering **ID 101**

A potential of *Rhodotorula graminis* TISTR 5124 on synthesis Polyhydroxyalkanoate (PHA) on optimization of nutrients

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Keywords: Polyhydroxyalkanoate, *Rhodotorula graminis*, Bioplastic

Abstract. Polyhydroxyalkanoate (PHA) is one of the alternatively biodegradable plastics which can be synthesized from a particular microorganism after the fermentation process. In this research, yeast strain *Rhodotorula graminis* TISTR 5124 was selected to ferment with the carbon source in the standard nutrient to preliminary study the optimized condition of PHA production. The synthesized PHA extracted from yeast cells was examined by FTIR spectroscopy. Experimental results indicated that the condition that gave the maximum growth rate of this yeast strain was P-limited condition at 81 hours where the cell number of 3.1×10^9cells/mL was obtained and corresponded to the optical density (OD) of 0.95 measured at 600 nm. The extracted PHA at 81 hours was examined by FTIR and the result indicated the stretching vibrations similar to copolymer PHBV. Maximum PHA content in P-limited condition was 54.4% corresponding to PHA yield of 65.1 (g/g-total sugar consumed) *Rhodotorula graminis* TISTR 5124 is therefore promising to be a good candidate to produce PHA and its derivatives.

Topic G: Chemical Engineering **ID 108**

Production of reducing sugars from hydrolysis of Napier grass by acid and alkaline

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Keywords: Napier grass, Hydrolysis, Reducing sugar, Phenol-sulfuric method

Abstract. The effects of particle size and type of acid and alkaline on hydrolysis of napier grass to obtain reducing sugars have been investigated. Dried napier grass was milled and sieved through the 60, 80 and 100 sieve mesh. The hydrolysis condition was performed in the autoclave at 122°C and 15 psi and the hydrolysis time was varied at 60, 90, 120 and 150 minutes. Each size of dried napier grass was hydrolyzed in four solutions which are hydrochloric acid, sulfuric acid, potassium hydroxide and calcium hydroxide at the same concentration of 2% v/v. The concentration of obtained reducing sugars were examined with the phenol-sulfuric method and compared with a calibration curve of the standard glucose solution. The results showed that the concentration of reducing sugar obtained from the acid hydrolysis was significantly higher than that with alkaline. Moreover, hydrolysis with hydrochloric acid gave the highest concentration of reducing sugar of 44.24 g/L at 90 minutes which was slightly higher than that with sulfuric acid of 41.83 g/L at 150 minutes. Hydrolysis with alkaline indicates very low concentration ofreducing sugar although the hydrolysis time was more than 150 minutes. SEM images highlight the difference of napier grass structure between untreated and after hydrolysis. TGA analysis on the napier grass residue explained the effect of hydrolysis on the degradation of light volatile compounds in napier grass.

Topic G : Chemical Engineering **ID 109**

Biodiesel production from unrefined *Krating* (*Calophyllum inophyllum*) seed oil using supercritical methanol

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Keywords: Biodiesel, Transesterification, *Calophyllum inophyllum*, *Krating* seed oil, Supercritical methanol.

Abstract. This work studied the feasibility of biodiesel production from unrefined *Krating* (*Calophyllum inophyllum*) seed oil using supercritical methanol. The experiments were conducted under the number of conditions in which the temperatures are 200-350ºC, pressures 8-18 MPa, and oil to methanol molar ratios 1:20-1:60. The results show that temperature, pressure and their interactions significantly influence yield. Fatty acid methyl esters (FAMEs) or biodiesel, were detected with a gas chromatography-mass spectrometer (GC-MS). The high FAME of 90.3 wt% was achieved at 260ºC, 16 MPa and oil to methanol molar ratio of 1:40. The experiment also reveals a decrease in acid value of *Krating* seed oil from initially 29 mg KOH/g to 0.3 mg KOH/g.

Topic G: Chemical Engineering **ID 110**

Biodegradable Poly(lactic acid)/Perkalite clay nanocomposites: Gas barrier properties

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Keywords: PLA, Clay, Layered double hydroxides, Nanocomposite, Gas barrier

Abstract. Nanocomposite films based on poly(lactic) acid (PLA) and organically nanoclay Perkalite were prepared by solvent casting method. The incorporation of Perkalite clay in PLA film was characterized by Fourier transform infrared spectroscopy (FTIR) and X-ray diffraction (XRD) techniques. Morphology of PLA/Perkalite film was investigated using scanning electron microscope (SEM). The gas barrier properties of PLA nanocomposite films were determined through oxygen transmission rate (OTR) and water vapor transmission rate (WVTR) measurement. Results from FTIR analysis indicates that Perkalite clay was incorporated in PLA film. SEM images show that dispersion of Perkalite particle on the PLA matrix was good with the additional of clay up to 3 pph (parts of clay per hundred part of PLA). The maximum reduction in OTR and WVTR of that nanocomposite film with Perkalite loading of 3 pph are 76% and 37%, respectively compared with neat PLA film. This proves that gas barrier property of PLA film is improved significantly with incorporation of Perkalite clay. The PLA/Perkalite nanocomposite film is a promising as green based packaging materials.

TopicG: Chemical Engineering **ID 114**

The effect of epoxy-functionalized chain extender on crystal growth and morphology of poly(3-hydroxybutyrate-*co*-3-hydroxyvalerate) (PHBV)

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Keywords: PHBV, Epoxy-functionalized, Chain extender, Crystallization, Growth rate

Abstract. The crystal growth rate of melt-crystallized poly(3-hydroxybutyrate-*co*-3-hydroxyvalerate) (PHBV) reacting with epoxy-functionalized chain extender was investigated by wide angle X-ray diffraction and polarized optical microscopy (POM).The maximum concentration of chain extender in this work was limited to 1.00 *%wt* for food contact considerations. The WAXD results revealed that the quantity of chain extender used in this study had no effect on crystal structure and all chain-extended PHBV had a PHB-type crystal structure. The rate of crystal growth determined from POM at various crystallization temperatures confirmed that the addition of epoxy-functionalized chain extender delayed the crystal growth rate but did not change the crystal growth process and morphology.

Topic G: Chemical Engineering **ID 115**

Utilization of Kelut's volcanic ash as the aggregate mixture of concrete brick

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Keywords: Kelut's volcanic ash, Concrete brick, Mechanical characteristics

Abstract. Kelut volcano had erupted in February 2014. The eruption has produced various materials i.e. ash, sands, etc. Volcanic ash contains various elements such as Si, Al, Ca, Fe, Na and P. It is potential to be used as raw material for cement-based products. This study investigates the utilization of Kelut's volcanic ash as the raw material of cement-brick. The Kelut's volcanic ash was analyzed to determine the contents of iron (Fe), aluminum (Al), and silica (Si). The volcanic ash was screened to obtain 100 mesh size of ash. The volcanic ash of 100 mesh size was mixed with cement, sand, and water with ratio of 1 kg cement, 2 kg volcanic ash, and 15 kg sand (1 :2 :15). The mixture of volcanic ash, sand and cement was poured and pressed in the concrete brick mold. The concrete brick was then aerated in a room for hardening process. The experiment was repeated for another ratio of raw material (cement: volcanic ash: sand = 2:1:15) and the age of the concrete brick (46, 61, 75 and 89 days). Concrete bricks were analyzed to determine the quality and the mechanical characteristics. The results has shown that Kelut's volcanic ash has a composition of aluminum (Al) 4.707%, silica (SiO_2) 23.4%, and iron (Fe) 3.85%, that is like the composition of the cement materials. The concrete bricks which are made of cement, Kelut's volcanic ash, and sand with the ratio of 2:1:15 has a maximum compression strength of 18.85 MPa at the age of 89 days. The addition of Kelut's volcanic ash has improved the strength of concrete brick. However, too much volcanic ash will lead to increasing compression strength.

TopicG: Chemical Engineering **ID 119**

Preparation and characterization of properties of acrylonitrile butadiene styrene waste plastic blended with virgin styrene butadiene rubber

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Keywords: ABS waste plastic, Virgin SBR, Recycling, Impact strength, Thermal resistance

Abstract. In this research, the effect of adding a virgin Styrene Butadiene rubber (SBR) on the morphology and properties of Acrylonitrile Butadiene Styrene (ABS) waste plastic has been investigated. The blends were prepared by melting method and characterized by means of mechanical testing, Scanning Electron Microscopy (SEM), Thermogravimatric Analysis (TGA) and Differential Scanning Calorimetry (DSC).The obtained results indicated that virgin SBR phase dispersed efficiently, effectively in the ABS matrix and impact strength along with thermal resistance of the blends significantly improved. Thus, investigated results in this work will open promising approach for recy cling ABS waste plastic.

Topic G: Chemical Engineering **ID 124**

Optimization of PEM fuel cell performance by examining proper catalyst ink ingredients from various solvents and Nafion for MEA fabrication

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Keywords: PEM Fuel cell, Membrane electrode assembly, Solvent, Nafion content

Abstract. The catalyst inks of membrane electrode assembly (MEA) were investigated by using isopropyl alcohol (IPA), tetrahydrofuran (THF) and Ethanol as solvent. The effects of Nafion content were also examined. The catalyst layers (CLs) of fabricated MEAs were analyzed using scanning electron microscopy (SEM) for in – plane and cross – section images. The images illustrated the drop size from fabrication. The thickness of CL was varied depending on types of solvent, where IPA, THF, and Ethanol had a thickness of 28, 22, and 18 micrometer, respectively. Polarization curve was used to perform fuel cell performance. Ethanol gave the best performance over MEA fabricated by IPA and THF. This yielded current density about 700 mA/cm^2 at the cell potential of 0.6 volt. At individual solvent, the optimal Nafion contents were observed as 20, 25, and 30 wt% corresponding to Ethanol, IPA and THF solvent, respectively.

Topic G: Chemical Engineering **ID 125**

A new strategy to improve quality of ready mixed concrete using rice husk ash

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Keywords: Rice husk ash, Cement, Pozzolanic reaction, Amorphous silica

Abstract. Quality improvement of ready mixed concrete would be achieved by control of surface properties of its constituents, which are cement and additives. Rice husk ash (RHA) which is solid waste received from rice husk fire combustion process would help improve such cement properties and reduce environmental burden due to land-filling. A new strategy to improve quality of ready mixed cement has been experimentally explored using ground RHA as an additive to mix with cement. Because of amorphous silica within ground RHA which could involve with the pozzolanic reaction, control of particle size distribution of RHA and weight ratio of RHA to cement would lead to quality improvement of ready mixed concrete. In this work, particle size distribution of RHA is represented by the fineness of RHA which is set from 3,200 to 5,100 cm^2/g. Meanwhile, the mixing ratio of RHA to cement is set from 5 percent to 20 percent by weight. It was found that the RHA fineness and the mixing ratio of RHA to cement could affect the 3, 7 and 28-day compressive strength of the ready-mixed concrete. RHA with a fineness of 5,100 cm^2/g could provide the highest compressive strength with the 10-15 percent of RHA is mixed with cement.

Topic G: Chemical Engineering **ID 134**

Microwave Assisted Extraction of Barakol from *Senna siamea*

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Keywords: Microwave assisted extraction, Conventional extraction, Barakol, *Senna siamea*

Abstract. Microwave assisted extraction was one of the various methods to extract many natural chemistry products. The problem of the previous traditional barakol extraction was the residue of organic solvent after the processes of concentrating and crystallization. Therefore, the present study, barakol was extracted from *Senna siamea* using the microwave assisted extraction (MAE). The optimize condition of MAE were evaluated. The yield percentage of obtained barakol was compared to the traditional solvent extraction. Barakol extracted from each technique were characterized using spectroscopy techniques. The results revealed that MAE help to enhance the efficiency extraction observed from the high yield and purity when compared to the traditional extraction method.

Topic G: Chemical Engineering **ID 155**

Hybrid neural network modeling and optimization of an anaerobic digestion of shrimp culture pond sediments in biogas production process

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Keywords: Hybrid neural network, Optimization, Anaerobic digestion, Biogas production

Abstract. Hybrid neural network (HNN) has received great attention especially for modeling a nonlinear system. Hence, HNN for modeling and optimization for determining optimum temperature profiles with maximal biogas production was studied basing on mathematical models initially describing the anaerobic digestion in biogas production process. The experiment of a 30-day process was conducted using sediments from shrimp ponds to simulate the daily performance of the HNN consisting of two-hidden layers with 7 and 9 nodes and the optimization of ambient temperature with satisfactory results obtained: a significant higher yield at 3.30 times compared with conventional methods.

Topic G: Chemical Engineering **ID 157**

Exploitation of three phase partitioning to concentrate and purify inulinase from *Kluyveromyces marxianus* DBKKU-Y-103

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Keywords: Purification, Inulinase, *Kluyveromyces marxianus*, Three phase partitioning

Abstract. The aim of this research was to explore the capability of three phase partitioning (TPP) to concentrate and purify inulinase from *Kluyveromyces marxianus* DBKKU-Y-103. In order to obtain high purity of inulinase, an optimal composition of TPP was examined. Initially effect of ammonium sulfate saturation [30–80% (w/v)] was examined with constant ratio of the crude extract to *t*-butanol [1.0:1.0 (v/v)]. Temperature and pH of the system were maintained at 25 °C and 5.0, respectively. Once the appropriate ammonium sulfate saturation was achieved, ratio of the crude extract to *t*-butanol [1.0:0.5–1.0:2.0 (v/v)] was investigated. Finally, pH of the TPP system (4-9) affected to the purification of enzyme was conducted. The results suggested that the purity of enzyme could improve to purification fold of 10.48 (774.62 U/mg) and activity recovery of 25.24% was achieved. The optimal composition of TPP contained ammonium sulfate saturation of 70% (w/v), ratio of crude extract to *t*-butanol of 1.0:1.0 (v/v) and pH of 7.0, respectively. Purity of the enzyme was also verified using gel electrophoresis. The molecular weight of the purified inulinase was approximately 90 kDa.

Topic G: Chemical Engineering **ID 191**

Preparation of graphite oxide using modified Tours Method by using raw graphite powder from jewelry industry waste

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Keywords: Tours Method, Graphite, Graphite oxide, Jewelry industry

Abstract. In this study, we modified Tours Method for graphite oxide (GO) production. The raw graphite powder was collected from jewelry industry, in order to achieve the most beneficial value of graphite material instead of wasting several tons of graphite into landfill. To observe an alteration of the materials, the raw graphite powder and the produced GO were characterized their surface structures using scanning electron microscope (SEM) as well as transmission electron microscope (TEM) for greater magnification. The crystalline properties was determined by X-ray powder diffraction (XRD) and the attached functionalities were examined using Fourier transform infrared spectrometer (FTIR). Regarding to the study, the modified Tours Method showed a great potential for large-scale preparations of graphite oxide in order to utilize this material over a broad range application.

Topic G: Chemical Engineering **ID 196**

Effect of bio-fibrils incorporating with TiO_2 on the properties of natural rubber foam

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Keywords: Biomass, Palm Fibers, Rubber latex foam

Abstract. In this study, empty fruit bunch (EFB) was pretreated and bleached with 2.5 M NaOH at 80°C for 8 h and ClNaO for 12 h, respectively. Then it was hydrolyzed in the acid mixture of 5%wt. $C_2H_2O_4$ and 48%wt. H_2SO_4 for 24 h. The obtained bio-fibrils and titanium dioxide (TiO_2) were filled into the natural rubber latex (NRL) with the help of vulcanizing agent, antioxidant, accelerators, curing agent and gelling agent to get the resulted natural rubber (NR) foams. The morphology properties and physical properties of all foam samples were checked by using scanning electron microscope and universal testing machine, respectively. The properties of EFB fibers and bio-fibrils were also compared. The density of prepared foams was found out. Resulted showed that the bio-fibrils have the smooth surface with smaller size than BFB fibers. Addition of these bio-fibrils and TiO_2 particles into NRL latex contributed the significant improvement of density and physical strength of the resulted foams. The composite foam containing 1.0 phr of bio-fibrils and 2.5 phr of TiO_2 had the highest value of density and tensile stress.

Topic G: Chemical Engineering **ID 229**

Synthesis and Characterization of silaned-graphene oxide-mordenite grafting

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Keywords: Mordenite, Graphene oxide, Silane, MPTES, Grafting

Abstract. The grafted materials of silaned-graphene oxide-mordenite (s-GO-MOR) were synthesized by grafting graphene oxide (GO) sheets to acid-treated mordenite and followed by functionalization with silane. GO sheets were prepared according to the modified Hummers method. 3-mercaptopropyltriethoxysilane (MPTES) was used as a silane coupling agent. The products were characterized by a Fourier transform infrared spectroscopy, X-ray diffraction, energy-dispersive X-ray spectroscopy and thermogravimetric analysis. The results confirmed the success of s-GO-MOR and showed excellent thermal stability.

Topic G: Chemical Engineering **ID 233**

Direct Conversion of Methane to Methanol on Fe-Porphyrin: A DFT Study

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Keywords: Oxidation of methane to methanol, Fe-Porphyrin, DFT, Reaction Mechanism

Abstract. Catalytic oxidation of methane to methanol is one among the most attractive processes for effective natural gas resource utilization. Fe-Porphyrin catalyzed oxidation of methane to methanol with nitrous oxide as an oxidant has been studied by DFT calculation. The nitrous decomposition on the supported Fe particle is the first step with the activation energy of 17.9 kcal/mol. The oxidation of methane to methanol is proposed to be two-step mechanism: the C-H bond breaking and the methanol formation. The activation energies are 26.6 and 3.0 kcal/mol, respectively. Therefore C-H bond breaking is the rate determining step. Fe-Porphyrin could be a promising material for the oxidation of methane to methanol.

Topic G: Chemical Engineering **ID 242**

Curing behaviors and thermal degradation kinetics of polybenzoxazine-polycaprolactone blends

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Keywords: Polybenzoxazine, Polycaprolactone, Curing, Kinetics, Thermal degradation

Abstract. In this study, the blends of polybenzoxazine (PBA-a)/polycaprolactone (PCL) was prepared at the weight ratio of 100/0, 80/20, 60/40, 40/60, 20/80, and 0/100. The curing behaviors of the blends were studied. The results reveal that the curing temperature of the blends was increased with the increase of PCL content. The decomposition temperature at maximum decomposition rate were increased and the char yield were decreased with the PCL content. In addition, the kinetics of thermal degradation were determined using Kissinger Model.

Topic G: Chemical Engineering **ID 266**

Amine-bearing activated rice husk ash for CO_2 and H_2S gas removals from biogas

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Keywords: Amine, Activated rice husk ash, Biogas, CO_2, H_2S

Abstract. In this study, Triamine–grafted activated rice husk ash (TRI-A-RHA) material were investigated in the CO_2 and H_2S removals from biogas. TRI-A-RHA was synthesized by deposition of Triamine chemical onto the surface of activated rice husk ash support. The TRI-A-RHA exhibited high CO_2 and H_2S adsorption capacities (of ~ 0.34 and 0.14 $mmol.g^{-1}$, respectively) and stabilities at room temperature condition. These could be the TRI-A-RHA adsorbent had high BET surface area and amine functionalization. These findings are suitable for acid separation from natural gas.

Topic G: Chemical Engineering **ID 294**

Effects of surface hydrophobicity on functionalization of oleic acid on Bombyx mori silkworm cocoons

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Keywords: Silk, Oleic acid, Plasma irradiation, Acid catalyzed esterification

Abstract. The objective of this study is to provide a method which allows introduction of functional groups onto silk cocoon surface. Plasma irradiation is straight-forward, relatively noninvasive and requires minimal chemical reaction steps to alter surface hydrophilicity of polymeric materials. Introduction of oleic acid on pristine and air-zero irradiated silkworm (Bombyx mori) cocoons was carried out via acid-catalyzed esterification. The reaction was confirmed by ATR-FTIR spectroscopy. Functionalization of oleic acids onto silkworm cocoons favors hydrophilic surface. In addition to the acid-catalyzed esterification, amide hydrolysis takes place as a side reaction. This reaction leads to formation of hydrophilic carboxylic acids and amines. The change in hydrophilic functionalities leads to an increase in cocoon wettability as confirmed by contact angle measurements.

Topic G: Chemical Engineering **ID 314**

Rice Hull Micro and Nanosilica: Synthesis and Characterization

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Keywords: Rice hull, Silica, Precipitation, Nanoparticle, Calcination

Abstract. Rice hull is a by-product natural material composing of high amount of silica. In this work, silica microparticles were synthesized from rice hull using 3 temperature levels of calcination at 500, 600, and 850 °C. Then, they were transformed to silica nanoparticles by precipitation method using sodium silicate as an initial substance synthesized from rice hull. Finally, the properties of silica particle were studied such as characteristics, morphology of particle, component, and size of silica. The result showed the silica structure became more crystalline when the temperature was increased. When the concentration of sodium silicate increased, more agglutination occurred in the silica structure. The results also indicated that the particle size and component of silica synthesized by heating rice hull at 600 °C followed by precipitation method were the same as those of commercial silica.

Topic G: Chemical Engineering **ID 320**

Vanillin production from lignin degradation using hydrothermal method over Fe_2O_3/Al_2O_3 catalysts

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Keyword: Vanillin, Lignin degradation, Catalyst, Hydrothermal

Abstract. Vanillin synthesis from lignin degradation using catalytic hydrothermal process over Fe_2O_3/Al_2O_3 catalyst was investigated. The Fe_2O_3/Al_2O_3 catalyst was prepared by wetness impregnation. The prepared catalysts were characterized by using XRD and BET method. The lignin degradation reaction was carried out in a batch high-pressure reactor. The effects of initial pressure, reaction temperature, and catalyst loading on vanillin yield were studied. It was found that an increasing of temperature gave an increasing of vanillin yield. However, the increasing of pressure and a number ofcatalyst loading showed the decrease of vanillin production due to the oxidation of produced vanillin to another product. The highest vanillin concentration of 8.54 mg/L was obtained at 160 ºC, 2 bars, and 0.5 g of the catalyst.

Topic G: Chemical Engineering **ID 341**

Properties of cassava starch-based foam composite containing sugarcane fiber and Origanum vulgare L. essential oil

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Keywords: Biodegradable foam, Essential oil, Cassava starch, Water resistance

Abstract. Properties of biodegrdable trays manufactured from cassava starch, sugarcane fibers and Origanum vulgare L. essential oils (OEO) were used as additives. The effect of these additives on water absorption index (WAI), water solubility index (WSI), the density and thermal analysis of the starch trays was determined. Based on the experimental results, the cassava starch incorporated with 8% essential oils and sugarcane fiber exhibited outstanding water resistance, comparing with those of polystyrene foam. It shows that the addition of OEO would have potential to enhance dimensional stability of the trays made from cassava starch.

Topic G: Chemical Engineering **ID 342**

Properties of light weight concrete containing crumb rubber subjected to high temperature

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Keywords: Lightweight aggregate, lightweight concrete, Crumb rubber

Abstract. In this study, the compressive strength, unit weight and chemical structure of light weight concrete (LWC) containing crumb rubber after exposure to high temperature are investigated. The crumb rubber was used as light weight aggregate in place of normal aggregate at the content of 3-15 wt% of LWC. For all mixtures, the water/cement ratio and sand/cement ratio were fixed at 0.5 and 0.2, respectively. The experimental results showed that the unit weight of LWC containing crumb rubber decreased with increasing crumb rubber content. The unit weight and compressive strength values are in range of 1566-1761 kg/m3, 12-29 MPa, respectively. The LWCs containing 3-7 wt% and 15 wt% crumb rubber can meet the requirement of ASTM standards for structural light weight concrete and masonry, respectively. After high temperature exposure, the unit weight loss and compressive strength loss were 25% and 75%, respectively. All specimens still complied with the requirement of ASTM standard for masonry.

Topic H

Computer and Information Technology

Improving Fermat Factorization Algorithm by dividing Modulus into Three Forms

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Keywords: Fermat's Factorization Algorithm (FFA), Modulus, Prime Number, Multi Forms of Modulus for Fermat Factorization Algorithm (Mn-FFA)

Abstract. Integer Factorization (IF) becomes an important issue since RSA which is the public key cryptosystem was occurred, because IF is one ofthe techniques for breaking RSA. Fermat's Factorization Algorithm (FFA) is one of integer factorization algorithms that can factor all values of modulus. In general, FFA can factor the modulus very fast in case that both of prime factors are very close. Although many factorization algorithms improved from FFA were proposed, it is still time – consuming to find the prime factors. The aim of this paper is to present anew improvement of FFA in order to reduce the computation time to factor the modulus by removing some iterations of the computation. In fact, the key of the proposed algorithm is the combination within the three techniquesto check the forms of the modulus before making decision to leave some integers out from the computation. In addition, the proposed algorithm is called Multi Forms of Modulus for Fermat Factorization Algorithm (Mn-FFA). The experimental results show that Mn-FFA can reduce the iterations of computation for all values of the modulus when it is compared with FFA and the other improved algorithms.

Feature reduction using minimum noise fraction and principal component analysis transforms for improving the classification of hyperspectral image

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Keywords: Classification, Feature Reduction, Hyperspectral image, MNF, PCA

Abstract. Dimensionality reduction is an important milestone in the preliminary process of high dimensional data analysis. Most of research in hyperspectral image field deal with data extraction techniques.Each feature extraction technique has its own uniqueness. Though each feature extraction technique has its advantages and disadvantages, using a specific technique may result in significant data lost. To avoid such problem, mixed reduction techniques are utilized in this research. In this work, dimensionality reduction is done by using PCA, MNF, and a combined PCA-MNF method is proposed. Image classification using minimum distance (MC) method is performed after dimensionality reduction technique is done. Result shows that our proposed method increases the accuracy of image classification, outperforms PCA and MNF, namely 80.77%.Whereas the accuracy of image classification using PCA is 40.37% and the accuracy of image classification using MNF is 77.21%.

The Use of Certainty Factor Method In Diagnosing Disease of Plantation Crops With Economic Values

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Keywords: Certainty factor, Expert system, Plantation crop

Abstract. Indonesia is a country which possesses various floras. One of the prospective crops that have economic value is plantation crops. Plantation crops which has economic value is potential of bringing in foreign exchange for the country , creating jobs , and becoming a source of incomes of the population , and to contribute to efforts to preserve the environment. Therefore, this paper outlines an alternative solution to help farmers in diagnosing diseases in plants. One solution is to create an expert system application that can diagnose diseases of plants of economic value by using certainty factor for search solutions. In research using knowledge base for the diseases that attack crops plantation such as coffee, cocoa, pepper, nutmeg, and coconut. All these types of plants are the most frequent in Indonesian plantation and possess high economic value. This research aims to help improve the knowledge of the Farmers in diagnosing diseases in plants, especially plants that include the type of high economic value. Stages performed in this study begins with a literature review, analysis, design, implementation and testing of the system. From the tests performed to the farmer it is proven that this application can increase farmers knowledge after using the application of use of certainty factor method in diagnosing disease of plantation crops with economic values. In this research resulted in a software that can diagnose diseases in plants by 36 diseases that applying Certainty factor method to get certainty in the search for solutions. Based on testing conducted to measure the the level of understanding of the farmers in diagnosing diseases in plants, it is shown that Traffic increased on average of 21.8 to 35.9 after using expert system applications which are built.

Neural network-based quality evaluation of germinated Hang rice

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Keywords: Geminated Hang rice, Image processing, Quality evaluation, Neural networks

Abstract. Germinated Hang rice is found widely in the northeast of Thailand. It is produced by the traditional folklore wisdom and high nutritional value to the human body. Hence, its quality is very crucial. Traditionally, quality of rice grains has been assessed manually. Apparently, this method is very time consuming and it highly relies on human skills and experience. Thus, the purpose of this research is to develop an image processing algorithm incorporated with a neural network classifier that can detect the following defects of geminated Hang rice grains: broken grains, discolored grains,un-husked paddy grains, deformed grains and withered grains. These defects do not exist in general milled rice grains. Thus, twenty-four features composed of nine grain color components, five grain shape parameters, and ten grain textural features are extracted from images.Then, these features are fed into the neural network classifier. As shown in the results, percent accuracy of our proposed method was 98.0%.

Face recognition and verification based on 2D circle technique

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Keywords: Circle, Euclidean distance, Face recognition, Principal component analysis

Abstract. This paper presents, how to recognize a face of portrait photographs by applying the principal components analysis (PCA) to get the feature vector and verification algorithm based on 2D circle. PCA was applied to modify the mean which is the cut of, 5% minimum and 5% maximum of data. For verification process, each image was reduced into 2 dimension (2D). Those images of each individual in 2D are encircled with the diameter calculated form the maximum Euclidean distance between any two vectors in each pair of those images. In this paper, two experiment were conducted. We chose test image in training set, verified them by using circle and shows the results of the proposed algorithms and others in 5 distance measures for the first experiment. Then, we also chose test image, which is not in training set and verify in the same way in the second experiment. We choose some images in Essex Faces94 (Female and Male Staff) to form a training set. The proposed algorithms show the better performance than other algorithms and they have recognition rate over 89%.

Topic H: Computer and Information Technology **ID 150**

Support vector regression-based synthesis of 12-lead ECG system from the standard 5 electrode system using lead V1

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Keywords: 12-lead ECG system, 5-electrode system with lead V1, Support vector regression

Abstract. The standard 12-lead electrocardiogram (ECG) is a fundamental but very efficient clinical method of heart disease diagnosis. Measuring all 12 leads is often cumbersome and impractical especially on a long term monitoring. There have been ways to reduce the number of electrodes in ECG system also from 10 down to 5 or 6 electrodes and various regression methods were applied to derive back those 12-lead ECG. This paper presents how support vector regression (SVR) is used to find a set of transfer function for deriving the 12-lead ECG from the standard 5-electrode setting using lead V1 system. The results of using the transfer functions for deriving have shown that the root mean square error (RMSE) was just over 8mV.

Topic H: Computer and Information Technology **ID 165**

Using GM(1,1) with sample standard deviation to forecast downtrend rainfall for small sample in Khon Kaen, Thailand

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Keywords: GM(1,1), Sample standard deviation, Small sample, Rainfall forecasting, Downtrend Forecasting

Abstract. The objective of this research is to forecast the rainfall, Khon Kaen cumulative annual rainfall data, using GM(1,1) and Markov chain for small sample size based on sample standard deviation. We compare the accuracy of prediction models between this approach–sdGM(1,1) and standard GM(1,1) in terms of MSE and PARE. We find that sdGM(1,1) is better than GM(1,1).

Topic H: Computer and Information Technology **ID 185**

Boundary detection of pigs in pens based on adaptive thresholding using the integral image and adaptive partitioning

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Keywords: Pig boundary detection, Image segmentation, Adaptive partitioning, Adaptive thresholding

Abstract. The investigation on the performance of boundary detection of pigs is fundamental for applications, such as pig weight estimation, pig feeding behavior analysis, and thermal comfort control. This article proposes a boundary detection for pigs in the feeder zone with a high density pen under insufficient and varied lighting, dirty pen scene and a small field of view. The method is based on adaptive thresholding by using the integral image and adaptive partitioning. First, we segment original gray scale image with adaptive thresholding using the integral image and then apply adaptive partitioning with connected components. Then, we utilize the maximum entropy threshold of each partition and merge the results. Our experimental results on 230 images show that the proposed method has higher average detection rate and lower execution time. Moreover, to the best of our knowledge, our study is the first attempt to investigate pig boundary detection in a practical farm environment, which involves dirty pen scenes with insufficient and varied lighting.

Topic H: Computer and Information Technology **ID 206**

Development of Customer Relationship Management (CRM) Model based on Maturity Level of Cobit 4.1 (Case Study: Cooperative Section at Departement of Industry, Trade, Cooperative, and Small-Medium Enterprises, Yogyakarta Province.)

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Keywords: COBIT 4.1, Cooperative Section, Customer Relationship Management (CRM) model, Departement Industry Trade Cooperative and Small-Medium Enterprises, Yogyakarta Province

Abstract. Departement of Industry, Trade, Cooperative, and Small-Medium Enterprises (DITCSMEs) Yogyakarta Province is one of the featured field that have implemented Blueprint IT of Jogja Cyber Province. One section in DITCSME namely Cooperative Section, this section has obstacles that limited human resourceses and lack of mastery and utilization of technoloty, services performed. Services performed by this section in serving the cooperative movement is currently using an offline manner. Cooperative section give Information system services only limited of information to help finish the job and not provide detail information to the customer. In the future, this section yet still difficulties in designing how to manage customer based on technology. This paper is based on research "Development of CRM Model based on Maturity Level of Cobit 4.1 (Case study: Cooperative Section at Departement of Industry, Trade, Cooperative, and Small-Medium Enterprises, Yogyakarta Province)". Stages of this research include analysis that the current analysis, calculation of COBIT 4.1, analysis of expected conditions, GAP analysis, modeling CRM, feasibility, and Recommendations. The results of this research is (1) the establishment of a framework for CRM Model in Cooperative Section at DITCSMEs Yogyakarta Province; (2) generated models that have been tested so that used as a reference at the Cooperative Section in CRM mapping and guidance to the management team on the applications building planning, by test results showed a 100% match.

Topic H: Computer and Information Technology **ID 209**

Applying Fault-tolerance on Multi-microcontroller System with RTOS

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Keywords: Fault-tolerance, Sift-out Modular Redundancy, Multi-microcontroller System, RTOS

Abstract. This paper proposes a design of fault-tolerance technology combined with a Real-Time Operation System (RTOS) to the multi-microcontroller system that. The aim of this work is to demonstrate the above issue via an embedded system with a "fault-tolerance" on a FreeRTOS kernel and driven by multi-microcontroller. A simple protocol that used to communicate between microcontrollers is USART and extra feature is a high-speed USART baud rate at 10.5 Mbit/s. The system has better performance than a conventional single microcontroller system. Sift-out modular redundancy, one of hybrid redundancy techniques in hybrid redundancy technique in fault-tolerance algorithm has applied in this work. The experiments covered two types of faults; Slave Fault and Master Fault. The results showed that faults occurred in the proposed multi-microcontroller system can be detected and recovered in order to finish the whole assigned process.

Topic H: Computer and Information Technology **ID 213**

Detecting Generalized Salt and Pepper Noise Image Based on Standard deviation

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Keywords: Noise detection, Generalized salt and pepper noise, Standard deviation

Abstract. The goal of this research is to detect generalized salt and pepper noise in grayscale and color images, using strip window and standard deviation. We compared the performance of algorithms between proposed algorithm (PA), Rank-Ordered Absolute Differences (ROAD), and Rank-Ordered Logarithmic Differences (ROLD) in term of Peak Signal to Noise Ratio (PSNR). We found that PA is better than ROAD and ROLD.

Social Network Newsworthiness Filter Based on Topic Analysis

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Keywords: Credibility measurement, Social media analysis, Topic analysis

Abstract. Assessing trustworthiness of social media posts is increasingly important, as the number of online users and activities grows. Current deploying assessment systems measure post trustworthiness as credibility. However, they measure credibility of all posts, indiscriminately. Credibility concept was intended for news type of posts. Labeling other types of posts with credibility scores may confuse the users. Previous notable work envisions filtering out non-newsworthy posts before credibility assessment as a key factor toward a more efficient credibility system. Thus, we propose and implement a topic-based supervised learning approach that uses TF-IDF and cosine similarity for filtering out the posts that do not need credibility assessment. Our experimental results show that about 70% of the proposed filtering suggestions are agreed by the users. Our results support the notion of newsworthiness, introduced in pioneer work of credibility assessment. The topic-based supervised learning approach is shown to provide a viable social network filter.

Topic H: Computer and Information Technology **ID 221**

Image matching with multi medium Delaunay triangulation

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Keywords: Delaunay triangulation, Image matching, Multidimensional, Image processing

Abstract. The Delaunay triangulation is well-known in the field of computational geometry, holography, networking and fingerprint matching. In our case, a matching image from the image database is proposed by using the Delaunay triangulation, which has the ability to perform multidimensional in matching. To prevent problems on the complexity of the dimensions, we proposed a method for the Delaunay triangulation matching with several medium dimensions from all feature vectors. Then, apply to match all the image's databases. In this paper, we use the color histogram as a representation of multidimensional feature vectors to test the matching in several environments and illustrate the main issues. The results in matching accuracy are satisfactory.

Topic H: Computer and Information Technology **ID 224**

The Software Architecture of Network Management System based on Elastics Search Technology

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Keywords: Network Monitoring System, Elastic Search

Abstract. The network monitoring system needs all data sources in order to monitors network service and system, resource capacity plan, statistics and accounting, fault management and performance; such as throughput, latency and round trip time. SNMP, audit log and network traffic are required for data analysis together. This paper present software architecture for network monitoring system that consists of data collection, data analysis and data visualization. The software architecture is implemented in web based application to evaluate this architecture.

Topic H: Computer and Information Technology **ID 225**

An Adaptive Personalized Learning System

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Keywords: Adaptive personalized learning system, Blended learning, Automatic in-class assessment, Support Vector Machine (SVM)

Abstract. Classroom assessment enables instructors to determine learners' needs, adjust instruction, and provide feedbacks to learners on their learning progress. To be truly effective, assessment should be blended as a part of the teaching sequence in order to verify learners' perception of the exposed context. However, this could be time-consuming and resulting in delay and discontinuity of class lectures; thus, making the practice difficult to carry out, especially for a large class size. This paper presents an adaptive personalized learning system that integrates learning technologies with classroom teaching in order to enable a dynamic response learning environment. With an easy-to-use interface, the system supports instructors in continuous assessment of learner's learning progress and automatic selection of supplementary learning materials to suit individual learners based on their performance in a "feedback loop" fashion. In addition, learners' comments and questions are collected and classified into relevant topic categories using Support Vector Machine (SVM)-based text categorization for further review and lecture improvement.

Topic H: Computer and Information Technology **ID 262**

Filter random forest for indoor Wi-Fi positioning

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Keywords: Indoor positioning, Wi-Fi, Machine learning, Ensemble

Abstract. This paper proposes the method called the filter random forest (FRF), which can enhance an accuracy of indoor positioning based on fingerprinting by employing the random forest (RF) algorithms and informative access point (AP) selection. FRF selects the informative APs from all APs. This process reduces noise data and complexity of FRF's learning. FRF is compared with the machine learning classifiers; i.e. RF, decision tree (DT), bagging (BAG) and boosting (BOOST), by exploiting the signal strength from the real measurement. The performance comparison is done in terms of accuracy of classification of positions and computational complexity of algorithms. The result of this study shows that FRF's accuracy is very similar to BAG's accuracy which is more accurate than DT and RF. Besides that, the computational complexity of FRF is the lowest among the others due to the effect of AP reducing.

Topic H: Computer and Information Technology **ID 264**

Classification of Diabetic Retinopathy using Artificial Neural Network

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Keywords: Diabetic Retinopathy, Artificial Neural Network, Image Processing, Telemedicine

Abstract. Diabetic retinopathy (DR) is one of the complications caused by diabetes which shows abnormalities symptoms in retinopathy and is a major cause of loss of vision. The screening by an ophthalmologist is the only way to prevent this problem. This work, aim to develop classification of diabetic retinopathy algorithm by using Artificial Neural Network (ANN) for work together with telemedicine project in Thailand. First, using mathematic morphology and image processing techniques to extract features that are factor of DR. Then, input into ANN to grading the symptoms of DR**.** When comparing the performance of proposed software with diagnosis of ophthalmologist found that, its diagnosis have accuracy of 98.89%, sensitivity of 99.26%, specificity of 97.77% and positive predictive values at 99.26%. Thus, proposed software can helps to increase occasion of screening diabetes patients, especially in remote area where lack of ophthalmologists or specialist to read fundus images. Suitable for telemedicine system. Moreover, also can improve accuracy of ophthalmologists's diagnosis.

Classifying Rubber Breed Based on Rough Set Feature Selection

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Keywords: Classification, Feature Selection, k-Nearest Neighbor, Rubber, Rough Sets

Abstract. Rubber is the economic crop that is planted widely in almost all regions of Thailand and makes a lot of income for the export of this country. Selecting a rubber breed for a particular region is one of the principal factors for the achievement of the rubber plantation. If the agriculturists get the rubber breeds unsuitable to be plant in their rubber garden, once the time to slit, the rubber water may have low quality and quantity. The objective of this work is to generate the rubber breed classifier by using the k-nearest neighbor technique based on selected set of features of rubbers. Rough set feature selection is proposed in this research to select a subset of relevant features of rubber optimally while retaining semantics. The data samples of 10 well-known breeds of rubber, 30 samples per breed, cultivated in the northeast of Thailand were used to generate the breed classifier. The accuracy rate of classifying the breed of rubber is rather good. Therefore, this generated breed classifier can assist the agriculturists classify and select the correct breed of rubber from the features of rubber in hand before cultivate in the rubber garden.

Topic H: Computer and Information Technology **ID 300**

Khaen sound synthesis using a subtractive method

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Keywords: Khaen, Sound synthesis, Subtractive method, Csound

Abstract. This article presents a khaen sound synthesis using subtractive method with presumed input signal. The presumed signal was sawtooth wave which contains strong harmonics at low frequency and rolled-off harmonics at high frequency. This allows a lower order filter design. The subtractive filters were 50th order infinite impulse response (IIR) filters designed from 8191st order finite impulse response (FIR) filters impulse responses, which were designed based on different between magnitude spectrum of the target sounds and that of the corresponding sawtooth wave. A realtime implementation on Csound was also presented. The quality of the synthesized sound still needs improvement.

Topic H: Computer and Information Technology **ID 304**

Deriving the 12-lead ECG from an EASI-lead system via support vector regression

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Keywords: ECG, 12-lead system, EASI-lead system, Linear regression, Dower method, Support vector regression

Abstract. The measuring of all 12-lead electrocardiogram (ECG) is often cumbersome and impractical especially on a long term monitoring. In 1988, Gordon Dower has introduced an EASI-lead system, where only 5 electrodes are used. In order to gain all 12-lead ECG back from this EASI-lead system, Dower's equation was proposed then. Ever since various attempts have been explored to improve the synthesis accuracy, mostly via Linear regression. This paper presents how support vector regression (SVR) is used to find a set of transfer function for deriving the 12-lead ECG from EASI-lead system. The experiments were conducted to compare the results those of SVR against those of Linear regression and those of Dower's method. The experimental results have shown that the best performance amongst those methods with the minimum of RMSE value for all signals with the standard 12-lead ECG was obtained by SVR, followed by Linear regression and Dower's equation, respectively.

Topic H: Computer and Information Technology **ID 337**

A variant of Pollard's Rho method for the ECDLP over a field of characteristic two

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Keywords: Elliptic curve, Pollard's Rho, ECDLP, Characteristic two

Abstract. The security of the elliptic curve cryptography (ECC) depends on the inability to compute the multiplicand given the original and product points. The problem to find this multiplicand is called the elliptic curve discrete logarithm problem (ECDLP). The baby-step giant-step algorithm is a generic algorithm that can be applied for ECDLPs. The running time of this algorithm and the space complexity are$O(\sqrt{Eord})$, where $Eord$ is group order. This paper shows how to apply Pollard's Rho Method to solve the same ECDLPs which has about the same running time as the baby-step giant-step algorithm, but only a small memory requirement.

Topic H: Computer and Information Technology **ID 338**

Broadcast-based skew correction technique for wireless sensor networks

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Keywords: Time synchronization, Wireless sensor network (WSN), Broadcast, Skew correction

Abstract. Time synchronization is a vital process in wireless sensor networks, where energy sources are highly limited. In this work, we propose a broadcast-based skew correction technique that will improve both the accuracy and the lifetime of any time synchronization protocol that only corrects time offsets among sensor nodes. Using time information broadcasted periodically by the root node, each client node can compensate its software clock frequency in real time after an initial offset correction. The experimental results show that a clock skew below 0.01 us/s can be consistently achieved with appropriate compensation parameters after the correction process is stabilized.

Topic H: Computer and Information Technology **ID 347**

Modified Watershed Transform Algorithm for Cancer Cell Segmentation Counting

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Keywords: Image segmentation, Watershed transform, Cancer cell

Abstract. In cancer research, the migration-invasion assay is one of the most important experiments used to evaluate the spreading potential of cancer cells from primary site of tumor to other organs . The process needs to read the number of cells spread to target organs on the pictures taken under microscopic in order to evaluate the performance of clinical trails on various cancer treatments . The number is usually counted, manually, under microscope or using Image J software as an assisting tool .However, the cells are difficult to identify since they are usually overlapped, hence, the process requires experienced researchers . Moreover, the process is time consuming and subjective, which could lead to an inaccurate results. In this paper, an alternative approach to segment and count the number of cells is presented .The proposed algorithm is based on digital image processing technique, specifically, Watershed transform . The studied pictures are from migration-invasion assay bile duct cancer cell line .The results are compared to the numbers reported by three experienced researchers .The results show that the proposed method can achieve 97. 01 % average on accuracy . The average time of processing per picture is 4.28 minute.

Topic I

Material Science and Engineering

Topic I: Materials Science and Engineering **ID 37**

Synthesis of TiO_2 nanotubes and the effects of deionized water on their surface morphology and microstructure

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Keywords: TiO_2 nanotube, Anodization, Deionized water, Surface morphology, Microstructure

Abstract. Nanotubes of TiO_2 have been synthesized on titanium metal by DC anodization at 50 V in an EG/NH_4F/D.I. H_2O electrolyte. The anodization apparatus which uses a platinum cathode is unique and designed to allow only for a single-face anodization. The influence of deionized water (D.I. H_2O) on the surface morphology of the nanotubes was investigated using the scanning electron microscope (SEM), while the microstructure before and after calcination was studied using X-ray diffraction technique (XRD). Results show that the surface density and uniformity of the TiO_2 nanotube arrays varies with the percentage of D.I. H_2O in the electrolyte. The best result was obtained at 6% volD.I. H_2O after calcination. This result is useful since, the surface morphology and microstructure play a vital role in the performance of TiO_2 nanotubes in various applications.

Carbothermic reduction of misamis oriental chromite ores

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Keywords: Carbothermic, Chromite, Reduction, Isothermal

Abstract. This study was conducted to determine the nonisothermal and isothermal reduction of chromium ores in the solid-state by reductants like solid carbon under argon and hydrogen-argon atmosphere. Two different chromite ores from local sources, sandy chromite ore from Opol, Misamis Oriental (SCO) and lumpy chromite ore from Manticao, Misamis Oriental (LCM) were used in the study. Isothermal and non-isothermal experiments were conducted in a fixed bed reactor heated in a vertical tube furnace in the temperature range 800 to 1000°C. Raw chromite and reduced samples were subjected to phase analysis and morphology characterization using X-ray flouresence (XRF), X-ray diffraction (XRD), and energy dispersive x-ray spectroscopy (EDX). It was found that reduction does not go to completion at this temperature range. The early stage of reduction of iron was controlled by nucleation and the later by nucleation or chemical reaction or both. The activation energy at the early stage of reduction is estimated to be 44.76 kJ/mol and the later stage of reduction is 144 kJ/mol for SCO and 76.5 kJ/mol for LCM. The reduction of chromium was controlled by chemical reaction.

Topic I: Materials Science and Engineering **ID 64**

Mechanical and Chemical Stabilities of Barium Alginate Gel: Influence of Chemical Concentrations

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Keywords: Barium alginate, Compressive test, Hydrogel, Chemical stability test

Abstract. There has been increasing interest of alginate gel utilization for environmental application. This study was aimed to investigate influence of sodium alginate and barium chloride concentrations on mechanical and chemical stabilities of the barium alginate gel. The barium alginate beads were mechanically tested using universal testing machine while the beads were soaked in the solutions with pHs of 5 to 9 or salts (sodium chloride, potassium chloride, and sodium hydrogen carbonate) for chemical stability test. The result showed that concentrations of barium chloride and sodium alginate obviously affected mechanical and chemical stabilities. Higher barium chloride concentrations decreased stress and Young's modulus of beads whereas higher alginate concentrations resulted to higher gel strength and flexibility. The stress and Young's modulus of 0.57 and 37.71 MPa were found in the best preparation condition (barium chloride of 1% and sodium alginate of 5%). For the chemical tests, the gel beads mostly tolerated in the solutions with different pHs and salt solutions excluding $NaHCO_3$. The gel beads prepared in this work sound potential for practice.

Topic I: Materials Science and Engineering **ID 77**

Improvement of acoustoelastic coefficient for residual stress measurement by ultrasonic in low carbon steel

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Keywords: Residual stress, Ultrasonic testing, Low carbon steel, Hardness, Pulser Voltage, Pulse Repetition Frequency

Abstract. This research aimed to exhibit the effects of variation of grain size, hardness and ultrasonic energy input for improving the residual stress measurement by ultrasonic in low carbon steel. Low carbon steel (SS400) was used to vary its grain size and hardness by fully annealing with 6 different temperature levels. The grain size and hardness of each specimen were analyzed by the microscope and hardness testing machine. Then each specimen was applied static tension load below yield point. The load was increased at 25 N/mm^2 (MPa) in increment. Through transmission technique with probe 2 MHz and surface ultrasonic wave were used. Ultrasonic energy input generated from Pulser-Receiver was changed its Pulser Voltage (PV) and Pulse Repetition Frequency (PRF). Traveling time of ultrasonic surface wave was measured by using Pulser/Receiver and displayed by an oscilloscope to calculate the ultrasonic velocity. The average of acoustoelastic coefficient was calculated based on the correlation between ultrasonic velocity and tensile stress. The results showed that the speed of ultrasonic waves depended on grain size and hardness of material. The ultrasonic energy input affected to the residual stress measurement. Finally, the constant value for residual stress measurement was created to increase the accuracy of residual stress determination.

Topic I: Materials Science and Engineering **ID 160**

Study on mechanical properties of natural rubber filled with molasses black/carbon black hybrid filler system

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Keywords: Natural rubber, Molasses, Carbon black, Hybrid filler

Abstract. Molasses is an inexpensive byproduct made during the extraction of sugars from sugarcane. Viscous molasses was converted to powder form under heating process. Molasses black (MB), mainly consisting of carbon, was finally obtained. As a result of elemental analyzer, it is evident that MB containing 56.13 % of carbon. Additionally, Fourier Transform Infrared Spectrophotometer (FTIR) result confirmed that function groups of MB were comparable with carbon black (CB). Nevertheless, the large particle size and low specific surface area of MB was less effective for reinforcement. Therefore, in this research, a feasibility study was carried out on the utilization of MB together with carbon black as hybrid filler in natural rubber (NR). Reinforcement of NR with MB/CB hybrid filler at various ratios was studied. The total hybrid filler content was 30 parts per hundred of rubber (phr). The mechanical properties were determined. The results revealed that the NR vulcanizates containing hybrid filler exhibited the better reinforcement than that filled with single MB filler.

Topic I: Materials Science and Engineering **ID 162**

Concentration and temperature dependences of effective ethanol vapor permeance of plastic films utilized in controlled release-based active packaging for horticultural products

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Keywords: Film permeance, Controlled release, Active packaging, Ethanol vapor

Abstract. In the present work effective film permeances to ethanol vapor (FPE) of Low Density Polyethylene (LDPE) and Nylon/PE films were determined in relations to ethanol vapor concentrations and storage temperatures (10°C and 25°C). The FPE was characterized using the isostatic and the gravimetric methods. The values of FPE show dependences on both storage temperatures and ethanol vapor concentration (0.25-3.17 mol·m^{-3}). Experimental data on FPE were well predicted with the exponential growth model with Root Mean Square Error (RMSE) value in a range of 0.0002-0.005. At comparable ethanol vapor concentration, research findings show that (i) average permeances of LDPE were higher than those of Nylon/PE, and, (2) the effective permeances measured at 10°C, for each films, were higher than those measured at 25°C, except the permeance of LDPE film measured at 10°C using 0.6-0.7 mol·m^{-3} was lower than that measured at 25°C.

Topic I: Materials Science and Engineering **ID 179**

Effect of small amount $BaTiO_3$ on properties of $K_{0.02}Na_{0.98}NbO_3$ ceramics with various sintering temperature prepared by molten salt method

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Keywords: (1-x)$K_{0.02}Na_{0.98}NbO_3$-(x)$BaTiO_3$ ceramics, Phase structure, Density, Dielectric properties, Molten salt method

Abstract. In the research, the properties of potassium sodium niobate – barium titanate [(1-x)$K_{0.02}Na_{0.98}NbO_3$-(x)$BaTiO_3$: (1-x)KNN-(x)BT] ceramics prepared by molten salt method with various molecular weight of BT or x are 0 and 0.05 were investigated. The calcined powders of pure $K_{0.02}Na_{0.98}NbO_3$ and (0.95) $K_{0.02}Na_{0.98}NbO_3$–(0.05) $BaTiO_3$ were pressed and sintered at1250 – 1325 ^oC and 1225 – 1300 ^oC for 2h, respectively.It was found that, the samples showed phase structure changing from monoclinic to orthorhombic with small amount $BaTiO_3$ addition. The densification of $K_{0.02}Na_{0.98}NbO_3$ ceramics and dielectric properties were improved with the addition of $BaTiO_3$. The (0.95)$K_{0.02}Na_{0.98}NbO_3$-(0.05)$BaTiO_3$ ceramics sintered at 1250 ^oC showed maximum density and dielectric constant (~8035), which was even comparable with that of $K_{0.02}Na_{0.98}NbO_3$ ceramics sintered at 1225 – 1300 ^oC.

Topic I: Materials Science and Engineering **ID 180**

Modification of eutectic Si in hypoeutectic Al-Si alloys with erbium addition

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Keywords: Thermal analysis, Rare earth, Eutectic solidification, Microstructure

Abstract. Effect of erbium (Er) on the eutectic Si morphologies in hypoeutectic Al-Si based alloys was investigated using thermal analysis and microstructure examination. The microstructural observations show that the addition of Er causes significant modification of the eutectic silicon morphology from a coarse plate-like to a fine fibrous one. Furthermore, the results of thermal analysis reveal that the addition of Er decreased the temperatures of eutectic nucleation and growth, and increased the eutectic undercooling. The eutectic undercooling caused by the presence of Er plays an important role in the modification of eutectic silicon.

Topic I: Materials Science and Engineering **ID 195**

RSM optimization for the production of activated carbons from para-wood residue

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Keywords: Activated carbon, RSM, Surface area, H_3PO_4 activation

Abstract. Para-wood residue was impregnated in 40% wt. of H_3PO_4 solution for 24 h before carbonization under different temperatures and times. The response surface methodology (RSM) based on Box-Behnken was applied to optimize the operating conditions in producing activated carbon with high specific surface area. The effects of three variables; impregnation ratio, carbonising temperature and time on the specific surface of activated carbons were investigated. The proposed model was almost in accordance with the experimental case with correlation efficient and of 0.9653 and 0.9029, respectively. The optimal conditions were found to be 6%wt. of impregnation ratio and carbonization at 400°C for 67.27 min. The predicted surface area of produced activated carbon under these optimal conditions determined by RSM was 1069.30 m^2/g. Experimental validation at these conditions was observed of 978.95 m^2/g which closely agreed with the predicted value. This obtained activated carbon structure composed of mesopores and micropores with the average pore diameter of 21.71°A. This study indicated the RSM based on Box-Behnken design was the effectively method to optimize the operating condition and maximize the specific surface area of produced activated carbons.

Topic I: Materials Science and Engineering **ID 210**

Nanostructure and Microstructure Evolution of D.C. Reactive Magnetron Sputtered CrN Thin Films

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Keywords: CrN, thin films, Nanostructured, Reactive magnetron sputtering

Abstract. The CrN thin films were deposited on silicon (100) substrate using reactive magnetron sputtering technique. The films were characterized by XRD, FE-SEM, EDS and nanoindentation techniques to examine the effect of deposition time on crystal structure, compositions, microstructure and hardness. The crystal structure, microstructure, element composition and hardness. The higher crystallinity through longer deposition time were investigated. The grain aggregration with columnar structure were obtained from FE-SEM. The Cr and N contents were not direct relationship with deposition time. The CrN coated sample performed hardness varied between 9 - 16 GPa.

Grain refining performance of Ce in hypoeutectic Al-Si alloy

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Keywords: Rare earth, Grain refinement, Microstructure, Secondary dendrite arm spacing

Abstract. Grain refining is an important technique to improve mechanical properties of hypoeutectic aluminum-silicon alloy. This study investigates the influence of cerium (Ce) on the grain refinement of hypoeutectic aluminum-silicon alloy. The macrostructure and microstructure of the as-cast samples were examined using optical microscopy (OM). The experimental results indicated that the rare earth cerium can effectively refine the primary α-Al dendrite. More than 50% grain size reduction was achieved after adding 0.6 wt.% Ce to the melt. The addition of Ce reduced the average SDAS and also reduced variation in the SDAS.

Topic I: Materials Science and Engineering **ID 284**

Hydroxyapatite from Golden Apple Snail Shell with Calcined Kaolin for Biomaterial Applications

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Keywords: Hydroxyapatite, Golden apple snail shell, Calcined kaolin, Simulated body fluid

Abstract. Biomaterials containing calcium phosphate ceramics have been used as bone substitute materials. In this study, the compressive strength and *in vitro* bioactivity tests of hydroxyapatite (HAp) from golden apple snail shell mixed with calcined kaolin (CK) were investigated for used as biomaterials. Mixed paste samples were cured at 23°C and 60°C for 2 days and curing continued at 23°C for 7 days. The effects of HAp:CK weight ratio on compressive strength and apatite formation in simulated body fluid (SBF) were investigated. The best compressive strength was 32.93 MPa at 25 % hydroxyapatite with 75% calcined kaolin at curing temperature of 60°C. Apatite formation was observed on sample surfaces after soaking in SBF for 28 days using SEM, EDS and XRD analyses. It was found that apatite formation took place on the surface of samples, consisting of HAp, after immersion in SBF.

Topic I: Materials Science and Engineering **ID 292**

Improvement of Early Compressive Strength in Belite Cement by Incorporating Silica Coated Single-Walled Carbon nanotubes

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Keywords: Carbon nanotubes, Belite cement, Silica coating, Composite

Abstract. This work demonstrated the improvement of belite cement compressive strength by incorporating nanosilica coated single-walled carbon nanotubes (SWNTs@SiO_2) into the cement paste. The structure and chemical compositions of SWNTs@SiO_2 materials were characterized by transmission electron microscopy and energy dispersive X-ray spectroscopy techniques, respectively. Belite cement composites were prepared by mixing belite cement paste with different loadings of SWNTs@SiO_2 ranging from 0.02 – 0.1 wt%. In order to measure the early strength of cement composites, the samples were aged for 7 days, and then subjected to compression tests. Effects of uncoated SWNTs and silica coated SWNTs loadings on the compressive strength of belite cement composites were studied. Without pre-coating SWNTs with nanosilica, the SWNTs additives led to large decrease in compressive strength of belite cement composite. Improvements in compressive strength of belite cement are shown in samples that incorporated SWNTs@SiO_2 loadings. The coating layer helps enhance bonding strength between reinforced SWNTs and the matrix, as well as promote hydration reactions in the cement paste. The highest increase in the compressive strength of 18.8 % is found in the sample with the minimal SWNTs@SiO_2 loading of 0.02%.

Topic I: Materials Science and Engineering **ID 299**

A Study on Modification Properties of Silicone Rubber Using Organic Filler from Golden Apple Snail Shells

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Keywords: Insulator Properties, Organic filler, ASTM D638-2a, Shells

Abstract. Silicone rubber room temperature vulcanization (RTV) is widely used as an insulator. This paper aims to improve the electrical and mechanical properties of RTV with organic filler from golden apple snail shells. The processed golden apple snail shells have the particle size of 75 μm. Specimen were made from silicone rubber with an addition of organic filler and inorganic filler for tested under ASTM D638-2a standard. The filler ratio was varying from 0 to 50% by weight with incremental of 5%. Experimental results showed that, there were good agreement in threshold of electrical and mechanical properties. RTV with the organic filler ratio of 40% out performed the inorganic filler in electrical aspect. Tensile strength of RTV was found to be increased when 5% addition of organic filler is used and decreases steadily as this filler is increased. The amount of filler has greater contribution to the hardness property of the RTV and it may become brittle when it is used in excessive amount.

Topic I: Materials Science and Engineering **ID 313**

Effect of welding speed on deformation behavior of friction welded aluminium/alumina

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Keywords: Friction welding, Aluminium AA6063, Alumina, Recrystallisation

Abstract. The objective of this experiment was to investigate deformation behavior of friction welded aluminium AA6063/alumina. Effect of welding speed on microstructural change and temperature gradient were determined. The result showed effects of welding speed on temperature and grains flow. Microstructures at the interfaces in all conditions exhibited recrystallised grains and hot deformation characteristic. Areas of Heat affected zone (HAZ) decreased with increasing welding speed. Hardness of recrystallized AA6063 grains decreased approximately by 30% . Increasing in amount of deformation increased the fully welded interface areas improving bonding strength of the weld.

Topic I: Materials Science and Engineering **ID 319**

A Study on Coconut Shell Powder Filled in Epoxy Resin: A Remedy forElectrical Tree GrowthInhibition

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Keywords: Coconut shell powder, Electrical tree

Abstract. Electrical tree phenomenon is a long term degradation and can be found in solid insulator material. Its phenomenon will degrade the characteristic of insulator and may lead to breakdown. The use of filler in the process of manufacturing for the insulation is very popular method. This paper presents the use of coconut shell powder (CSP) filler in epoxy resin for inhibition of electrical tree growth. The CSP is filled with in ratio of 0.1, 0.3, 0.5, 0.8 and 1.0% by weight. Theelectrical tree wastestedby AC voltage of 15kV and conducted for 30 minutesin this experiment. Experimental results shown that, the pure epoxy resin using as a controlled has tree length of 3.20mm. While the epoxy resin using CSP filler of 1% by weight has a tree length propagation of 2.10 mm. The shorten length of electrical tree may be affected by the combination of modified permittivity(Ɛ) value of an insulator. Also, this study has shown that the CSP may be a potential candidate as a filler compound to be used as electrical tree inhibition for electrical insulation system.

Topic I: Materials Science and Engineering **ID 359**

Recycled Concrete Aggregate (RCA) Thai Reverse Logistics Supply Chain Management for Ready Mix Plants

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Keywords: Recycled Concrete Aggregate (RCA), Ready Mix Concrete, Logistics, Supply Chain Management (SCM)

Abstract. Thailand and namely Bangkok is currently experiencing a construction boom. New condominiums are being erected throughout the city and the construction material of choice is concrete. Concrete is being produced by mixing water, cement and aggregates. The concrete plant can be either on-site or off-site in this case the concrete needs to be trucked from the ready mixed plant to the job site. The raw materials (cement and aggregates) for the concrete have to be shipped to the concrete plant. Aggregates are either fine or coarse and are made by crushing rocks or hardened concrete which results in so called recycled concrete aggregates (RCA).The composition of concrete waste (RCA) is Ca (21.9%), Si (8.27%), Al (4.58%), O (53.51%), C (11.74%) [1] and has similar strength and properties as rock from the mountain. In this case the RCA can be either generated on-site by demolition the existing structure or from a designated quarry site or other demolition site. The objective of the study was to look at all three cases and the advantages and challenges associated with the RCA production site. The main savings found are in terms of terms of transportation costs (fuel and time) when comparing RCA to aggregates from a remote natural quarry. There are additional savings in terms of global warming in the production process and the energy used in mining the raw material as well as disposal costs for the existing structure. The study used an on-line survey of young logistics management professionals to compare the various scenarios in a Thai context and analyzed the findings statistically using SPSS in order to create a theoretical model for RCA as part of a sustainable ready mixed concrete supply chain in Thailand and ASEAN.

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PROGRAM
Research program in Hazardous Substance Management
in Agricultural Industry
Center of Excellence on Hazardous Substance Management (HSM)

Friday August 5, 2016
Parallel session 5, Room: Erawan 1

MC: Associate Prof. Dr. Tawan Limpiyakorn & Dr. Thunyalux Ratpukdi

	Title	Speaker
10.30-10.45	▪ Opening speech & HSM overview ▪ Industrial waste treatment technology & management	Associate Prof. Dr. Sutha Khaodhiar (HSM Director, Chulalongkorn University)
10.45-11.00	▪ Introduction of the research program in Hazardous Substance Management in Agricultural Industry ▪ Effect and treatment of toxic organic substances in biosolid used as agricultural fertilizer	Associate Prof. Dr. Alisa S. Vangnai (Chulalongkorn University)
11.00-11.15	Degradation of phenyl urea herbicides by physicochemical approaches	Associate Prof. Dr. Varong Pavarajarn (Chulalongkorn University)
11.15-11.30	Control of Antibiotics Using Cell Entrapment Technique: A Case Study of Silver Nanoparticles	Associate Prof. Dr.Sumana Siripattanakul-Ratpukdi (Khon Kaen University)
11.30-11.45	Occurrence and Controls of Endocrine Disruptor in Environment	Dr. Parinda Thayanukul (King Monkut's Uninersity of Technology Thonburi)
11.45-12.00	Effect of biofilm on formation and reduction of disinfection by-products	Associate Prof. Dr. Patiparn Punyapalakul (Chulalongkorn University)
12.00-12.05	Closing remarks	Associate Prof. Dr. Sutha Khaodhiar (HSM Director, Chulalongkorn University)

Note: The talk (13 min); Q&A (2 min)

พรหมลิขิต

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