



PROGRAM BOOK



International Joint Conference of

2016 2nd International Conference of Industrial, Mechanical, Electrical, and Chemical Engineering (ICIMECE) and 2016 Annual Conference on Industrial and System Engineering (ACISE)

Supported by :



Yogyakarta, Indonesia
October 6 - 7, 2016

Organized by :



PROGRAM BOOK

**International Joint Conference of 2016 2nd Industrial, Mechanical,
Electrical, and Chemical Engineering (ICIMECE) and 2016
Annual Conference on Industrial and System Engineering
(ACISE)**

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The logo for ICIMECE features a stylized blue and white graphic above the text "icimece" in a lowercase, sans-serif font.The logo for ACISE features a stylized blue and white graphic above the text "ACISE" in a bold, uppercase, sans-serif font.

Organized by :

Universitas Sebelas Maret (UNS)

Universitas Diponegoro (UNDIP)

Institut Teknologi Bandung (ITB)

Web : imece2016.ft.uns.ac.id or 2016acise.ft.undip.ac.id

E-mail : Imece2016@ft.uns.ac.id

Yogyakarta, Indonesia

October 6 - 7, 2016

TABLE OF CONTENTS

Cover.....	1-3
Table of Contents	4
Welcome Message	5
Conference in Brief	
Organizers and Committees	5-7
Program Schedule	8-10
Keynote Speakers	11-15
Oral Presentation Guidelines.....	16-17
Conference Informations	18
Necessary Information	
Passport and Visa	19
Airports and Airport Tax.....	19
Currency	19
Language.....	20
IDD (International Direct Dialing).....	20
Hospital and Drug Store	20
Transportation.....	21-22
Indonesia in Brief	23
Jogjakarta in Brief	24
Beautiful Destinaton of Yogyakarta	25-26
Parallel Session Schedule	27-96

Welcome Message



On behalf Organizing, Steering, and Technical Program Committee, it is my privilege to welcome you to the Joint International Conference of The Second Industrial, Mechanical, Electrical, and Chemical Engineering & Industrial and System Engineering (ICIMECE & ACISE 2016).

The ICIMECE & ACISE 2016 organized by Faculty of Enigeering - Sebelas Maret University in collaboration with Faculty of Enigeering - Diponegoro University, and the School of Electrical and Informatics, Institute Technology Bandung (ITB), and the Institute of Electrical and Electronics Engineers (IEEE) with technical co-sponsored by the Indonesia Section C Chapter and Indonesia Section SP/ED/E/PES Joint Chapter.

The first ICIMECE (formerly known as IMECE) was held in 2015 while the first ACISE was held in 2014 as a domestic conference. This year, these two conferences are joined together to be broad, widely provide opportunities for the different areas to exchange new ideas and also experiences, as well as to establish business or research relations and to find global partnership for future collaboration in the fields of Engineering. The conference is expected to be an effective platform for the three axis of triple helix namely ABG (Academic–Business–Government) forum, to share ideas and to present the works of scientists, engineers, educators and students. Speakers from Australia, Indonesia, Japan, Malaysia, South Korea, the Republic of the Philippines, the United Kingdom, The People's Republic of China and Turkey were submitted articles to this conference.

In closing, It was our great honor and pleasure to accept the responsibilities and challenges of Conference General Chair. We hope that the conference will be stimulating, informative, enjoyable and fulfilling experience for all who attend it.

Organization and Committees

Conference Advisers:

Agus Purwanto
Sebelas Maret University
 Dwi Hendratmo W
Bandung Institute of Technology
 Budiyo
Diponegoro University

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 M. Agung Wibowo
Diponegoro University
 Dwi Aries Himawanto
Sebelas Maret University
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Sebelas Maret University
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Sebelas Maret University
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Sebelas Maret University
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 Syamsul Hadi
Sebelas Maret University
 Eko Pujiyanto
Sebelas Maret University
 Augustinus Sujono
Sebelas Maret University

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Wahyudi Sutopo
Sebelas Maret University

Co-Chairs:

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Bandung Institute of Technology
 Naniek Utami Handayani
Diponegoro University

Technical Program:

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 Wakhid Ahmad Jauhari
Sebelas Maret University
 Burhanuddin Halimi

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Sebelas Maret University
 M. Mujiya Ulkhaq
Diponegoro University

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Sebelas Maret University
 Diana Puspita Sari
Diponegoro University

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Sebelas Maret University
 Taufiq Al-Makmun
Sebelas Maret University
 Yusuf Priyandari
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 Dyan Ika Rinawati
Diponegoro University

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Sebelas Maret University
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Diponegoro University

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Sebelas Maret University, Indonesia
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University of Andalas, Indonesia
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Gadjah Mada University, Indonesia
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Sepuluh Nopember Institute of Technology, Indonesia
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BPPT, Indonesia
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Sepuluh Nopember Institute of Technology, Indonesia
 Muhammad Reza
ABB, Sweden
 Mukmin Widyanto A.
Bandung Institute of Technology, Indonesia
 Mustofa
Sekolah Tinggi Manajemen Industri, Indonesia
- Naniek Utami Handayani
Diponegoro University, Indonesia
 Novie Susanto
Diponegoro University, Indonesia
 Pekik Argo Dahono
Bandung Institute of Technology, Indonesia
 Pranoto Hidaya Rusmin
Bandung Institute of Technology, Indonesia
 Ratna Purwaningsih
Diponegoro University, Indonesia
 Rini Dharmastiti

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 Hennie Husniah
University of Langlangbuana,
Indonesia
 Hery Suliantoro
Diponegoro University, Indonesia
 Hilwadi Hindersah
Bandung Institute of Technology,
Indonesia
 Ida Ayu
University of Technology, Malaysia
 Inayati
Sebelas Maret University, Indonesia
 Indrawanto
Bandung Institute of Technology,
Indonesia



Universitas Gadjah Mada, Indonesia
 Singgih Saptadi
Diponegoro University, Indonesia
 Stefanus Eko
Sepuluh Nopember Institute of Technology,
Indonesia
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Sebelas Maret University, Indonesia
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Swiss German University, Indonesia
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Sebelas Maret University, Indonesia
 Jonrinaldi
Andalas University, Indonesia



PROGRAM SCHEDULE
**International Joint Conference of 2016 2nd International
 Conference of Industrial, Mechanical, Electrical, Chemical
 Engineering & 2016 Annual Conference on Industrial and System
 Engineering (ICIMECE & ACISE 2016)**

Royal Ambarrukmo Hotel Jogjakarta, Jl. Laksda Adisucipto No.81, Daerah Istimewa
 Yogyakarta 55281, Phone:(0274) 488488
 Day-1: Thursday, October 06, 2016

TIME	PROGRAM ACTIVITIES
07.00 – 09.00 a.m	Conference Registration
09.00 – 09.10 a.m	Opening Ceremony by MC (support by HMTI UNS)
09.10 – 10.55 a.m	<ul style="list-style-type: none"> - National Anthem - Reporting Speech of SC of IC IMECE by Dean of Faculty Engineering, Sebelas Maret University, Dr.techn.Ir. Sholihin As'ad, M.T - Reporting Speech of SC of ACISE by Dean of Faculty Engineering, Diponegoro University, Ir. M. Agung Wibowo, MM, MSc, PhD - Opening Speech by UNS' Rector, Prof Dr. Ravik karsidi, MS - Keynote Speech by Director of Quality Assurance on behalf Ministry of Research, Technology & Higher Education : Prof drh Aris Junaidi, Ph.D - MoU signment between UNS and PT Festo Indonesia
09.55 – 10.15 a.m	<i>Coffe Break</i>
10.15 a.m – 12.10 p.m	Keynote Speech I : Drs Slamet Ajji Pamungkas M.Eng. Head of Sub-Directorate Information and Data Analisis Badan Ekonomi Kreatif
	Keynote Speech II : Prof. Amran Rasli, Director of ICC, Universiti Teknologi Malaysia Theme: “Contribution of innovation and technology commercialization at Universities to National Economic Growth: a case study from ICC-UTM Malaysia”
	Keynote Speech III : Assoc. Prof Erdem Cuce, Ph.D - Bayburt University. Theme“Technology Commercialization in Energy”
	Keynote Speech IV : Mr.Safri Susanto, S.T. Didactic Manager PT Festo di Indonesia. Title : Industri 4.0 is All about Future Production Process

	Discussion and Question/Answer with Keynote Speakers Moderator : Retno Tanding Suryandari SE., M.E.,Ph.D (Sebelas Maret University)
12.15 - 01.00p.m	Photo Session & L U N C H
01.15 –03.00 p.m	Parallel Session I (@presentation 20’)
03.10 – 03.25 p.m	Coffee break
03.25 – 05.15p.m	Parallel Session II (@presentation 20’)
07.30- 09.00 p.m	Conference Dinners - <i>Speech from International Office,</i> - <i>Sponsorship Reward</i> - <i>Award Announcement</i> - <i>Performace Art from</i>

*) Request from committee



icimece



ACISE

Day-2, Friday, October 07, 2016

TIME	PROGRAM ACTIVITIES
08.00 – 08.45 a.m	Conference Registration
08.45 – 09.15 a.m	Coffe Break
09.15 – 11.15 a.m	Keynote Speech V : Prof. Muhammad Nizam, ST., MT., Ph.D Professor of Power Systems, Universitas Sebelas Maret Theme: “Commercialization of Renewable Energy: Economic Opportunities and Energy Management”
	Keynote Speech VI: Sarjiya, ST., MT., P.hD. Chair of Power and Energy Society Chapter, IEEE Indonesia, Universitas Gadjah Mada, (UGM). Talk Title: “Commercialization of Renewable Energy: Power System and Technology”
	Keynote Speech VII : Warsono M., ST., M.Phil. , General Manager Transmission of East Java and Bali Region, PLN. Talk Title: “Commercialization of Renewable Energy: Policies and Regulations”
	Discussion and Question/Answer with Keynote Speakers Moderator : Dr. Singgih Saptadi, ST. MT (Diponegoro University)
11.15 a.m – 12.30 p.m	Friday Shalah
12.30 – 01.00 p.m	Lunch Break
01.00 – 03.10 p.m	Parallel Session III (@presentation 20”)
03.10 – 03.25 p.m	Coffe Break
03.25 – 05.15 p.m	Parallel Session IV (@presentation 20”)

Keynote Speaker



Chief of Badan Ekonomi Kreatif

Biography

Triawan Munaf

Triawan Munaf was born in Bandung, November 28th1958. Triawan is son from couple Bahar Munaf and ETTY Munaf. He married with Luki Ariani. They are parents from Virania Munaf and Sherina Munaf. He became Kepala Badan Ekonomi Kreatif after officialy inaugurated by the president of Indonesia, Ir. Joko Widodo, on 26th January 2015, through Keputusan Presiden (Kepres) Nomor 9 P year 2015. He became the first chief for the new established institution that has the same level with the ministry. Badan Ekonomi Kreatif is a new established state institution that used to be a part of Ministry of Tourism and Creative Economy.

Triawan engaged in the field of advertising and founded *Euro RSCG AdWork* on 26th December 1989. One of his clients is Partai PDI Perjuangan. The PDI Perjuangan icon, white mouthed bull is one of his creation.



Director, UTM Innovation and Commercialisation Center, UTM

Biography

Prof. Amran bin Muhammad Rasli Ph.D

Mr. Amran bin Md. Rasli is a respected figure in Innovation and Commercialization Center, Universiti Teknologi Malaysia. He was born on June 5th, 1961 in Kuala Lumpur,

Malaysia. On 1983 he got his B.A. (Statistics) with C.G.P.A. of 3.00 from California State University, Chico, California, until 2005 with his PhD in Society, Business & Globalisation from Roskilde University, Denmark.

Mr. Amran has many professional qualifications or memberships which he has been joining until now, from a member of SPSS User Group to an advisory member and board of Trustees to the Asia Pacific Business, Innovation and Technology Management Society (Jan 1, 2012-Dec 31, 2015). He also had a consultancy or training since 1991. Many awards have been given to him, such as Represented Malaysia for the APEC-HRD-BMN Project in Developing Cross-Cultural Training for SMEs on Interactive CD-ROM. He attended the first Project Meeting and Inception Workshop on January 18-20th, 1997 in Sydney, Australia, and the latest one is Anugerah Khidmat Cemerlang in conjunction with Citra Karisma Universiti Teknologi Malaysia 2013. Not only awards, he also has many research records which he had made since 1991 until now.



Technology Commercialization in Energy Bayburt University, Turkey

Biography

Erdem Cuce, Ph.D



Dr. Erdem Cuce has received his PhD from the University of Nottingham on sustainable building technologies. He has worked on numerous scientific projects in the scope funded by notably EU, TSB, DECC, EPSRC, BRITISH COUNCIL, TUBITAK and international based commercial companies. He has strong numerical, computational, experimental and simulation skills as well as comprehensive CFD techniques based on UDFs for thorough performance assessment of physical systems. Currently, he is the author or co-author of over 70 scientific papers notably in high-impact SCI journals and prestigious international conference proceedings.

His latest book "Toward thermal superinsulation technologies in buildings: Latest developments in glazing and building fabric" has been released in August 2015 by German Publisher LAP Lambert Academic Publishing.

He is currently working as a visiting scientist in the Institute of Sustainable Energy Technologies at the University of Nottingham. He is also working as an expert in energy optimization, energy conservation and energy management strategies with a consultant role.



Didactic Manager PT Festo

Biography

Safri Susanto, S.T.

Safri Susanto, he was born February 29th 1976. He is currently working as a Didactic Manager PT Festo from 2007 until now. He is also working as a trainer for change module 1, 2, and 3 in the Sales Training Program Festo A.G from 2012 until now. He worked as Product and Market Specialist Merger and Acquisition LabVolt Inc. Quebec Canada on period 2013 – 2014. In 2005 until 2008 he worked as Lecturer of Pneumatic and Hydraulic University of Indonesia F-MIPA Akademi Teknik Bogor.



Professor of Power System, Universitas Sebelas Maret

Biography

Prof. Muhammad Nizam, ST., MT., Ph.D

Muhammad Nizam, He was born in Surakarta July, 20th 1970. He received his B.Eng and M.Eng degrees in Electrical Engineering from Universitas Gadjah Mada (UGM), Indonesia and Ph.D degree in Electrical Engineering, Universitas Kebangsaan Malaysia, Malaysia, in 1994, 2002 and 2008 respectively.

Since 1998, he has been with the Faculty of Engineering of Universitas Sebelas Maret (UNS) and was a full professor there since 2011.

He received Bronze Medal, in Intelligent Power Quality Monitoring Instrument 19th International Invention, Innovation and Technology Exhibition, Kuala Lumpur, Malaysia, 9th-11th May 2008, Organized by MTI, Malaysia, 2008. His research interest includes reliability

and economic operation of power systems, optimization in the power systems, power system dynamic and stability. He is a member of IEEE, PII.



*Chair of Power and Energy Society Chapter, IEEE Indonesia,
Universitas Gadjah Mada*

Biography

Sarjiya, ST., MT., P.hD.

He was born in Yogyakarta, Indonesia, in 1973. He received his B.Eng and M.Eng degrees in Electrical Engineering from Universitas Gadjah Mada (UGM), Indonesia and Ph.D degree in Electrical Engineering, Chulalongkorn University, Thailand, in 1998, 2001 and 2008 respectively.

He is Chair of Power and Energy Society Chapter, IEEE Indonesia. His research interest includes reliability and economic operation of power systems, optimization in the deregulated power systems. He is a member of IEEE, PII, and, MKI.



General Manager Transmission of East Java and Bali Region, PLN

Biography

Warsono M., ST., M.Phil.,

Warsono, graduated from the Department of Electrical Engineering and Information Technology Universitas Gadjah Mada, Indonesia in 1994. He received Master of Philosophy in Power Engineering & Management from University of Abertay, Dundee, UK in 2000. He is General Manager Transmission of East Java and Bali Region, 2015.

Oral Presentation Guidelines

1. Prepare Presentation

Each oral presentation will be 20 minutes (long maximum) followed by Q&A. Length presentation material should be in accordance with your time allotted. You are kindly requested to be at the presentation room at least 15 minutes before the session starts. Please refer to conference book or schedule to find your assigned schedule and session. The presentation format is in power point presentation (ppt and pptx) and pdf.

2. Backup Copy Presentation

Recommended to copy your presentation file in conference location. You can update your file 1 hour before conference at Registration Desk.

3. Suggestions for a good presentation

- Slide Detail

Each slide should have a maximum of five points or short sentences. Slides should represent summary points of your discussion rather than your verbal presentation in totality. Please avoid using transitions between slides and within slides as these become distracting.

- Number of slides

The duration of your presentation will determine the number of slides that is acceptable. As a general rule, if your presentation takes 15 minutes in duration, 5 slides would be acceptable. However, your presentation style may suggest a different time required each slide. Please plan the slides carefully. Remember you'll talk about your slides not read them.

- Font

Font type and size is determined by personal preference. Basic fonts such as 'times new roman' or arial are easy to read. A font size of 26-30 is acceptable.

- Content

As described above, the content of your slides should be brief. Your presentation should have a distinct introduction, body conclusion and Acknowledgements.

- Images and Illustrations

Always check for the presence of copyright notices and watermarks on images downloaded from the Internet or copied from another source. Copyright notices are not always visible on images, however, this does not mean that one does not exist. When in doubt, you should seek written permission from the publisher before using any images or illustrations in your conference presentation, as this will most definitely be required if you submit your paper for Publication at a later stage. Additionally, if you are using personal photographs, you will need to obtain written permission from all of the people whose identity is visible in the photograph.

Conference Informations

Official Language

The official language of the conference is English. All presentation including discussion shall be made in English.

Badges

All the participants are asked to wear their name badges in order to enter the session room.

Registration Desk

The registration desk is available on Karaton I

Lunch

Lunch will be served at Royal Restaurant with Lunch Ticket.

Gala Dinner

Date : Thursday, October 6th 2016

Time : 07.30 – 09.00 PM (GMT +7)

Venue : Pendopo Royal Ambarukmo Hotel

Dress Code : Formal / Batik

All registered participants are invited to attend gala dinner free of charge. A full course meal and entertainment will be provided.



Necessary Information

Passport and Visa

Passport must be valid for minimum six months. Visa On Arrival (VOA) is granted to foreigners who intend to visit Indonesia for tourism, social and culture, business or government duties. This VOA is granted to foreign nationals who fulfill requirements and conditions upon arrival in Indonesia. The following is the list of countries that can apply for VOA in Indonesia.

Algeria	Greece	New Zealand
Arab Emirate	Hungary	Oman
Argentina	Iceland	Panama
Australia	India	Poland
Austria	Ireland	Portugal
Bahrain	Italy	Qatar
Belgium	Tunisia	Romania
Brazil	Japan	Russia
Bulgaria	Kuwait	Saudi Arabia
Cambodia	Laos	Slovakia
Canda	Latvia	Slovenia
China	Libya	South Africa
Cyprus	Liechtenstein	South Korea
Czech Republic	Lithuania	Spain
Denmark	Luxembourg	Suriname
Egypt	Maldivies	Sweden
Estonia	Malta	Switzerland
Fiji	Mexico	Taiwan
Finland	Netherland	United State of America
France	Monaco	United Kingdom
Germany	Norway	United Arab Emirate

Airport and Airport Tax

Adi Sucipto International Airport (*Indonesian : Bandar Udara Internasional Adi Sucipto*) is an airport in Jogjakarta. It is located on Jalan Raya Solo Km 9. There is no airport tax because the tax include in price of ticket.

Currency

Only Indonesian currency (Rupiah) is acceptable at regular stores and restaurants. Certain foreign currencies and major credit cards are accepted by most hotels, restaurants, and souvenir shops. The change rates 1 USD is about 13.300 IDR.

Language

Bahasa Indonesia is the national language.

IDD (International Direct Dialing)

Country Code : +62

City Code : Jogjakarta +62-274

Police

Magelang Km 12, Sleman 55514

T : (+62 274) 868424

Hospital and Drug Store**Hospital**

1. JIH Hospital
Ring road utara, Sleman, Jogjakarta
T : (+62 274) 4463535
2. Panti Rapih Hospital
Cik Di Tiro 30, Caturtunggal, Depok, Sleman, Jogjakarta.
T : (+62 274) 563333
3. Condong Catur Hospital
Manggis 6, Condongcatur, Depok, Sleman, Jogjakarta.
4. Dr. Sardjito Hospital
Kesehatan 1, Sekip, Sinduadi, Sleman, Jogjakarta.
T : (+62 274) 587333
5. Bestheda Hospital
Jenderal Sudirman 70, Jogjakarta
T : (+62 274) 586688
6. Jogja Hospital
Wirosaban Barat 1, Sorosutan , Umbulharjo, Jogjakarta.
T : (+62 274) 371195

Drug Store

1. K-24 Ambarukmo
Laksda Adisucipto 150A, Ambarukmo
T : (+62 274) 489233
2. Husada Bima Perkasa
Laksda Adisucipto 56A, Jogjakarta
T : (+62 274) 7103288

**Transportation**

There are some option transportation like bus, taxi, or train to get conference venue in Ambarukmo Hotel Jogjakarta.

Transjogja

Transjogja is a city bus with many of facilities, such as air conditioner and services well. The bus is operated from 05.30 – 21.30 (GMT + 7 hour).

- From Adi Sucipto Airport, Jogjakarta
The Adi Sucipto Airport is located on Jalan Raya Solo Km 9, it's about 5 km from Hotel. The convenient transportation to reach Ambarukmo Hotel is Bus Transjogja corridor 1A and 1B. The price about 3500 IDR. Another transportation to get Ambarukmo Hotel is to take an airport taxi. The taxi operate with argo system.
- From Tugu Station, Jogjakarta

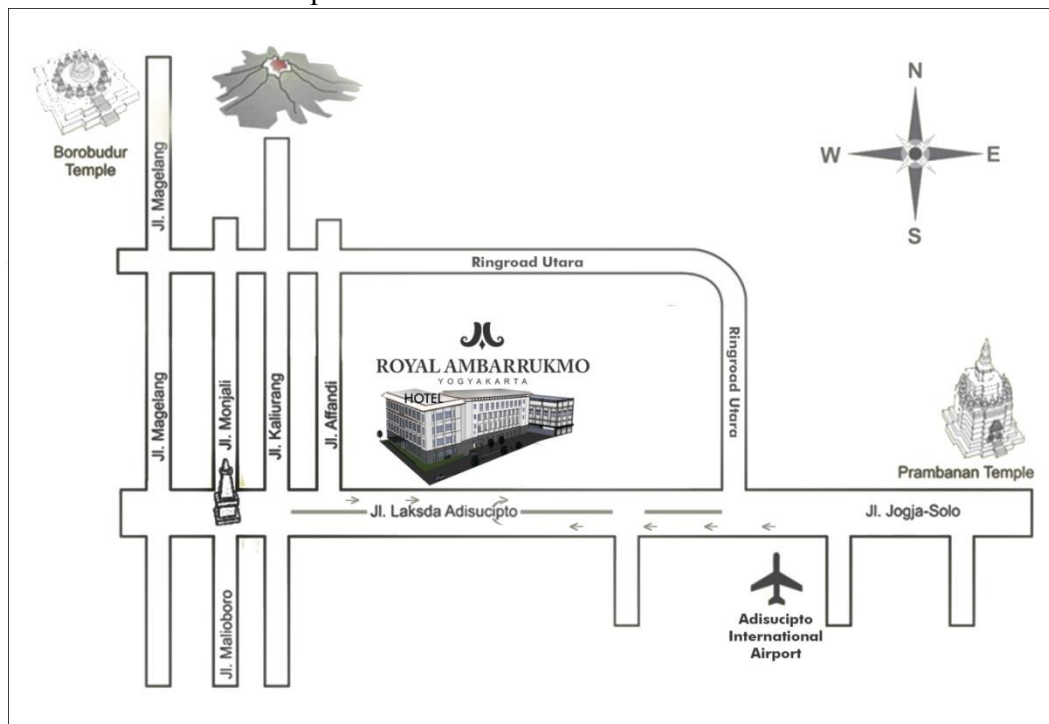
Tugu Station is located on Jalan Pasar Kembang Sosro Menduran, it's about 5 km from Hotel. The transportation from this station to conference venue can take Bus Transjogja corridor 1A and 1B. The price about 3500 IDR.

- From Maguwo, Jogjakarta

Lempuyangan Station is locaten on Maguwoharjo, Sleman, it's about 5.4 km from Hotel. The trasportation from this station to conference venue can take Bus Transjogja corridor 1A and 1B. The price about 3500 IDR.

- From Bus Station Giwangan

Public transportation that can be used to get the conference venue is by Bus Transjogja corridor 3B and stop at Adi Sucipto Airport and then continue with bus transjogja corridor 1A or 1B. The price is about 3500 IDR.



Indonesia in Brief

Indonesia is the world's fourth-most-populous country in the world. The Indonesian national motto is "Unity in Diversity" or in Sanskrit language is "Bhinneka Tunggal Ika". There are some 300 ethnic groups, a result of both the country's unique geography and history. Indonesia has 250 distinct languages with Bahasa Indonesia as national language. Six religions are formally recognized in Indonesia and have official national holidays commemorating events of importance to their followers.

Indonesia is divided into 31 provinces, which 2 special regions (*Daerah Istimewa Yogyakarta* and *Nanggroe Aceh Darussalam*), and 1 special capital city that is Jakarta. Indonesia has three time zones that is Western Indonesia Time (GMT +7), Central Indonesia Time (GMT + 8), East Indonesia Time (GMT + 9).

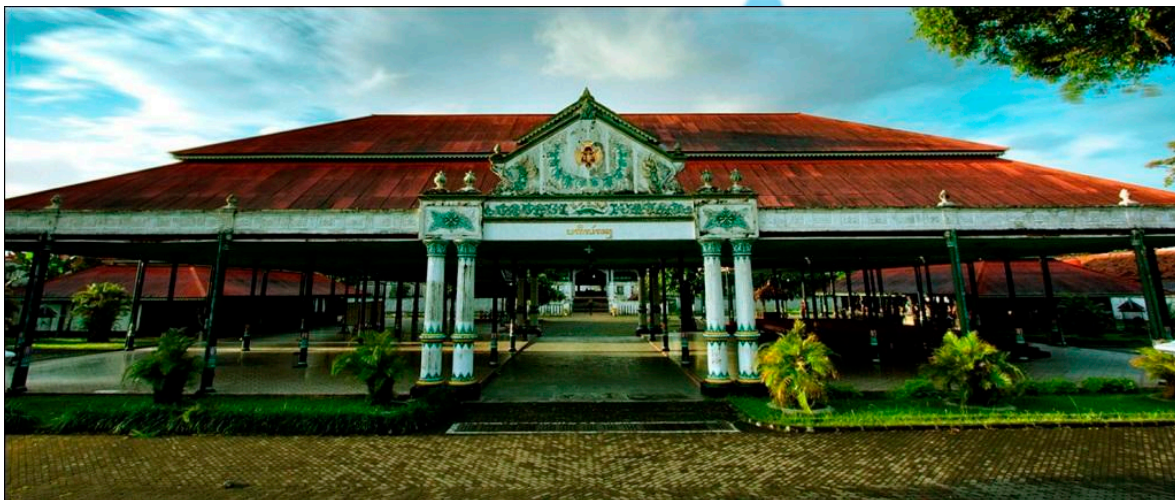


Jogjakarta

Yogyakarta also **Jogja** or **Jogjakarta**, is a city and the capital of Yogyakarta Special Region in Java, Indonesia. It is renowned as a center of education (*Kota Pelajar*), classical Javanese fine art and culture such as batik, ballet, drama, music, poetry, and puppet shows. Yogyakarta was the Indonesian capital during the Indonesian National Revolution from 1945 to 1949, with Gedung Agung as the president's office. One of the districts in Yogyakarta, Kotagede, was the capital of the Mataram Sultanate between 1575 and 1640.

The city of Yogyakarta is an administrative part of the Yogyakarta Special Region which has the status of a province in Indonesia. The regencies of Bantul and Sleman have population densities far higher than the surrounding countryside (over 1,500 per square kilometer) and are effectively dormitory communities of the greater area of Yogyakarta. Within the greater Yogyakarta area lies the city of Yogyakarta called *Kota Yogyakarta*.

The area of the city of Yogyakarta is 32.5 square kilometres (12.5 square miles). While the city spreads in all directions from the *kraton* (the Sultan's palace), the core of the modern city is to the north, centered around Dutch colonial-era buildings and the commercial district. Jalan Malioboro, with rows of pavement vendors and nearby market and malls, is the primary shopping street for tourists in the city, while Jalan Solo, further north, is a shopping district more frequented by locals. At the southern end of Malioboro, on the east side is the large local market of Beringharjo, not far from Fort Vredeburg, a restored Dutch fort.



BEAUTIFUL DESTINATION of YOGYAKARTA

CANDI PRAMBANAN



Prambanan is the largest Hindu temple of ancient Java, and the construction of this royal temple was probably started by Rakai Pikatan as the Hindu Sanjayas answer to the Buddhist Sailendra's Borobudur and Sewu temples nearby.

Getting There :Using Transjogja take number 1A from Plaza Ambarukmo. The first one leaves around 6AM, then every 20 minutes. Depending on traffic, the journey normally takes around 30 minutes, but can

take an hour when traffic is heavy. From the terminal station, cross the busy road, turn right, and walk around 300 metres to the pedestrian entrance.

Operating Hours : 7.30 A.M – 5.00 P.M

Website : <http://corporate.borobudurpark.com/node/20>



MALIOBORO STREET

Malioboro Street is a major shopping street in Yogyakarta. It lies north-south axis in the line between Yogyakarta Kraton and Mount Merapi.

Getting There :Using Transjogja take number 1A from Plaza Ambarukmo, then stop at Maliboro Street Transjogja Stop.

Operating Hours :8.00 A.M – 9.00 P.M

Website :-



KASONGAN VILLAGE

Kasongan village is the dwelling place of kundis, which means earthenware jugs and later refers to people who make any earthenware jug-like as kitchen tools and ornaments.

Getting There :With a private vehicle, from the center of Yogyakarta . You can through the streets of Bantul . Upon entering km 5.6

in Bantul road on the west there is a red arch-shaped corridor that reads Kasongan .



POK TUNGGAL BEACH

Pok Tunggal Beach has a beautiful panorama with white sand and karst. On the east side and the west coast is flanked by towering cliffs.

Getting There : With a private vehicle route can be through : Yogyakarta - Piyungan - Patuk , Sambipitu -ArahBunder Forest - Ivory - Logandeng -Siyono - BPD Monument Roundabout - Jl . KyaiLegi- South Ring Road - Jl . KRT Djodiningrat - Jl .Girisubo - Wonosari - Jl .Saptosari - Tepus - PokTunggal .Or : Yogyakarta - Imogiri , Bake - Jl .

Saptosari - Tepus Directions to Baron



PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 01.00 – 03.10 P.M.

Room : Pemandangan I
Session : Electrical Engineering I
Chair : Dr. Umar Khayam

6A1-1 Efficiency of Energy Consumption on ZRP and AODV by applying Sensor-MAC
 01:10 P.M

Nata Jaya, Rizki Yugitama, Romi Nur Ismanto, Riri Fitri Sari

Departement of Electrical Engineering, Faculty of Engineering University of Indonesia, Indonesia

Abstract

In mobile ad hoc network (MANET), energy consumption is one of the foremost vital restrictions that deteriorate the performance of the whole network. This paper presents a performance evaluation of the energy efficient AODV and ZRP routing protocols for MANET using Sensor-MAC. We evaluate the energy consumption of the Sensor-MAC protocol for wireless sensor networks. Since sensor nodes are equipped with limited energy of batteries, reducing energy consumption is a critical issue for extending the network lifetime. We use NS2 to implement the energy consumption of Sensor-MAC and standard 802.11 protocol and used the routing protocol ZRP and AODV. The experiment result shows that the S-MAC implementation is better than the IEEE 802.11.

6A1-2 **X-Band Antenna Design for Indonesian Ground Surveillance Man Pack Radar**
 01.30 P.M

Ken Paramayudha

Research Center for Electronics and Telecommunication, Indonesian Institute of Sciences, Indonesia

Abstract

In this paper, an X Band antenna for ground surveillance manpack radar was designed with 15 x 38 cm dimension using RT/Duroid 5880 substrate. The array consisted of 64 patches antenna with a carved slit to obtain a horizontal polarization. The gap between antenna feed were evaluated and the results are that that antenna gain and side lobe level will decrease as the gap became larger. This design has 200 MHz bandwidth with gain of 25.2 dB and side lobe level of -22.7 dB.

6A1-3 **Crossroads traffic density monitoring and injection mitigation through visual recognition**
 01.50 P.M

Amir Pohan, Liza Lattif, Rudzidatul Dziyauddin

Institut Sains dan Teknologi Nasional, Universitas Teknologi Malaysia, Malaysia

Abstract

Monitor and control traffic conditions are important in intelligent transport systems to reduce congestion, especially at intersections. The approach is needed to reduce the negative effects of the congestion at junctions and steps taken to control traffic at the intersection. The project identifies the number of cars through video image detection and thus take into account traffic and road width at each branch junction to resolve congestion by coordinating traffic lights. This project involves with the design, manufacture, and analysis of traffic monitoring system through computer technology and profile intersection. The system notifies the congestion monitored in three stages (empty, medium and many) and the size of the width of the road, road capacity and type of intersection. This study uses Indonesian Highway Capacity Manual (IHCM) with Fuzzy algorithm to detect vehicles using surveillance cameras at four traffic lights junctions. The green light is determined by the density of the vehicle and the type of intersection using adobe flash simulated.

6A1-4 **Piezoelectric Transformer with Pulse Dropping Technique for High Voltage Generation**

02.10 P.M

Mochammad Facta, Hermawan, Zainal Salam, Zolkafle Buntat

School of Electrical Engineering and Informatics Institut Teknologi Bandung, Indonesia



Abstract

This paper describes implementation design and analysis of piezoelectric transformer with pulse dropping technique to produce high voltage. The main contribution is the implementation of pulse dropping mode in inverter switching mechanism to decrease heat of piezoelectric transformer during the high voltage generation. Piezoelectric transformer fed by inverter in this work is dedicated to generate high voltage in high frequency. However, load current drawn from the transformer causes temperature rise and deterioration of internal elements of piezoelectric. As operating temperature reach the maximum limit, the output voltage of piezoelectric becomes non sinusoidal and decreases in magnitude. In pulse dropping technique, there are two modes in period of inverter switching. The first mode is called as power injection and the second is called as relaxation period. The experiments was carried out by a high frequency inverter, power MOSFET as power electronic switch, KW06-559 infra red thermometer to detect temperature of piezoelectric transformer, and resistive-capacitive component as a load. Without the use of pulse dropping technique during experiment, the temperature of piezoelectric reached the maximum limit at 70°C,

voltage output was unstable and the piezoelectric was easy to crack. It was found that first mode maintained high voltage output at 2.45 kV peak to peak and the second mode successfully maintained the average temperature of piezoelectric in the range of 35 – 40°C.

6A1-5 **Influence of manufacturing process on Soft-Magnetic Properties of Iron Powder**
02.30 P.M

Muhammad Nizam, Miftahul Anwar, Ivan, P., Hery, T. W.

Department of Electrical Engineering Sebelas Maret University, Indonesia

Abstract

Nowadays, a lot of electrical equipments use the alternating current with high frequency. Soft magnetic is the right choice to use in alternating current or high frequency, because it can repeatedly be magnetized and demagnetized in a short time. The metallurgy process begins with the fabrication of the powder using a milling machine and ball milling thus produced iron powder of 100 mesh size, then the powder was heated up to 600°C for an hour. The iron powder was laced by epoxy resin and compacted with a pressure variation 4, 5, 6 tons for an hour. The hardness testing uses Vickers test and microstructure observation by SEM (scanning electron microscopy). The result show that the 6-ton of compact pressure has the highest hardness value of 41,22 VHN and produces the lowest porosity value of 18%. Hardness value increases while the porosity value decreases by the increasing of the compact pressure.



PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 01.00 – 03.10 P.M.

Room : Pemandangan II
Session : Supply Chain and Business
Chair : Dr. Cucuk Nur Rosyidi

6B1-1 Investigating Total Cost and Service Level of Parts with Different Booking
01:10 P.M Type Using Continuous Review Method

Ibnu Pandu Bintang Pamungkas, Pringgo Widyo Laksono, Wakhid Ahmad Jauhari

Industrial Engineering Sebelas Maret University, Indonesia

Abstract

A hospital equipment company that has large market must maintain their competitiveness both in terms of the quality, price, number of employees, timeliness of delivery, the expansion of marketing, technology development, et

all. Problems that faced by hospital equipment companies in Indonesia are often running out of stock of one of the actuator motor parts of the electric bed product. Motor actuator is imported from abroad supplier. These parts should be imported so the availability of goods can be maintained. On the other hand, the import process that takes a long lead time and high costs become a serious problem for the company. In this case study, the supplier offers two types of booking, there are the booking type 1 which is a standard order cost with a long lead time and the booking type 2 which has higher order cost and faster lead time. Here, we investigate the total cost and the service level resulting from both booking types by utilizing a continuous review method. Finally, the result of the research shows that the booking type 1 gives a lower total cost and a higher service level. Therefore, the type 1 is selected for managing the part of motor actuator.

6B1-2 **A Periodic Review Model for Vendor-Buyer System with Inspection Errors and Adjusted Production Rate**

01:30 P.M

Wakhid Ahmad Jauhari¹, Selvia Mayangsari², Nugthoh Arfawi Kurdhi³

¹*Department of Industrial Engineering, Sebelas Maret University, Indonesia*

²*Department of Industrial Engineering, Sebelas Maret University, Indonesia*

³*Department of Mathematic, Sebelas Maret University, Indonesia*

icimece

Abstract

The aim of this paper is to develop an integrated single vendor-buyer inventory problem with periodic review policy. The model considers inspection errors, partial backorder, adjusted production rate, dan variable lead time. The buyer faces stochastic demand and uses periodic review model to control the inventory level. An inspection process is established by the buyer to categorize the items received from the vendor. An inspection process is imperfect. The inspector may incorrectly classify the item. Defective items found by the inspector will be returned to the vendor at next delivery. The shortages are allowed in the model and are assumed to be partially backordered. The aim of this model is to determine the optimal review period, optimal number of delivery, and the optimal production rate so that can minimize the total cost supply chain system. Further, a numerical example is given to illustrate the application of the proposed model.

6B1-3 **A Closed-Loop Supply Chain Model for Supplier-Manufacturer-Retailer System with Rework and Waste Disposal**

01.50 P.M

Eva Kholisoh, Wakhid Ahmad Jauhari, Cucuk Nur Rosyidi

Industrial Engineering Sebelas Maret University, Indonesia

Abstract

In this paper, we develop a closed-loop supply chain by considering inspection, sorting, waste disposal, and rework. There are three parties involved in the model, namely retailer, manufacturer, and supplier. The retailer's demand is satisfied by newly manufactured items or remanufactured items. The model uses two recovery processes toward used items, namely remanufacturing and refurbishing. The recoverable items which cannot be recovered to as good as new item will be categorized as refurbishable items and will be sold to a secondary market. The defective items produced from manufacturing system will be reworked. The objective of the model is to determine retailer's time cycle, frequency of remanufacturing cycle, delivery frequency of finished items from manufacturer to retailer in the remanufacturing phase, delivery frequency of finished items from manufacturer to retailer in the regular production phase, and delivery frequency of raw material from supplier to manufacturer by maximizing the joint total profit. An iterative procedure is suggested to obtain the optimal decision variables. A numerical example is presented to illustrate the application of the model.

6B1-4 **Inventory Model Proposal Q Model By Considering Product Expiry And Product Return On Pharmaceutical Products At RSUD Kardinah**
02.10 P.M

Rosi Puspitasari, Ary Arvianto, Dyah Ika Rinawati

Department Of Industrial Engineering, Faculty Of Engineering, Diponegoro University, Indonesia

Abstract

The existence of inventory for a company is essential and unavoidable, but its presence is often regarded as a waste. Therefore, inventory control is an important thing to do in order to optimally fulfilled product demand. Pharmaceutical unit is an installation support for the Hospital to provide drugs. Medicine is one of perishable products. Recently at department of pharmaceutical logistic in a Hospital, there are drugs that were not sold for 3 consecutive months a.k.a deathstock due to its slow-moving stock, so that the drugs stored too long in warehouse and lead to great inventory cost due to large storage cost. Drugs which will expire should be return to the supplier with an average lead time of five months, this raised the risk of stockout and high opportunity lost on the sale of these drugs. It is necessary to control supply by considering probabilistic demand, expiry and product return so it can minimize total cost of the inventory. The purpose of this research was to determine the optimal order quantity of drugs and minimizing the quantity of expired drugs to return. From model development and numerical calculations can be concluded that the inventory model was developed on this research solved the inventory problems which has probabilistic demand factor, expiry factor and product return factor.

6B1-5 **Market Pre-Test Results of Commercializing New Technologies: A Case Study of Eco-Absorber**

02.30 P.M

Arinda Soraya Putri¹, Yuniaristanto Yuniaristanto², Wahyudi Sutopo³, Kuncoro Diharjo⁴, Citra Kusuma⁵

¹*Laboratory of Business and Logistic System, Industrial Engineering Department, Sebelas Maret University, Indonesia*

^{2,3}*Industrial Engineering Department, Sebelas Maret University, Indonesia*

⁴*Mechanical Engineering Department, Sebelas Maret University, Indonesia*

⁵*Technology Innovation Centre, Sebelas Maret University, Indonesia*

Abstract

In general, commercializing new technologies have many problems in the beginning of their lifecycle, especially the process relate to marketing. In case study of commercializing products from Research and Development of University, the commercialization scheme can be made by incubating products along with tenants in an incubator in collaboration with other parties who have capability in market test (pre-test market). Pre-test market of new products with new technology requires new survey mechanism with many limitations of media survey (sample, market info, user, etc.). This article discusses about pre-test market methodology and the results of commercializing new technologies by using a case study of Eco-Absorber panel acoustic that commercialized by start-up company. We proposed methodology by using SWOT analysis to determine 4P elements; using 2 stages survey to get appropriate STP, and analyzing the data by using reliability and validity test. Appropriate respondents were chosen by purposive sampling and have obtained data as many as 101 samples. This paper contributes to construct a methodology of pre-test market for a new product with new technology to be ready for commercialization and to assist incubator and tenant in decision making for development and improvement product before it is launched into the market as well as product marketing.

6B1-6 **A Concept of Economics Value for Cost of Natural Resource**

02.50 P.M

Christiono Utomo, Nadjaji Anwar, Yani Rahmawati

Institut Teknologi Sepuluh Nopember, Indonesia

Abstract

Every company in Indonesia is responsible for their worker health and safety condition as mentioned in UU No I year 1970. In manufacturing industries there are many manual task dealing with high work load and risk, so that they require excellent concentration and physical condition. There is no ideal way to

guarantee worker safety without a real time physiological monitoring. This paper reports our ongoing study in conceptual design development of worker's clothing which is equipped with a wearable instrumentation system. The system is designed to detect and measure body temperature and pulse in real time. Some electrical components such as, LCD (liquid crystal display), LEDs (light emitting diode), batteries, and physiological sensors were assembled. All components are controlled by a wearable on board controller. LEDs is used as alert which can indicate abnormal physical conditions. The LCD was added to provide more detail information. TMP 36 and XD-58C were selected as the physiological sensors. Finally, an Arduino Lilypad was chosen for the controller. This instrumentation system was verified by accurately detected and inform physiological condition of 3 subjects. Further we are going to attach the system to a worker's clothing which was specifically designed to simple and comfort usage.

PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 01.00 – 03.10 P.M.

Room : Pemandangan III

Session : Mechanical and Chemical Process

Chair : Dr. Arwindra Rizqiawan

6C1-1 **Fabrication and integration of PDMS-glass based microfluidic with optical absorbance measurement device for coliform bacteria detection**
01:10 P.M

M.Z. Sahdan¹, N.M. Salih², M. Morsin³, M.T. Asmah⁴, N. Nafarizal⁵, B. Kristiawan⁶, S. Hadi⁷, S. Suyitno⁸, A. Jamaluddin⁹

^{1,2,3,4,5} *Microelectronics and Nanotechnology–Shamsuddin Research Centre (MiNT-SRC) Universiti Tun Hussein Onn Malaysia, Malaysia*

^{6,7,8} *Mechanical Engineering Department, Faculty of Engineering, Universitas Sebelas Maret, Indonesia*

⁹ *Physica Education Program, Faculty of Teacher Training and Education, Universitas Sebelas Maret, Indonesia*

Abstract

The detection of coliform bacteria which contain the disease-causing microorganism is a useful indication for water contamination. Currently, the emerging of technology in molecular biology research and industry is in demand for portable and miniaturized system. This paper demonstrates the development and integration of microfluidic and optical absorbance measurement device for portable coliform bacteria detection. The microfluidic device was fabricated with glass and polydimethylsiloxane (PDMS) material using photolithography, replica molding (soft lithography), and oxygen plasma bonding techniques. Then, the optical absorbance measurement device for

coliform bacteria detection was developed using 470 nm blue light emitting diode (LED), photo detector, ARDUINO microcontroller, liquid crystal display (LCD), and mechanical elements. The coliform bacteria suspension sample was inserted into the microfluidic device and the presence of coliform bacteria was analyzed using the developed optical absorbance measurement device. The absorbance measurement from the prototype and colony number of the coliform bacteria samples were collected and analyzed. The final analysis had indicated that the developed prototype was able to detect the coliform bacteria in suspension at the lowest detection of 17,200 CFU/ml.

6C1-2
01:30 P.M **Biocomposite of Super Absorbent Polymer (SAP) from Rice Straw-Polyacrylamida (PAM) and Corncob-Polyacrylamida (PAM): Synthesis and Characterization**

Supriyanto Supriyanto, Yoga Adesca Cahyadi, Muhammad Heprizon, Muhammad Arief Guswandi, Wahyu Prayogi

Department of Environmental Engineering, Universitas Islam Indonesia (UII), Indonesia

Abstract

The biocomposite of Super Absorbent Polymer (SAP) has synthesized based on cellulose and polyacrilamida (PAM). To increase the value of waste, the cellulose is extracted from of corncob and rice straw. Then the cellulose was mixed with PAM to get irradiation from electron beam machine. To know the biocomposite SAP was characterized. The classification consisted of cellulose level, swelling factor, grafting factor, depreciation level and functional group. The comparison SAP based on cellulose showed that the cellulose level equals with other characterization of SAP level. Meanwhile the functional group found O-H from PAM and C-N from cellulose.

6C1-3
01:50 P.M **Mass Transfer Study on the Enzymatically Extraction of Cured Vanilla Pods (The utilization of isolated rumen liquid of cellulose)**

V. Paramita¹, M.E. Yulianto², S. Nugroho³, B. Surastri⁴, I. Sundarni⁵, A. Oktawiyono⁶

^{1,2,5,6} *Dept. of Chemical Engineering, Diponegoro University, Indonesia*

³ *Dept. of Mechanical Engineering, Diponegoro University, Indonesia*

⁴ *Dept. of Pharmacology, Diponegoro University, Indonesia*

Abstract

This research focused the study on the enzymatically extraction mass transfer of vanillin from cured vanilla pods. The novelty and the main innovations of this research is the development of hydrolysis-extraction process by using

enzymatic extractor conducted with microwave. The enzyme of cellulose was isolated from rumen liquid. It can disrupt the shell wall of the pods in order to shift the equilibrium phase, therefore spurring the extraction rate and yield. The analysis of vanillin content was performed by using high performance liquid chromatography, following by the application of Matlab software in order to analyze the mass transfer of vanillin into continuous phase. The mass transfer coefficient (KLa) of enzymatically extraction of cured vanillin content at 40°C was found 3.8116 s⁻¹ which greater than extraction without enzyme (3.1523 s⁻¹).^o

6C1-4 **A Study on The Adsorption Equilibrium and Kinetics of Methylene Blue onto Orange Peel Wastes as Biosorbents**

02.10 P.M

Arenst Andreas, Jeremy Reinaldo, Kevin Tertira

Department of Chemical Engineering, Faculty of Industrial Technology, Parahyangan Catholic University, Indonesia

Abstract

The goal of this work was to study the potential application of orange peel as a biosorbent for removing methylene blue (MB) in aqueous solution. The effects of different reaction parameters such as the initial MB concentration, contact time, adsorbent dosage, solution temperature and initial pH on MB adsorption were investigated. MB adsorption uptake was found to increase with increase in initial concentration, contact time and solution temperature. The adsorption equilibrium data were best represented by the Freundlich model. Adsorption kinetic was found to follow the pseudo-second-order kinetic model. These results indicate clearly the efficiency of orange peel as a low-cost solution for dye solution treatment.

6C1-5 **Effect of internal resistance mismatch on performance of battery pack LiFePO₄**

02.30 P.M

Fengky Adie Perdana¹, Agus Supriyanto², Agus Purwanto³, Anif Jamaluddin⁴

^{1,2} *Physics Department, Sebelas Maret University, Indonesia*

³ *Chemical Engineering, Sebelas Maret University, Indonesia*

⁴ *Physics Education Program, Sebelas Maret University, Indonesia*

Abstract

This paper describes a mismatch of internal resistance battery LiFePO₄ when assembling into battery pack. Internal resistance battery is a number that states the value of resistance that exist within the battery component, it will affect the State of Health, State of Charge, life time, until the heat generated by the battery. The tools used in this experiment include the internal resistance tester

EQ-MSK-BK300, battery analyzer BST8-3, and the results are observed in real time on software TC5.3. The experimental results showed that there are differences produced by some of the battery pack that has a different internal resistance.

6C1-6
02.50 P.M

Overcut and Material Removal Rate on Electrochemical Machining of Aluminium and Stainless Steel using Isolated Brass Electrode

Aris Widyo Nugroho, Sudarisman, M. Budi Nurahman, Purna Septiadi

Mechanical Engineering Department, Universitas Muhammadiyah Yogyakarta, Indonesia

Abstract

The electrochemical machining has been developed as an alternative for conventional techniques of machining very hard materials and complex shape without any harm to tool and residual stresses. This paper addresses the influence of processing parameters on the overcut (OC) and Material Removal Rate (MRR) of a custom-built electrochemical machine. In addition, the angle of overcut for the workpieces were also examined. Stainless steel and aluminium plate with thickness of 0.4 mm as workpieces were machined using ECM equipped with a 3-mm isolated brass rod as electrode in sodium chloride as electrolytic solution. Experiments were conducted with the developed setup by varying the machining voltage and initial workpiece-to-electrode gap with a constant tool movement. MRR in ECM was obtained from weight loss measurement while image analysis using open source software (ImageJ) was applied to assist OC determination. The result shows that increase in machining voltage and gap enhances ion's mobility and conductivity for conduction, so that it results MRR, overcut and angle of overcut getting higher.

PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 01.00 – 03.10 P.M.

Room : Pemandangan IV
Session : System Modelling
Chair : Dr. Rika Ampuh Hadiguna

6D1-1
01:10 P.M

A Joint Inventory Policy under Permissible Delay In Payment and Stochastic Demand

Jonrinaldi, M. Yugo Primadi, Rika Ampuh Hadiguna

Department of Industrial Engineering, Andalas University, Indonesia

Abstract

Inventory cannot be avoided by organizations including service organizations. One of them is hospital which has a functional unit to manage the drugs and other medical supplies such as disposable and laboratory material which is called Pharmacy Department which is responsible to conduct all pharmacy services in the hospital. The current problem in Pharmacy Department of Pariaman Hospital is that the level of inventory is too high. It causes the cost to keep the inventory is also too high. Inventory is needed to keep the service level to the customers but it can also increase the cost of investment and holding the items, so there must be a policy to manage the inventory efficiently while it can fulfil the demand. Therefore, this paper proposes a joint inventory policy under condition permissible delay in payment and stochastic demand. This proposed model is fit with the actual condition where suppliers offered the hospital a certain period to complete the payment of the order. This paper also proposes a solution procedure to find the optimal solution using Software Lingo 13.0. A numerical example using data from the hospital is given to illustrate and analyze results of the model. The results of the proposed inventory model shows that the total cost of inventory of the model is IDR 137,334,815.34 which is lower 37,4% compared with the total cost of inventory by using current policy which is IDR 219,511,519.45. Analysis of the results is conducted to fit with real situation of the system studied.

6D1-2 **A Supply Chain Model to Improve The Beef Quality Distribution Using Investment Analysis : A Case Study**
01:30 P.M

Alessandra Lupita¹, Sabrina Heriza Rangkuti², Wahyudi Sutopo³, Muhammad Hisjam⁴

¹ *Research Assistant of Lab. of Logistics System and Business, Dept. of Industrial Engineering, Fac. of Engineering, Sebelas Maret University, Indonesia*

² *Undergraduate Student of Industrial Engineering Department, Faculty of Engineering, Sebelas Maret University, Indonesia*

^{3,4} *Dept. of Industrial Engineering, Sebelas Maret University, Indonesia*

Abstract

There are significant differences related to the quality and price of the beef commodity in traditional market and modern market in Indonesia. Those are caused by very different treatments of the commodity. The different treatments are in the slaughter lines, the transportation from abattoir to the outlet, the display system, and the control system. If the problem do not solved by the Government, the gap will result a great loss of the consumer regarding to the quality and sustainability of traditional traders business because of the declining interest in purchasing beef in the traditional markets. This article aims to improve the quality of beef in traditional markets. This study proposed A Supply Chain Model that involves the schemes of investment and government incentive for improving the distribution system. The supply chain

model is can be formulated using the Mix Integer Liner Programming (MILP) and solved using the IBM®ILOG®CPLEX software. The results show that the proposed model can be used to determine the priority of programs for improving the quality and sustainability business of traditional beef merchants. By using the models, The Government can make a decision to consider incentives for improving the condition.

6D1-3
01.50 P.M **A Collaborative Inventory Model for Vendor-Buyer System with Inspection Errors, Unequal Sized Shipment, and Repairable Item**

Irfan Hilmi Hamdani, Wakhid Ahmad Jauhari, Cucuk Nur Rosyidi

Production System Laboratory, Department of Industrial Engineering, Sebelas Maret University, Indonesia

Abstract

This paper develops an integrated inventory model consisting of single-vendor and single-buyer system. The demand in buyer side is deterministic and the production process is imperfect and produces a certain number of defective items. The delivery within a single production batch from vendor to buyer is increasing by a fixed factor. After the delivery arrives at the buyer, an inspection process is conducted. The inspection process is not perfect. Errors may occur when the inspector misclassifies a non-defective item as defective, or incorrectly classifies a defective item as non-defective. All the product which is defective will be repaired by a repair-shop. After the defective item arrives at the repair shop, it will undergo perfect inspection. The defective item will be repaired and returned to the buyer. This model provides an optimal solution for the expected integrated total annual cost of the vendor and the buyer. The result from numerical examples shows that the integrated model will result in a lower joint total cost in comparison with the equal-sized policy.

6D1-4
02.10 P.M **Joint decision of pricing and order quantity by considering product substitution in dual channel supply chain**

Erwin Widodo

Industrial Engineering Department, Institut Teknologi Sepuluh Nopember, Indonesia

Abstract

Dual channel supply chain (DCSC) has been attracting many researchers' attention. Their contributions mainly are in two folds, namely pricing problem and inventory policy. However, research to address both pricing and inventory problems simultaneously are still scarce. Meanwhile in recent competitive market, product substitution is an unavoidable practice in fulfilling customer demand when the main product is unavailable. Thus how to decide price and order quantity by considering product substitution under DCSC setting is an

interesting topic to address. In this paper, corresponding mathematical model incorporating such problem are proposed. This model consists of objective function measuring sales revenue and inventory cost, and some constraints to assure positive profit margin, interplaying price between online and offline channel, and positive demand. Two pricing scheme, namely Vertical Nash and Stackelberg Leadership are evaluated. The result shows that in any situation of substitution level, Vertical Nash solution provides higher financial performance than that under Stackelberg Leadership. In addition, this work's results have also revealed that there exist some threshold values differentiating when is better off to apply Vertical Nash scenario, and, when is vice versa, Stackelberg Leadership scenario is preferable.

6D1-5 **A Mixed Integer Linear Programming Model for Operational Planning of A Biodiesel Supply Chain Network from Used Cooking Oil**

02.30 P.M

Jonrinaldi, Rika Ampuh Hadiguna, Rades Salastino

Department of Industrial Engineering, Faculty of Engineering Andalas University, Indonesia

Abstract

Environmental consciousness has paid many attention nowadays. It is not only about how to recycle, remanufacture or reuse used end products but it is also how to optimize the operations of the reverse system. A previous research has proposed a design of reverse supply chain of biodiesel network from used cooking oil. However, the research focused on the design of the supply chain strategy not the operations of the supply chain. It only decided how to design the structure of the supply chain in the next few years, and the process of each stage will be conducted in the supply chain system in general. The supply chain system has not considered operational policies to be conducted by the companies in the supply chain. Companies need a policy for each stage of the supply chain operations to be conducted so as to produce the optimal supply chain system, including how to use all the resources that have been designed in order to achieve the objectives of the supply chain system. Therefore, this paper proposes a model to optimize the operational planning of a biodiesel supply chain network from used cooking oil. A mixed integer linear programming is developed to model the operational planning of biodiesel supply chain in order to minimize the total operational cost of the supply chain. Based on the implementation of the model developed, the total operational cost of the biodiesel supply chain incurred by the system is less than the total operational cost of supply chain based on the previous research during seven days of operational planning about amount of 2,743,470.00 or 0,186%. Production costs contributed to 74.6 % of total operational cost and the cost of purchasing the used cooking oil contributed to 24.1 % of total operational cost. So, the system should pay more attention to these two aspects as changes in the value of these aspects will cause significant effects to the change in the total

operational cost of the supply chain.

6D1-6 **Load Allocation of Power Plant using Multi Echelon Economic Dispatch**
02.50 P.M Wahyuda¹, Budi Santosa²

¹ *Industrial Engineering, Universitas Mulawarman, Indonesia*

² *Industrial Engineering, Institut Teknologi Sepuluh November, Indonesia*

Abstract

In this paper, the allocation of power plant load which is usually done with a single echelon as in the load flow calculation, is expanded into a multi echelon. A plant load allocation model based on the integration of economic dispatch and multi-echelon problem is proposed. The resulting model is called as Single Objective Multi Echelon Economic Dispatch (SOME ED). This model allows the distribution of electrical power in more detail in the transmission and distribution substations along the existing network. Considering the interconnection system where the distance between the plant and the load center is usually far away, therefore the loss in this model is seen as a function of distance. The advantages of this model is its capability of allocating electrical loads properly, as well as economic dispatch information with the flexibility of electric power system as a result of using multi-echelon. In this model, the flexibility can be viewed from two sides, namely the supply and demand sides, so that the security of the power system is maintained. The model was tested on a small artificial data. The results demonstrated a good performance. It is still very open to further develop the model considering the integration with renewable energy, multi-objective with environmental issues and applied to the case with a larger scale.

PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 01.00 – 03.10 P.M.

Room : Karaton I
Session : Logistics and Business I
Chair : Dr. Singgih Saptadi

6E1-1 **Measurement Framework for Product Service System Performance of Generator Set Distributors**

01:10 P.M

Tanika Sofianti

*Laboratory of Industrial System Engineering, Department of Industrial Engineering,
Faculty of Engineering and Information Technology, Swiss German University*

Abstract

In selling Generator Set in B2B market, some manufacturers assisted by distributors to sell products. This is due to the limited resources owned by the manufacturer for adding service element to enhance the competitiveness of the generator sets. Genset distributor sells products to B2B market together with supports to their customers, to complement products made by the manufacturer. Industrial distributor develops services to meet the needs of the customer. Generator set distributors support machines and equipments produced by manufacturer. Generator Set distributors sell the generators together with services to enhance value obtained by the customers from the machines. Services are provided starts from bidding process, ordering the machines from the manufacturer, delivery, installation, until the after sale stage such as maintenance. This paper promotes framework to measure PSS of Generator Set distributors in delivering their products and services for the customers. The methodology of conducting this research is by adopting the provider and customer perspective and considering the tangible and intangible products. The research leads to the idea of the improvement of current Product Service System of a generator set distributor. This research needs further studies in more detailed measures and the implementation of measurement tools.

6E1-2 **An Empirical Study of E-Negotiation in Consulting Business**

01:30 P.M Yanı Rahmawati, Christiono Utomo
Institut Teknologi Sepuluh Nopember, Indonesia

Abstract

Information and communication technology (ICT) has been widely developed. There will be no string attached for any businesses to develop their selves. Communication becomes much simple and easy. Virtual studio is one result that supports business process, particularly for consulting business in engineering and architectural. Thus, it supports the collaboration among consultants to produce finest design. This study purposed empirical study of e-negotiation practices in consulting business, essentially the consulting firms of commercial properties development. Survey, in-depth interview, and questionnaire distribution to 60 designers with e-negotiation experiences are used to explore facilities and communication supports in e-negotiation. The results are then analyzed using scatter plot of mean as well as standard deviation score, and also are verified by using case study.

6E1-3 **Risk Analysis Using AS/NZS 4360:2004, Bow-Tie Diagram and ALARP on Construction Projects of Banyumanik Hospita**

01:50 P.M Diana Puspita Sari, Darminto Pujotomo, Nadira Kusuma Wardani
Industrial Engineering Departement, Diponegoro University, Indonesia

Abstract

The Determination of risk is an uncertain event. Risks can have negative or positive impacts on project objectives. A project was defined as a series of activities and tasks that have a purpose, specifications, and limits of cost. Banyumanik Hospital Development Project is one of the construction projects in Semarang which have experienced some problems. The first problem is project delays on building stake. The second problem is delay of material supply. Finally, the problem that occurs is less management attention to health safety as evidenced by the unavailability of PPE for the workers. These problems will pose a risk to be a very important risk management performed by contractors at the Banyumanik Hospital Development Project to reduce the impact that would be caused by the risk borne by the provider of construction services. This research aim to risk identification, risk assessment and risk mitigation. Project risk management begins with the identification of risks based on the project life cycle. The risk assessment carried out by AS / NZS 4360: 2004 to the impacts of cost, time and quality. The results obtained from the method of AS / NZS 4360: 2004 is the risk that requires the handling of mitigation. Mitigated risk is the risk that had significant and high level. There are four known risks that require risk mitigation with Bow-Tie diagrams which is work accidents, contract delays, delays in material and design changes. Bow-Tie diagram method is a method for identifying causal and preventive action and recovery of a risk. Results obtained from Bow-Tie diagram method is a preventive action and recovery. This action is used as input to the method ALARP. ALARP method is used to determine the priority of the strategy proposed in the category broadly acceptable, tollerable, and unacceptable.

6E1-4 **Developing Framework for Measuring the Transition to Lean**

02.10 P.M Tanika D Sofianti, Invanos Tertiana, Triarti Saraswati, Setijo Awibowo, Aditya Tirta Pratama

Laboratory of Industrial System Engineering, Department of Industrial, Engineering, Faculty of Engineering and Information Technology, Swiss German University, Indonesia

Abstract

Lean manufacturing is one of the most used methodologies in the society today to achieve high effective improvements in a company's operations. Lean manufacturing techniques and concepts represent one way in industry that is changing their culture towards efficiency and continuous improvement. From the overview of some literatures about lean manufacturing, they highlighted the need of developing tools focused on assessment of the implementation of lean principles themselves, rather than quantitative metrics. Many researchers tried to develop the measures of the performance of lean implementation in order to find how to optimize the

implementation of lean manufacturing. This paper will analyze some existing measurement tools such as Strategos, Lockheed Marting Lean Assessment, Assessment Throughput Lean, Lean Enterprise Self-Assessment Tool, and Shingo criteria. The result of this analysis will be used to develop a new framework for measuring the readiness of a company to initiate Lean and to identify the potential solutions to accelerate the transition. Some staffs from lean department of a manufacturing company in Indonesia that has implemented Lean intensively will be involved to verify if the proposed framework is proper for the measurement.

6E1-5 **Designing Model of Industrial Cluster on Competitiveness of Aloe vera Industry in Pontianak City**

02.30 P.M

Silvia Uslianti, Ratih Rahmahwati

Department of Industrial Engineering , Tanjungpura University, Indonesia

Abstract

Pontianak city has become the largest center production of Aloe vera in Indonesia. Aloe vera known as the tropical plant and grow on peatland which required special treatments for its cultivation. Many varieties of Aloe vera products were processed and became the leading commodities from Pontianak City. The local government committed to support the center of Aloe vera plants through the Major of Agricultural Industries, however there was a problem in its competitive advantage that still have low competitiveness in domestic and international market. According to Master Plan for the Acceleration and Expansion of Indonesia Economic Development (MP3EI) 2011-2025, cluster approach adopted by Indonesia. The main purpose of this study was to identify the key success factors that determined competitive advantage of Aloe vera industries by Porter's diamond analyze. The second purpose of this study was to develop a conceptual model for the Aloe vera center improvement based on stakeholder's role through the cluster approach. The result of the study showed that the Aloe vera center has completed stakeholders that gave impact to develop a cluster. It indicated that the Aloe vera center can developed to be an ideal cluster.

6E1-6 **An Analysis of E-Business Adoption by Indonesian Manufacturing SMEs: A Conceptual Framework**

02.50 P.M

Singgih Saptadi¹, Hanggar Pratama², Iman Sudirman³, Atya Nur Aisha⁴, Brav Deva Bernadhi⁵

^{1,2} *Center for Study of Logistics and E-Business, Industrial Engineering Department, Universitas Diponegoro*

^{3,4} *Industrial Engineering Department, Institut Teknologi Bandung*

⁵ *Industrial Engineering Department, Universitas Islam Sultan Agung*

Abstract

Our reserach focuses on small and medium enterprises that engage in manufacturing sector. Considering the contribution of IT to SMEs' business performance, we would to analyze the adoption of e-business by SMEs. Using business process approach, we have studied in which business processes that SMEs have adopted, but we have not studied the intensity of e-business adoption in each business processes. In this paper, we develop a conceptual framework that relates the business performance and the intensity of e-business adoption. We also propose some antecedents that may relate to the intensity of e-business adoption.

PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 01.00 – 03.10 P.M.

Room : Karaton II

Session : Manufacturing and Supply Chain Management

Chair : Dr. Eko Liquiddanu

6F1-1 **Invited Speaker :Errors Prevention in Manufacturing Process through Integration of Poka Yoke and TRIZA**
01:10 P.M

Syed Ahmad Helmi¹, Nur Nashwa Nordin², Muhammad Hisjam³

¹ *Center for Engineering Education, Universiti Teknologi Malaysia, 81310 Johor, Malaysia*

^{1,2} *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, 81310 Johor, Malaysia*

³ *Department of Industrial Engineering, Faculty of Engineering Sebelas Maret University Surakarta, Indonesia*

Abstract

Integration of Poka Yoke and TRIZ is a method of solving problems by using a different approach. Poka Yoke is a trial and error method while TRIZ is using a systematic approach. The main purpose of this technique is to get rid of product defects by preventing or correcting errors as soon as possible. Blame the workers for their mistakes is not the best way, but the work process should be reviewed so that every workers behavior or movement may not cause errors. This study is to demonstrate the importance of using both of these methods in which everyone in the industry needs to improve quality, increase productivity and at the same

time reducing production cost.

6F1-2
01:30 P.M

Make or Buy Decision Model with Multi-Stage Manufacturing Process And Supplier Imperfect Quality

Mega Aria Pratama, Cucuk Nur Rosyidi

Master Program of Industrial Engineering, Graduate Program, Sebelas Maret University, Indonesia

Abstract

This research develops an make or buy decision model considering supplier imperfect quality. This model can be used to help companies make the right decision in case of make or buy component with the best quality and the least cost in multistage manufacturing process. The imperfect quality is one of the cost component that must be minimizing in this model. Component with imperfect quality, not necessarily defective. It still can be rework and used for assembly. This research also provide a numerical example and sensitivity analysis to show how the model work. We use simulation and help by crystal ball to solve the numerical problem. The sensitivity analysis result show that percentage of imperfect generally not affect to the model significantly, and the model is not sensitive to changes in these parameters. This is because the imperfect cost are smaller than overall total cost components.

6F1-3
01.50 P.M

Developing Weighted Criteria To Evaluate Lean Reverse Logistics Through Analytical Network Process

Teuku Yuri, Inaki Hakim, Rike Khrisnawardani

Department of Industrial Engineering, Faculty of Engineering, Universitas Indonesia, Indonesia

Abstract

Reverse logistics is a part of supply chain that bring materials from consumers back to manufacturer in order to gain added value or do a proper disposal. Nowadays, most companies are still facing several problems on reverse logistics implementation which leads to high waste along reverse logistics processes. In order to overcome this problem, Madsen [Framework for Reverse Lean Logistics to Enable Green Manufacturing, Eco Design 2009: 6th International Symposium on Environmentally Conscious Design and Inverse Manufacturing, Sapporo, 2009] has developed a lean reverse logistics framework as a step to eliminate waste by implementing lean on reverse logistics. However, the resulted framework sets aside criteria used to evaluate its performance. This research aims to determine weighted criteria that can be used as a base on reverse logistics evaluation by considering

lean principles. The resulted criteria will ensure reverse logistics are kept off from waste, thus implemented efficiently. Analytical Network Process (ANP) is used in this research to determine the weighted criteria. The result shows that criteria used for evaluation lean reverse logistics are Innovation and Learning (35%), Economic (30%), Process Flow Management (14%), Customer Relationship Management (13%), Environment (6%), and Social (2%).

6F1-4
02.10 P.M

A Closed-Loop Supply Chain Model for Manufacturer-Collector System with Inspection, Waste Disposal and Price-Quality Dependent Return Rate

Anissa Rianda Putri, Wakhid Ahmad Jauhari, Cucuk Nur Rosyidi

Department of Industrial Engineering, Faculty of Engineering, Sebelas Maret University, Indonesia

Abstract

This paper studies a closed-loop supply chain inventory model, where the primary market demand is satisfied from the inventory of newly produced and remanufactured items. We intend to integrate a manufacturer and a collector as a supply chain system. Used items are collected and will be inspected and sorted by the collector, and the return rate of used items is depended upon price and quality factor. Used items that aren't pass this process, will be considered as waste and undergone waste disposal process. Recoverable used items will be sent to the manufacturer for recovery process. This paper applies two types of the recovery process, i.e. remanufacture and refurbish. The refurbished items are sold to a secondary market at a reduced price. Further, the return rate is variable and depends upon the acceptance level of the returned items. This model provides an optimal solution by maximizing the joint total profit. A numerical example is presented to illustrate the application of the model.

6F1-5
02.30 P.M

Dynamic Supplier Selection Problem Considering Full Truck Load in Probabilistic Environment

Sutrisno¹, Purnawan Adi Wicaksono²

¹ *Department of Mathematics, Diponegoro University, Indonesia*

² *Department of Industrial Engineering, Diponegoro University, Indonesia*

Abstract

In this paper, we propose a mathematical model in a probabilistic dynamic optimization to solve a dynamic supplier selection problem considering full truck load in probabilistic environment where some parameters are uncertain. We determine the optimal strategy for this problem by using

stochastic dynamic programming. We give some numerical experiments to evaluate and analyze the model. From the results, the optimal supplier and the optimal product volume from the optimal supplier were determined for each time period.

6F1-6 **Value Stream Mapping to Enhance Sustainability: Literature review**

02.50 P.M Sri Hartini¹, Udisubakti Ciptomulyono², Maria Anityasari³

¹ *Ph.D. student, Department of Industrial Engineering, Sepuluh Nopember Institute of Technology, Surabaya. Department of Industrial Engineering, Diponegoro University, Indonesia*

^{2,3} *Department of Industrial Engineering, Sepuluh Nopember Institute of Technology, Indonesia*

Abstract

This paper presents a review of literature on extended VSM to enhance sustainable manufacturing. Literature review was done using two viewpoints. First, analyzed of the literature based on its research methods, research scope and the metrics used to measure sustainable manufacturing. Second, analyzed of the literature based on its contribution, its application area and its limitation. Though some researches had proposed how to increase sustainability, none of those researches showed the effect of the increase of performance metrics to the level of sustainability. Finally, this paper discusses the limitation of previous researches and proposes some opportunities and challenges for future research.

PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 03.35 – 05.15 P.M.

Room : Pemandangan 1
Session : Electrical Engineering II
Chair : Dr. Arwindra Rizqiawan

6A2-1 **Design of Experiments to Parameter Setting in a Genetic Algorithm for Optimal Power Flow with TCSC Device**

03:35 P.M

Chico Hermanu Brillianto Apribowo¹, Sasongko Pramono Hadi², Sarjiya³

¹*Department of Electrical Engineering Sebelas Maret University, Indonesia*

²*Department of Electrical Engineering and Information Technology, Gadjah Mada University, Indonesia*

³*Department of Electrical Engineering and Information Technology, Gadjah Mada University, Indonesia*

Abstract

With ever-increasing demand for electricity and complexity of power system, optimal power system operation issue becomes important. Optimal power flow (OPF) with optimal placement and rating of thyristor controlled series capacitor (TCSC) is a solution to determine the economic operating costs and power flow analysis with in constraint stated below. This paper mainly concerned to minimize total cost of generation with location and rating of TCSC are optimized using genetic algorithm-design of experiment (GA-DOE). To validate the proposed method, simulations are performed on IEEE 30 bus system. The simulation results for IEEE-30 bus system, total cost of generation reduced 0,244 \$/hour (0,03%) compared to OPF without TCSC. And active power losses are reduced 0,078 MW (0,84 %) compared to OPF without TCSC.

6A2-2
03.55 P.M

Application Of Wavelet Transform On Partial Discharge Signal Denoising

Umar Khayam, Tria Kasna Lestari

School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Indonesia

icimace Abstract

In general, the main technique to eliminate noise from the signal of partial discharge can be realized in the time and frequency domain. The analysis of the partial discharge signal in frequency and time domain is the basic methodology in signal processing. When the signal is processed in the frequency domain, the time domain information would be lost. To resolve these weaknesses, the wavelet transform is developed to provide information in time and frequency domain. Wavelet transform (WT) has become a great new tool for processing signals in the last few years and wavelet transform has been applied to various fields successfully. In this study, the PD signal is denoised using wavelet transform. The application used threshold parameter of wavelet. The output of this application is that the noise can be muted from the signal of partial discharge.

6A2-3

Design of Hilbert Antenna as Partial Discharge Sensor

04.15 P.M Umar Khayam and Fakhri Alfaruq

School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Indonesia

Abstract

This paper deals with the design and implementation of Hilbert antenna as partial discharge (PD) sensor. Hilbert antenna was designed to measure

PD induced EM wave in the frequency from 300 MHz to 3 GHz. Dimension of antenna (such as outer dimension, conductor length and conductor width), number of iteration, feed point position, substrate material and thickness affect to the response frequency of antenna. Outer dimension of antenna is defined 7 cm at third iteration of Hilbert so that the input impedance of antenna is approximate at 50 Ohm and resonance frequency at 953 MHz. Hilbert antenna was simulated using Ansoft HFSS 13 and testing by using vector network analyzer.

6A2-4

Overtaking assistant system (OAS) with fuzzy logic method using camera sensor

04.35 P.M

Khalid Anindyaguna, Noor Cholis Basjaruddin

Department of Electrical Engineering, Politeknik Negeri Bandung, Indonesia

Abstract

Overtaking assistant system (OAS) is one of ADAS' subsystem that assists the driver on overtaking decision making. In this research, an OAS for overtaking one vehicle on one-way road and two-way road is realized using radio control (RC) car. Fuzzy logic is used as the overtaking decision making method with the distance of the overtaken and approaching RC car as the input, while the output is one of three movement decisions which is approaching the overtaken car, delaying overtaking, or overtaking. Overtaking will be performed on safe distance condition based on fuzzy logic rule. Overtaking delay will be performed if the distance is perceived as not safe enough. Pixy CMUcam5 is functioned as the distance sensor to convert other RC car's pixel width into the distance between the said RC car and this system. The test result shows that this system can overtake one RC car in front of it with high success rate on both one-way and two-way road.

6A2-5

Electromyography (EMG) Signal Recognition Using Combined Discrete Wavelet Transform Based on Artificial Neural Network (ANN)

04.55 P.M

Moh Arozi¹, Farika T Putri¹, Mochammad Ariyanto¹, Wahyu Caesarendra¹ and Augie Widyotriatmo²

¹*Mechanical Engineering Department, Faculty of Engineering, Diponegoro University, Indonesia*

²*Faculty of Industrial Technology, Institut Teknologi Bandung, Indonesia*

Abstract

Rapid disability patients increasing over time and need a solution in the future. Hand amputation is one form of disability that common in

Indonesian society. A possible solution would be necessary at the moment is the development of prosthetic hand that has the ability as a human hand. The development of neuroscience has now reached the stage of the body's ability to use the signal as an input signal to operate a system. One of the applications of the science development is the use of electromyography (EMG) signals as an input to the control system to operate the prosthetic hand. This study is divided into two stages: a preliminary study and further research. Initial research focus in the process of EMG signal pattern recognition and advanced research focus in the development of a prototype prosthetic hand that is integrated with the controller system. Preliminary research indicates that the results of pattern recognition EMG signal using wavelet transform and Artificial Neural Network (ANN) classification has an accuracy rate of about 77.5 %. Based on these results, it can be concluded that the study results could be used as a signal input to program control of the prosthetic hand that will be developed in phase two.

PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 01.00 – 03.10 P.M.

Room : Pemandangan 2

Session : Decision Making

Chair : Dr. Jonrinaldi

6B2-1 **Performance Criteria Development of Maintenance Service Provider
Using Case Study Approach Analysis**

03:35 P.M

Moses Laksono Singgih¹, Primahasmi Dalulia²

¹*Department of Industrial Engineering Institut Teknologi Sepuluh Nopember (ITS) , Indonesia*

²*Department of Industrial Engineering Merdeka University, Indonesia*

Abstract

Maintenance activities, both corrective and preventive, are initially conducted by maintenance department in each company. Currently, some companies implement outsourcing strategies in performing maintenance activities. Outsourcing is the delegation of business functions in total or partial to other companies in conjunction with the administrative and operational activities. One of the advantages of outsourcing is the company can focus on its core business. In addition, outsourcing is more economical due to the maintenance of activities budget; there is an adjustment of fixed costs into variable costs. Original Equipment Manufacturer (OEM) only handles their equipment but third party outsourcing is considered more advantageous because third party outsourcing can handle some types of equipment at once. One of the

industries that implement outsourcing in maintenance activity is healthcare industry named hospital. Intensive Care Unit (ICU) is part of the hospital which is very vital so that it requires medical equipment with high availability and reliability. The aim of this research is to develop performance criteria for assessing the performance of medical equipment or maintenance outsourcing service provider. Several previous studies have identified performance criteria for maintenance service providers, both in the field of medical equipment as well as manufacturing area. The aim of this research is to develop criteria for assessing maintenance outsourcing performance in healthcare industry. The criteria development methodologies are elaborating previous studies criteria as well as the integrating Case Study Analysis and Delphi to obtain new criteria. Elaboration results of the previous studies, Case Study Analysis and Delphi method obtained 17 criteria to measure performance.

6B2-2 **Decision Support System of SMB Telkom University Roadshow Location Prioritization With Weighted Sum Model Method**

03.55 P.M

Ammar Naufal, Amelia Kurniawati, Muhammad Azani Hasibuan

Industrial Engineering Faculty Telkom University, Indonesia

Abstract

SMB Telkom University annually organizes roadshow visits to high schools in Indonesia as one of the marketing strategies of new student recruitment activities which are become their responsibility. Admission Manager as a key person in SMB Telkom University has two assistants to make sure this program is work nicely. In its implementation, they have limitations, such as: limited financial budgets, limited marketing staff, and lack of time; hence, they cannot visit all the high school. But it is too complicated in their attempt to filter out the potential high schools. First, criteria weight score should already inputted by Admission Manager and the school data have to be inputted by Data and Analysis Assistant Manager include their perform score based on the criteria. Later, Marketing and Public Relations Assistant Manager must calculate that data manually using Weighted Sum Model Method (WSM) to get the value of potential score of each high school. Then potential score is sorted manually from the highest to the lowest score. All actions and all users using a single worksheet. This web application act as a Decision Support System (DSS). It prevents Data and Analysis Assistant Manager input the same school twice, it prevents all the data deleted by accident, it prevents Marketing and Public Relations Assistant Manager wasting time to calculate the potential value of each high school. This web application will sorted that WSM method results into a priority list of high school automatically and give information add-on such as the school's phone number and where is the school Address, even it gives a direction map.

Last but not least it is also has a much friendlier interface than a worksheet.

6B2-3
04.15 P.M

The Evaluation of Criteria and Subcriteria of Research Project Selection Using Fuzzy Analytical Hierarchy Process Method

Christina Ayu Kusumawardani, Cucuk Nur Rosyidi, Wakhid Ahmad Jauhari

Production System Laboratory Industrial Engineering Department, Sebelas Maret University, Indonesia

Abstract

Universitas Sebelas Maret (UNS) is a university in which one of its goal is to develop research studies and community service in order to produce the high quality of teaching and learning. UNS then allocates at least 10% of its budget implemented list fund from PNBP (Pendapatan Negara Bukan Pajak, i.e. non-tax revenue) for Research and Community Service Program under the supervision of LPPM (Lembaga Penelitian dan Pengabdian kepada Masyarakat/Institute for Research and Community Service) of UNS. To maintain the research and community service quality, LPPM has several criteria in the selection of research proposals. These criteria and their importance weights were determined internally by LPPM. In this study, we evaluate the existing criteria and sub-criteria in early stage of proposal selection called desk evaluation stage. The evaluation is conducted by comparing the criteria and sub-criteria against the criteria and sub-criteria from other top public universities in Indonesia. Fuzzy analytical hierarchy process is then used to determine the importance weight of those criteria and sub-criteria.

6B2-4
04.35 P.M

Feasibility Study of Industrial Projects: A Fuzzy AHP Approach

Masoud Rahiminezhad Galankashi¹, Maryam Mofarahi³, Muhammad Hisjam², Syed Ahmad Helmi¹

¹*Department of Materials, Manufacturing and Industrial Engineering Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Malaysia*

²*Department of Industrial Engineering Faculty of Engineering Sebelas Maret University, Indonesia*

³*Informatics Lab, Department of Industrial Engineering Inha University, South Korea*

Abstract

The main objective of this study is to develop a Fuzzy Analytic Hierarchy Process (FAHP) for the aim of conducting feasibility study in the electrical industries. Regardless of the numerous quantity of

researches on feasibility study and related techniques, proposing an integrated approach to combine and unify critical factors of feasibility with analytic approaches is less investigated. To fill this gap, this research was conducted to propose a framework to assess the feasibility of industrial project aligned with addressing a FAHP to assist managers for selecting the best alternative. Particularly, 6 key indicators proper for feasibility study of industrial projects were proposed using literature survey. The validity of proposed indicators was accredited using a Nominal Group Technology (NGT). The proposed indicators were used to assist an investment company to evaluate three projects. Finally, a FAHP were used to select the best alternative using the proposed indicators. Therefore, the ranking of industrial projects is the main result of this study.

6B2-5
04.55 P.M

Enhancing Competitiveness of Textile and Clothing Small-Medium Industries through Performance Measurement of Logistics Using SCOR Method

Nunung Nurhasanah, Widya Nurcahayanti Tanjung, Endang Ripmiatin, Shifa Aini Wulandari, Mariyatul Qibtiyah, Meliantika

*University of Al Azhar Indonesia Faculty of Science and Technology
Department of Industrial Engineering, Indonesia*

icimece

Abstract

Performance measurement is one of the things that are important in the process of continuous improvement. Performance measurement method used in this study is the SCOR (Supply Chain Operations Reference). Fuzzy AHP calculation used to calculate criteria weights, they are: Reliability, Responsiveness, Agility, Cost and Asset Management. Based on the calculation of logistics system performance assessment at SME XYZ obtain performance measurement results of 99% (Excellent), and there are attributes that can be repaired is Additional Delivery Volume.

PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 01.00 – 03.10 P.M.

Room : Pemandangan 3
Session : Ergonomic and Product Design I
Chair : Dr. Tanika Sofianti

6C2-1
03:35 P.M

Using Nasa Task Load Index And Maslach Burnout Inventory For Evaluating The Subjective Mental And Physical Workload Of Nurse Central Surgical Installation Hospitals Karanganyar

Meilani Rosita, Irwan Iftadi, Rahmadiyah Dwi Astuti

Department of Industrial Engineering Faculty of Engineering, Sebelas Maret University, Indonesia

Abstract

The installation of the Central surgical nurse is in charge of medical personnel to provide health services to the community. The workload that was given to the installation of the Central surgical nurse very fluctuating depending on the patient's condition is handled as well as the type of surgery performed. The workload coupled with the mental burden that comes from the authorities and the family will be the safety of the lives of patients and the success of the surgery, which it was feared would result in decreased productivity and stress due to workload is either mentally, physically, and emotionally. This prolonged stress can lead to fatigue physical, mental, and emotional that can terminate the occurrence of burnout in nurses. This study was completed using the physical workload measurement methods with% CVL, mental workload using the NASA-TLX, and measurements of the Maslach Burnout Inventory with burnout. The results showed that the installation of the Central surgical nurse Karanganyar hospitals with a level of burnout that is medium and mild, the average physical workload experienced by entering the category of medium and light. Meanwhile the mental burden of the nurse enters the category of very high and high. The purpose of this research is to know the magnitude of mental and physical workload and burnout levels experienced nurse surgical installation centrally to increase productivity of nurses.

6C2-2
03.55 P.M

Applying Deep Fryer And Spinner Experiments for Optimization Multiresponse Water Content and Fat Content of Oyster Mushroom Chips Using Taguchi and PCR-TOPSIS Methods

Rizqy Widhianggitasari¹, Retno Wulan Damayanti^{1,2}, Pringgo Widyo Laksono^{1,2}

¹*Department of Industrial Engineering Faculty of Engineering, Sebelas Maret University Surakarta, Indonesia*

²*Center for Study of Technology Development and Industrial Collaboration, LPPM Sebelas Maret University, Indonesia*

Abstract

To optimize the production of oyster mushroom chips in one of the small and medium industry producers oyster mushroom chips, conducted experiments setting optimal level deep fryer and spinner in the production of oyster mushroom chips chips to obtain the oyster

mushroom chips with water content and fat content optimized simultaneously. Study experimental oyster mushrooms relates to multiresponse of the water content and fat content. These experiments using the Taguchi and the PCR-TOPSIS method. The Taguchi method aims to improve the quality of products and processes as well as in reducing the cost and resources to a minimum. PCR method shows the ability of a process to meet design specifications set. Technique for Order Performance by Similarity to Ideal Solution (TOPSIS) method for decision making optimal combination multiresponse case. Both responses are calculated using the smaller the better. Multiresponse optimal conditions based on A2-B1-C1. The combination of these levels by a factor of the type of flour at 80% rice flour and tapioca flour 20%, the factor of frying temperature at 150-160oC, and the factor of time for the draining process in 1 minute

6C2-3
04.15 P.M **Ergonomic Checkpoints as the Base of Stamping Station Work Facilities Improvement**

Bambang Suhardi¹, Nabilla Zoratoshi¹, Pringgo Widyo Laksono¹, Benette Custodio²

¹*Department of Industrial Engineering Sebelas Maret University, Indonesia*

²*Department of Industrial Engineering University of the Philippines, Indonesia*

Abstract

Work productivity in the stamping station in Batik Merak Manis Laweyan is one of the key components to the business continuity. Using ergonomics checkpoints with results validated through a Focus Group Discussion, hand tools and machine safety was identified as the major area for production process improvement. This research aims to improve the production process by designing ergonomic work facilities. From observation, the hand tools and machine safety is primarily associated with the work table, the cooker table for the candle, and the batik stamp. In formulating the improved design, the rational method by Cross was used, specifically the four stages design process; clarifying objectives, establishing function (penetapan fungsi), setting requirements, and determining characteristics. Improved stamping station's work facilities such as the work table and batik stamp's handle cover were designed, incorporating the worker's need, ergonomic principles, and anthropometric measurement.

6C2-4
04.35 P.M **Applying Hazard Analysis Critical Control Point (HACCP) for Production Process of Oyster Mushroom Chips in Small and Medium Enterprise (SME)**

Risya Zeline¹, Retno Wulan Damayanti^{1,2}, Pringgo Widyo Laksono^{1,2}

¹*Department of Industrial Engineering Sebelas Maret University, Indonesia*

²*Center for Study of Technology Development and Industrial Collaboration, LPPM Sebelas Maret University, Indonesia*

Abstract

Food safety is very crucial in the food industry so that the food is produced doesn't have a negative effect on consumers. The purpose of this research is to determine the critical production processes that cause negative effects on the product. To guarantee the safety of oyster mushroom chips production, the Hazard Analysis Critical Control Points (HACCP) system was applied to the production process. HACCP is implemented based on the 7 principles in SNI (Indonesian National Standard) 01-4852-1998 about the implementation steps of HACCP. The 7 principles that must be applied in preparing HACCP plan were hazard analysis, Critical Control Point (CCP) determination, critical limit establishment, CCP monitor system establishment, corrective action establishment, verification, and also documentation establishment. Seven principles implemented in the production process of oyster mushroom chips in SME Boyolali, there were 5 CCP: in the water, in the boiling process, frying process, chips draining process, and packaging process.

6C2-5
04.55 P.M

Model Simulations of Noise Pollution due to Departures and Approaches of Passenger Aircrafts around Achmad Yani Airport Semarang – Indonesia

Pertiwi Andarani¹, Titik Istirokhatun¹, Glorian Suhariani¹, Wiwik Budiawan²

¹*Dept. of Environmental Engineering Faculty of Engineering, Diponegoro University (UNDIP), Indonesia*

²*Dept. of Industrial Engineering Faculty of Engineering, Diponegoro University (UNDIP), Indonesia*

Abstract

In Indonesia, Achmad Yani Airport in Semarang city is an airport operated by PT Angkasa Pura 1 which can service 3.2 million passengers each year in 2013. Unfortunately, air transportation can cause numerous environmental damages with serious consequences on population health, such as noise. Noise control of an airport operation can be evaluated its effectiveness through a tool. One of the commonly used is noise contour which can be integrated in INM (Integrated Noise Model). As a first step to evaluate the noise control, the objective of

this study is to develop a noise contour around Achmad Yani Airport by using INM and to measure the area of affected land use which exceeded the permissible limit. In this research, the simulation was conducted on Saturday schedule. The lowest number of aircraft operations per runway was scheduled on Saturday when there are 44 departures and 44 approaches. According to this study, the area of community noise level I, II, and III using WECPNL (Weighted Equivalent Perceived Noise Level) based on the Government Ordinance No. 40/2012 are 6.774 km²; 2.701 km²; and 1.32 km², respectively. The results are different with the one measured by the Environmental Agency in Semarang city due to different method. There are a hospital, six schools where located in Community noise level I. Further study is needed to identify possible noise control at Achmad Yani Airport.

PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 01.00 – 03.10 P.M.

Room : Pemandangan 4

Session : Manufacturing and Quality Management I

Chair : Dr. Erwin Widodo

6D2-1 The Development of Integrated Indonesian Healthcare Model Using Kano Model, QFD and BSC
03:35 P.M

Jonny, Teuku Yuri M. Zagloel

Department of Industrial Engineering University of Indonesia

Abstract

This paper aims to present an integrated health care model for Indonesian health care industry. Based on previous researches, there are two health care models in the industry such as disease- and patient-centered care models. In their developments, the patient-centered care model is widely applied due to its capability in reducing cost and improving quality simultaneously. However, there is still no comprehensive model resulting in cost reduction, quality improvement, patient satisfaction and hospital profitability simultaneously. Therefore, this research is intended to develop that model. In doing so, first, a conceptual model using Kano's Model, Quality Function Deployment (QFD) and Balanced Scorecard (BSC) is developed to generate several important elements of the model as required by stakeholders. Then, a case study of an Indonesian hospital is presented to evaluate the validity of the model using correlation analysis. As a result, it can be concluded that the model is validated implying several managerial insights among its elements such as 1)

leadership ($r=0.85$) and context of the organization ($r=0.77$) improve operations; 2) planning ($r=0.96$), support process ($r=0.87$) and continual improvement ($r=0.95$) also improve operations; 3) operations improve customer satisfaction ($r=0.89$) and financial performance ($r=0.93$) and 4) customer satisfaction improves the financial performance (0.98).

6D2-2

03.55 P.M

Operating Room Scheduling Using Hybrid Clustering Priority Rule and Genetic Algorithm

Linda Wahyuni Santoso, Aisyah Ashrinawati Sinawan, Andi Rahadiyan Wijaya, Andi Sudiarso, Nur Aini Masruroh, Muhammad Kusumawan Herliansyah

Department of Mechanical and Industrial Engineering Gadjah Mada University, Indonesia

Abstract

Operating room is a bottleneck resource in most hospitals so that operating room scheduling system will influence the whole performance of the hospitals. This research develops a mathematical model of operating room scheduling for elective patients which considers patient priority with limit number of surgeons, operating rooms, and nurse team. Clustering analysis was conducted to the data of surgery durations using hierarchical and non-hierarchical methods. The priority rule of each resulting cluster was determined using Shortest Processing Time method. Genetic Algorithm was used to generate daily operating room schedule which resulted in the lowest values of patient waiting time and nurse overtime. The computational results show that this proposed model reduced patient waiting time by approximately 32.22% and nurse overtime by approximately 32.74% when compared to actual schedule.

6D2-3

04.15 P.M

Kanban System Implementation in Cardboard Supply Process (Case Study: PT. Akebono Brake Astra Indonesia - Jakarta)

Christina Ayu Kusumawardani¹, Pringgo Widyo Laksono^{1,2,3}

¹*Laboratory of Production System, Department of Industrial Engineering, Sebelas Maret University, Indonesia*

²*Center for Research in Manufacturing Systems, Sebelas Maret University, Indonesia*

³*Center for Study of Technology Development and Industrial Collaboration, LPPM Sebelas Maret University, Indonesia*

Abstract

Continuous improvement is needed by every manufacturing company to optimize their production. One way to reach that goal is eliminating waste that occurs in company. In PT. Akebono Brake Astra Indonesia – Jakarta (AAIJ), there are seven “muda” (waste) that always strived to remove, such as muda transportation that occurs in the cardboard supply system made by the non-value movement of PIC in packing area to take cardboard from warehouse. This research use Kaizen theory to get rid of muda transportation by changing the cardboard supply system that were previously done manually by PIC of packing area become taken over by a towing operator and apply Kanban system to improving the cardboard supply system information by creating set up of Kanban system that produce Material and Information Chart (MIFC), Standardized Work Chart (SWC), calculation of Kanban population, and Work Instruction (WI). This research lead to improvement of cardboard supply process, clearer and more cyclic information flow in cardboard supply system, and reduction of cost due to saving of manpower.

6D2-4

04.35 P.M

The Robust Corrective Action Priority- An Improved Approach For Selecting Competing Corrective Actions In FMEA Based On Principle Of Robust Design

Agung Sutrisno¹, Indra Gunawan², Iwan Vanany³

¹*Department of Mechanical Engineering Sam Ratulangi University, Indonesia*

²*Entrepreneurship, Commercialization and Innovation Center Adelaide University, South Australia*

³*Institut Teknologi Sepuluh November (ITS), Indonesia*

Abstract

In spite of being integral part in risk – based quality improvement effort, studies improving quality of selection of corrective action priority using FMEA technique are still limited in literature. If any, none is considering robustness and risk in selecting competing improvement initiatives. This study proposed a theoretical model to select risk –based competing corrective action by considering robustness and risk of competing corrective actions. We incorporated the principle of robust design in counting the preference score among corrective action candidates. Along with considering cost and benefit of competing corrective actions, we also incorporate the risk and robustness of corrective actions. An example is provided to represent the applicability of the proposed model.

6D2-5
04.55 P.M

Integrating the Analytic Hierarchy Process and Importance-Performance Analysis into ISO 14001 Framework for Assessing Campus Sustainability

Susatyo N. W. Pramono, M. Mujiya Ulkhaq, Reza Trianto, Dyah R. Rasyida, Nadia A. Setyorini, Priska R. Setiowati

Department of Industrial Engineering Diponegoro University, Indonesia

Abstract

There has been an international emerging issue in the role of higher education in promoting sustainability due to numerous declarations and commitments related to the need of sustainability in higher education. As a result, there is an increasing number of higher educations that have embarked on projects and initiatives to incorporate sustainability into their systems. Higher educations could implement ISO 14001 framework that is recognized as a guide for an organization which aim to implement an environmental management system to pursue the sustainability. This research tried to attempt an extension of the previous work in assessing campus sustainability using ISO 14001 framework by integrating the analytic hierarchy process and importance-performance analysis (IPA). The inclusion of IPA is because many organizations are constrained by limitations on the resources they have so that it has to be decided how those limited resources are best deployed to attain the goals to be achieved. The self-assessment scores of ISO 14001 would the performance and the AHP result is the importance part of the IPA. A case study is conducted at the Diponegoro University, which is located in Semarang, Indonesia. The result indicates that only two main elements of ISO 14001 are located in the second quadrant of IPA, i.e. high performance and high importance. The result also could be a basis for the university to identify, prioritize, and improve the programs related to sustainability and ensure that valuable resources are allocated in the most effective areas.

PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 01.00 – 03.10 P.M.

Room : Karaton I
Session : Product Design and Ergonomics I
Chair : Dr. Bambang Suhardi

6E2-1
03:35 P.M

How SEIPS Can Be Used As Model For A Macroergonomic Approach In Sub-unit Healthcare Case Study: The Nurse

Perception On Fatigue In Surgery Ward Unit

Ardian Ade Pristiyana, Irwan Iftadi

Industrial Engineering Department Sebelas Maret University, Indonesia

Abstract

Occupational fatigue in healthcare nurses which has multifaceted issues is associated with decreased patient safety and the quality of nursing care. The aim of this study was to investigate the nurses fatigue problem in sub-unit healthcare based on their perceptual experience. Interviews were conducted and analyzed utilizing a direct qualitative content analysis approach using NVivo Software and guided by Model of System Engineering Initiative for Patient Safety (SEIPS). The findings of this research were a steering on what nurses perceive as contributing and preventing to fatigue which are likewise arranged in SEIPS model. It was shown that a macroergonomic approach is valuable for understanding complexities of work systems, even though it is a small unit organization.

6E2-2

03.55 P.M

Modification of Working Conditions Based on Ergo THK Reducing Workload, Muscle Tension and Fatigue of Rice Milling Workers in Jinengdalem Village Buleleng

L. P. Ruliati¹, I. D. P Sutjana²

¹Post Graduate Program of Ergonomics Physiology Udayana University, Indonesia

²Department of Physiology Faculty of Medicine Udayana University, Indonesia

Abstract

Rice mill is one of the businesses in informal sector. From the rice milling process ergonomic problems arise when employees work with bent position that done repeatedly to lift grain sacks to be transferred to peeler machine. This situation will affect the comfort of work, thus increasing the workload, muscle tension, and fatigue. The consequence will certainly affect the health and productivity of workers. In this study introduces ergo Tri Hita Karana (ergo THK) as an ergonomics intervention model which solves ergonomics problems of the cultural aspects of THK. The study aim is to determine the modification of working conditions based Ergo THK to reduce workload, muscle tension and fatigue. This research uses Randomized Pretest and Posttest Control Group Design experimental design. The subjects were 30 male rice mill workers with an age range of 16 until

56 years, and then divided into 15 subjects in the control group and 15 subjects in the treatment group. The results showed that the average posttest workloads in the control group are 136.950 more less 0.297 and in the treatment group are 107.60 more less 0.396. Significance analysis showed that after the two groups done their activities, the average workload significantly different p less than 0.005. The amount of reduction in the workload between the two groups was 21.43 percent. In muscle tension posttest showed that the mean score of the muscle tension in the control group was 62.67 more less 7.31 and the treatment group was 20.96 more less 2.96. Significance analysis showed that both groups mean muscle-tension results were significantly different p less than 0.005. The amount of reduction in tension between the control group and the treatment group while working was 66.55 percent. At fatigue posttest showed that the mean score of fatigue in the control group was 76.40 more less 13.51 and the treatment group was 55.53 more less 9.51. Significant analysis showed that the mean fatigue of both groups significantly different p less than 0.005. The amount of reduction in fatigue between the control group and the treatment group while working was 27.31 percent. From this study it can be concluded that the modification of the working conditions based on Ergo THK can reduce the workload by 21.43 percent, muscle tension by 66.55 percent and fatigue by 27.31 percent.

6E2-3

04.15 P.M

Improving The Work Position of Worker Based on Manual Material Handling in Rice Mill Industry

Rahmaniyah Dwi Astuti, Susy Susmartini, Ade Putri Kinanti

Department of Industrial Engineering Sebelas Maret University, Indonesia

Abstract

In traditional industries still using manual material handling to weight lifting. Worker at the rice mill, especially in rice filtering activity has wrong ergonomic posture to enforce the body bends and carried loads too heavy cause of injury for lower back and waist. The work attitude is unnatural posture. This study aimed to determine the severity of the workload, the level of risk posed to the rice taking activities and suggested as an improvement to it. Identify the operator complaints used Nordic Body Map method. Rapid Entire Body Assessment (REBA) method is used to provide an assessment of the working posture of the operator. Assessment of the working posture on rice filtering process shows that REBA score is 12 with a explanation very high level of risk and action level is 4 which means the action needs to be repaired immediately. Biomechanics calculation shows result 6713.21 N, the result of the calculation of the biomechanics of worker

in the rice filtering activities indicates that the activities would pose a risk or injury. Therefore, improvement in rice filtering activity by designing a tool for lowering the risk level worker. The design tools are illustrated with 2D modeling resulted in the level of risk that is working REBA score became 3 which shows a low risk level. Biomechanics calculation after designed of tools show the result is 6282.86 N. The results means the activities carried out are still in safe condition and does not pose a risk or injury.

6E2-4
04.35 P.M

Environmental Impact Analysis of Batik Natural Dyes Using Life Cycle Assessment

Dyah Ika Rinawati, Diana Puspita Sari, Bambang Purwanggono, Andy Tri Hermawan

Industrial Engineering Department, Faculty of Engineering, Diponegoro University, Indonesia

Abstract

The use of natural dyes for batik dyeing is fewer than synthetic dyes because of its limitations in the application such complexity in manufacture and usage. For ease of use, natural dyes need to be processed into instant products both of powder and liquid. Production process of liquid natural dye is simpler and require less energy. However, liquid natural dye is less efficient in storage and shelf life is less durable because it has a high water content, and its transport more expensive. The appropriate method to analyze and compare the environmental impacts of powder and liquid natural dyes is Life Cycle Assessment (LCA). The "cradle to grave" approach used to assess environmental impact of powder and liquid natural dyes of Jalawe rind throughout production of natural dyes, natural dyes distribution and use of natural dyes for coloring batik, Assessment of environmental impacts consists of (1) goal and scope definition, (2) inventory analysis, (3) impact assessment, and (4) interpretation, with eco costs 2012 v3.3 as impact assessment method. Results of this study showed that liquid natural dyes has environmental impacts in eco costs value € 14,197 while powder natural dye has eco costs value € 8,149 per 10 pieces of batik cloth. From these results it was found that the distribution of liquid dyes, mordanting and packaging of liquid dyes are the largest contributor to the value of eco costs. The recommendation given is addition of evaporation process in the liquid dyes production and use of biomordant as a substitute of alum for mordanting.

6E2-5
04.55 P.M

New Product Development: A Batik Multifunctional Chair

Sri Indrawati and Nias Sukmaningsih

Abstract

The biggest challenge facing by Batik industry in ASEAN Economic Community (AEC) era is the greater number of fashion competitors both domestically and internationally. Based on that condition, the development of new product variants by considering product performance and price is needed. This research was conducted to develop batik products with a new target market. Products that being developed is batik multifunction chair using integrated value engineering and analytic hierarchy process methods. This research has been done in several stages, ie. information stage, creative stage, value analysis and product prototyping. The results of this research shows that the batik multifunctional chair product criteria are aesthetic (29%), multifunctional (34%) and ergonomic (37%). There are three new product design alternatives that successfully being developed. Based on value analysis, the product design alternatives that have the highest value is alternative design 2, the value is 2,37. The production cost for this design is Rp. 500.000,-. Alternative design 2 specification are using Mahoni wood, Batik parang rusak pattern with natural coloring process, can be used as table and fit with customer's body anthropometry. Then a batik multifunctional chair prototype is developed based on the best alternative design.

PARALLEL SESSION SCHEDULE

Thursday, 6th October 2016 01.00 – 03.10 P.M.

Room : Karaton II
Session : Decision Support System
Chair : Dr. Muh. Hisjam

6F2-1 **Data Mining to Enhance Laboratory Assistant Recruitment in College Institution**
 03:35 P.M

Rayinda Pramuditya Soesanto, Amelia Kurniawati, Luciana Andrawina,
 Damanhuri Nurul Huda, Burhanuddin Yamani

Department of Industrial Engineering, Telkom University, Indonesia

Abstract

In university, there is three main focus that university should achieve

despite the characteristic of each institution, the three main focus are teaching, research and community service. In teaching and research, the needs of laboratory assistant in the university are often valued as the important factor for the success of the delivery of teaching and research. This research is trying to map the successful laboratory assistant model for recruitment purpose using knowledge conversion method. The respondent for this research are the alumni and current laboratory assistant from industrial engineering department in Telkom University. Future research can be conduct regarding the implementation and evaluation of the model in another faculty or institution.

6F2-2
03.55 P.M

Evaluate The Use of Tanning Agent in Leather Industry Using Material Flow Analysis, Life Cycle Assessment and Fuzzy Multi Attribute Decision Making (FMADM)

Salman Alfarisi¹, Sugoro Bhakti Sutono², Wahyudi Sutopo³

^{1,2}Department of Industrial Engineering Pelalawan School of Technology Pelalawan, *Indonesia*

³Departement of Industrial Engineering Faculty of Engineering, Sebelas Maret University, *Indonesia*

Abstract

Tanning industry is one of the companies that produce many pollutants and cause the negative impact on the environment. In the production process of tanning leather, the use of input material need to be evaluated. The problem of waste, not only have a negative impact on the environment, but also human health. In this study, the impact of mimosa as vegetable tanning agent evaluated. This study will provide alternative solutions for improvements to the use of vegetable tanning agent. The alternative solution is change mimosa with indusol, gambier, and dulcotan. This study evaluate the vegetable tanning of some aspects using material flow analysis and life cycle assessment approach. Life cycle assessment (LCA) is used to evaluate the environmental impact of vegetable tanning agent. Alternative solution selection using fuzzy multi-attribute decision making (FMADM) approach. Results obtained by considering the environment, human toxicity, climate change, and marine aquatic ecotoxicity, is to use dulcotan.

6F2-3
04.15 P.M

The Evaluation of Criteria and Subcriteria of Research Proposals Using ANP Method

Karina Muryastuti, Cucuk Nur Rosyidi, Pringgo Widyo Laksono

Department of Industrial Engineering, Sebelas Maret University, Indonesia

Abstract

Evaluation is needed by system which used multi criteria decision making to improve the system. In the proposal assessment process, the importance weight value of each criteria is an important factor. Based on interviews with LPPM UNS stakeholders, it was known that criteria and the weight value in the proposal selection process was obtained by a meeting among the stakeholders, i.e. Chairman of LPPM UNS, Secretary of LPPM UNS, and Department of Quality Assurance of LPPM UNS. Therefore, there are many subjectivity in the determination of the criteria and the weight. This research uses Analytic Network Process (ANP) method to evaluate the criteria and subcriteria and determine the weights. This research aims to determine the weight value for each criteria and subcriteria in research proposal selection. This research attempts to provide some new criteria and subcriteria for research proposal selection and the weight value. The criteria and sub-criteria were obtained using questionnaire and hence the resulted linkages between the criteria and subcriteria will be more accurate.

6F2-4
04.35 P.M

SCOR based Key Success Factors in Cooking Oil Supply Chain: Buyers Perspective in Padang City

Fatimah Zahara, Rika Ampuh Hadiguna

Department of Industrial Engineering, Faculty of Engineering, Andalas University, Indonesia

icimece

Abstract

Supply chain of cooking oil is a network of companies from palm oil as raw material to retailers which work to create the value and deliver products into the end consumers. This paper is aimed to study key success factors based on consumer's perspective as the last stage in the supply chain. Consumers who are examined in this study are restaurants management or owners. Restaurant is the biggest consumption of cooking oil. The factors is studied based on Supply Chain Operation Reference (SCOR) version 10.0. Factors used are formulated based on the third-level metrics of SCOR Model. Factors are analyzed using factors analysis. This study found factors which become key success factors in managing supply chain of cooking oil encompass reliability, responsiveness and agility. Key success factors can be applied by governments as policy making and cooking oil companies as formulation of the distribution strategies.

6F2-5
04.55 P.M

Evaluation and Selection of 3PL Provider Using Fuzzy AHP and Grey TOPSIS in Group Decision Making

Annisa Kesy Garside, Thomy Eko Saputro

Industrial Engineering Department University of Muhammadiyah Malang, Indonesia

Abstract

Selection of a 3PL provider is a problem of multi criteria decision making, where the decision maker has to select several 3PL provider alternatives based on several evaluation criteria. A decision maker will have difficulty to express judgments in exact numerical values due to the fact that information is often incomplete and the decision environment is uncertain. This paper presents an integrated fuzzy AHP and Grey TOPSIS for the evaluation and selection of 3PL provider method. Fuzzy AHP is used to determine the importance weight of evaluation criteria. For final selection, grey TOPSIS is used to evaluate the alternatives and obtain the overall performance which is measured as closeness coefficient. This method is applied to solve the selection of 3PL provider at PT. X. Five criterias and twelve sub-criterias were determined and then the best alternative among four 3PL providers was selected by proposed method.

PARALLEL SESSION SCHEDULE

Friday, 7th October 2016 01.00 – 03.10 P.M.

Room : Pemandangan I
Session : Electrical Engineering III
Chair : Dr Umar Khayam

7A1-1 **Light Sensor Selection of Wi-MoLS (Wireless Modern Light Sensor) Based on Analytic Hierarchy Process (AHP)**
 01.10 P.M

Rifqi Fatchurrahman, Handika Putra, Irfan Joyokusumo, Muhammad Hasan Habib, Ifitah Imawati, Sasongko Pramono Hadi

Department of Electrical and Information Technology, Universitas Gadjah Mada, Indonesia

Abstract

This paper presents a technique for selecting the light sensor candidates according to its effectivity and sensitivity criteria. The light sensor candidates, such as light dependent resistor, photodiode, and phototransistor, is taken due to its good performance in daylight sensing. Analytic Hierarchy Process (AHP) which provides a structured technique for organizing and analyzing complex decisions based on mathematics was chosen. It offers simple ways in matrix based-operations to rank the best light sensor candidates over those criteria. The results show that light dependent resistor is the most effective and sensitive light sensor by 62.16 % in score instead of phototransistor (19.72%) and photodiode (18.12%).

7A1-2 **Performance on Precision Analysis of Mobile Robot Map Making**

01.30 P.M

DeviceSuditama¹, Budhi S Kusuma²¹*Mechanical Engineering Department Engineering Faculty Medan Area University*²*Industrial Engineering Department Engineering Faculty Medan Area University***Abstract**

The first step in detailed assessment, this research analyzes the precision existing construction autonomous of robotic technologies in the development of construction technologies and the attributes of the technologies which can influence their use by construction companies. Autonomous map making of room interior is becoming a widely used tool in robotic for various applications. One of the major problems to deal with in the development in map making focused on

the empirical examination of accuracies. This paper present analysis of the precision of map created by a robotic arm of 6 articulated degrees of freedom mounted on a mobile carriage and utilizes a laser beam range finder for horizontal and vertical rotational scanning.

7A1-3

An Analysis of Automatic Balance Evaluator and Rehabilitation Instrument System Processing

01.50 P.M

Suditama¹, Zuraida Z²¹ *Mechanical Engineering Department Engineering Faculty Medan Area University*² *School of Health Sciences Universiti Sains Malaysia (USM) Kota Bharu, Kelantan, Malaysia***Abstract**

The automatic Balance Evaluator and Rehabilitation (ABER) is a general term that covers all the techniques used to quantify postural control in upright stance in either static or dynamic conditions. Among them, Automatic Balance Evaluator and Rehabilitation is a noninvasive specialized clinical assessment technique used to quantify the central nervous system adaptive mechanisms (sensory, motor and central) involved in the control of posture and balance, both in normal (such as in physical education and sports training) and abnormal conditions (particularly in the diagnosis of balance disorders and in physical therapy and postural reduction). Due to the complex interactions among sensory, motor, and central processes involved in posture and balance, ABER requires different protocols in order to differentiate among the many defects and impairments which may affect the patient's posture control system. Thus, ABER challenges it by using several combinations of visual and support surface

stimuli and parameters.

7A1-4
02.10 P.M **Hysteresis Current Controller with Clamp for Improving Grid-Connected Inverter Efficiency**

Adinda Ihsani Putri, Arwindra Rizqiawan, Fahrur Rozzi, Novan Zakkia, Yanuarsyah Haroen, Pekik Argo Dahono

School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Indonesia

Abstract

Grid-connected inverter (GCI) has played important role in today's microgrid trends. In order to accurately control both active and reactive power, GCI should utilize an appropriate current controller which provides reliable steady state and dynamic feature. Hystereris current controller has been already well-known for its simplicity, outstanding stability, fast dynamic response, insensitivity to load parameters, and inherent peak current capabilities. However, hysteresis current controller suffers with unfixed switching frequency, higher switching losses, and poorer efficiency. In this paper, hysteresis current controller with clamp method is proposed to reduce switching losses thus improving efficiency. This method works by clamping on the switches during peak current period of sinusoidal output current and let the switches to operate during off-peak period. Experimental setup has been built to verify the proposed method. It can be shown that the proposed hysteresis control with clamp has better efficiency compared to the conventional one.

7A1-5
02.30 P.M **The Opportunity of PHEV in Indonesia**

Muhammad Nizam, Agus Mujianto

Mechanical Engineering Department, Sebelas Maret University, Indonesia

Abstract

Nowadays, the air pollution increase significantly. Transportation is the main cause of the increase in air pollution. This is cause of its growth, vehicle number growth rapidly. To solve this problem there was made electric cars. Electric cars have zero emissions. However, the electric car has the disadvantage that the high cost of batteries, short distances and inadequate infrastructure. One type of vehicle powertrain has been developed. That is plug in hybrid vehicle (PHEV). PHEV use two source of energy for vehicle they are battery and fuel. It makes PHEV less emission than conventional vehicle. Indonesia is also currently running a program of emissions reduction and fuel savings. So the use of PHEV to Indonesia can be proposed. This study focused on analysis well to wheel fuel economy

and emission of conventional and alternative vehicle (PHEV) in Indonesia. This study used Surakarta to represent Indonesia's vehicle speed character. Advisor used to compare conventional vehicle and PHEV in fuel economy and emission. The result of this study is PHEV 31,85% more economy than conventional vehicle. And PHEV less emission than conventional vehicle about 41.3% for HC, 46,8% for CO and 17,5% for NOx. From the results of this study, the PHEV has a great opportunity to replace conventional vehicles as a means of transportation in Indonesia

7A1-6
02.50 P.M

Design, Implementation, and Testing of Partial Discharge Signal Processing System

Umar Khayam and Yoga Aji Surandaka

School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Indonesia

Abstract

This research discusses the design, implementation, and testing of software to perform partial discharge signal processing. The software is designed so that it can be used to perform signal processing function on partial discharge signal using High Pass Filter (HPF), Low Pass Filter (LPF), Band Pass Filter (BPF), Fast Fourier Transform (FFT), and Inverse Fast Fourier Transform (IFFT). The design of software application is done first by making the graphical user interface (GUI) in MATLAB and then give the command on each UI Control so users do not have difficulty in running the software. Once the software application testing is completed by providing input data in the form of a sinus signal of voltage source to determine whether the software application has been created as expected. Applications that have been tested are used to perform signal processing of PD. From the results of this research will be obtained a software application that can perform signal processing functions of PD by performing HPF, LPF, BPF, FFT, and IFFT.

PARALLEL SESSION SCHEDULE

Friday, 7th October 2016 01.00 – 03.10 P.M.

Room : Pemandangan 2
Session : Ergonomics and Product Design II
Chair : Dr Eko Pujiyanto

7B1-1
01.10 P.M

Analysis of the Community Website Usability Using Koohang's Model Based on Performance Task Comparison Result

Diana Puspita Sari, Novie Susanto and Zodiake Loventa Zendri Polii

Industrial Engineering Departement, Diponegoro University, Indonesia

Abstract

Kaskus.co.id is one of the biggest community site which ranks 1st in Indonesia and 257 positions for the world in 2010. As time went on, many other similar sites with kaskus.co.id that is able to meet the needs of Indonesian social-networking communities such as forum.detik.com. This gives the impact of a decline in the number of access to the site kaskus.co.id and shift its rank. The results of the interview against the user community site kaskus.co.id is there are some shortcomings on the site, i.e. the process of posting the increasingly complicated, too many ads that cover the main content, and the difficulty of organizing pictures. The purpose of the research is to determine the value of usability of the community site kaskus.co.id as Indonesia's largest sites which ranks 1st in Indonesia in 2010. There are 22 indicators divided into 3 indicators for performance task and 19 indicators Koohang model. Performance Task is used to find out the level of site performance directly while the indicator of Koohang models used for qualitative questionnaire assessment. The determination of the value of usability of the site kaskus.co.id obtained using WEBUSE with merit conversion scale. The whole valuation WEBUSE respondents will be processed to earn points for each questionnaire indicators and the level usability of the community site kaskus.co.id. The results of this study in the form of value of usability of the sites, the analysis of the 19 indicators that affect the value of usability and indicators guide the creation of community sites. In this kaskus.co.id case, we obtained information that kaskus.co.id has a moderate level of usability.

7B1-2

01.30 P.M

Evaluation and Designing Street Lighting with Solar Cell: A Case Study

Ika Shinta Mardikaningsih¹, Wahyudi Sutopo², Roni Zakaria³, Muhammad Nizam⁴ and Evizal Abdul Kadir^{5,6}

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⁵Wireless Communication Centre, Faculty of Electrical Engineering, Universiti Teknologi Malaysia. Malaysia

⁶Fakultas Teknik, Universitas Islam Riau, Indonesia

Abstract

Street lighting problems are high operating costs, lux incompatible with the standards, and then the lamps are inefficient. In addition, one effect of the use of street lighting which does not effectively and efficiently can cause electrical energy crisis. Currently, street lighting is still use fossil fuels to generate electricity. Even though fossil fuels known inexpensive and mostly used to generate energy, it is non-renewable and environmentally unfriendly caused by carbon dioxide. The street lighting at University incompatible with the standard and does not function properly, so it can reduce the level of safety and convenience on campus. Based on the problem we need an alternative to overcome it. This article aims to evaluate and making plans the design of street lighting at the University, as a case study, to compare with the Indonesian Standard of Street Lighting. The evaluation conducted to determine the existing condition of street lighting and to analyze compatibility with the standard. Evaluation related with lux, distance, pole, and the amount of lamp power. Based on the evaluation known that street lighting is not compatibility with the standard so that needed planning and design of street lighting. Planning and design can be used as an alternative to solve the problem. Design covering the structure of street lighting, the type of installation, and the material used. It is known that the design of street lighting using solar energy is a good alternative to solve the problems.

7B1-3
01.50 P.M

Designing Size of Batik Shirt For Male College Student in Surakarta Using Anthropometric Data (Case Study: Male College Student of Industrial Engineering Major in Surakarta)

Bambang Suhardi, Alifah Khairina and Fakhrina Fahma

Department of Industrial Engineering Faculty of Engineering, Sebelas Maret University, Indonesia

Abstract

Batik is one of Indonesian culture that is growing very rapidly proved with inaugurated batik into the world cultural heritage by UNESCO. Batik should be developed in various aspects in order to meet the needs of consumers, one of them in batik shirt size aspect. But unfortunately in terms of size, batik still has the disadvantage, there are difference in male size batik shirt between one batik shop and other batik shop. This makes the performance of selling batik is not optimal because consumers have difficulty in finding the appropriate size of batik shirt with anthropometry, eg in shop A consumer obtain batik shirt with size M but when it is at the store B, this consumers gain size L. This will make consumers confused while looking for the appropriate batik shirt size based on their anthropometry. The author tried to make a proposal in batik shirt size corresponding with male college student anthropometric data of Industrial

Engineering Major of Sebelas Maret University (UNS) and Muhammadiyah University of Surakarta (UMS) with K-Means cluster method to obtain the appropriate size. First determined the desired number of clusters which is four cluster size : S, M, L and XL. Then the anthropometric data of students grouped by cluster K-Means method to get male size batik shirt according to anthropometry male college student of Industrial Engineering Major in Surakarta.

7B1-4

Analysis of Potential Work Accidents Using Hazard Identification, Risk Assessment and Risk Control (HIRARC) Method

02.10 P.M

Bambang Suhardi, Andhika Ayu Valentina Estianto and Pringgo Widyo Laksono

Department of Industrial Engineering Faculty of Engineering, Sebelas Maret University, Indonesia

Abstract

Batik Merak Manis Laweyan is one of the batik industry in Surakarta, where in the production process there is the potential accidents. The company also has provided personal protective equipment to workers to minimize the risk, but in reality, not all workers use personal protective equipment. The purpose of this study was to analyze the potential hazards that may occur and determine root causes of the occurrence so as to minimize the number of occupational accidents. This research uses the method of Hazard Identification, Risk Assessment and Risk Control (HIRARC) in analyzing potential hazards that may occur in the workplace by identifying hazards, risk assessment, and rank the risks. The risks that have the highest ratings will then be analyzed using the method of Fault Tree Analysis to find out the root cause of the occurrence. The results showed that there were 15 potential hazards, where two potential hazards have a high risk level, 6 potential hazards have a medium risk level and 7 potential hazards have a low risk level. Two potential hazards with high risk, it is known that factors causing potential hazards are a factor of dye used, the use of personal protective equipment such as masks, or the space factor of production.

7B1-5

Review of Wheelchair Technology Development in the last 10 Years

02.30 P.M

Cindy Wahyufitriyani, Susy Susmartini and Ilham Priadythama

Departement of Industrial Engineering University of Sebelas Maret Surakarta, Indonesia

Abstract

The number of disability in several countries is high and continues to rise.

This attracts researching to conduct more research in disability. The limitation of mobility is an important issue to be considered for disabled people so it does not rely on others to do their daily activities. Wheelchair is one of assistive technology which aims to help people who suffered in mobility. Nowadays, wheelchair development is not only limited to manual wheelchairs that need to be driven by its users, but also there is an intelligent wheelchair that is designed to be move automatically making it easier for the user. This paper aims to review of wheelchair technology control development in the last 12 years so that it could give some vision about further research to develop a wheelchair.

PARALLEL SESSION SCHEDULE

Friday, 7th October 2016 01.00 – 03.10 P.M.

Room : Pemandangan 3
Session : Quality and Product Development
Chair : Dr. Bambang Suhardi

7C1-1 **Designing Framework for Standardization Case Study : Lithium-Ion Battery Module in Electric Vehicle Application**
 01.10 P.M

Niken Aristyawati¹, Fakhрина Fahma², Wahyudi Sutopo², Muhammad Nizam³, Agus Purwanto⁴, Bendjamin B. Louhenapessy⁵, Ary Budi Mulyono⁵

¹Laboratory of Quality System, Departement of Industrial Engineering, Faculty of Engineering, Sebelas Maret University, Indonesia

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⁵The Center of Research and Development Center for Standardization National Standardization Agency of Indonesia, BSN, Indonesia

Abstract

The regulation such as the national standards and testing requirements play important roles in industries. The roles of the standard are ensuring safety for consumers and producers, increase of product competitiveness, and the reduction trade of barriers. Currently, Indonesia is in the stage of developing electric vehicle industries, so that the standards which are related to electric vehicle such as standards for the electric vehicle batteries are needed. Additionally, Indonesia doesn't have any relevant standards to regulate it.

This study, the FACTS approach (A Framework for Analysis, Comparison, and Testing of Standards) was used to construct a framework for standardization and testing requirements of the lithium-ion battery module products. There are 3 stages in the FACTS approach, namely analysis, comparison, and testing. The FACTS approach helps determine the tests which are needed by lithium-ion battery module in electric vehicle application. The FACTS approach gives additional information formalisms and structure, so that the developed standard will be applicable for all stakeholders. The FACTS approach only use for standardization process especially at the drafting stage. Finally, eight parameters/ tests are determined as standard draft contents for lithium-ion battery module in electric vehicle application.

7C1-2
01.30 P.M

Standard Development: Case Study of Indonesian National Standard of Cell Battery Lithium-ion Ferro Phosphate Secondary for Electric Vehicle Applications

Dana Prianjani¹, Muhammad Nizam², Fakhri Fahma³, Wahyudi Sutopo³, Agus Purwanto⁴, Bendjamin B. Louhenapessy⁵, Ary Budi Mulyono⁵, Niken Aristyawati¹

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⁵Research and Development Center, Standardization National Standardization Agency, BSN, Indonesia

Abstract

In general, the process of developing new standards had problems in early the development process. In particular to identify what steps are necessary to develop new standards. Methodology of writing this article were conducted using the methodology of FACTS (Framework for Analysis, Comparison and Testing of the Standard). The results of this paper are the new standard for the Indonesian National Standard of Lithium-ion Battery Cell Ferro Phosphate for Electric Vehicle Applications.

7C1-3
01.50 P.M

Further Study on a Short Wheel Base Recumbent Bicycle Frame Using Simulated Finite Element Analysis

Ilham Priadythama, Bambang Suhardi, Iksan Adiasa

Industrial Engineering Department, Sebelas Maret University, Indonesia

Abstract

Bicycle development as a mode of urban transport by consider the ergonomic and health aspects have been developed since 2011 by the Department of Industrial Engineering, Sebelas Maret University. Based on the result, we get that the Short Wheel Base Recumbent Bike selected as the best concept for an urban condition. Then the prototype was made. The results of the prototype, it was discovered that the bike have a high weight because of the structure of a frame that made from steel with a large size and thick material. We still use steel as the frame material because it has low price, high manufacture ability, high formability more than other materials and highly recommended for the material of the bike in urban area. Because these problem, the research has continued to get the standard tube using simulated finite element analysis (FEA) which eventually resulted the best tube geometry for SWB Recumbent Bike is rectangular steel tube 30 x 60 mm with the material wall thickness is 1.3 mm. But the results are not optimal because the size of the dropout on the main frame is not calculated. So we need more research to find the size of the main frame by calculating the size of dropout.

This study aims to determine did using the size of underneath (25 x 50 mm) and with reduce the size of dropouts remain capable and safe in use for SWB recumbent bike frame material. This research same as before, use Autodesk Inventor to Simulation Finite Element Analysis. As the result, rectangular steel tube 25 x 50 mm with the reduction of the dropout still capable and safe in use for SWB Recumbent Bicycle.

7C1-4
02.10 P.M

Manual Wheelchair Intervention on Transmition System by Assistive Technology to Increase User Mobility

Febriana Kusumawardani¹, Susy Susmartini², Lobes Herdiman²

¹*Department of Industrial Engineering, University of Sebelas Maret, Indonesia*

²*Master Program of Industrial Engineering, Graduate Program of Sebelas Maret University, Indonesia*

Abstract

Mobility is an individual's ability to be able to move freely, easily, and organized with the aim to meet the needs of the activity in order to maintain health. Individuals who have limited runs require walking aids, one of these tools is a manual wheelchair. The need for technology applied to these tools, so as to improve the quality of life of individuals who have limited runs. The goal of this research is to intervene in problems hub to improve the mobility of the manual wheelchair's user, as efforts to implement assistive technology to increase the mobility of users. To find out the needs of users,

we design questionnaires based on seven key principles of universal design. Results of the questionnaire showed that wheelchair's users are fatigue when using a manual wheelchair. Preliminary studies indicate that the location of the hub effect is not significant to the speed of the wheelchair so that the suggestions given to improve the speed of the wheelchair is by change the type of hub. Then this design also uses TRIZ method, where there are some contradictions against the expected technical needs. Based on TRIZ methods, the inventive solution obtained is parameter changes, mechanical substitution, and self-service. So use internal gear 3-speed hub as a solution to the problems of transmission in a manual wheelchair.

7C1-5
02.30 P.M **Effect of Speedometer Positioning: Distraction and Workload While Driving**

Wiwik Budiawan, Rahadi Ferri Putranto and Dyah Ika Rinawati

Dept. of Industrial Engineering, Diponegoro University, Indonesia

Abstract

One of the automotive design car developments is speedometer position change. There are two speedometer positions used by the public, i.e. in behind the steer and on the center of dashboard. Speedometer position affects the visual scanning time information on the speedometer (glance). Total Time glances are very influential to distraction and workload while driving. The purpose of this study is to determine the position of the speedometer that minimizes distraction and workload while driving. The type of this research is a real experimental study using real cars on the road. The number of respondents involved was 12 peoples. Distraction data were obtained from the total glances while driving (using cameras). While the workload while driving was obtained from a questionnaire adapted from DALI (Driving Load Activity Index). Based on the analysis of total glances and questionnaires, speedometer on the center of dashboard showed a higher total glances and higher average value of global demand attention, visual demand, as well as stress. Consequently, in order to maintain safety and comfort in driving, the speedometer position in behind the steer is better than on the center of dashboard.

7C1-6
02.50 P.M **Optimization of PBGA Encapsulation Considering Fluid/Structure Interaction Using Response Surface Methodology**

Dadan Ramdan¹, Darianto¹, C.Y Khor²

¹*Fakultas Teknik Universitas Medan Area, Indonesia*

²*Faculty of Engineering Technology, Universiti Malaysia, Malaysia*

Abstract

This paper presents the optimization of the Plastic Ball Grid Array (PBGA) package during the encapsulation process. Optimized design of the PBGA package enhances the encapsulation process and minimizes the stress and deformation on the wires. The physical and process parameters (i.e., pressure inlet, diameter of wire, vent height, and mould filled time) were optimized via response surface methodology using central composite design (CCD) to minimize the stress of wire, wire sweep, filling time and void in package during the encapsulation process. The optimization of the PBGA encapsulation was carried out by considering the fluid/structure interaction (FSI) aspects. The optimum empirical models were examined and well confirmed with the simulation results. The optimum design of the PBGA package (30 mm × 30 mm) for both physical and process parameters was characterized by 8 wire bonds, 0.25 mm of vent thickness, 4.46 s of filling time and 2.52 % of void at the inlet condition of 10 MPa.

PARALLEL SESSION SCHEDULE

Friday, 7th October 2016 01.00 – 03.10 P.M.

Room : Pemandangan 4
 Session : Logistics and Business II
 Chair : Dr. Singgih Saptadi

7D1-1 **Development of The Industrial Zone Base Local Wisdom in Madurese - Indonesia**

01.10 P.M

Rachmad Hidayat

Department of Industrial Engineering, University of Trunojoyo, Indonesia

Abstract

The planning of an industrial zone does not merely concern that of industrial buildings; rather, it must also pay attention to other sectors affected by the operation of the industry. Thus, the planning of an industrial zone should provide an area to accommodate a wide range of the resulting activities which are the by products of the industrial activities. Madurese culture constitutes a factor with a considerable influence on the spatial plan and relates to the fact that the local customs are capable of establish the structural identity of the area. Taking into account the various physical natural constraints and trends of land use, as well as the spatial structure of the industrial zone and the surrounding area, the scope of the mapping in the planning of land use of an industrial zone should include an area of facility and utility development, open green spaces, urban areas, sewage plants, and other supporting facilities.

7D1-2 **A Game Theory Model for Stabilizing Price of Chili: A Case Study**

01.30 P.M Ari Wardayanti¹, Afgan Suffan Aviv³, Wahyudi Sutopo² and Muhammad Hisjam²

¹*Lab. of Logistics System and Business, Industrial Engineering Dept., Sebelas Maret University, Indonesia*

²*Fac. of Engineering, Sebelas Maret University, Indonesia*

³*Under Graduate Student of Industrial Engineering Dept., Indonesia*

Abstract

Chili is one of the important agricultural commodity in Indonesia because of its widely consumption by the Indonesian. Chili becomes one of the commodities that experience price fluctuations and important cause of yearly inflation in Indonesia. The unstable price of chili is affected by the scarcity of the commodity in some months and the difference of the harvest season. This study proposes a model to solve the problem by considering the substitution of fresh chilies with dried chili. We propose the cooperative of chili's farmer as entities that process fresh chili into dried. The existence of substitution products is expected to maintain the price stability chili. This research was conducted by taking a case study on chili commodity markets in Surakarta which consists of 19 traditional markets. This study aims to create a price stabilization scheme with product substitution using game theory model. There are 4 strategies proposed in game theory model to describe the relationship between producers and consumers. In this case, the producers are the farmers and the consumers are the merchants market. A mixed strategy of was chosen to determine the optimal value among 4 strategies. From the calculation results obtained optimal value when doing a mixed strategy of IDR 201,188,829,000.

7D1-3
01.50 P.M **Implementation of Lean Supply Chain Management: A Case Study on Loading Process of Fertilizer at PT Petrokimia Gresik Port**

Agus Tri Wibowo and Naniek Utami Handayani

Industrial Engineering Department, Diponegoro University, Indonesia

Abstract

PT. Petrokimia Gresik is one of the largest fertilizer producer in Indonesia which has a cross-country network of supply chain and distribution throughout the archipelago, either in bulk fertilizer or in bag fertilizer. This research was conducted at PT. PG port which is the main point of the logistics activities in the firm itself, either loading or unloading. This research focus on the process of loading the in bag fertilizer. Problems that occur in this process are due to the inefficiency of the flow of the Supply Chain, caused by the presence of waste and non-value added activities.

The purpose of this study was to determine what kind of waste that occurs during the process, as well as suggestions for improvements using the concept of Lean Supply Chain and Value Stream Mapping, and look for the cause of the problem using the 5 Whys method. The most influential types of waste during the process stream is Waiting Time (20.42%), and Non-Value Added activities of 51.9%. By using 5Whys, the largest cause of waste found are the length of the truck waiting for the cargo, numbers of crane are already inproper, and the absence of the scheduling and charge allocation. Recommended solutions are scheduling and allocation, creation of special line in the warehouse, and supplying cranes with appropriate load speed. Based on improvement suggestions, total NVA predicted to be reduced to 59.8%

7D1-4
02.10 P.M

THE ANALYSIS OF MARKET KNOWLEDGE COMPETENCE EFFECT AND RESEARCH & DEVELOPMENT (R&D) TOWARD THE POLICY MAKING OF NEW PRODUCT DEVELOPMENT

Bambang Purwanggono, Agung Sesuko and Wiwik Budiawan

Dept. of Industrial Engineering, Diponegoro University, Indonesia

Abstract

this study has three purposes. The first purpose of this study is to examine the effect of size of enterprise on the extent to which internet technology assimilates into the daily operations of the enterprise. The second purpose of this study is to examine the effect of the critical success factors on the adoption of internet technology, and the third purpose of this study is to examine the effect of adoption of internet technology on the performance of the enterprise. One hundred and thirteen SMEs of batik in Pekalongan, Central Java Province was chosen as a sample of this study. Data for this study was collected using questionnaire and personal interviews. Then, the data from the questionnaire were analyzed with Statistical Package for Social Sciences (SPSS). This study found that the critical success factor for adoption of internet technology is different between small enterprises and medium enterprises. The impact of adoption of internet technology for the performance of enterprise is higher in the medium size of enterprise than in the small size of enterprise

7D1-5
02.30 P.M

Technical Feasibility for Commercialization of Lithium Ion Battery as a Substitute Dry Battery for Motorcycle

Indah Kurniyati¹, Wahyudi Sutopo², Roni Zakaria³ and Evizal Abdul Kadir⁴

¹Laboratory of Business and Logistic System, Departement of Industrial Engineering, Sebelas Maret University, Indonesia

²Industrial Engineering and Techno-economics Research Group, Departement of

Industrial Engineering Faculty of Engineering, Indonesia

³*Departement of Industrial Engineering Faculty of Engineering, Sebelas Maret University*

⁴*Wireless Communication Centre, Faculty of Electrical Engineering, Universiti Teknologi Malaysia, Malaysia*

Abstract

Dry battery on a motorcycle has a rapid rate of voltage drop, life time is not too long, and a long charging time. This are problems for users of dry battery for motorcycle. When the rate in the voltage decreases, the energy storage in the battery is reduced, then at the age of one to two years of battery will be dead and can not be used, it makes the user should replace the battery. New technologies development on a motorcycle battery is lithium ion battery. Lithium ion battery has a specification that has been tested and possible to replace dry battery. Characteristics of lithium ion battery can answer the question on the dry battery service life, the rate of decrease in voltage and charging time. This paper discusses about the technical feasibility for commercialization of lithium ion battery as a substitute cleaning in motorcycle battery. We proposed methodology of technical feasibility goldsmith commercialization by using a model of the technical feasibility and reconfirm the technical standard using the national standard of motorcycle battery. The battery has been through all the stages of the technical feasibility of the goldsmith model. Based on the results of the study, lithium ion batteries have the minimum technical requirements to be commercialized and has been confirmed in accordance with the standard motorcycle battery. This paper results that the lithium ion battery is visible to commercialized by the technical aspect.

PARALLEL SESSION SCHEDULE

Friday, 7th October 2016 01.00 – 03.10 P.M.

Room : Karaton I
Session : Manufacturing and Quality Management II
Chair : Dr. Eko Liquidanu

7E1-1 **Multi-Objective Optimization Model of CNC Machining to Minimize Processing time and Environmental Impact**

01.10 P.M

Aulia Hamada, Cucuk Nur Rosyidi and Wakhid Ahmad Jauhari

Department of Industrial Engineering Faculty of Engineering, Sebelas Maret University, Indonesia


Abstract

Minimizing processing time in a production system will increase the efficiency of a manufacturing company. Processing time is influenced by several machining parameters such as cutting speed, feed rate, and depth of cut. However, the machining parameters not only affect the processing time but also affect the environmental impact. Hence, optimization model is needed to optimize the machining parameters to minimize the processing time and environmental impact. In this paper, a multi-objective optimization is developed to minimize the processing time and environmental impact which will result in optimal decision variables of cutting speed and feed rate. Environmental impact is converted from environmental burden through the use of eco-indicator 99. In the numerical example, OptQuest optimization software from Oracle Crystal Ball is used to solve the model.

7E1-2
01.30 P.M **Study of Inventory Control in Manufacturing Process Based on Lean Six Sigma**

Hong Chen

College of Electrical Engineering, Zhejiang University, Chinese


Abstract

The inventory cost has important impact on the production cost. In order to get the maximum circulation of funds of enterprise with minimum inventory cost, the inventory control with Lean Six Sigma is presented in supply chain management. The inventory includes both the raw material and the semi-finished parts in manufacturing process. Though the inventory is often studied, the inventory control in manufacturing process is seldom mentioned. This paper reports the inventory control from the perspective of manufacturing process by using statistical techniques including DMAIC, Control Chart, and Statistical Process Control. The process stability is evaluated and the process capability is verified with Lean Six Sigma philosophy. The demonstration in power meter production shows the inventory is decreased from 25% to 0.36%, which indicates the inventory control can be achieved with Lean Six Sigma philosophy and the inventory cost in production can be saved for future sustainable development in supply chain management.

7E1-3
01.50 P.M **Simulation System Optimize The Process Of Time Product Packaging Tin Plate Coil PT. LTX**

Dyah Lintang Trenggonowati

Industrial Engineering Department, Engineering Faculty, Sultan Ageng Tirtayasa University, Indonesia

Abstract

PT. LTX is a company engaged in manufacturing that produce tin plate coil form. Coil packaging process needs to be done before it is sent to the customer. In the process of packaging the coil is found on the machine appender bottleneck causing measurement stations of diameter and wrapping coil to be delayed which makes the time coil packaging is not optimal. This study aims to determine the simulation model of the existing coil packaging process, determining the proposed improvements to optimize the timing of coil packaging process, as well as find out the time optimal coil packaging process. This study uses a software simulation with ProModel 7.5. ProModel simulation results showed that the average time coil packaging process for 657.81 hours per month, so that made three design alternatives and the best improvement is the third alternative with the addition of resources such as forklifts and additional mounting stations crown that yield an average of 315.296 hours per month.

7E1-4
02.10 P.M

Original Observations-based Control Charts for Monitoring the Mean of Autocorrelated Processes: A comparison among modified Shewhart, modified EWMA, and ARMAST charts

Muhammad Mujiya Ulkhaq¹, Favian Dewanta²

¹*Department of Industrial Engineering, Diponegoro University, Indonesia*

²*School of Electrical Engineering, Telkom University, Indonesia*

Abstract

Conventional control charts are considered satisfied enough to monitor the observations that are assumed to be independent and identically distributed (IID). Nevertheless, in real industry environment, the process data exhibits some serial dependence or autocorrelation in which the IID assumption is violated. With the presence of autocorrelation, the control limits of the control charts should be loosened since the tight control limits can decrease the in-control average run length (ARL); thus, lead to a higher false alarm rate. This paper aims to compare the performance and investigate the relative effectiveness of three control charts: modified Shewhart (mShewhart), modified EWMA (mEWMA), and ARMAST charts, based on the original observations when the process data follows ARMA(1,1) model. The parameters of those charts are manipulated to give the in-control ARL of 370. The simulation results shows that the mShewhart chart is not completely robust to the deviation from IID assumption for small mean shifts. Although the mEWMA chart is very good at detecting small mean shift, the optimal ARMAST chart outperforms the mEWMA chart when there is autocorrelation in the process. In addition, the ARMAST chart also surpasses the mShewart in



monitoring large mean shift.

7E1-5
02.30 P.M

CIMOSA Process Classification for Business Process Mapping in Non Manufacture Firms: A Case Study

Effi Latiffianti, Nurhadi Siswanto, Stefanus Eko Wiratno and Yudha Andrian Saputra

Department of Industrial Engineering, Institut Teknologi Sepuluh Nopember (ITS), Indonesia

Abstract

A business process mapping is one important means to enable an enterprise to effectively manage the value chain. One of widely used approaches to classify business process for mapping purpose is Computer Integrated Manufacturing System Open Architecture (CIMOSA). CIMOSA was initially designed for Computer Integrated Manufacturing (CIM) system based enterprises. This paper aims to analyze the use of CIMOSA process classification for business process mapping in the firms that do not fall within the area of CIM. Three firms of different business area that have used CIMOSA process classification were observed: an airline firm, a marketing and trading firm for oil and gas products, and an industrial estate management firm. The result of the research has shown that CIMOSA can be used in non-manufacturing firms with some adjustment. The adjustment includes addition, reduction, or modification of some processes suggested by CIMOSA process classification as evidenced by the case studies.

PARALLEL SESSION SCHEDULE

Friday, 7th October 2016 01.00 – 03.10 P.M.

Room : Karaton II
Session : System Modelling II
Chair : Dr. Cucuk Nur Rosyidi

7F1-1
01.10 P.M **Optimal Manpower Allocation in Aircraft Line Maintenance (Case in GMF AeroAsia)**

Violita Effelin Puteri¹, Yuniaristanto², Muhammad Hisjam²

¹*Logistics System and Business Laboratory, Sebelas Maret University, Indonesia*

²*Department of Industrial Engineering, Sebelas Maret University, Indonesia*

Abstract

This paper presents a mathematical modeling to find the optimal manpower allocation in an aircraft line maintenance. This research focuses on assigning the number and type of manpower that allocated to each service. This study considers the licenced worker or Aircraft Maintenance Engineer Licence (AMEL) and non licenced worker or Aircraft Maintenance Technician (AMT). In this paper, we also consider the relationship of each station in terms of the possibility to transfer the manpower among them. The optimization model considers the number of manpowers needed for each service and the requirement of AMEL worker. This paper aims to determine the optimal manpower allocation using the mathematical modeling. The objective function of the model is to find the minimum employee expenses. The model was solved using the ILOG CPLEX software. The results show that the manpower allocation can meet the manpower need and the all load can be served.

7F1-2
01.30 P.M **Location and Allocation Decision for Supply Chain Network of Cajeput Oil (Case in XYZ Company)**

Finda A. Mahardika¹, Muhammad Hisjam², Budi Widodo³, Bobby Kurniawan⁴

¹*Laboratory of Logistics and Business System, Department of Industrial Engineering, Sebelas Maret University, Indonesia*

²*Department of Industrial Engineering, Sebelas Maret University, Indonesia*

³*Research and Development Center Perum Perhutani Cepu, Indonesia*

⁴*Department of Industrial Engineering, University of Sultan Ageng Tirtayasa, Indonesia*

Abstract

Cajeput oil is a very promising business. And now, the fulfillment of Cajeput oil in Indonesia is still lacking. It's because the rate of production Cajeput leaves in Indonesia is still low. In Indonesia, XYZ company manages forests in 7 region. XYZ currently are developing Cajeput oil business. XYZ is currently doing business productivity improvement of cajeput by planting cajeput trees in Tangen, Sragen. Besides the Cajeput trees planting program, XYZ plan to do the construction distillery Cajeput leaves. The purpose of the research in this paper is to minimize the total cost of the supply chain network of Cajeput oil in XYZ and to determine whether the construction of a Cajeput distillery should be done or not. This paper uses mixed integer linear programming to make mathematical models. To minimize the total cost, used IBM® ILOG®CPLEX software. From IBM® ILOG®CPLEX software. From the calculation ILOG®CPLEX IBM® software can be seen that the minimum total cost would be obtained if XYZ opened a new distillery with a capacity of 25000kg and a new factory with a capacity of 10000kg. Besides all the truck owned can be used

entirely at optimal capacity.

7F1-3
01.50 P.M

Multi-Objective Problem of The Modified Distributed Parallel Machine and Assembly Scheduling Problem (MDPMASP) with Eligibility Constraints

Ikhlusal Amallynda, Budi Santosa

Industrial Engineering Department, Institute of Technology Sepuluh Nopember, Indonesia

Abstract

In this paper we consider some realistic complexity of scheduling problem. First, we study the distributed parallel machines and assembly scheduling problem (DPMASP) with eligibility constraints. There is a set of identical factories with parallel machines in the first stage and a single assembly machine in the second stage. But in fact, many companies collaborate with several different factories to support the production and supply chain process. Moreover, a factory definitely has several parallel machines which have different specifications and capacities. So we developed a new scheduling problem called modified distributed parallel machine and assembly scheduling problem (MDPMASP) with eligibility constraints to accommodate these conditions. The scheduling problem in this paper consists of two stages, production, and assembly. The first stage comprises non-identical factories, where each factory consists of several non-identical unrelated parallel machines. Jobs have to be assigned to one of the machines at the certain factory. Finished jobs at the production stage are assembled into final products through an identical assembly program in the second stage by a single assembly machine. Second, we consider the multi-objective problem of minimizing the mean flow time and the number of tardy products simultaneously. This problem, which is known to be NP-hard, is important in practice, as the former criteria reflect the customer's demand and the manufacturer's perspective in supply chain and production system. The main contribution of our work is a development of an existing scheduling problem (DPMASP) and presentation of a new methodology for solving the proposed problem. MDPMASP with eligibility constraints being an NP-hard problem, therefore we proposed four simple heuristic algorithms based on beam search algorithm and NR algorithm, and two proposed metaheuristic algorithms based on genetic algorithm (GA) and simulated annealing (SA) to solve both of problem. Our computational experiments indicate that the proposed algorithms find efficient solutions in most cases. Various parameters and operators of the proposed algorithms are discussed and calibrated by means of Taguchi statistical technique. All proposed algorithms are tested with Matlab software. Result show that the proposed problem and algorithms is able to be implemented and to solve moderately-sized instances, and giving best solutions close to optimum.

- 7F1-4 Yarn Supplier Selection Using Analytical Hierarchy Process (AHP) and
02.10 P.M Standardized unitless Rating (SUR) Method on Textile Industry
Muhammad Hendy Erfaisalsyah, Agus Mansur, Annisa Uswatun Khasanah
Department of Industrial Engineering, Universitas Islam Indonesia, Indonesia

Abstract

For a company which engaged in the textile field, specify the supplier of raw materials for production is one important part of supply chain management which can affect the company's business processes. This study aims to identify the best suppliers of raw material suppliers of yarn for PC.GKBI based on several criteria. In this study, the method used to assess the performance of the suppliers is the integration between the Analytical Hierarchy Process (AHP) and the Standardized Unitless Rating (SUR). By using AHP, we can know the value of the relative weighting of each criterion. While SUR shows the sequence performance value of the supplier. Supplier ranking calculation results can be used to know the strengths and weaknesses of each supplier based on its performance criteria. From the final result it can be known which suppliers should correct or improve their performance in order to create long term cooperation.

icimece

PARALLEL SESSION SCHEDULE

Friday, 7th October 2016 03:35 - 05.15 P.M.

Room : Pemandangan 1
Session : Electrical Engineering IV
Chair : Dr. Arwindra Rizqiawan



- 7A2-1 **Wireless Water Flow Monitoring Based On Android Smartphone**
03:35 P.M Anif Jamaluddin¹, Dewanto Harjunowibowo², Dwi Teguh Rahardjo³, Egy Adhitama⁴, Syamsul Hadi⁵
¹²³⁴Physics Education Department Sebelas Maret University, Indonesia
⁵Mechanical Engineering Department Sebelas Maret University, Indonesia

Abstract

In this study, a wireless data acquisition system was developed for wireless water flow monitoring (WWFM) in a closed channel pipeline system using android Smartphone. ATMEGA 328 single chip microcontroller (Arduino Uno Prototyping Platform) with a Bluetooth module, Near Field Communication - NFC tag, Smartphone with NFC reader, and G1- ½ water flow sensor are applied in this design. The frequency input to the

microcontroller was the pulse train which transferred from the G1- ½ hall-effect water flow sensor. Then, the data from the microcontroller was transferred to an Android Smartphone using Bluetooth wireless serial communication. In addition, the NFC-tag is used as water flow sensor identification and location. Android Application was designed based on App Inventor for Android (AIA) which MIT platform. As the result, sensor ID based on NFC tag and flow rate of water using Android application on Smartphone was showed by the system. According to the experimental test, the flow monitoring ran well and displayed real-time of flow water in the closed channel pipeline system. The accuracy of wireless water flow measurement is 99.98%.

7A2-2 **Electric Field Analysis in 150kV GIS Bushing**

03:55 P.M Syarif Hidayat, Rachmad Pujianto, Umar Khayam

Department of Electrical Power Engineering, School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Indonesia

Abstract

This paper deals with the electric field optimization on the bushing of 150 kV Gas Insulated Substation (GIS) using functionally gradient material (FGM). The basic bushing insulation model is made from oil impregnated paper with permittivity equals 4. The dimension of the model of the bushing before and after modification is the same. FGM is done by reducing the size of the bushing insulation basic model up to 90% and adding the material whose higher permittivity on the top of the basic material up to 100%. Mica with relative permittivity 9 is chosen as grading material. Therefore the bushing with FGM consist of oil impregnate paper with relative permittivity 4 and mica with relative permittivity 9. The mica material is placed between the conductor and oil impregnated paper. The maximum electric field intensity on 150 kV GIS bushing without modification is 80.54 kV/cm. The maximum electric field intensity is still below the electric field breakdown of oil impregnated paper (284 kV/cm). FGM modification with Mica layer reduces the maximum electric field on spacer to 66. 55 kV/cm

7A2-3 **Electric Field Optimization on 150 kV GIS Spacer using Functionally Gradient Material**

04.15 P.M

Fransiskus Damanik, Umar Khayam

Department of Electrical Power Engineering, School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Indonesia

Abstract

Gas Insulated Substation (GIS) requires spacer for supporting conductor.

Spacer as supporting insulator is one of component in GIS that has been reported to have failures in operation[1]. Electric field distribution in 150 kV GIS spacer will be analyzed in this paper. Spacer will be modified to reduce electric field intensity especially on triple junction area (conductor, SF6 and spacer).

7A2-4
04.35 P.M

Computer Facial Animation with Synthesize Marker on 3D Faces Surface

Samuel Gandang Gunanto, Mochamad Hariadi, Eko Mulyanto

Department of Electrical Engineering, Institut Teknologi Sepuluh Nopember, Indonesia

Abstract

An animated character has its own characteristics and behaviour. The animator needs to be skilled enough to make a complex animation, especially on making face expression. A Well defined facial expression can represent the emotional condition and make the animation more expressing the mood. But most facial animation is done by manually, frame-by-frame. It is very time-consuming. This research proposed a combination methods for handling the facial animation based on marker location and face surface from the 3D character. The motion data captured based on the location and movement of the marker then implemented on 3D face model to generate the motion guidance. As a guidance, this marker data role as a centroid of a vertex cluster. The cluster provided by implementing segmentation fp-NN Clustering method based on surface and can visualize the deformation using linear blend skinning methods. The result from this research shows that this system can automatically generate facial animations based on the marker data and the surface segmentation. The visualization of deformation arranges accordingly to the motion captured data and organized sequentially.

7A2-5
04.55 P.M

Static Analysis of STATCOM Placement Effect on the Voltage Quality and Available Transfer Capability

Taufik Aristo, Sasongko Pramono Hadi, Yusuf Susilo Wijoyo

Department of Electrical Engineering and Information Technology, Universitas Gajah Mada, Indonesia

Abstract

Optimization of the existing transmission line is important nowadays. The optimization can be done by adjusting reactive power in the transmission line. Static compensator (STATCOM) can be used to adjust the reactive

power on the network. By optimal placement using voltage stability index with relative voltage change method, the potential of STATCOM to improve voltage quality and available transfer capability (ATC) is evaluated through simulation. The simulation shows that voltage quality improved, indicated by the voltage magnitude that close to one p.u. and increasingly sloping curve. The ATC, on normal load Increased by 39.21% and on heavy load ATC increased by 116.26%.

PARALLEL SESSION SCHEDULE

Friday, 7th October 2016 03:35 - P.M.

Room : Pemandangan 4

Session : Product Design and Ergonomics II

Chair : Dr. Eko Pujiyanto

7D2-1 **Design of Smart Medicine Box for Elderly Person Based on Quality Function Deployment (QFD)**

03:35 P.M

Brina Cindy Lestari¹, Dyah Santhi Dewi², Rusminto Tjatur Widodo³

¹²*Department of Industrial Engineering, Sepuluh Nopember Institute of Technology, Indonesia*

³*Department of Electrical Engineering, Electronic Engineering Polytechnic Institute of Surabaya, Indonesia*

Abstract

The elderly who has a particular disease need to take some medicines in everyday with correct dosages and appropriate by time schedules. However, the elderly frequently forget to take medicines because of their memory weakened. Consequently, the product innovation of elderly healthcare is required for helping elderly takes some medicine more easily. This research aims to develop a smart medicine box by applying quality function deployment method. The first step is identifying elderly requirements through an ethnographic approach by interviewing thirty two of elderly people as respondents. Then, the second step is translated elderly requirements to technical parameter for designing a smart medicine box. The smart box design is focused on two main requirements which have highest importance rating including alarm reminder for taking medicine and automatic medicine box. Finally, the prototype design has been created and tested by using usability method. The result shown that 90% from ten respondents have positive respond on the feature of smart medicine box. The voice of alarm reminder smart medicine box is easy to understand by elderly people for taking medicines.

7D2-2 **The Application of Quality Function Deployment and Ergonomic: A**

03:55 P.M **Case Study for A New Product Design of A Texon Cutting Tool**

Rosnani Ginting, Ukurta Tarigan, Nismah Panjaitan

Department of Industrial Engineering, University of North Sumatra

Abstract

The process of Leather Shoe manufacturing are consists of two parts, namely the upper and lower part (layer). The layer is contained the process of making and cutting patterns of Texon. Texon is a material that is as hard as cardboard that is used as a layer pattern forming shoe. This work was done using manual tools, and tend to ignore the principles of ergonomics. The main approach of this research is using Quality Function Deployment (QFD). The main focus of QFD is to engage the customers in the product development process at the beginning of the planning, which needs and customer desires are used as the starting point of the QFD process, and it is referred as the Voice of Customer. The underlying philosophy is that customers are not always satisfied. The evaluation and ergonomic considerations in the design of cutting tools Texon pattern is indicated through Anthropometric data applications that are relevant to the design of Texon.

7D2-3 **Conceptual Design of Wearpack with Physiology Detector Feature Based On Wearable Instrumentation**

04.15 P.M

Melani Sukirman¹, Pringgo Widyo Laksono², Ilham Priadythama³, Susy Susmartini⁴ and Bambang Suhardi⁵

^{1,3,4,5}*Industrial Engineering Department, Faculty of Engineering, Sebelas Maret University, Indonesia*

²*Center Study of Technology Development and Industrial Collaboration, Indonesia*

Abstract

Every company in Indonesia is responsible for their worker health and safety condition as mentioned in UU No I year 1970. In manufacturing industries there are many manual task dealing with high work load and risk, so that they require excellent concentration and physical condition. There is no ideal way to guarantee worker safety without a real time physiological monitoring. This paper reports our ongoing study in conceptual design development of worker's clothing which is equipped with a wearable instrumentation system. The system is designed to detect and measure body temperature and pulse in real time. Some electrical components such as, LCD (liquid crystal display), LEDs (light emitting diode), batteries, and physiological sensors were assembled. All

components are controlled by a wearable on board controller. LEDs is used as alert which can indicate abnormal physical conditions. The LCD was added to provide more detail information. TMP 36 and XD-58C were selected as the physiological sensors. Finally, an Arduino Lilypad was chosen for the controller. This instrumentation system was verified by accurately detected and inform physiological condition of 3 subjects. Further we are going to attach the system to a worker's clothing which was specifically designed to simple and comfort usage.

7D2-4
04.35 P.M

MANAGEMENT SYSTEM OF HEALTH AND SAFETY WORK (SMK3) WITH JOB SAFETY ANALYSIS (JSA) IN PT NIRA MURNI CONSTRUCTION

Melliana, Armen, Yusrizal, Syarifah akmal

Department of Industrial Engineering Management, School of Technology Dumai, Indonesia

Abstract

PT Nira Murni construction is a contractor of PT Chevron Pacific Indonesia which engaged in contractor, fabrication, maintenance construction suppliers, and labor services. The high of accident rate in this company is caused the lack of awareness of workplace safety. Therefore, it requires an effort to reduce the accident rate on the company so that the financial losses can be minimized. In this study, Safe T-Score method is used to analyze the accident rate by measuring the level of frequency. Analysis is continued using risk management methods which identify hazards, risk measurement and risk management. The last analysis uses Job safety analysis (JSA) which will identify the effect of accidents. From the result of this study can be concluded that Job Safety Analysis (JSA) methods has not been implemented properly. Therefore, JSA method needs to follow-up in the next study, so that can be well applied as prevention of occupational accidents.

7D2-5
04.55 P.M

The Workplace Climate and Workload of Batik Merak Manis Laweyan Production Room

Bambang Suhardi¹, Sry Yohana Simanjuntak², Pringgo Widyo Laksono³ and Dewanto Harjunowibowo⁴

Department of Industrial Engineering, Sebelas Maret University, Indonesia

Architecture and Built Environment Department, The University of Nottingham, England

Abstract

The work environment is everything around the labours that can affect them in the exercise of duties and work that is charged. In a work environment, there are workplace climate and workload which affect the labour force in carrying out its work. The working climate is one of the physical factors that could potentially cause health problems towards labour at extreme conditions of hot and cold that exceed the threshold limit value allowed by the standards of health. The climate works closely related to the workload accepted by workers in the performance of their duties. The influence of workload is pretty dominant against the performance of human resources and may cause negative effects to the safety and health of the labours. This study aims to measure the effect of the work climate and the workload against workers productivity. Furthermore, some suggestions to increase the productivity also been recommended. The research conducted in production room of Batik Merak Manis Laweyan. The results showed that the workplace climate and the workload at eight stations in production room of Merak Manis do not agree to the threshold limit value that has been set. Therefore, it is recommended to add more opening windows to add air velocity inside the building thus the humidity and temperature might be reduced.

7D2-6
05.15 P.M. **A Proposed Power Assisted System of Manual Wheelchair Based on Universal Design for Eldery**

Cindy Wahyufitriyani, Susy Susmartini, Lobes Herdiman and Ilham Priadythama

Department of Industrial Engineering, University of Sebelas Maret, Indonesia

Abstract

Difficulties in walking is high percentage case in the limitations mobility of the elderly. An assisted technology commonly used to help the elderly who have walking difficulty is a manual wheelchair. However, the elderly frequently experiences difficulties in operating manual wheelchair due to gradually degradation of their physical condition. Preliminary study results showed that the average grip strength of the hands of seven elderly subjects was 13.8 ± 6.96 kg and the value is relatively weak. In addition, the mean maximum speed of 7 elderly subjects when doing to round the wheelchair is 0.6 ± 0.2 m / s. This value is only 56.4% compared with an average speed of 20-23-year age group (8 males), which is 1.1 ± 0.1 m / s. This shows that the elderly who have walking difficulty have low grip strength and speed in operating a wheelchair. On the other hand, manual wheelchairs suffer an inadequate technology solution to solve the problem. Therefore, an assistive technology is proposed to create mobility aid to accommodate the elderly needs. One approach used is Universal Design. This paper proposes a system of intervention in the manual wheelchair

through the 7 principles of Universal Design approach. The preliminary principle has not been able to accommodate the needs of the elderly will become a reference in the proposed design of this study

PARALLEL SESSION SCHEDULE

Friday, 7th October 2016 03:35 - 04:35 P.M.

Room : Karaton I
Session : Logistic and Business III
Chair : Dr. Cucuk Nur Rosyidi

7E2-1 **Open Pit Mining Profit Maximization Considering Selling Stage and Waste Rehabilitation Cost**
 03:35 P.M

Benazir Imam Arif Muttaqin, Cucuk Nur Rosyidi

Master Program of Industrial Engineering, Graduate Program Sebelas Maret University, Indonesia

Abstract

In open pit mining activities, determination of the cut-off grade becomes crucial for the company since the cut-off grade affects how much profit will be earned for the mining company. In this study, we developed a cut-off grade determination modes for the open pit mining industry considering the cost of mining, waste removal (rehabilitation) cost, processing cost, fixed cost, and selling stage cost. The main goal of this study is to develop a model of cut-off grade determination to get the maximum total profit. Secondly, this study is also developed to observe the model of sensitivity based on changes in the cost components. The optimization results show that the models can help mining company managers to determine the optimal cut-off grade and also estimate how much profit that can be earned by the mining company. To illustrate the application of the models, a numerical example and a set of sensitivity analysis are presented. From the results of sensitivity analysis we conclude that the changes in the sales price greatly affects the optimal cut-off value and the total profit.

7E2-2 **Concept of Economic Readiness Levels Assessment**
 03:55 P.M Yuniaristanto¹, Wahyudi Sutopo², Anugerah Widiyanto³, Arinda Soraya⁴

¹ *Industrial Engineering Department, Sebelas Maret University*

² *Industrial Engineering and Techno-economics Research Group, Sebelas Maret University*

³ *Technology Incubation Center, Agency for the Assessment and Application of Technology Jakarta*

⁴ *Laboratory of Business and Logistic System, IE Department, Sebelas Maret University*

Abstract

This research aims to build a concept of Economic Readiness Level (ERL) assessment for incubator center. ERL concept is arranged by considering both market and business aspects. Every aspect is divided into four phases and each of them consists of some indicators. Analytic Hierarchy Process (AHP) is used to develop the ERL in calculating the weight of every single aspect and indicator. Interval scale between 0 and 4 is also applied in indicator assessment. In order to calculate ERL, score in every indicator and the weight of both the aspect and indicator are considered. ERL value is able to show in detail the innovative product readiness level from economic sight, market and business aspect. There are four levels in Economic Readiness Level scheme which are investigation, feasibility, planning and introduction

7E2-3

Targeting as the Basis for Pre-test Market of Lithium-ion Battery

04:15 P.M Yuniaristanto¹, Roni Zakaria², Virda Hersy Lutviana Saputri³, Wahyudi Sutopo⁴, Evizal Abdul Kadir⁵

^{1,2}*Industrial Engineering Department, Faculty of Engineering, Sebelas Maret University, Indonesia*

³*Laboratory of Business and Logistic System, Sebelas Maret University, Indonesia*

⁴*Industrial engineering and Techno-economics Research Group, Sebelas Maret University*

⁵*Wireless Communication Centre, Universiti Teknologi Malaya, Malaysia*

Abstract

In general, process associated with marketing is a challenge in the commercialization of new technologies. The successful marketing of technology products is determined by the efforts in commercialization process. In technology commercialization process scheme, products of Research and Development of the University along with the tenant are incubated in a business incubator as the first step. In a business incubator the entrepreneurs candidate is encouraged to be proactive and support value added in order to establish a successful start-up company. This article discusses about market segmentation and target as a first step in market pre-test of a new technology. Lithium ion battery which is commercialized through start-up companies is the case study. This start-up companies must be able to respond the changes and bring in customers as well as maintain them so that companies can survive and evolve to achieve its objectives. The start-up companies conducts a market survey to determine consumer wants and needs, target market, and know consumers

review of the lithium ion battery product. The research aims to segment customers and target marketing actions effectively. Marketing strategy (segmentation and targeting) is used to make questionnaire and cluster analysis in data processing. Respondents were selected by purposive sampling and have obtained data as many as 80 samples. As the results study, there are three cluster segmentations for lithium ion battery with their own distinguished characteristics.

7E2-3
04:35 P.M

Universities' innovation and technology commercialization: challenges and solutions from the perspectives of Malaysian Research Universities

Amran Rasli¹, Tan Owee Kowang²

¹*Director, Innovation and Commercialization Centre Universiti Teknologi Malaysia*

²*Senior Lecturer, Faculty of Management Universiti Teknologi Malaysia*

Abstract

The roles of universities in the context of a nation's shift towards sustainable competitive advantage have changed drastically recently. Universities are now expected to contribute to the creation of new knowledge-based industries, i.e. to support knowledge-based economic growth through the creation of industrially-relevant knowledge/innovation and their commercialization, and to attract global MNCs in new emerging industries; and foster entrepreneurial mindset to support the future knowledge economy where stable job opportunities are no longer guaranteed. As such, there is a need to inculcate the spirit of enterprise as compared to the past where high economic growth has provided graduates with good career prospects as salaried employees, particularly in MNC subsidiaries and the government. The shift requires a bigger role in supporting innovation and commercialization, i.e. to venture beyond its traditional function of teaching, research and publication by incorporating a technology commercialization role which will inevitably help the institution to improve its global ranking. However, there are many national and operational obstacles that impede the progression of research and development to commercialization and entrepreneurship. The main challenges include: (1) lack of connectivity between the industry and academia; (2) myopic perception of the market; (3) inability to evaluate viability from ideas to innovations and beyond; (4) lack of support for investment in new technologies, and (5) lack of positive culture among academic researchers. To overcome the aforementioned obstacles, priority in developing a complete commercialization ecosystem has become a national agenda for most emerging economies.



Targeting as the basis for pre-test market of lithium-ion battery

Yuniaristanto, R. Zakaria, V. H. L. Saputri, W. Sutopo, and E. A. Kadir

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Targeting as the Basis for Pre-Test Market of Lithium-ion Battery

Yuniaristanto^{1, a)}, R. Zakaria¹, V. H. L. Saputri², W. Sutopo³, and E. A. Kadir⁴

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Abstract. This article discusses about market segmentation and targeting as a first step in pre-test market of a new technology. The benefits of targeting towards pre-test market are pre-test market can be conducted to focus on selected target markets so there is no bias during the pre-test market. In determining the target market then do some surveys to identify the state of market in the future, so that the marketing process is not misplaced. Lithium ion battery which is commercialized through start-up companies is the case study. This start-up companies must be able to respond the changes and bring in customers as well as maintain them so that companies can survive and evolve to achieve its objectives. The research aims to determine market segments and target market effectively. Marketing strategy (segmentation and targeting) is used to make questionnaire and cluster analysis in data processing. Respondents were selected by purposive sampling and have obtained data as many as 80 samples. As the results study, there are three segments for lithium ion battery with their own distinguished characteristics and there are two segments that can be used as the target market for the company.

INTRODUCTION

The role of university in the new company development is increasingly getting more attention. Due to pressure in contribution of economic development, technology commercialization, and research capitalization; there is a new understanding how universities can enhance new company development [1]. A spin-off has been chosen as the best way for the start-up company in Sebelas Maret University [2]. Before a spin-off company is launched, university must analyse the time and provides a framework to launch it qualitatively [3]. According to the Institute for Research and Community Services (LPPM) of Sebelas Maret University (UNS), there are 80 considerable innovative products as 22 patents, 43 brands and 10 copyrights in 2013. However, there is no any single study output has been successfully commercialized [4].

Sebelas Maret University has three inventions that are incubated in PIT and directed to be a university spin off [5]. In order to commercialize the spin offs successfully Technology Innovation Center of Sebelas Maret University (PIT-UNS) conducts cooperation with Technology Incubator Center of Agency for the Assessment and Application of Technology (BIT-BPPT) in incubating tenant. One of the companies is PT Futura Energi Nusantara (FEN). Product of PT FEN is 18650 lithium ion batteries, called Ferphos. Lithium ion (Li-ion) is one of the rechargeable batteries [6]. The Li-ion battery is a potential technology for commercialization as it can contribute more to market of secondary battery industry in Indonesia [7]. Based on previous research studying about mini manufacturing plant for battery 10kWH, it is feasible to implement a Li-ion battery company [8]. The technical feasibility for this lithium ion battery can meet the level 7 of TRLs [9].

Ferphos has passed one of commercialization testing step, production testing. The next stage is pre-test market. A preliminary research is conducted to determine target market of lithium ion battery as the basis of pre-test market. By doing targeting is expected to the company can focus its resources to the most profitable market segments and companies can focus on the market segment that most understandable by the company, so there is no bias during the pre-test market. This study is also interesting to do because there is no pre-test market research that begins with targeting.

Targeting has an essential role to result a better conversion [10]. For that purpose, company has the technology to locate and target consumers [11] [12]. With improved targeting technology, companies are increasingly interested in optimizing their advertisement through targeting specific consumer segments, especially when introducing new products [13].

Basically, all forms of enterprises are oriented to high profit and prosperity for all stakeholders. A company is always encouraged to achieve good outcome and acceptance of their products in the market. Various attempts were made in order to obtain maximum sales volume [14]. However, not all of those efforts are in accordance with their expectations. Some companies suffered losses due to a mismatch in determination of the marketing strategy as well as errors in the selection of market segmentation, target and position [15].

Due to the urgency for every company especially in beginning stage, the marketing strategy becomes an inevitably essential foundation of a company. It will contribute in company survival, where a good marketing strategy will be beneficial particularly in obtaining a lot of turnover, a large market, and consumers loyalty to the company's products [16]. Modern strategic marketing core consists of three main steps which are segmentation, determination of target markets and positioning [17]. Those three steps are often called STP (segmenting, targeting, positioning).

STP measurement can be used as a basis for product planning. Product planning includes process in designing products that related to marketing goals and environmental changes. Products planning based on marketing strategy will enable the company to produce products that can meet the consumer's needs [15]. Almost all of companies are applying the concept of segmentation, targeting and positioning. Due to that concept, the company may be able to recognize and classify their potential customers based on their similarities and differences [18].

Based on Fig 1, Vishal Sapru divided the consumer segment into four types for global consumption. The consumer segment, which accounted for 60.3% of total lithium-ion battery revenues in 2013, is expected to see its market share reduced to 23.9% in 2020 [19]. Based on that study, the motivation of this research are to determine the segments and target markets for lithium ion battery products especially in Indonesia. This activity becomes one of the steps for PT FEN in preparation to be a university spin-off and one part of the company's market testing.

This study is limited to identification the segments and target market of consumer lithium-ion batteries, while market positioning is not addressed. This is due to determine market position, its should compare these products apple to apple with other similar products. While the lithium ion batteries manufactured by PT FEN is a new product with custom size A5 and rarely found in the market, so is it hard to do market positioning.

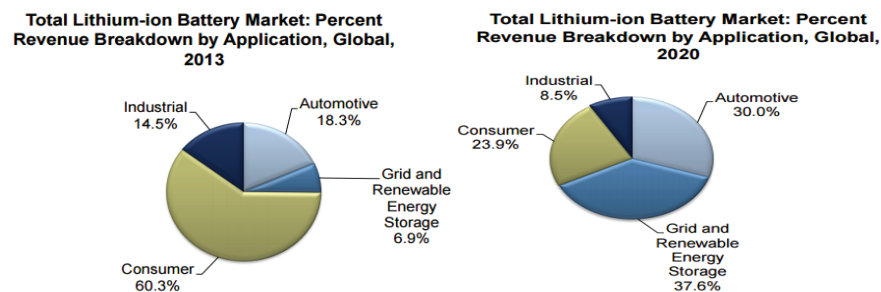


FIGURE 1. Market Overview

LITERATURE STUDY

Marketing is an activity aimed at achieving the company's goals. It is done by fulfilling the needs of customers or clients then directing the flow of goods and services that meet them from producer [20]. In that case, the company must choose the marketing strategy which will determine the target market and marketing mix [17]. Almost any marketing textbook will tell that the key to successful marketing can be summed up by the STP strategy—

segmentation, targeting, and positioning. This approach suggests that the mass market consists of some number of relatively homogeneous groups, each with distinct needs and desires [15].

Segmentation is the process of separating a market into groups of customers, prospective customers, or buying situations as some members of each resulting group are more like with those in same group than members of the other group. [21]. There are several variables that can be used as the basis for segmentation [22]:

1. Geographic: a marketing activity carried out by dividing up the market in some geographical unit characteristics such as area, population, density, and climate.
2. Demographics: a marketing activity undertaken by dividing the market into groups with the variables of age, gender, income, occupation, education, family size, religion, race, generation, citizenship, and social class.
3. Psychographics: a marketing activity carried out by dividing consumers into groups by lifestyle and personality variables.
4. Behavior: marketing activities which split consumer status over different groups by usage status, benefits sought usage occasions, readiness to buy and attitudes towards products variables.

After determining the market segments, the next step is to choose a segment that will be the target market. Target market is one or few market segments that will be the focus of marketing activities [23]. Once segments have been identified, decisions about how many and which customer groups to target can be made [24]. In choosing a target market, there are several criteria that need to be considered [23], which are:

1. The target market should be responsive to the products developed.
2. Potential sales should be quite extensive.
3. Adequate growth.
4. Target market can be achieved optimally.

Positioning includes the design and supply of corporate image for the target market and it is important to know company's position from competitor's view [25]. "Branding"," service "," reliability" and "attraction" emerged as the most dominant positioning strategy [26]. To determine the position of the product, there are three steps [23]:

1. Identify comparative advantage.
2. Choose a competitive advantage.
3. Establish and communicate the position.

Some of the basis used in the determination of the position, include: attributes, price and quality, the use of the product, class of products, and competitors [27].

STP strategy can be used as a prefix in the pre-test market as the appropriate consumers in target market will be the respondents in the pre-test market survey. Pre-test market models are increasingly being used by consumer products company for evaluating new products prior to market testing [28]. As the result from pre-test market, the products may proceed to market testing with a much higher chance of going to a national introduction. Pre-test market has long been applied to a wide range of products or services like advertising [29]. Entrepreneurs from PIT as the instance, has done a pre-test market for their technology-based products such as acoustic panels [30] and clinic management application [31]. The position of the current study are described in Table 1.

TABLE 1. Research Positions

Author	The Object of Study		Research Focus
	Segmentation	Targeting	
Mittal et. al (2016) [32]	√		Demographic segmentation, a cluster analysis approach
Young et.al (2005) [33]		√	Customer targeting method: customer map
This research	√	√	Geographic, demographic, psychographics, and behavior segmentation; cluster analysis; crosstab analysis

METHODOLOGY

The research methodology of this paper is shown in Fig.2. This research uses descriptive analytic survey method and aims to describe segments and target market of lithium ion batteries manufactured by PT FEN. The rationale to conduct the market segmentation has attracted considerable interest in marketing [27] [34] [35]. The research begins with literature study. After that, customer segments and potential markets of lithium ion batteries are analyzed. Then,

it is continued with targeting that will be set in the minds of customers. In this paper, there are four segmentation variables which are: geographic, demographic, psychographic, and behavior.

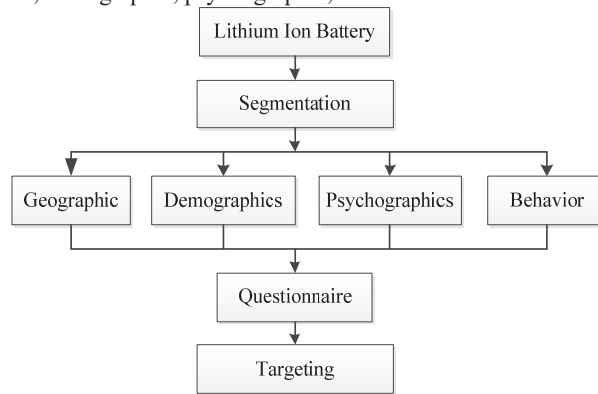


FIGURE 2. Research methodology

Primary data were collected by distributing questionnaires to the end-customer of battery. The population of this research is all batteries consumer in Indonesia. While the number of research samples were taken by 80 respondents who have bought and used lithium ion batteries.

The first step in data processing in this study is the examination of the completeness of the questions contents list. The next step is entry the respondent's answer data and integrated them in the form of a code into the computer. Then, data analysis is done by descriptive analysis to all variables and cluster analysis to learn the market segment. After that, the determination of market segments that will be targeted is done by the justification of researchers based on type of lithium ion battery manufactured by the company.

This research is used as a basis for pre-test market of products 18650 cylindrical rechargeable lithium ion battery cell from PT FEN. Products manufactured by PT FEN has a trade name Ferphos. This battery has 3.2 V voltage and 1300 mAh capacity. While the size of the battery is 18 mm of diameter and 65 mm of height. The product is shown in Fig. 3.



FIGURE 3. Ferphos rechargeable battery

RESULTS AND DISCUSSION

This research uses a public survey to collect data. Data processing and analysis is run by software SPSS 20 which include descriptive analysis, cluster analysis, and crosstab analysis. As the results, segmentation and target market of lithium ion battery products can be identified.

Description the Profile of Respondents

Descriptive analysis is used to describe the data that have been collected in order to make the data more easily and quickly understood by others. The profile of respondents is shown in Table II. Here is a descriptive analysis based on the results of the questionnaire for the lithium ion battery.

TABLE 2. The Profile Of Respondents

Variable		n	%
Gender	Male	28	35%
	Female	52	65%
Year of birth	> 1993	6	8%
	≤ 1993	74	93%
Education	SD/SMP/SMA	70	88%
	Diploma	1	1%
	Bachelor	8	10%
	Master	1	1%
Work	Student	1	1%
	College student	68	85%
	Government employees	2	3%
	Private	3	4%
Income	Entrepreneur	6	8%
	< IDR 1.000.000	29	36%
	IDR 1.000.000 to IDR 2.500.000	38	48%
	IDR 2.500.001 to IDR 5.000.000	11	14%
	> IDR 5.000.000	2	3%
Using of battery each month	1-3 pieces	74	93%
	4-8 pieces	5	6%
	> 8 pieces	1	1%
Place to buy battery	Online	3	4%
	Outlet	59	74%
	Exhibition	4	5%
	Supermarket	7	9%
	Electrical appliance shop	7	9%

According to Table II, many respondents of this research using 1-3 lithium ion batteries each month (93%) and make purchases at outlets (74%). Some respondents (31%) had suffered damage when using batteries. Among respondents mention the type of damage that occurs is leaking battery, the battery expands, and battery drop.

Based on descriptive analysis it can be known what kind of applications of lithium batteries that have been used by the respondent. Most respondents are already using lithium in electronic devices such as smartphones, tablets, notebook and power bank as shown in Fig.4. While in Fig. 5, it is noticeable that durability, long lasting, battery capacity, quality and price in sequence are dominating criteria used by respondents as consideration in purchasing lithium ion battery.

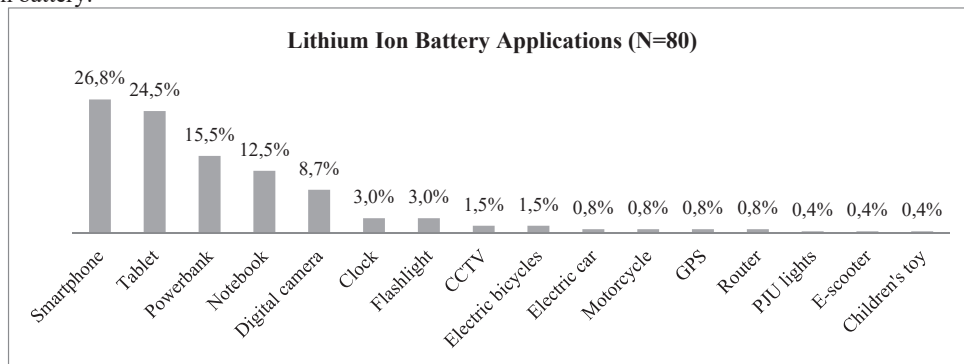


FIGURE 4. Lithium ion battery applications

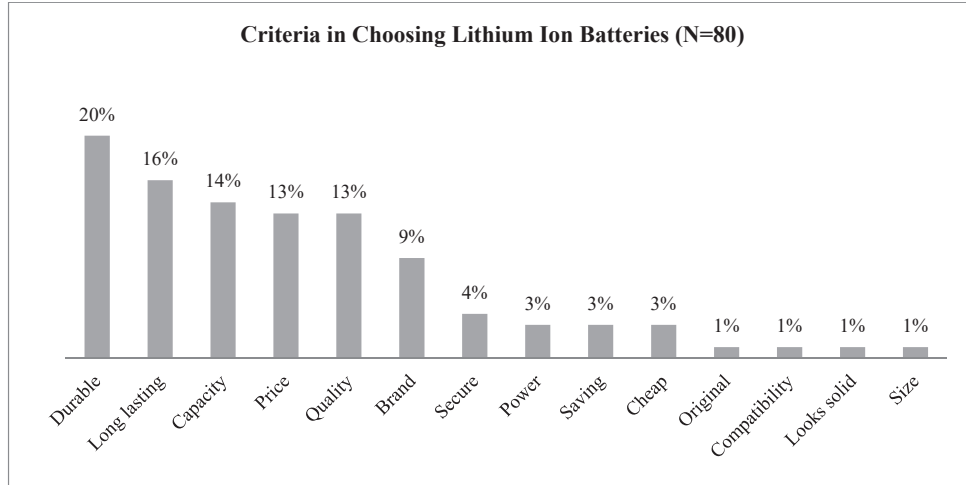


FIGURE 5. Criteria in choosing lithium ion batteries

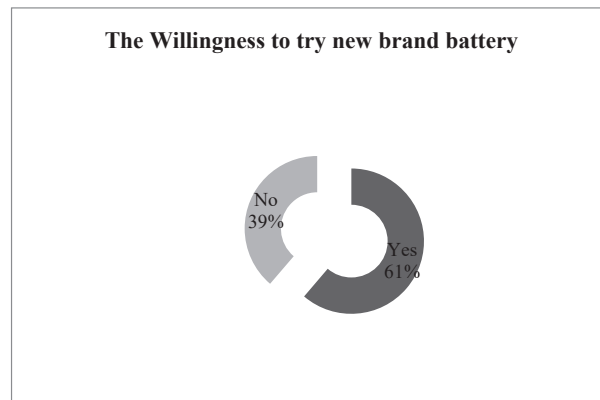


FIGURE 6. The willingness to try new brand battery

Based on Fig. 6, we also know that from 80 respondents, 61% or 49 respondents were willing to try a lithium ion battery with a new brand, while the remaining 39% or 31 respondents are not.

Cluster Analysis Lithium Ion Battery as a Market Segmentation

Based on the results of cluster analysis using SPSS software 20, it is known that there are three groups of segmentation. The characteristics of each cluster can be found in appendix 1. Based on the analysis in appendix 1, the characteristics of respondents in cluster 1 dominantly are women with age less than 23 years old and the education level is elementary/junior high/high school. Job status is a college student with pocket money less than IDR 1.000.000,- per month. The number of batteries that are used every month is 1-3 batteries and majority buy battery at the retail outlet.

Characteristics of respondents in cluster 2 majority are women with age less than 23 years old and the education level is elementary/junior high/high school and the majority of jobs are college students. Amount of pocket money for every month is between IDR 1,000,000 to IDR 2,500,000. Most of them using 1-3 batteries every month and buy these batteries at the retail outlet.

Cluster 3 majority are women with age less than 23 years old and the education is elementary/junior high/high school. Job status is as a college student with a monthly allowance of < IDR 1,000,000 to IDR 2,500,000. They majority use 1-3 batteries every month and buy these batteries at the outlet.

The group division is based on the variables used in the survey questionnaire. Each cluster has a different main characteristic in buying lithium battery products. The list of the main characteristics is shown in Table 3.

TABLE 3. The Main Characteristics Market Segmentation Of Lithium Ion Battery

Cluster		
<i>1</i>	<i>2</i>	<i>3</i>
<ul style="list-style-type: none"> - Using Li-ion battery products for meeting the needs. - Buying Li-ion batteries as needed 	<ul style="list-style-type: none"> - Consider the country of origin of the product manufacturer. - Assume Li-ion battery products used by middle-class society - Choosing a Li-ion battery with packaging that has local ethnic characteristic - Using Li-ion battery instead of Lead Acid batteries. - Buying products Li-ion battery of the brands are well known and trusted - Buying products Li-ion batteries because they are attracted to the brand. - Using Li-ion batteries because the batteries are environmentally friendly. - Buying products Li-ion battery by considering the promo price. - Assume products Li-ion batteries easily obtained. - The shape and color of Li-ion battery packs influence buying decisions. - Buying Li-ion battery as interested in advertising - Comparing other brands before buying Li-ion - Assume that the Li-ion battery product prices more affordable than conventional batteries. 	<ul style="list-style-type: none"> - Assume Li-ion batteries are mostly used by the upper class - Assume products Li-ion battery is very easy to use. - Assume Li-ion battery gives the impression of a high-tech. - Having an electronic device using Li-ion batteries is more than one. - Distance to point of sale affect buying interest. - Buying Li-ion battery because it has warranty. - Buying Li-ion battery because it has a strong level of resistance / durability. - Buying Li-ion battery because it has a light weight. - Buying Li-ion batteries because many friends are using it.

Based on the results in Table 3, it can be concluded that Cluster 1 is composed with type of customers who will buy lithium batteries that satisfy their needs. Cluster 2 consists of consumers who consider the brand of product, country of origin of the product manufacturer, price promotions, advertisement, and using lithium batteries instead of lead acid batteries. While member in cluster 3 are consumers who think that the lithium battery has a high-tech and electronic appliance, use a lithium battery more than once, consider the distance of the purchase point, warranty, durability and weight of the battery, as well as the influence of friends in purchasing of battery products.

Variables that are considered important enough for the three groups are simplicity of use, the needs of respondents, respondents' intention to have more than one electronic devices, environmental aspect, affordability, warranty, high durability and a light weight.

The next analysis is to determine the profile of the formed cluster by using crosstab analysis for some general questions. An analysis of cluster results will be carried out with the questions of lithium ion battery that has been applied to any products owned by each respondent.

According to Table IV, respondents in the first cluster are likely to apply lithium ion battery on a smartphone, tablet, notebook, power banks, clocks, flashlight and digital camera. While the second cluster member prefer to use the battery for smartphones, tablets, power banks, notebook, digital camera, flashlight, clocks, CCTV, and electric bike. The remaining respondents in third cluster tend to utilize it for smartphone, tablet, notebook, power banks, wall clocks, flashlights, digital camera, e-scooter, and electric bike.

TABLE 4. Cluster Groups Based On Lithium Ion Battery Application

Cluster		
<i>1</i>	<i>2</i>	<i>3</i>
The majority using lithium batteries to be applied on a smart-phone, tablet, notebook, power banks, clocks, flashlight and digital camera.	The majority of respondents use lithium batteries for smart-phones, tablets, power bank, notebook, digital camera, flashlight, clocks, CCTV, and electric bike.	The majority of respondents using lithium as a smartphone, tablet, notebook, power banks, wall clocks, flashlights, digital camera, e-scooter, and electric bike.

Determination of Target Market Analysis

The market has different characteristics and it is naturally a compulsory for the company to be able to select markets in accordance with their ability. Market segmentation is a way for companies to classify heterogeneous market into homogeneous parts market. As the execution, the company should be able to determine and select the target market (the same market, the different market or concentrated market) and market needs so that marketing can run effectively.

Segmentation is the first step for the company to determine who will enter the market and offer the company's products to the market. After determining the market segments to be served the next step is to choose one or more target markets which potentially provide benefits to the company.

Based on segmentation upon the characteristics of the respondent, PT FEN can enter the segment 2 and segment 3 (Fig. 7). The criteria for the respondents are as follows:

1. Income between 1 million to 2.5 million
2. Use a lithium ion battery for 1-5 years
3. Apply the battery on a smartphone, tablet, notebook, power bank, digital camera, flashlight, clocks, e-scooter, and electric bike
4. Use 1-3 lithium ion batteries
5. Prefer to buy batteries at the outlet, exhibitions, and online
6. Choose the battery with the characteristics of durable, long lasting, good quality, capacity on demand, and trusted brand.

Regarding to the company's ability that has been yet possible to produce various types of lithium ion batteries, the company may try to market their products to consumers who have been also using the battery pack in their development. Electric bike users, service providers such as children's toys (odong-odong), electric motorcycles and electric cars for children are the examples.

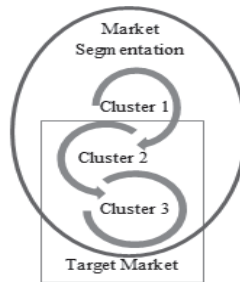


FIGURE 7. Cluster segment for pre-test market lithium ion battery

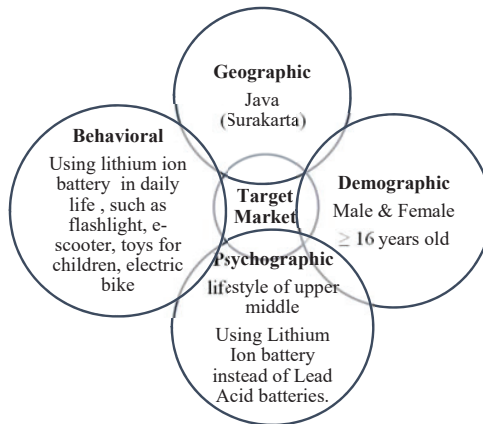


FIGURE 8. Target market for pre-test market lithium ion battery

From the results of market targeting can be made a managerial implication for the company as shown in Table 5. The managerial implication can increase company productivity by increasing the capacity, quality, efficiency and effectiveness of existing resources.

TABLE 5. Managerial Implications From The Result

Research Result	Managerial Implications
Price effect on consumer choice	The price of environment-friendly products is positively related to consumer preference. Consumers tend to use price as an indicator of quality. So as long as quality of lithium ion batteries product are high can generate high consumer satisfaction, in which case consumers feel has got a safe product, has joined protecting the environment and has been getting a product that is comparable in quality to the price, but do not close the possibility for consumers to choose products with a promo price.
Environment-friendly products effect on consumer choice	With increasing awareness of consumers to consider environmental issues in their purchasing behavior, then the company should not just maintain the quality of its products, but even more so to be able to create new innovations of products that are reliable, environmentally friendly and understand the needs of consumers.
Places effect on consumer choice	Provide commodity place that is easily accessible by potential customers, even by providing a delivery service for busy consumers and have a narrow time for shopping.
Advertisement effect on consumer choice	Consumers pay attention to ads when purchasing a product that needs to be widely advertising through print and social media nor word of mouth.

Unlike the target market of the old technology, the new technologies-Ferphos lithium ion battery-has a size A5 to the battery cell and battery pack. Hence it can be used for electronic devices that use cell batteries such as flashlights and toys, as well as electronics that use a battery pack such as electric bicycles, e-scooters, and small generators. It allows new technology of lithium ion battery to be applied to various electronic instruments. Therefore, the results of research on the target market is expected to be used as a reference in implementing the pre-test market for lithium ion batteries.

CONCLUSION

Based on segmentation and targeting of the lithium ion battery product, there are three segments of consumer. Each segment has unique characteristics, profiles, and different behavior where it could affect consumer choice. Most customers of lithium ion batteries use the batteries for smartphones, tablets, notebook and power bank.

They use lithium ion batteries because of high-tech impression, popular among friends, and the country of origin of battery makers is trusted. The important things that are considered important by respondents about the lithium ion battery is environmental aspect, affordability, warranty, high durability and light weight.

From this research can be seen the characteristics that describe the consumer nature and behavior of each segment. These characteristics can be used as a consideration in making a new product to meet consumer needs in accordance

with the segment. The creation of products that comply with the segmentation can be used as a potential investment for business.

Further research can be conducted more in-depth study of the market survey for lithium ion battery that produced by PT FEN. The company may conduct a pre-test market based on target market obtained from this study by implementing the batteries test usage to consumers. The findings can be used as product improvements and developments by the company.

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