



Program & Abstracts Book



ESTIC

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The 3rd Engineering Science and Technology International Conference
Faculty of Industrial Technology, Universitas Bung Hatta

August 30th – 31st, 2016
Pangeran Beach Hotel
Padang West Sumatera, Indonesia



Organized by:
Department Of Chemical Engineering
Faculty of Industrial Technology Universitas Bung Hatta
Padang, West Sumatera, Indonesia

Chairman of ESTIC 2016

On behalf of The Organizing Committee, we are pleased to welcome you in Padang, West Sumatera, Indonesia, to The3rd Engineering, Science, and Technology International Seminar 2016 (ESTIC 2016).



The conference was initiated on 2011 and 2013 by the Faculty of Industrial Technology of Universitas Bung Hatta under previous name of National Conference of Science and Technology (Resatek) at the UBH campus. The conference then changes its name into Engineering Science and Technology International Conference on 2016 and expands its scope to international conference. This conference has facilitated the communication between scientists across applied in engineering technology science and allows the applied technology professionals to contribute their expertise to deal with empowerment issues.

The aimed of the conference is promoting engineering technology research activities in Indonesia and overseas, in the hope of building and strengthening networks and collaborations. Therefore, the theme is "Applied Technology for Sustainable Development" and encompassing many relevant topic such as: Energy, Material Science And Technology, Environmental Science And Technology, Food Processing Technology, Industrial Management Technology, Technical Vocational Education and Training, and other related topic. As a new comer, we proudly announced that we have about 80 abstract coming from Saudi Arabia and Asian countries such as Japan, Malaysia, Thailand and Indonesia. The selected paper will publish on two Scopus Indexed Journals: The International Journal on Advanced Science, Engineering and Information Technology (IJASEIT) and Asian Research Publishing Network (ARPN).

We thank for all the participant of committee which has done their duty to select abstract which fulfill to the level appropriately to be published on journal or proceeding. The participant will be divided into 4 parallel sessions which comprise of seven categories, due to the topic of this conference.

The conference will hold for two days and hope you will enjoy interaction other participant. We hope you will have an interesting experience during your stay in Padang.

Finally, we thank for all sponsors and other parties that we cannot possibly mention one by one. We apologize for any inconveniences during the conference and we hope we can improve it much better next time.

Padang, August, 30th 2016.
Dr. Mulyazmi, S.T., M.T.

Rector of Universitas Bung Hatta

On behalf of Universitas Bung Hatta, we are delighted to welcome you in Padang (the Rendang city), West Sumatera, Indonesia.

It is a great honor for us to have you from all over the world to attend to The 3rd Engineering, Science, and Technology International Seminar 2016 (ESTIC 2016). For the first time, this conference is held by Chemical Engineering Department of Universitas Bung Hatta, after several years has been successfully hold National Conference of Science and Technology (Resatek) since 2011. There are about 80 participants will attend on this conference. The participants include our colleagues from many university around in Asian, such as Japan, Malaysia, Thailand, and Indonesia, which mean that the improvement of knowledge would cross any borders including island.



The theme was chosen for this conference is "Applied Technology for Sustainable Development". Applied engineering technology was progressing rapidly and enables us to reveal and comprehend how this universe works. I believe that this theme has challenges for all engineers how to develop of sustainable industry process and energy, innovative materials, conceptual and process design. However, the aim of the research is how to create the better life for the future without neglect the negative impact due to the activities incurred.

Finally, I would like to thank to the member of committee, who has worked very hard to run the conference. I would like to express our gratitude to keynote speakers and invited speakers for the active participant in this conference. I thank to our participants to present and share the experiences with other colleague in the same field, and we hope the communication among us can always be maintained.

Padang, August 30th, 2016

Prof. Dr. Niki Lukviarman, SE., Akt., MBA

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Gifu University, Japan

Dr. Krittiya Lertpocasombut
(Thammasat University, Thailand)

Dr. Oki Muraza
King Fahd University, Saudi Arabia

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Rezi Hidayati

Keynote Speakers

Prof. Dr. Yazid Bindar

Institut Teknologi Bandung, Indonesia

*“Closing the Gaps Between Designed and Operational
Unit Process Performances”*

Prof. Dato’ Dr. Kamaruzzaman Sopian

Universiti Kebangsaan Malaysia

*“Evaluation And Optimization Of A Multi Ejectors -Flash
Tank Absorption Refrigeration”*

Dr. Toshiro Yamada

Gifu University, Japan

*“Water And Sediment Quality In Open Channels
Receiving Of Effluents From Small-Scale Onsite
Wastewater Treatment Facilities (Johkasou)”*

Dr. Krittiya Lertpocasombut

Thammasat University, Thailand

*“Use of Natural Materials Wasted for Water Treatment
and Wastewater Treatment Plants”*

Dr. Oki Muraza

King Fahd University, Saudi Arabia

*“Catalytic Technologies To Convert (Bio-) Natural Gas
Derivatives To Industrial Chemicals”*

Prof. Dr. Shinji Kambara

Gifu University, Japan

*“Innovative Hydrogen Production, Storage, and
Utilization System”*

Ir. Benny Wendry, M.M*

PT. Semen Padang, Indonesia

Invited Speakers

Dr. Eng. Reni Desmiarti

Universitas Bung Hatta, Indonesia

“Disinfection of Salmonella Thypi ‘O’ by Inductively Coupled Plasma Radio Frequency”

Dr. Inna Kholida Sari

Universitas Bung Hatta, Indonesia

“Human Judgment in a Stock Control System - A review for a Disaster Situation”

Dr. Muchamad Oktaviandri

Universitas Bung Hatta, Indonesia

“An ANN model for designing Micro-hydro Turbine”

Dr. Hidayat, ST., MT

Universitas Bung Hatta, Indonesia

“Evaluation of Micro Hydropower Using Overall Equipment Effectiveness (OEE) Methode”

Technical Program

Tuesday, August 30th, 2016.

Time	PROGRAM
07.30-08.30	Registration of participants
08.30-09.00	Opening ceremony: <ul style="list-style-type: none">▪ Chairman of The Committee▪ Rector of Universitas Bung Hatta
09.00-09.40	Keynote Speaker 1: Prof. Dr. Yazid Bindar
09.40-10.20	Keynote Speaker 2: Prof. Dr. Shinji Kambara
10.20-10.40	Coffee Break I
10.40-11.20	Keynote Speaker 3: Prof. Dato' Dr. Kamaruzzaman Sopian
11.20-12.00	Keynote Speaker 4: Ir. Benny Wendry, M.M
12.00-13.30	Lunch
13.30-15.25	Parallel session 1
15.25-16.00	Coffee break 2
16.00-17.35	Parallel session 2
19.00-20.00	Gala Dinner

Wednesday, August 31st, 2016.

Time	PROGRAM
07.30-08.30	Registration of participants
08.30-09.10	Keynote Speaker 5: Dr. Toshiro Yamada
09.10-09.50	Keynote Speaker 6: Dr. Krittiya Lertpocasombut
09.50-10.30	Keynote Speaker 7: Dr. Oki Muraza
10.30-11.00	Coffee break 1
11.00-12.55	Parallel session 3
12.55-13.30	Lunch
13.30-15.25	Parallel session 4
15.25-16.00	Coffee break 2
16.00-16.30	Announcement of Oral Presentation Award Closing Ceremony

Tentative Program

Tuesday, August 30th, 2016.

Time	Program			
07.30-08.30	Registration of participants			
08.30-08.45	Chairman of The Committee			
08.45-09.00	Rector of Universitas Bung Hatta			
09.00-09.40	Keynote Speaker 1: Prof. Dr. Yazid Bindar			
09.40-10.20	Keynote Speaker 2: Prof. Dr. Shinji Kambara			
10.20-10.40	Coffee Break I			
10.40-11.20	Keynote Speaker 3: Prof. Dato' Dr. Kamaruzzaman Sopian			
11.20-12.00	Keynote Speaker 4: Ir. Benny Wendry, M.M			
12.00-13.30	Lunch			
	Parallel session 1			
	Basa 1	Basa 2	Batuah	Anai
13.30-13.45	IS 01	IS 02	IS 03	IS 04
13.50-14.05	A 001	B 001	E 001	G 001
14.10-14.25	A 002	B 002	E 002	G 002
14.30-14.45	A 003	B 003	E 003	G 003
14.50-15.05	A 004	B 004	E 004	G 004
15.10-15.25	A 005	B 005	E 005	G 005
15.25-16.00	Coffee break 2			
16.00-17.35	Parallel session 2			
	Basa 1	Basa 2	Batuah	Anai
16.00-16.15	A 006	C 001	D 001	F 001
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17.00-17.15	A 009	C 004	D 004	F 004
17.20-17.35	A 010	C 005	D 005	F 005
19.00-20.00	Gala Dinner			

Wednesday, August 31st, 2016.

Time	Program			
07.30-08.30	Registration of participants			
08.30-09.10	Keynote Speaker 5 Dr. Toshiro Yamada			
09.10-09.50	Keynote Speaker 6 Dr. Krittiya Lertpocasombut			
09.50-10.30	Keynote Speaker 7 Dr. Oki Muraza			
10.30-11.00	Coffee break 1			
11.00-12.55	Parallel session 3			
	Basa 1	Basa 2	Batuah	Anai
11.00-11.15	A 011	B 006	G 006	E 006
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12.40-13.30	Lunch			
13.30-15.25	Parallel session 4			
	Basa 1	Basa 2	Batuah	Anai
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14.30-14.45	G 011	B 015	E 011	C 009
14.50-15.05	D 006		E 012	C 010
15.10-15.25				
15.25-16.00	Coffee break 2			
16.00-16.30	Announcement of Oral Award Closing Ceremony			

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Simulation of Energy Savings in a Six Floor Library Building University of Surabaya

Elieser Tarigan^{1,2,*}, Djuwari¹, Fitri Dwi Kartikasari^{3,2}

¹Electrical Engineering, University of Surabaya, Jl. Raya Kalirungkut, Surabaya 60292, Indonesia

²Informatics Engineering, University of Surabaya Jl. Raya Kalirungkut, Surabaya 60292, Indonesia

³Center for Renewable Energy Studies, PSET, University of Surabaya, Surabaya 6029, Indonesia

* Corresponding authors: elieser@staff.ubaya.ac.id

Abstract. The present work simulated energy saving strategies for a six floor library building at the University of Surabaya, Indonesia using EDGE (Excellence in Design for Greater Efficiency) simulation. Simulation results shows that by applying combination of four measures: OFE4, OFE8, OFE16 and OFE 29 would result in the total energy efficiency of 52.6%. The measures refer respective to: external shading devices, higher thermal performance glass, radiant cooling and heating system, and daylight photoelectric sensors for internal spaces. The 4 measures are not affected the energy building comfortness. Using these measures parameters will give the 1 CO₂ saving of 759 tCO₂/year, and about 2.2 years of payback period is.

Keywords:

Energy simulation, Energy building, Energy efficiency, Energy saving, Library building,

1. Introduction

Energy use by human populations has increased at a rapid rate in particular, by extraction and combustion of fossil fuels. This however results in many environmental problems at local, regional and global scales [1]–[6]. Studies from a number of countries have shown that the adoption of energy efficient technology has the potential to substantially reduce the amount of energy used in commercial and industrial buildings [1]. There have been few quantitative attempts to identify energy saving measures. Nevertheless, it is clear that the potential to implement energy saving measures exists [3], [7].

This study simulates the energy savings in the central library building of University of Surabaya (Ubayu) which consist of a six floor library building. The simulation work is conducted to find the most feasible way of energy efficiency. The information and the results from this study is expected to be useful and applicable for scaling up to wider scope of similar buildings as one way to promote and toward energy sustainability.

University of Surabaya is one of the most important private universities, especially eastern region of Indonesia and it has long history. The university occupies three locations at East Java Province, two of which are located at different area in Surabaya city (Campus 1 and Campus 2) and another one (Campus 3) at Trawas Mojokerto. The academic activities are mainly held in Campus 2 where central library is located. The university has a very high concern for sustainability issues.

2. Methods

Energy simulation in this study is conducted using web-based simulation software namely EDGE (Excellence in Design for Greater Efficiency) provided by IFC of World Bank Group. The software is free to anyone who creates a user account[8] at website <https://app.edgebuildings.com>. The object of this study is an existing six floor library building at the University of Surabaya, Indonesia. The building consists of 10,625 m² in total. The front of the building is facing South West (SE). Figure 1 shows the front view of the building. The wall of the building is constructed by common brick and plaster. The floor is from of 20 cm x 20 cm ceramic. About 30% of façade and all sides of exterior wall are closed windows glass of single layer with aluminum frame. Inside of the building is divided into several partitions for different purposes, such as bookshelves, reading rooms, computer rooms, offices, bath rooms, etc. Figure 3 shows typical situation inside of the building. The building uses a centralized cooling system which is turned on during working hours 07.00 – 19.00. For lighting, all of the lamps installed (FL lamp) are also turned on during working hours. Electricity is supplied by national electricity grid, PLN. These information, along with other real conditions and information of the buildings are used as base case of simulation.

The software calculates the utility savings and reduced carbon footprint building against a base case. The saving energy opportunities will be known by entering as much of the building's information as possible into the software, and choosing systems and solutions[9]. The **software used** provides a measurable way to cut back on the resource intensity of new buildings, empowering stakeholders to determine the most cost-effective options for a building's resource-efficient design. There are three main measures feature in the software: energy measures, water measures, and material measures.

In this work, however, simulation was carried out with focus on energy measures for the building. From four building categories in the software, the type of "Office Building" was selected as this type is considered the most suitable based the input parameters. There are 30 energy efficiency measures on the simulation for the type of buildings. The simulation work is conducted to find the most feasible measures to apply for the simulated buildings.

3. Results and Conclusions

Based case condition of energy uses in the simulated building is firstly determined from the software. It is obviously seen that the "open plan office" segment, which represent the main rooms functioned for library activities, need significant portion of energy. The base case condition of energy uses then was tempted to improve the saving energy by simulating with 30 energy efficiency measures.

The main simulation results is summerized in tabulated form as shown in Table 1. It shows the codes, the refered energy saving measure, and the estimated energy saving by accupaying the particular measure. Of the 30 measures, there are about 9 measures would give result of energy saving higher than 10%, however in terms of cost, easyness and other considerations, not all of them are feasible to be applied in the building.

Simulation results shows that by applying combination of four measures: OFE4, OFE8, OFE16 and OFE 29 would result in the total energy efficiency of 52.6%. The measures refer respective to: external shading devices, higher thermal performance glass, radiant cooling and heating system, and daylight photoelectric sensors for internal spaces. The comparison of base case and improve case of energy use is shown in Figure 2. The measures are not affected the energy comfort in the building. Applying these measures would give the operational CO₂ saving of 759 tCO₂/year. In term of costs, the payback period is about 2.2 years.

Table 1 Energy Saving Measures and Simulation Results

Measures Codes	Energy Saving Measures	Energy Saving (%)
OFE01	Reduced window to wall ratio	11.38
OFE02	Reflective paint/tiles for roof solar reflectivity	1.17
OFE03	Reflective paint for external walls solar reflectivity	1.30
OFE04	External shading devices	16.49
OFE05	Insulation of roof surfaces	2.30
OFE06	Insulation of external walls	3.60
OFE07	Low e coated glass	8.16
OFE08	Higher thermal performance glass	17.42
OFE09	Natural ventilation offices, corridors, lobby	24.88
OFE10	Ceiling fans in all office rooms	22.80
OFE11	Variable refrigerant volume (vrv) cooling system	2.47
OFE12	Air conditioning with air cooled screw chiller	-9.92
OFE13	Air conditioning with water cooled chiller	5.40
OFE14	(Geothermal) ground source heat pump	-3.62
OFE15	Absorption chiller powered by waste heat	0.52
OFE16	Radiant cooling and heating system	16.89
OFE17	Recovery of waste heat from the generator for space heating	0
OFE18	Variable speed drives on the fans of cooling towers	0.69
OFE19	Variable speed drives in ahus	0.18
OFE20	Variable speed drives pumps	0
OFE21	Sensible heat recovery from exhaust air	1.63
OFE22	High efficiency condensing boiler for space heating	0
OFE23	Air economizers during favorable outdoor conditions	0
OFE24	Energy saving light bulbs internal spaces	10.69
OFE25	Energy saving light bulbs external spaces	0.75
OFE26	Lighting controls for corridors & staircases	0.09
OFE27	Occupancy sensors in bathrooms, conference rooms and closed cabins	1.76
OFE28	Occupancy sensors in open offices	4.56
OFE29	Daylight photoelectric sensors for internal spaces	15.0
OFE30	Solar photovoltaics	24.87

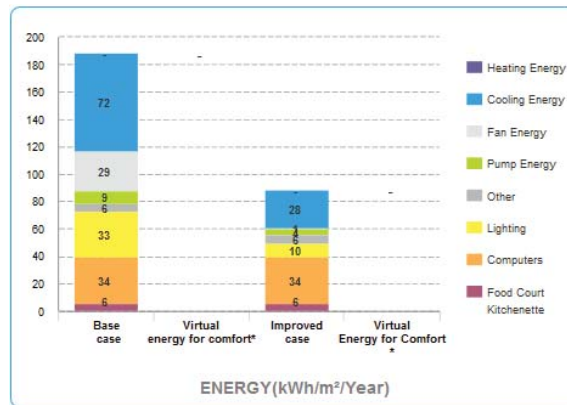


Figure 2 Base case and improved case of energy use

Upto 28% of energy saving could be attempted by occupying natural ventilation offices, corridors, lobby (OFE09) and using ceiling fans in all office rooms (OFE10). However, this way will impact the energy comfort of the building. On the other hand, using of renewable energy (solar photovoltaic, PV) of 404 kWp would save energy about 25% and operational CO₂ saving of 358 tCO₂/year. The initial cost for PV system however is significantly high with payback period of 14,5 years.

4. Acknowledgement(s)

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5. References

- 1 J. F. Bonnet, C. Devel, P. Faucher, and J. Roturier, "Analysis of electricity and water end-uses in university campuses: Case-study of the University of Bordeaux in the framework of the Ecocampus European Collaboration," *J. Clean. Prod.*, vol. 10, no. 1, pp. 13–24, 2002.
- 2 J. Di Stefano, "Energy efficiency and the environment: The potential for energy efficient lighting to save energy and reduce carbon dioxide emissions at Melbourne University, Australia," *Energy*, vol. 25, no. 9, pp. 823–839, 2000.
- 3 Y. Geng, K. Liu, B. Xue, and T. Fujita, "Creating a 'green university' in China: A case of Shenyang University," *J. Clean. Prod.*, vol. 61, pp. 13–19, 2013.
- 4 G. Ho, S. Dallas, M. Anda, and K. Mathew, "Renewable energy in the context of environmentally sound technologies - training and research programmes at the Environmental Technology Centre, Murdoch University," *Renew. Energy*, vol. 22, no. 1, pp. 105–112, 2001.
- 5 R. L. Hwang, T. P. Lin, and N. J. Kuo, "Field experiments on thermal comfort in campus classrooms in Taiwan," *Energy Build.*, vol. 38, no. 1, pp. 53–62, 2006.
- 6 B. Patel and P. Patel, "Sustainable campus of Claris lifesciences through green initiatives," *Renew. Sustain. Energy Rev.*, vol. 16, no. 7, pp. 4901–4907, 2012.
- 7 N. Suwartha and R. F. Sari, "Evaluating UI GreenMetric as a tool to support green universities development: Assessment of the year 2011 ranking," *J. Clean. Prod.*, vol. 61, pp. 46–53, 2013.
- 8 Ifc.org, "Why EDGE," 2016. [Online]. Available: http://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/EDGE/Why+Edge/. [Accessed: 20-Jun-2016].
- 9 Buildup.eu, "Excellence in Design for Greater Efficiencies (EDGE)," 2016. [Online]. Available: <http://www.buildup.eu/en/learn/tools/excellence-design-greater-efficiencies-edge-0>. [Accessed: 20-Jul-2016].



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