Link Go To Paper

Free Access to the whole issue

MATEC Web of Conferences

Volume 204 (2018)

International Mechanical and Industrial Engineering Conference 2018 (IMIEC 2018)

Malang, Indonesia, August 30-31, 2018

P. Puspitasari, A.H. Suryanto, T. Lenggo Ginta, I. Srikun, A. Ayu Permanasari, M. Niaz Akhtar, M. Sharifi Jebeli, Y. Rohmat Aji Pradana, D. Zakariya Lubis, A. Larasati and A. Dwi Astuti (Eds.)

Open Access

Statement of Peer review

Published online: 21 September 2018

PDF (43.4 KB)

- Industrial Management
- Optimization
- Manufacture and System Design
- Energy
- Material
- Manufacture
- Construction

Open Access

Welcoming address - Rector State University of Malang 00001

H. Ahmad Rofi'uddin

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400001

Open Access

Welcoming address - Chairman of International Mechanical and Industrial Engineering Conference, IMIEC 2018 00002

Sukarni

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400002

Link Go To Paper

PDF (240.3 KB)

Open Access

Tribological advancement – strategies and effects towards emissions and global energy consumption 00003

Masjuki Hassan, Syahir Amzar Zulkifli, Harith Hasnul and Ashraf Yusoff

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400003

PDF (337.8 KB) | References

Open Access

Developments of next generation refrigerants and heat transfer 00004

Akio Miyara

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400004

PDF (431.7 KB) | References

Open Access

Incorporation of nano-modified material in the production of smart concrete 00005

Prakasit Sokrai and Natt Makul

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400005

PDF (453.7 KB) | References

Open Access

Triethylammonium hydrogen sulfate ionic liquid as a low-cost solvent: A short review of synthesis, analysis and applications 00006

S. M. Shahrul Nizan Shikh Zahari, Hazeeq Azman and Latifah Karim

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400006

PDF (411.0 KB) | References

Open Access

Multistage artificial aging optimization for tensile properties of Duralium using Response Surface Method (RSM) 00007

Poppy Puspitasari, Tsamroh Dewi Izzatus, Mochamad Achyarsyah, Beny Bandanajaya and Dewi puspitasari

PDF (345.3 KB) | References

Open Access

Characteristics of nanoclay reinforced starch biocomposites through the extrusion process 00008

Heru Suryanto, Alfian Widi Rahmawan, Solichin, Sahana Rizki Tata and Uun Yanuhar

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400008

PDF (408.1 KB) | References

Link Go To Paper

Open Access

Kinetic analysis of co-combustion of microalgae *spirulina platensis* and synthetic waste through the fitting model 00009

Sukarni Sukarni, Ardianto Prasetiyo, Sumarli Sumarli, Imam Muda Nauri and Avita Ayu Permanasari

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400009

PDF (283.8 KB) | References

Open Access

Thermal decomposition behavior of water hyacinth (*eichhornia crassipes*) under an inert atmosphere 00010

Sukarni Sukarni, Aloon Eko Widiono, Sumarli Sumarli, Retno Wulandari, Imam Muda Nauri and Avita Ayu Permanasari

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400010

PDF (347.7 KB) | References

- *Industrial Management*

Open Access

Temporal and spatial prediction of retailer growth 01001

Bertha Maya Sopha, Fredrika Makasenda and Anna Maria Sri Asih

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401001

PDF (519.2 KB) | References

Open Access

A study of consumer preferences for customized product design 01002

Endang Retno Wedowati, Moses Laksono Singgih and I Ketut Gunarta

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401002

PDF (179.4 KB) | References

A study on perceptions of preschool Children's furniture design: Pictorial stimuli experiment 01003

Pornchai Tamthintha, Kusuma Palaprom and Kritchakhis Nawattanaprasert

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820401003

Link Go To Paper

PDF (370.3 KB) | References

Open Access

Demand forecasting in Small and Medium Enterprises (SMEs) ED Aluminium Yogyakarta using causal, time series, and combined causal-time series approaches 01004

Wildanul Isnaini and Andi Sudiarso

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820401004

PDF (225.1 KB) | References

Open Access

Analysis of human behavioral attributes in improving disaster evacuation strategy of mount merapi 01005

Anna Maria Sri Asih, Ekky Novia Rubbyarta and Bertha Maya Sopha

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820401005

PDF (235.8 KB) | References

Open Access

Quality control of palm kernel oil using Individual Moving Range (I-MR) chart 01006

Fatimah, M Sayuti and Elsa Putri Pertiwi

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820401006

PDF (484.2 KB) | References

Open Access

Service design improvement in Ragunan Zoo using TRIZ methodology 01007

Inaki Maulida Hakim, Kusuma Narpawandawi and Teuku Yuri M. Zagloel

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820401007

PDF (241.8 KB) | References

Open Access

Development of sustainable procurement monitoring system performance based on Supply Chain Reference Operation (SCOR) and Analytical Hierarchy Process (AHP) on leather tanning industry 01008

Arditya Nur Waaly, Ari Yanuar Ridwan and Mohammad Deni Akbar

Published online: 21 September 2018

Open Access

Classification of sub-sectors in creative industry for regional economic development 01009

Deltaningtyas Tri Cahyaningrum, Erwin Widodo and Niniet Indah Arvitrida

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401009

PDF (251.7 KB) | References

Link Go To Paper

Open Access

The impact of supply chain partnership and market driven strategy on consumer behavior in buying Vocaloid Hatsune Miku products 01010

Vicio Rizky Damar and Markus Hartono

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401010

PDF (360.3 KB) | References

Open Access

Competitiveness attributes of Small and Medium Enterprises (SMEs) in the global market (case study: garment SMEs in Tri Tunggal Village, Lamongan) 01011

Issa Dyah Utami, Trisita Novianti and Teuku Iqbal Dianta Romansa

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401011

PDF (248.4 KB) | References

Open Access

Failure Modes and Effects Analysis (FMEA) for evaluation of a sugarcane machine failure 01012

Hilma Raimona Zadry, Dendi Adi Saputra, Agung Budiman Tabri, Difana Meilani and Dina Rahmayanti

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401012

PDF (184 KB) | References

Open Access

Development of quality improvement matrix: An integrated tools for quality improvement 01013

Katon Muhammad and Putu Dana Karningsih

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401013

PDF (210.1 KB) | References

Open Access

Designing Key Performance Indicators (KPI) with macro ergonomics approach 01014

DOI: https://doi.org/10.1051/matecconf/201820401014

PDF (211.1 KB) | References

Link Go To Paper

Open Access

A data envelopment analysis approach for assessing the efficiency of small and medium-sized wood-furniture enterprises: a case study 01015

Diana P. Sari, Naniek Utami Handayani, M. Mujiya Ulkhaq, Wiwik Budiawan, Dea Ladysia Maharani and Fahmi Ardi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401015

PDF (308.7 KB) | References

Open Access

Occupational Health And Safety (OHS) management for employees on the risk of diseases due to the intensity of computer use in the workplace/industry 01016

Andika Bagus Nur Rahma Putra, M. Ihwanudin, Erwin Komara Mindarta, Poppy Puspitasari and M. Mirza Abdillah Pratama

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401016

PDF (381.7 KB) | References

Open Access

Electricity sustainable energy management model for community development holistically in Phranakhon Rajabhat University 01017

Isaree Srikun

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401017

PDF (261.6 KB) | References

Open Access

Understanding Facilities Management Practices to Improve Building Performance: The opportunity and challenge of the facilities management industry over the world 01018

Astri Anindya Sari

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401018

PDF (297.5 KB) | References

- Optimization

Open Access

Optimization of industrial machine maintenance scheduling using ant colony method 02001

Iwan Aang Soenandi and Teuku Emily Budiman

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402001

Open Access

Manufacturing optimization using Tsukamoto fuzzy inference system method: A case study in block paving and solid concrete block industry 02002

M Sayuti, Juliananda and Diana Khairani Sofyan

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402002

Link Go To Paper

PDF (378.4 KB) | References

Open Access

The hybrid-model architectural modelling based on ARIMA-BPNN methods for building materials demands forecasting 02003

Cynthia Hayat and Iwan Aang Soenandi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402003

PDF (384.7 KB) | References

Open Access

Product mix optimization on multi-constraint production planning-a Fuzzy Mixed Integer Linear Goal Programming (FMILGP) approach: A single case study 02004

Meriastuti Ginting, Martin Kirawan and Budi Marpaung

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402004

PDF (263.3 KB) | References

Open Access

Optimizing coal blending quality through supplier selection and order allocation: A case of cement industry 02005

Dicky Fatrias, Nilda Tri Putri, Pri Gustari Akbar and Fidela Andari Fae

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402005

PDF (284.3 KB) | References

Open Access

A heuristic method for solving airline crew pairing problems 02006

Khusnul Novianingsih and Rieske Hadianti

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402006

PDF (250.2 KB) | References

Open Access

Optimization of inbound logistics cost in automotive industry 02007

Inaki Maulida Hakim, Rolina Oktapiani Zaqiah and Yuri M. Zagloel Teuku

PDF (436.3 KB) | References

Link Go To Paper

Open Access

Evaluation of random parking layout SBA mall using integer linear programing 02008

Prima Denny Sentia, Nissa Prasanti, Andriansyah and Rizfa Ramadhani Pulungan

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402008

PDF (332.2 KB) | References

Open Access

Traffic queue modeling using arena simulation software (a case study of Mergan 4-Way intersection in Malang City) 02009

Dani Yuniawan, P.P Aang Fajar, Samsudin Hariyanto and Romi Setiawan

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402009

PDF (250.4 KB) | References

Open Access

Traffic queue proposal solution on T-junction by utilizing arena simulation software (case study of Dinoyo T-Junction Malang City) 02010

Dani Yuniawan, P.P Aang Fajar, Samsudin Hariyanto and W.P Ide Bagus

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402010

PDF (269.4 KB) | References

Open Access

Feasibility model for freight train insertion in one way – train schedule 02011

Arrifah Ratna Sari and Ahmad Rusdiansyah

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402011

PDF (397.3 KB) | References

Open Access

Modelling of Cutting Tool Condition Monitoring System (CTCMS) to support industry 4.0 02012

Ari Setiawan, Dina Angela and Billy Irawan

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402012

PDF (377.5 KB) | References

Open Access

Fatkhor Rozi and Evy Herowati
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820402013
Link Go To Paper
PDF (367.6 KB) | References

Open Access

An integrated fuzzy AHP and TOPSIS model for evaluating the performance of raw material suppliers: A case study in lasem batik writing centre 02014

Diana Puspita Sari, Wismar Rizki Wijayanti, Adhie Prayogo, M. Mujiya Ulkhaq and Dyah Ika Rinawati
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820402014
PDF (380.2 KB) | References

Open Access

Two-Sided assembly line balancing to minimize number of workstation with considering the relationships between tasks 02015

Dina Rachmawaty, Putu Dana Karningsih and Budi Santosa
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820402015
PDF (356.4 KB) | References

Open Access

Preventive maintenance policy on leasing by considering the usage rate 02016

Moh. Jufriyanto, Nani Kurniati and Ade Supriatna
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820402016
PDF (283.0 KB) | References

Open Access

A Comparison of Exact Method - Metaheuristic Method in Determination for Vehicle Routing Problem 02017

Hilyatun Nuha, Putu Eka Dewi Karunia Wati and Wiwin Widiasih
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820402017
PDF (320.6 KB) | References

Open Access

The effect of Kurtosis on the accuracy of artificial neural network predictive model 02018

Aisyah Larasati, Anik Dwiastutik, Darin Ramadhanti and Aal Mahardika
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820402018
PDF (293.8 KB) | References

Open Access

Ergonomic workstations for handicraft product made from fluorescent lamp waste 03001

Mochammad Rofieq

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403001

Link Go To Paper

PDF (355.1 KB) | References

Open Access

Knowledge sharing, visibility improvement and productivity growth: Evidence from agro-industry manufacturing firm 03002

Kevin Natalardo and Oki Sunardi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403002

PDF (246.8 KB) | References

Open Access

Microwave-assisted extraction of phenolic compounds from *Moringa oleifera* seed as anti-biofouling agents in membrane processes 03003

Ni'matul Izza, Shinta Rosalia Dewi, Ashried Setyanda, Agung Sukoyo, Panggulu Utoro, Dimas Firmanda Al Riza and Yusuf Wibisono

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403003

PDF (304.8 KB) | References

Open Access

A development of sustainable and successful business model for Thai local products: The mixed crispy rice noodle, Phra Na Khon Sri Ayutthaya Province 03004

Kusuma Palaprom and Kritchakhris Nawattanaprasert

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403004

PDF (263.7 KB) | References

Open Access

The use of indonesian soybean variety with time and planting location to the production to meet the demand 03005

Nelly Budiharti and Ing Wardana

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403005

PDF (261.1 KB) | References

Open Access

Development of agrotourism business model as an effort to increase the potency of tourism village(case study: Punten Village, Batu City) 03006

DOI: https://doi.org/10.1051/matecconf/201820403006

PDF (331.0 KB) | References

Link Go To Paper

Open Access

Reliability analysis of hanger shot blast KAZO machine in foundry plant 03007

Rinaldi Sam Prabowo, Priyo Agus Setiawan, Anda Iviana Juniani, Wiediartini and Ika Erawati

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403007

PDF (301.8 KB) | References

Open Access

Design of working procedure for handling the breakdown machine in parameter of reaction time based on Jidoka system approach in cement company 03008

Putri Nilda Tri, Amrina Elita, Rahmayanti Dina and Shifanof Gilang

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403008

PDF (242.2 KB) | References

Open Access

Kansei engineering-based robust design model for logistics services 03009

Markus Hartono and Amelia Santoso

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403009

PDF (377.1 KB) | References

Open Access

Development of fatigue, accident experiences and safety culture relationships to the risk of fishing perception on the accidents of fishing vessel small and medium 03010

Septi Nurindah Sari, Ratna Sari Dewi and Adithya Sudiano

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403010

PDF (468.2 KB) | References

Open Access

Designing an ergonomic backpack for sixth grade elementary school students in Bandung based on the ideal weight of backpack load 03011

Sonna Kristina and Bella Amanda

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403011

PDF (345.4 KB) | References

Open Access

Rhadityo Shakti Budiman and I Ketut Gunarta

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403012

PDF (618.4 KB) | References

Link Go To Paper

Open Access

Assessment of exposure packaging worker and designing work methods using OCRA index in fertilizer producer company 03013

Ainun Dwi Fridayati, Wiediartini, Haidar Natsir Amrullah, Muhammad Shah, Urip Mudjiono and Edy Prasetyo Hidayat

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403013

PDF (321.4 KB) | References

Open Access

Fire risk assessment on hammer mill machine with human reliability assessment (HRA) and component reliability approaches 03014

Khariza Amalia, Haidar Natsir Amrullah, Arief Subekti, Moch. Luqman Ashari, Edy Prasetyo Hidayat, Urip Mudjiono and Hendro Agus Widodo

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403014

PDF (455.5 KB) | References

Open Access

Towards the greenship assessment and certificate of new building Design Recognition (DR) for the design of IDB-funded integrated classroom building *Universitas Negeri Malang*, Indonesia 03015

Apif M. Hajji and Dian Ariestadi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403015

PDF (337.8 KB) | References

Open Access

Enhanced rooftop rainwater harvesting quality through filtration using zeolite and activated carbon 03016

Anie Yulistyorini, Gilang Idfi and Evy Dwi Fahmi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403016

PDF (284.6 KB) | References

Open Access

Injection well as an eco-drainage solution to reduce surface run-off at the State University of Malang 03017

DOI: https://doi.org/10.1051/matecconf/201820403017

PDF (274.9 KB) | References

Link Go To Paper

Open Access

Development lean assessment indicator: A case study 03018

Iffad Rakhmanhuda and Putu Dana Karningsih

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403018

PDF (354.5 KB) | References

- *Energy*

Open Access

Spark ignition engine modeling for in-cylinder pressure and temperature prediction using simulink 04001

Nike Septivani and Byan Wahyu Riyandwita

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404001

PDF (360.5 KB) | References

Open Access

Artificial salmon tracking algorithm: Preliminary designing approach for optimizing the integrated mixed energy composition 04002

A.N. Afandi, Irham Fadlika, Quota Alief Sias, Y. Rahmawati, D. Lestari, A.N. Handayani, Yunis Sulistyorini, C.W.A. Farrel and R.S.A. Michiko

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404002

PDF (281.7 KB) | References

Open Access

Utilization of the dethridge wheel as a low head power generator and loss analysis 04003

Dan Mugisidi, Oktarina Heriyani, Rizal Andi Luhung and Moh. Ramdani Dwi Andrian

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404003

PDF (268.3 KB) | References

Open Access

Methods in water conservation as part of green building rating tools in indonesia – case study: Design of integrated classrooms building in *Universitas Negeri Malang*, Indonesia 04004

Apif M. Hajji, Bambang Suprianto and Dian Ariestadi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404004

PDF (690.2 KB) | References

Link Go To Paper

Link Go To Paper

Open Access

Performance testing of a downdraft biomass gasifier stove for cooking applications 04011

Woranuch Jangsawang

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404011

PDF (279.3 KB) | References

Link Go To Paper

Open Access

A preliminary review of Indonesian national standard of chair and desk for junior high school level 04012

Yanto, Chih-Wei Lu and Winda Y. Caroline

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404012

PDF (441.4 KB) | References

Open Access

Mitigation of the alternative energy for the wind farm center considering temperature and wind speed 04013

Rima Septiani Prastika, A.N. Afandi and Dwi Prihanto

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404013

PDF (505.5 KB) | References

Open Access

CFD analysis of partial slip effect on the performance of hydrodynamic lubricated journal bearings 04014

Muchammad, Bambang Yunianto, Mohammad Tauviqirrahman, Widhi Ahmad Wicaksono and Jamari

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404014

PDF (419.9 KB) | References

Open Access

Effect of perforated concave delta winglet vortex generators on heat transfer augmentation of fluid flow inside a rectangular channel: An experimental study 04015

Syaiful, MSK Tony SU, Nazaruddin Sinaga, Retno Wulandari and Myung-whan Bae

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404015

PDF (418.8 KB) | References

Open Access

Effect of various number conical strip inserted in the tube on heat transfer performance 04016

INTERNATIONAL MECHANICAL & INDUSTRIAL ENGINEERING CONFERENCE
(IMIEC) 2018

Link Go To Paper

WELCOMING ADDRESS
Rector State University of Malang

Dear
Mr. Chairman and committee member of the International Mechanical and Industrial Engineering Conference 2018 (IMIEC 2018), Ladies and Gentleman, the co-hosts, respectable keynote speakers and invited speakers, parallel speakers and all participants of the conference, All the pleasure is mine to welcome you all to State University of Malang, the learning university which values on tradition, integrity, continuity and innovation.

Ladies and gentleman,
It is an honour to be the host of the IMIEC 2018 as it provides unique opportunity for respectable researchers, experts, scholars, students and even policy makers to share ideas on hot issues and trending topics in mechanichal engineering. IMIEC 2018 also aims to establish framework as well as international collaboration amongst universities in Indonesia and worldwide research facilities, especially to facilitate research publications by Indonesian students and scholars in reputable international journals. It is undoubtful that the crucial step to pave the way for a university to gain international recognition, it must be indexed internationally, entering all fields of reputable peer-reviewed publications. At State University of Malang, we got this challenge, we do believe that such conference like IMIEC can be regarded as potential answer to the aforementioned challenge and therefore makes this conference prestigious. The State University of Malang is proactively luring, supporting and encouraging its researchers to be bravely publish their works on internationally reputable journals.

Therefore, I would like to take this occasion to express my appreciation to keynote and invited speakers of the conference, the prominent figures in their field. My appreciation should also be addressed to all co-host universities who have shared significant contribution to make this event possible. To all parallel speakers as well as all participants coming from various places, your contribution makes this conference is truly special.

Finally, in anticipation of a successful conference, I hereby officially open the International Mechanical and Industrial Engineering Conference 2018. Good luck and Have a wonderful time and nice conference, Thank you,

Rector of State University of Malang

Prof. Dr. H. Ahmad Rofi'uddin

INTERNATIONAL MECHANICAL & INDUSTRIAL ENGINEERING CONFERENCE
(IMIEC) 2018

WELCOMING ADDRESS

Chairman of International Mechanical and Industrial Engineering Conference, IMIEC 2018

Distinguished guests, respected colleagues, and ladies and gentlemen,

It is the time successfully to wrap up a year's work. Considering just how busy you all must be, thank you very much for taking your precious time to participate in the **International Mechanical and Industrial Engineering Conference, IMIEC 2018.**

In particular, I would like to extend my gratitude to distinguished keynote speakers from abroad. First of all, please allow me to express my sincere appreciation for coming to our city for:

1. **Prof. Dr. Ir. Masjuki bin Hj Hassan., from Department of Mechanical Engineering, University of Malaya, Malaysia**
2. **Prof. Ir. I Nyoman Pujawan, M.Eng, Ph.D, From Department of Industrial Engineering, Sepuluh November Institute of Technology, Surabaya**
3. **Prof. Akio Miyara, from Department of Mechanical Engineering, Saga University, Japan**
4. **Prof. Prakasit Sokrai, from Department of Industrial Engineering, Pranakhon Rajabhat University, Thailand.**

And also our invited speakers and presenters from all over the world,

5. **SM Shahrul Nizan Shikh Zahari PhD, DIC, MRSC, Industrial Chemical Technology Programme, Faculty of Science & Technology, Universiti Sains Islam Malaysia**
6. **Assoc. Prof. Andrzej Katunin, from Institute of Fundamentals of Machinery Design, Faculty of Mechanical Engineering,Silesian University of Technology, Poland.**

I welcome all of you and hope that this event will serve as a catalyst for strengthening national and international cooperation on the share of all coverage mechanical engineering and industrial engineering.

This conference is being held in a series of events **64th Anniversary of State University Malang** and **53rd Anniversary of Engineering Faculty**.

In addition, I am most thankful for the ceaseless efforts of all committee members of IMIEC consortia, all organizers, all cooperating institution as well as the sponsors that support us.

In this opportunity, I would like to report related to scientific of IMIEC 2018. The committee has received up to 200 manuscripts from 7 countries and more than 15 institutions. From 200 manuscript, the committee has decided to accept 122 papers that will published in MATEC International Proceeding indexed by SCOPUS. There are 7 topics consist of 4 topics from Mechanical Engineering and 3 topics from Industrial Engineering.

For your information, IMIEC 2018 is bianual event that continuing the previous event at 2016 which is IMEEEC 2016. We hope that we can continue to bring this tremendous event on IMIEC 2019.

Last but not least, I strongly hope that all of the distinguished guests gathered here today will offer your generous support and encouragement for the successful conference.

Thank you.

Chairman IMIEC 2018

Link Go To Paper

Characteristic comparison of photovoltaic module and photovoltaic thermal

Krismadinata[1,3,*], *Remon* Lapisa[2], *Syahril*[2] and *Asnil*[3]

[1]Energy Research Centre, Faculty of Engineering, Universitas Negeri Padang, 25171 Padang, Indonesia
[2]Depart. of Mechanical Engineering, Faculty of Engineering, Universitas Negeri Padang, 25171 Padang Indonesia
[3]Depart.of Electrical Engineering, Faculty of Engineering, Universitas Negeri Padang, 25171 Padang, Indonesia

Abstract. This paper discusses an attempt to compares the electrical characteristics of two solar modules of the same type and size in which one of the solar modules at the bottom is mounted a copper pipe for circulating water (as call photovoltaic thermal). The research was steered to observe water cooling effect to electrical characteristics of PV module. This system serves as a heat absorption on the bottom of the solar module. The experiment is conducted at the same time, place, and sunlight intensity conditions for both solar modules. The characteristics of short-circuit current, open circuit voltage, upper and lower temperature and the irradiation of sunlight from the two solar modules are observed. The test results show that photovoltaic thermal generate greater electrical power than solar modules not equipped with heat absorption

1 Introduction

Recently, one of the big problems facing the world is global warming. The massive use of fossil fuels for industry and transportation has triggered a large amount of CO2 content in the air that has an impact on the greenhouse effect. The use of energy sources that are not derived from fossils is one alternative to overcome global warming. Solar energy will not be exhausted until the doomsday. This is one alternative solution in the use of energy. Popular technologies in utilizing solar energy are solar heaters and solar modules (photovoltaic).

Solar heater is a technology that utilizes the sun beam into heat energy. This technology is widely used in household to heat water. The solar module also known as photovoltaic (PV), can convert sunlight into electrical energy. This technology is widely used for the electrification of villages in remote area where they are away from the electricity connection utilities.

* Corresponding author: krisma@ft.unp.ac.id

The problem of PV is during operation only about 15% of the solar radiation can be converted into electrical energy and others are wasted into heat. Though solar energy contains sun radiation and heat. It is very unfortunate if the energy used is just one of the two elements. One of PV weakness is the power efficiency of the PV decrease as the temperature around the PV module increases [1].

This is a reason, why the concept of "PV cooling" becomes so important in PV generation. It is applied to increase the electrical power generated. The PV cooling reduces the heat around the PV module and at the same time, it is gotten heat energy source.
The technology that can answer the above problem is by combining a PV module with a solar water heating module. This method is employed to improve the characteristics of solar panels by draining water under solar panels. They absorb heat around the solar panel. This system is known as PV solar heater or Photovoltaic Thermal (PVT). This system can eliminate external power source for water heater as well as to cool the solar PV module.

PVT technology has been realized since 1950 [2] and developed by [3]. This technology is long over reviewed. In the 2000s, it was continued to review by [4-8]. The optimizing of PVT design has been conducted by [9]. Research on the Rhodes Island has been reported that PVT efficiency was 9% lower than conventional solar heaters [10].The research on PVT technology is also quite popular in Indonesia, especially employing water as heat absorbing media. [11-13].

In this paper, an effort to comprise the electrical characteristics of PV module and PVT module. The research was conducted to inspect water cooling effect to electrical characteristics of PV module.

2 Methods

The experiment was conducted employing two PV modules of the same size, power, and model. One PV module is equipped with copper pipes, water pumps that can drain the water so it can function to absorb heat. When the temperature inside the copper pipe is larger than 420C the water pump works to drain the hot water to the storage tank and draw cold water back into the copper pipe.

The PVT is designed employing copper pipes as ducts that are placed under the solar panels. They are designed spiral-shaped. The diameter of ducts is 5/8 inch. This spiral copper pipe is placed under a solar module with a cross-sectional position along the side of the solar module. Those ducts is built with 10 curvatures. They are designed to flow more fluids. The experiment setup can be shown in Figure 1.

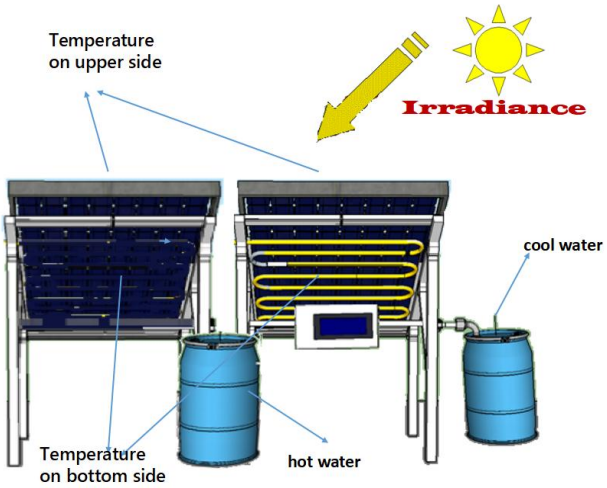


Fig. 1. Design of experiment setup

The experiments were conducted at Faculty of Engineering Universitas Negeri Padang (FT UNP). The latitude of FT UNP, Padang City West Sumatera is -0.9470832 or 0°56'49.5"S, and the longitude is 100.4172 or 100°25'1.85"E. The characteristics explored are solar irradiation, temperature of PV module on the upper side, temperature PV module on the bottom side, open-circuit voltage, and short-circuit current from PV module. Observations were also conducted at the same time as the same measuring instrument.
Both solar modules used have specifications as shown in table 1.

Table 1. Specification of PV module used

Specification	**Rate**
Pmax	50Watt (Peak)
Voc	21.6 Volt
Isc	2.98 Ampere
Vmp	17.6 Volt
Imp	2.85 Ampere
Size (mm)	835 X 540 X 28

3 Results and Analysis

A copper pipe that serves as a water flow conduit placed on the bottom side of the solar module can be seen in Figure 2. The conduit configuration is designed circles. This is done to get the amount of heat absorbed more.

A complete series of PV module and PVT module testing can be shown in Figure 3. The experiments setup is equipped with a monitoring system. It records all data regarding to PV and PVT modules characteristic. All measured data are stored in the memory of computer and processed and displayed in the graph. The observed data are irradiation of sunlight, ambient temperature, maximum output power, open-circuit voltage (V_{OC}) and short circuit-current (I_{SC}).

The data are collected starting morning at 9 o'clock and end at 15 o'clock. The monitoring system updates the data every 15 minutes. It needs to get detail information on characteristics changes. In Figure 4 the temperature chart changes to both solar modules.

The observed temperature is the temperature above the solar module. The maximal temperature achieved in this observation reaches 58^0C in the PV module, while temperature on upper side of the PVT module is lower than the PV module.

Figure 5 shows that the temperature on bottom side of the PVT module is lower than the PV module. The maximum temperature the PVT module reaches is 44^0C, corresponding to the initial temperature reference.

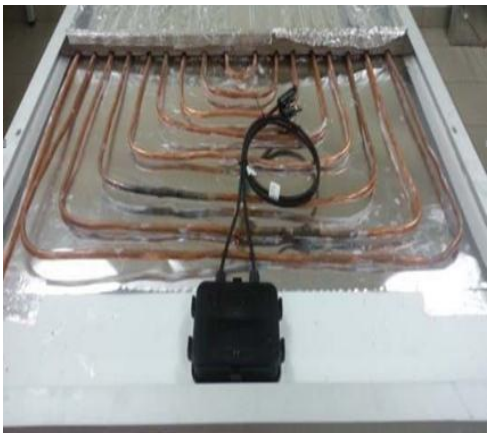


Fig. 2. Copper pipe as water flow conduit

Fig. 3. Experiment test setup

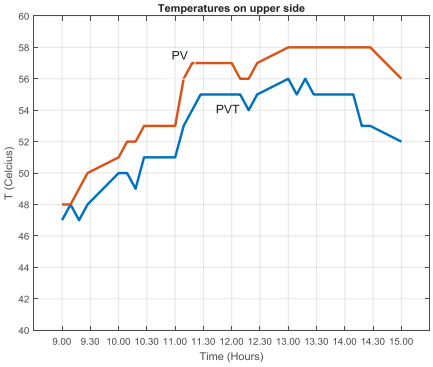


Fig. 4. Temperatures on upper side

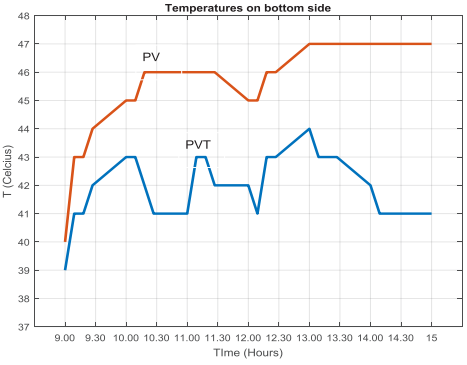


Fig. 5. Temperatures on bottom side

The voltage and current generated by the PVT module are higher than the PV module. It is especially at 13:00, the open-circuit voltage and short-circuit current of the PV module become the lowest at that time. this is shown in Figure 6 and Figure 7.

The high voltage and current on the PVT module compared to the PV module also impact on the power generated. This is shown in Figure 8.

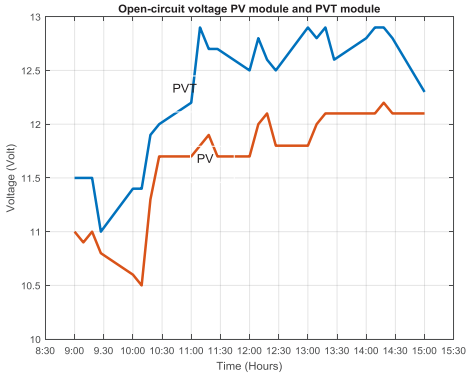


Fig. 6. V_{OC} of PV and PVT modules

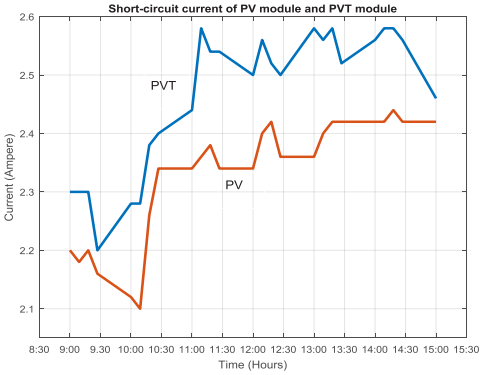


Fig. 7. I_{SC} of PV dan PVT modules

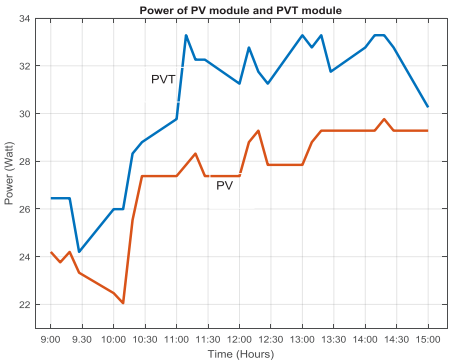


Fig. 8. Power comparison PV and PVT

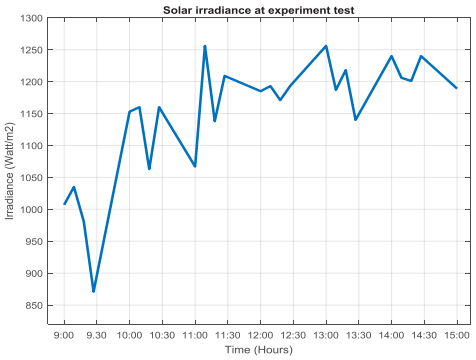


Fig. 9. Solar irradiation at experiment test

The highest solar irradiation is achieved at 13:00, as well as the current generated by the PVT module. At 11:15, the irradiation of light is quite high also close to irradiation at 13.00, but within the time it occurs clouds that reduce irradiation received solar module. This is illustrated in Figure 9.

4 Conclusions

In this paper, the performance of the PV module and PVT module is investigated. Data of temperature around the PV and PVT module, solar irradiation, short circuit current, open circuit voltage of the PV modules are explored. Those data are processed and analyzed for both solar modules. The results show that the PVT module has a better performance in terms of the power generated than the PV module. The liquid or water that passes on the PVT module acts as a coolant or heat absorber from the PV module so that it reduces the temperature of the solar module. The dropping temperature of the solar module can increase the electrical power generated by the module.

Authors gratefully acknowledge the support of Ministry of Research, Technology and Higher Education Republic of Indonesia (KEMENRISTEKDIKTI) for providing financial support under scheme research through PUPT grant No. 855/UN35.2/PG/2018.

References

1. H. G. Teo, P. S. Lee, & M. N. A. Hawlader , Applied Energy, **90** 309-315 (2012)
2. H. C. Hottel, A. Whillier, (1958)
3. L. W. Florschuetz. *Solar Energy*, **22** 361–366 (1979)
4. H. A. Zondag, D. W. de Vries, W. G. J. van Helden, R. J. C. van Zolingen, A. A. van Steenhoven, *Solar Energy* ,113–128 (2002)
5. A. Tiwari, M. S. Sodha, *Solar Energy,* **80** 751–9 (2006)
6. T. T. Chow, *Applied energy*, **87** 365-379 (2010)
7. Y. Tripanagnostopoulos, T. H. Nousia, M. Souliotis & P. Yianoulis, *Solar energy*, **72** 217-234 (2002)
8. P. G. Charalambous, G. G. Maidment, S. A. Kalogirou, & K. Yiakoumetti, *Applied Thermal Engineering*, **27** 275-286 (2007)
9. G. Mittelman, A. Kribus & A. Dayan, *Energy Conversion and Management* **48** 2481-2490 (2007)
10. N. Christandonis, G. A. Vokas & F. Skittides, *WSEAS Transactions on Circuits and Systems* 3 (2004)
11. M. P. Lukman, & J. Junaedy, *Stmik Kharisma Makassar* **2** 34-45 (2017)
12. Mustafa, R. Magga, & Y. Arifin, *Jurnal IPTEK* **19** 67-74 (2015)
13. R. Subarkah & Belyamin, *Poli-Teknologi*, **10** (2013)

MATEC Web of Conferences

Volume 204 (2018)

International Mechanical and Industrial Engineering Conference 2018 (IMIEC 2018)

Malang, Indonesia, August 30-31, 2018

P. Puspitasari, A.H. Suryanto, T. Lenggo Ginta, I. Srikun, A. Ayu Permanasari, M. Niaz Akhtar, M. Sharifi Jebeli, Y. Rohmat Aji Pradana, D. Zakariya Lubis, A. Larasati and A. Dwi Astuti (Eds.)

Open Access

Statement of Peer review

Published online: 21 September 2018

PDF (43.4 KB)

- Industrial Management
- Optimization
- Manufacture and System Design
- Energy
- Material
- Manufacture
- Construction

Open Access

Welcoming address - Rector State University of Malang 00001

H. Ahmad Rofi'uddin

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400001

Open Access

Welcoming address - Chairman of International Mechanical and Industrial Engineering Conference, IMIEC 2018 00002

Sukarni

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400002

Link Go To Paper

PDF (240.3 KB)

Open Access

Tribological advancement – strategies and effects towards emissions and global energy consumption 00003

Masjuki Hassan, Syahir Amzar Zulkifli, Harith Hasnul and Ashraf Yusoff

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400003

PDF (337.8 KB) | References

Open Access

Developments of next generation refrigerants and heat transfer 00004

Akio Miyara

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400004

PDF (431.7 KB) | References

Open Access

Incorporation of nano-modified material in the production of smart concrete 00005

Prakasit Sokrai and Natt Makul

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400005

PDF (453.7 KB) | References

Open Access

Triethylammonium hydrogen sulfate ionic liquid as a low-cost solvent: A short review of synthesis, analysis and applications 00006

S. M. Shahrul Nizan Shikh Zahari, Hazeeq Azman and Latifah Karim

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400006

PDF (411.0 KB) | References

Open Access

Multistage artificial aging optimization for tensile properties of Duralium using Response Surface Method (RSM) 00007

Poppy Puspitasari, Tsamroh Dewi Izzatus, Mochamad Achyarsyah, Beny Bandanajaya and Dewi puspitasari

PDF (345.3 KB) | References

Link Go To Paper

Open Access

Characteristics of nanoclay reinforced starch biocomposites through the extrusion process 00008

Heru Suryanto, Alfian Widi Rahmawan, Solichin, Sahana Rizki Tata and Uun Yanuhar

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400008

PDF (408.1 KB) | References

Open Access

Kinetic analysis of co-combustion of microalgae *spirulina platensis* and synthetic waste through the fitting model 00009

Sukarni Sukarni, Ardianto Prasetiyo, Sumarli Sumarli, Imam Muda Nauri and Avita Ayu Permanasari

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400009

PDF (283.8 KB) | References

Open Access

Thermal decomposition behavior of water hyacinth (*eichhornia crassipes*) under an inert atmosphere 00010

Sukarni Sukarni, Aloon Eko Widiono, Sumarli Sumarli, Retno Wulandari, Imam Muda Nauri and Avita Ayu Permanasari

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820400010

PDF (347.7 KB) | References

- Industrial Management

Open Access

Temporal and spatial prediction of retailer growth 01001

Bertha Maya Sopha, Fredrika Makasenda and Anna Maria Sri Asih

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401001

PDF (519.2 KB) | References

Open Access

A study of consumer preferences for customized product design 01002

Endang Retno Wedowati, Moses Laksono Singgih and I Ketut Gunarta

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401002

PDF (179.4 KB) | References

A study on perceptions of preschool Children's furniture design: Pictorial stimuli experiment 01003

Pornchai Tamthintha, Kusuma Palaprom and Kritchakhis Nawattanaprasert

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820401003

PDF (370.3 KB) | References

Open Access

Demand forecasting in Small and Medium Enterprises (SMEs) ED Aluminium Yogyakarta using causal, time series, and combined causal-time series approaches 01004

Wildanul Isnaini and Andi Sudiarso

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820401004

PDF (225.1 KB) | References

Open Access

Analysis of human behavioral attributes in improving disaster evacuation strategy of mount merapi 01005

Anna Maria Sri Asih, Ekky Novia Rubbyarta and Bertha Maya Sopha

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820401005

PDF (235.8 KB) | References

Open Access

Quality control of palm kernel oil using Individual Moving Range (I-MR) chart 01006

Fatimah, M Sayuti and Elsa Putri Pertiwi

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820401006

PDF (484.2 KB) | References

Open Access

Service design improvement in Ragunan Zoo using TRIZ methodology 01007

Inaki Maulida Hakim, Kusuma Narpawandawi and Teuku Yuri M. Zagloel

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820401007

PDF (241.8 KB) | References

Open Access

Development of sustainable procurement monitoring system performance based on Supply Chain Reference Operation (SCOR) and Analytical Hierarchy Process (AHP) on leather tanning industry 01008

Arditya Nur Waaly, Ari Yanuar Ridwan and Mohammad Deni Akbar

Published online: 21 September 2018

Open Access

Classification of sub-sectors in creative industry for regional economic development 01009

Deltaningtyas Tri Cahyaningrum, Erwin Widodo and Niniet Indah Arvitrida

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401009

PDF (251.7 KB) | References

Open Access

The impact of supply chain partnership and market driven strategy on consumer behavior in buying Vocaloid Hatsune Miku products 01010

Vicio Rizky Damar and Markus Hartono

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401010

PDF (360.3 KB) | References

Open Access

Competitiveness attributes of Small and Medium Enterprises (SMEs) in the global market (case study: garment SMEs in Tri Tunggal Village, Lamongan) 01011

Issa Dyah Utami, Trisita Novianti and Teuku Iqbal Dianta Romansa

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401011

PDF (248.4 KB) | References

Open Access

Failure Modes and Effects Analysis (FMEA) for evaluation of a sugarcane machine failure 01012

Hilma Raimona Zadry, Dendi Adi Saputra, Agung Budiman Tabri, Difana Meilani and Dina Rahmayanti

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401012

PDF (184 KB) | References

Open Access

Development of quality improvement matrix: An integrated tools for quality improvement 01013

Katon Muhammad and Putu Dana Karningsih

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401013

PDF (210.1 KB) | References

Open Access

Designing Key Performance Indicators (KPI) with macro ergonomics approach 01014

DOI: https://doi.org/10.1051/matecconf/201820401014

PDF (211.1 KB) | References

Link Go To Paper

Open Access

A data envelopment analysis approach for assessing the efficiency of small and medium-sized wood-furniture enterprises: a case study 01015

Diana P. Sari, Naniek Utami Handayani, M. Mujiya Ulkhaq, Wiwik Budiawan, Dea Ladysia Maharani and Fahmi Ardi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401015

PDF (308.7 KB) | References

Open Access

Occupational Health And Safety (OHS) management for employees on the risk of diseases due to the intensity of computer use in the workplace/industry 01016

Andika Bagus Nur Rahma Putra, M. Ihwanudin, Erwin Komara Mindarta, Poppy Puspitasari and M. Mirza Abdillah Pratama

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401016

PDF (381.7 KB) | References

Open Access

Electricity sustainable energy management model for community development holistically in Phranakhon Rajabhat University 01017

Isaree Srikun

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401017

PDF (261.6 KB) | References

Open Access

Understanding Facilities Management Practices to Improve Building Performance: The opportunity and challenge of the facilities management industry over the world 01018

Astri Anindya Sari

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820401018

PDF (297.5 KB) | References

- Optimization

Open Access

Optimization of industrial machine maintenance scheduling using ant colony method 02001

Iwan Aang Soenandi and Teuku Emily Budiman

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402001

PDF (436.3 KB) | References

Link Go To Paper

Open Access

Evaluation of random parking layout SBA mall using integer linear programing 02008

Prima Denny Sentia, Nissa Prasanti, Andriansyah and Rizfa Ramadhani Pulungan

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402008

PDF (332.2 KB) | References

Open Access

Traffic queue modeling using arena simulation software (a case study of Mergan 4-Way intersection in Malang City) 02009

Dani Yuniawan, P.P Aang Fajar, Samsudin Hariyanto and Romi Setiawan

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402009

PDF (250.4 KB) | References

Open Access

Traffic queue proposal solution on T-junction by utilizing arena simulation software (case study of Dinoyo T-Junction Malang City) 02010

Dani Yuniawan, P.P Aang Fajar, Samsudin Hariyanto and W.P Ide Bagus

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402010

PDF (269.4 KB) | References

Open Access

Feasibility model for freight train insertion in one way – train schedule 02011

Arrifah Ratna Sari and Ahmad Rusdiansyah

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402011

PDF (397.3 KB) | References

Open Access

Modelling of Cutting Tool Condition Monitoring System (CTCMS) to support industry 4.0 02012

Ari Setiawan, Dina Angela and Billy Irawan

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402012

PDF (377.5 KB) | References

Open Access

Fatkhor Rozi and Evy Herowati

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402013

Link Go To Paper

PDF (367.6 KB) | References

Open Access

An integrated fuzzy AHP and TOPSIS model for evaluating the performance of raw material suppliers: A case study in lasem batik writing centre 02014

Diana Puspita Sari, Wismar Rizki Wijayanti, Adhie Prayogo, M. Mujiya Ulkhaq and Dyah Ika Rinawati

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402014

PDF (380.2 KB) | References

Open Access

Two-Sided assembly line balancing to minimize number of workstation with considering the relationships between tasks 02015

Dina Rachmawaty, Putu Dana Karningsih and Budi Santosa

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402015

PDF (356.4 KB) | References

Open Access

Preventive maintenance policy on leasing by considering the usage rate 02016

Moh. Jufriyanto, Nani Kurniati and Ade Supriatna

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402016

PDF (283.0 KB) | References

Open Access

A Comparison of Exact Method - Metaheuristic Method in Determination for Vehicle Routing Problem 02017

Hilyatun Nuha, Putu Eka Dewi Karunia Wati and Wiwin Widiasih

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402017

PDF (320.6 KB) | References

Open Access

The effect of Kurtosis on the accuracy of artificial neural network predictive model 02018

Aisyah Larasati, Anik Dwiastutik, Darin Ramadhanti and Aal Mahardika

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820402018

PDF (293.8 KB) | References

Open Access

Ergonomic workstations for handicraft product made from fluorescent lamp waste 03001

Mochammad Rofieq

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403001

Link Go To Paper

PDF (355.1 KB) | References

Open Access

Knowledge sharing, visibility improvement and productivity growth: Evidence from agro-industry manufacturing firm 03002

Kevin Natalardo and Oki Sunardi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403002

PDF (246.8 KB) | References

Open Access

Microwave-assisted extraction of phenolic compounds from *Moringa oleifera* seed as anti-biofouling agents in membrane processes 03003

Ni'matul Izza, Shinta Rosalia Dewi, Ashried Setyanda, Agung Sukoyo, Panggulu Utoro, Dimas Firmanda Al Riza and Yusuf Wibisono

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403003

PDF (304.8 KB) | References

Open Access

A development of sustainable and successful business model for Thai local products: The mixed crispy rice noodle, Phra Na Khon Sri Ayutthaya Province 03004

Kusuma Palaprom and Kritchakhris Nawattanaprasert

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403004

PDF (263.7 KB) | References

Open Access

The use of indonesian soybean variety with time and planting location to the production to meet the demand 03005

Nelly Budiharti and Ing Wardana

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403005

PDF (261.1 KB) | References

Open Access

Development of agrotourism business model as an effort to increase the potency of tourism village(case study: Punten Village, Batu City) 03006

DOI: https://doi.org/10.1051/matecconf/201820403006

PDF (331.0 KB) | References

Link Go To Paper

Open Access

Reliability analysis of hanger shot blast KAZO machine in foundry plant 03007

Rinaldi Sam Prabowo, Priyo Agus Setiawan, Anda Iviana Juniani, Wiediartini and Ika Erawati

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403007

PDF (301.8 KB) | References

Open Access

Design of working procedure for handling the breakdown machine in parameter of reaction time based on Jidoka system approach in cement company 03008

Putri Nilda Tri, Amrina Elita, Rahmayanti Dina and Shifanof Gilang

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403008

PDF (242.2 KB) | References

Open Access

Kansei engineering-based robust design model for logistics services 03009

Markus Hartono and Amelia Santoso

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403009

PDF (377.1 KB) | References

Open Access

Development of fatigue, accident experiences and safety culture relationships to the risk of fishing perception on the accidents of fishing vessel small and medium 03010

Septi Nurindah Sari, Ratna Sari Dewi and Adithya Sudiano

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403010

PDF (468.2 KB) | References

Open Access

Designing an ergonomic backpack for sixth grade elementary school students in Bandung based on the ideal weight of backpack load 03011

Sonna Kristina and Bella Amanda

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403011

PDF (345.4 KB) | References

Open Access

Rhadityo Shakti Budiman and I Ketut Gunarta

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403012

Link Go To Paper

PDF (618.4 KB) | References

Open Access

Assessment of exposure packaging worker and designing work methods using OCRA index in fertilizer producer company 03013

Ainun Dwi Fridayati, Wiediartini, Haidar Natsir Amrullah, Muhammad Shah, Urip Mudjiono and Edy Prasetyo Hidayat

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403013

PDF (321.4 KB) | References

Open Access

Fire risk assessment on hammer mill machine with human reliability assessment (HRA) and component reliability approaches 03014

Khariza Amalia, Haidar Natsir Amrullah, Arief Subekti, Moch. Luqman Ashari, Edy Prasetyo Hidayat, Urip Mudjiono and Hendro Agus Widodo

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403014

PDF (455.5 KB) | References

Open Access

Towards the greenship assessment and certificate of new building Design Recognition (DR) for the design of IDB-funded integrated classroom building *Universitas Negeri Malang*, Indonesia 03015

Apif M. Hajji and Dian Ariestadi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403015

PDF (337.8 KB) | References

Open Access

Enhanced rooftop rainwater harvesting quality through filtration using zeolite and activated carbon 03016

Anie Yulistyorini, Gilang Idfi and Evy Dwi Fahmi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403016

PDF (284.6 KB) | References

Open Access

Injection well as an eco-drainage solution to reduce surface run-off at the State University of Malang 03017

DOI: https://doi.org/10.1051/matecconf/201820403017

PDF (274.9 KB) | References

Link Go To Paper

Open Access

Development lean assessment indicator: A case study 03018

Iffad Rakhmanhuda and Putu Dana Karningsih

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820403018

PDF (354.5 KB) | References

- *Energy*

Open Access

Spark ignition engine modeling for in-cylinder pressure and temperature prediction using simulink 04001

Nike Septivani and Byan Wahyu Riyandwita

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404001

PDF (360.5 KB) | References

Open Access

Artificial salmon tracking algorithm: Preliminary designing approach for optimizing the integrated mixed energy composition 04002

A.N. Afandi, Irham Fadlika, Quota Alief Sias, Y. Rahmawati, D. Lestari, A.N. Handayani, Yunis Sulistyorini, C.W.A. Farrel and R.S.A. Michiko

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404002

PDF (281.7 KB) | References

Open Access

Utilization of the dethridge wheel as a low head power generator and loss analysis 04003

Dan Mugisidi, Oktarina Heriyani, Rizal Andi Luhung and Moh. Ramdani Dwi Andrian

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404003

PDF (268.3 KB) | References

Open Access

Methods in water conservation as part of green building rating tools in indonesia – case study: Design of integrated classrooms building in *Universitas Negeri Malang*, Indonesia 04004

Apif M. Hajji, Bambang Suprianto and Dian Ariestadi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404004

PDF (690.2 KB) | References

DOI: https://doi.org/10.1051/matecconf/201820404016

PDF (325.3 KB) | References

Link Go To Paper

Open Access

The implementation of Customer Relationship Management (CRM) on textile supply chain using k-means clustering in data mining 04017

Anik Dwiastuti, Aisyah Larasati and Endang Prahastuti

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404017

PDF (253.6 KB) | References

Open Access

Numerical simulation of the effect of material catalytic converter on gas emission 04018

Suheni, Rudy Sunoko, Slamet Wahyudi and Amin S Leksono

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820404018

PDF (430.7 KB) | References

- *Material*

Open Access

Quenching and tempering parameter on Indonesian hot rolled plate steel for armour steel 05001

Yurianto, Pratikto, Rudy Sonoko, Wahyono and A.P. Bayuseno

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820405001

PDF (260.5 KB) | References

Open Access

Development of Aceh iron sand to produce pig iron: studies on hardness properties 05002

M Sayuti, Akhyar Ibrahim, Muhammad Yusuf and Reza Putra

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820405002

PDF (234.3 KB) | References

Open Access

Mechanical and physical properties of aluminium-silicon (Al-Si) casting alloys reinforced by Zinc Oxide (ZnO) 05003

Poppy Puspitasari, Okky Rachmadilla Soepriyanto, Muhammad Ilman Nur Sasongko, Johan Wayan Dika and Andoko

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820405003

PDF (353.9 KB) | References

The effects of sodium hydroxide and potassium permanganate treatment on roughness of coconut fiber surface 05004

Muhammad Arsyad and Rudy Soenoko

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405004

Link Go To Paper

PDF (759.4 KB) | References

Open Access

Electric polarization properties of $BaTiO_3$-$BiFeO_3$ as nanomultiferroic material produced by sol-gel method 05005

Dwita Suastiyanti, Maykel T.E. Manawan and Marlin Wijaya

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405005

PDF (384.0 KB) | References

Open Access

Phase separation on ricinoleic acid freezing 05006

Firman, Barlian Hasan and Muhammad Anshar

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405006

PDF (248.3 KB) | References

Open Access

Microstructure and mechanical characteristics of hot forged lateritic steels 05007

Satrio Herbirowo, Luqmanul Hakim and Bintang Adjiantoro

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405007

PDF (521.1 KB) | References

Open Access

Analyze the effect of phosphorus on the mechanical properties and microstructure on cast iron 05008

Achmad Sambas, Ananto Gamawan and Sophiadi Gunara

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405008

PDF (458.2 KB) | References

Open Access

Fiberglass reinforced plastic as construction material for Indonesian fishing vessels – challenges and future potential development 05009

I Putu A. Wibawa and Richard W. Birmingham

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405009

Open Access

Effects of brass addition on the flexural strength and microstructure of porous clay/brass composites 05010

Muh Amin, Rubijanto Juni Pribadi and Jamasri

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405010

Link Go To Paper

PDF (528.4 KB) | References

Open Access

Morinda citrifoliia L. as a renewable raw material for surface active agent 05011

Trismawati and D. Wikanaji

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405011

PDF (454.1 KB) | References

Open Access

Human error probability analysis of overhead crane operation in steel fabrication company using SLIM-DEMATEL-ANP method 05012

Annisya Arumy Nurdiawati, Lukman Handoko, Am Maisarah Disrinama, Haidar Natsir Amrullah, Denny Dermawan, Muhammad Shah and Fais Hamzah

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405012

PDF (293.8 KB) | References

Open Access

Numerical simulation of the oxygen distribution in silicon melt for different argon gas flow rates during Czochralski silicon crystal growth process 05013

Zumrotul Ida, Jyh-Chen Chen and Thi Hoai Thu Nguyen

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405013

PDF (415.8 KB) | References

Open Access

Analisys of casting defects and mechanical properties on Al-Si alloys using Bangkalan local clays as sand casting binder 05014

Candi Galih Syaifullah, Ayik Bela Saputra, F Shabrina Ruhyatul and Poppy Puspitasari

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405014

PDF (291.4 KB) | References

Open Access

Heru Suryanto, Tito Arif Sutrisno, M. Muhajir, Neena Zakia and Uun Yanuhar
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405015
Link Go To Paper
PDF (513.9 KB) | References

Open Access

The effectiveness of mendong plaited rope production: the design of automatic mendong rope twisting machine 05016

Duwi Leksono Edy, Widiyanti, Fahru Riza and Kharis Sofia Sari
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405016
PDF (486.1 KB) | References

Open Access

The potential of silk fibroin as a polymer composite reinforcement for bone implant materials 05017

Purnomo, Putu Hadi Setyarini and Ana Hidayati Mukaromah
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405017
PDF (561.4 KB) | References

Open Access

The inhibitive effect of tannin in *Psidium guajava* leaves towards 304SS corrosion in concentrated HCl 05018

Andita N. F. Ganda, Andoko, P. H. Setyarini and Femiana Gapsari
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405018
PDF (382.9 KB) | References

Open Access

Growth of anodic Aluminum Oxide using titanium as cathode – a review 05019

Putu Hadi Setyarini, Femiana Gapsari and Purnomo
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405019
PDF (217.7 KB) | References

Open Access

Heat treatment effect on metal matrix composite with brass matrix and fly ash 05020

Aminnudin Aminnudin and Moch. Agus Choiron
Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820405020
PDF (375.8 KB) | References

Open Access

Study the effect of angle of attack on flow characteristics at racing bike helmet using CFD 06001

Syamsuri, M Hasan Syafik and Yudho Putro Iswanto

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820406001

Link Go To Paper

PDF (315.3 KB) | References

Open Access

Enhancement of shearography-based damage identification using best tree wavelet packet analysis 06002

Andrzej Katunin, Hernani Lopes and José Viriato Araújo dos Santos

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820406002

PDF (375.6 KB) | References

Open Access

Damage evaluation based on ultrasonic testing of compos-ite aircraft elements and image analysis methods 06003

Angelika Wronkowicz and Krzysztof Dragan

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820406003

PDF (319.1 KB) | References

Open Access

Effect of friction welding conditions on tensile strength and hardness of AISI 310 stainless steel joints 06004

Muhammad Iswar and Rusdi Nur

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820406004

PDF (371.8 KB) | References

Open Access

GECOBRIDGE: A concept of a smart eco-friendly integrated bridge utilizing geopolymer and graded concrete technology 06005

M. Mirza Abdillah Pratama, Yustika Dyah Pratiwi, Miftah Aliyil 'Ilmi and Alifah Mahardika

Published online: 21 September 2018
DOI: https://doi.org/10.1051/matecconf/201820406005

PDF (291.8 KB) | References

Open Access

Multi objective optimization for kerf and material removal rate in wire electrical discharge machining using Taguchi method combined grey relational analysis 06006

DOI: https://doi.org/10.1051/matecconf/201820406006

PDF (272.5 KB) | References

Open Access

Experimental and CFD analysis of rotary multi vane expander for small capacity generation 06007

Mohammad Mahardika

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820406007

PDF (410.4 KB) | References

Open Access

Effect of concession model and deregulation logistics policy for increasing port customer satisfaction in Indonesia 06008

Sirajuddin, Sunaryo and T. Yuri Zagloel

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820406008

PDF (285.9 KB) | References

Open Access

Hardness analysis on carburized steel weld joint by SMAW using different welding current 06009

Yanuar Rohmat Aji Pradana, Wahono, Dicky Tanzila and Azmi Lukman

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820406009

PDF (1.107 MB) | References

Open Access

An Effect of Electric Current Variations and Wire Feed Rate on Low Carbon Steels Toward Tensile Strength on The Result of Gas Metal Arc Welding 06010

Taufik Hardiansyah, Moch Rofi Imron, Johan Handoko, Solichin and Abdul Qolik

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820406010

PDF (156.2 KB) | References

- Construction

Open Access

Estimation of calcaneal deformation while standing from the boolean operation between 3D and footprint image and its comparison with lateral x-ray 07001

Dwi Basuki Wibowo, Agus Suprihanto, Achmad Widodo and Gunawan Dwi Haryadi

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820407001

PDF (334.1 KB) | References

Simulation of human bone implant duralium material with variation loading using Ansys software 07020

Didin Mujahidin, Poppy Puspitasari and Djoko Kustono

Published online: 21 September 2018

DOI: https://doi.org/10.1051/matecconf/201820407020

PDF (490.2 KB) | References

MATEC Web of Conferences

eISSN: 2261-236X

INTERNATIONAL MECHANICAL & INDUSTRIAL ENGINEERING CONFERENCE
(IMIEC) 2018

WELCOMING ADDRESS
Rector State University of Malang

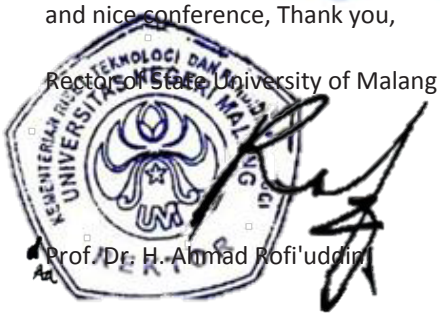
Dear
Mr. Chairman and committee member of the International Mechanical and Industrial Engineering Conference 2018 (IMIEC 2018), Ladies and Gentleman, the co-hosts, respectable keynote speakers and invited speakers, parallel speakers and all participants of the conference, All the pleasure is mine to welcome you all to State University of Malang, the learning university which values on tradition, integrity, continuity and innovation.

Ladies and gentleman,
It is an honour to be the host of the IMIEC 2018 as it provides unique opportunity for respectable researchers, experts, scholars, students and even policy makers to share ideas on hot issues and trending topics in mechanichal engineering. IMIEC 2018 also aims to establish framework as well as international collaboration amongst universities in Indonesia and worldwide research facilities, especially to facilitate research publications by Indonesian students and scholars in reputable international journals. It is undoubtful that the crucial step to pave the way for a university to gain international recognition, it must be indexed internationally, entering all fields of reputable peer-reviewed publications. At State University of Malang, we got this challenge, we do believe that such conference like IMIEC can be regarded as potential answer to the aforementioned challenge and therefore makes this conference prestigious. The State University of Malang is proactively luring, supporting and encouraging its researchers to be bravely publish their works on internationally reputable journals.

Therefore, I would like to take this occasion to express my appreciation to keynote and invited speakers of the conference, the prominent figures in their field. My appreciation should also be addressed to all co-host universities who have shared significant contribution to make this event possible. To all parallel speakers as well as all participants coming from various places, your contribution makes this conference is truly special.

Finally, in anticipation of a successful conference, I hereby officially open the International Mechanical and Industrial Engineering Conference 2018. Good luck and Have a wonderful time and nice conference, Thank you,

Rector of State University of Malang



Prof. Dr. H. Ahmad Rofi'uddin

INTERNATIONAL MECHANICAL & INDUSTRIAL ENGINEERING CONFERENCE
(IMIEC) 2018

WELCOMING ADDRESS
Chairman of International Mechanical and Industrial Engineering Conference, IMIEC 2018

Distinguished guests, respected colleagues, and ladies and gentlemen,

It is the time successfully to wrap up a year's work. Considering just how busy you all must be, thank you very much for taking your precious time to participate in the **International Mechanical and Industrial Engineering Conference, IMIEC 2018.**

In particular, I would like to extend my gratitude to distinguished keynote speakers from abroad. First of all, please allow me to express my sincere appreciation for coming to our city for:

1. **Prof. Dr. Ir. Masjuki bin Hj Hassan., from Department of Mechanical Engineering, University of Malaya, Malaysia**
2. **Prof. Ir. I Nyoman Pujawan, M.Eng, Ph.D, From Department of Industrial Engineering, Sepuluh November Institute of Technology, Surabaya**
3. **Prof. Akio Miyara, from Department of Mechanical Engineering, Saga University, Japan**
4. **Prof. Prakasit Sokrai, from Department of Industrial Engineering, Pranakhon Rajabhat University, Thailand.**

And also our invited speakers and presenters from all over the world,

5. **SM Shahrul Nizan Shikh Zahari PhD, DIC, MRSC, Industrial Chemical Technology Programme, Faculty of Science & Technology, Universiti Sains Islam Malaysia**
6. **Assoc. Prof. Andrzej Katunin, from Institute of Fundamentals of Machinery Design, Faculty of Mechanical Engineering,Silesian University of Technology, Poland.**

I welcome all of you and hope that this event will serve as a catalyst for strengthening national and international cooperation on the share of all coverage mechanical engineering and industrial engineering.

This conference is being held in a series of events **64th Anniversary of State University Malang** and **53rd Anniversary of Engineering Faculty**.

In addition, I am most thankful for the ceaseless efforts of all committee members of IMIEC consortia, all organizers, all cooperating institution as well as the sponsors that support us.

In this opportunity, I would like to report related to scientific of IMIEC 2018. The committee has received up to 200 manuscripts from 7 countries and more than 15 institutions. From 200 manuscript, the committee has decided to accept 122 papers that will published in MATEC International Proceeding indexed by SCOPUS. There are 7 topics consist of 4 topics from Mechanical Engineering and 3 topics from Industrial Engineering.

For your information, IMIEC 2018 is bianual event that continuing the previous event at 2016 which is IMEEEC 2016. We hope that we can continue to bring this tremendous event on IMIEC 2019.

INTERNATIONAL MECHANICAL & INDUSTRIAL ENGINEERING CONFERENCE (IMIEC) 2018

Last but not least, I strongly hope that all of the distinguished guests gathered here today will offer your generous support and encouragement for the successful conference.

Thank you.

Chairman IMIEC 2018

Characteristic comparison of photovoltaic module and photovoltaic thermal

Krismadinata[1,3,*], *Remon* Lapisa[2], *Syahril*[2] and *Asnil*[3]

[1]Energy Research Centre, Faculty of Engineering, Universitas Negeri Padang, 25171 Padang, Indonesia
[2]Depart. of Mechanical Engineering, Faculty of Engineering, Universitas Negeri Padang, 25171 Padang Indonesia
[3]Depart.of Electrical Engineering, Faculty of Engineering, Universitas Negeri Padang, 25171 Padang, Indonesia

Abstract. This paper discusses an attempt to compares the electrical characteristics of two solar modules of the same type and size in which one of the solar modules at the bottom is mounted a copper pipe for circulating water (as call photovoltaic thermal). The research was steered to observe water cooling effect to electrical characteristics of PV module. This system serves as a heat absorption on the bottom of the solar module. The experiment is conducted at the same time, place, and sunlight intensity conditions for both solar modules. The characteristics of short-circuit current, open circuit voltage, upper and lower temperature and the irradiation of sunlight from the two solar modules are observed. The test results show that photovoltaic thermal generate greater electrical power than solar modules not equipped with heat absorption

1 Introduction

Recently, one of the big problems facing the world is global warming. The massive use of fossil fuels for industry and transportation has triggered a large amount of CO2 content in the air that has an impact on the greenhouse effect. The use of energy sources that are not derived from fossils is one alternative to overcome global warming. Solar energy will not be exhausted until the doomsday. This is one alternative solution in the use of energy. Popular technologies in utilizing solar energy are solar heaters and solar modules (photovoltaic).

Solar heater is a technology that utilizes the sun beam into heat energy. This technology is widely used in household to heat water. The solar module also known as photovoltaic (PV), can convert sunlight into electrical energy. This technology is widely used for the electrification of villages in remote area where they are away from the electricity connection utilities.

* Corresponding author: krisma@ft.unp.ac.id

The problem of PV is during operation only about 15% of the solar radiation can be converted into electrical energy and others are wasted into heat. Though solar energy contains sun radiation and heat. It is very unfortunate if the energy used is just one of the two elements. One of PV weakness is the power efficiency of the PV decrease as the temperature around the PV module increases [1].

This is a reason, why the concept of "PV cooling" becomes so important in PV generation. It is applied to increase the electrical power generated. The PV cooling reduces the heat around the PV module and at the same time, it is gotten heat energy source.
The technology that can answer the above problem is by combining a PV module with a solar water heating module. This method is employed to improve the characteristics of solar panels by draining water under solar panels. They absorb heat around the solar panel. This system is known as PV solar heater or Photovoltaic Thermal (PVT). This system can eliminate external power source for water heater as well as to cool the solar PV module.

PVT technology has been realized since 1950 [2] and developed by [3]. This technology is long over reviewed. In the 2000s, it was continued to review by [4-8]. The optimizing of PVT design has been conducted by [9]. Research on the Rhodes Island has been reported that PVT efficiency was 9% lower than conventional solar heaters [10].The research on PVT technology is also quite popular in Indonesia, especially employing water as heat absorbing media. [11-13].

In this paper, an effort to comprise the electrical characteristics of PV module and PVT module. The research was conducted to inspect water cooling effect to electrical characteristics of PV module.

2 Methods

The experiment was conducted employing two PV modules of the same size, power, and model. One PV module is equipped with copper pipes, water pumps that can drain the water so it can function to absorb heat. When the temperature inside the copper pipe is larger than 420C the water pump works to drain the hot water to the storage tank and draw cold water back into the copper pipe.

The PVT is designed employing copper pipes as ducts that are placed under the solar panels. They are designed spiral-shaped. The diameter of ducts is 5/8 inch. This spiral copper pipe is placed under a solar module with a cross-sectional position along the side of the solar module. Those ducts is built with 10 curvatures. They are designed to flow more fluids. The experiment setup can be shown in Figure 1.

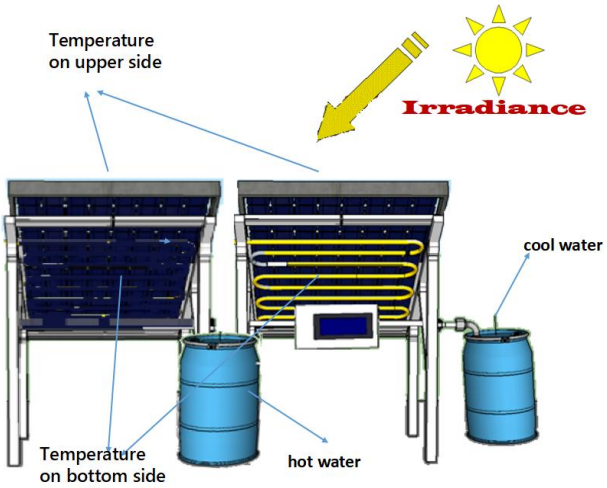


Fig. 1. Design of experiment setup

The experiments were conducted at Faculty of Engineering Universitas Negeri Padang (FT UNP). The latitude of FT UNP, Padang City West Sumatera is -0.9470832 or 0°56'49.5"S, and the longitude is 100.4172 or 100°25'1.85"E. The characteristics explored are solar irradiation, temperature of PV module on the upper side, temperature PV module on the bottom side, open-circuit voltage, and short-circuit current from PV module. Observations were also conducted at the same time as the same measuring instrument.
Both solar modules used have specifications as shown in table 1.

Table 1. Specification of PV module used

Specification	**Rate**
Pmax	50Watt (Peak)
Voc	21.6 Volt
Isc	2.98 Ampere
Vmp	17.6 Volt
Imp	2.85 Ampere
Size (mm)	835 X 540 X 28

3 Results and Analysis

A copper pipe that serves as a water flow conduit placed on the bottom side of the solar module can be seen in Figure 2. The conduit configuration is designed circles. This is done to get the amount of heat absorbed more.

A complete series of PV module and PVT module testing can be shown in Figure 3. The experiments setup is equipped with a monitoring system. It records all data regarding to PV and PVT modules characteristic. All measured data are stored in the memory of computer and processed and displayed in the graph. The observed data are irradiation of sunlight, ambient temperature, maximum output power, open-circuit voltage (V_{OC}) and short circuit-current (I_{SC}).

The data are collected starting morning at 9 o'clock and end at 15 o'clock. The monitoring system updates the data every 15 minutes. It needs to get detail information on characteristics changes. In Figure 4 the temperature chart changes to both solar modules.

The observed temperature is the temperature above the solar module. The maximal temperature achieved in this observation reaches 58^0C in the PV module, while temperature on upper side of the PVT module is lower than the PV module.

Figure 5 shows that the temperature on bottom side of the PVT module is lower than the PV module. The maximum temperature the PVT module reaches is 44^0C, corresponding to the initial temperature reference.

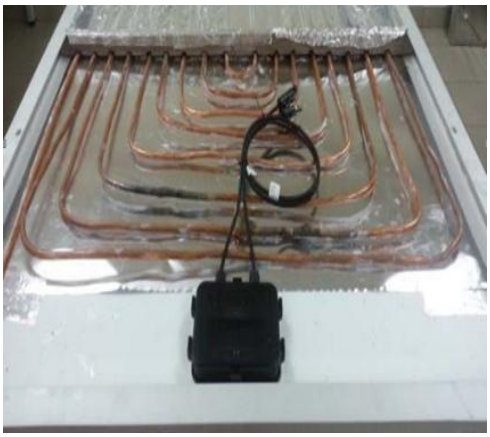


Fig. 2. Copper pipe as water flow conduit

Fig. 3. Experiment test setup

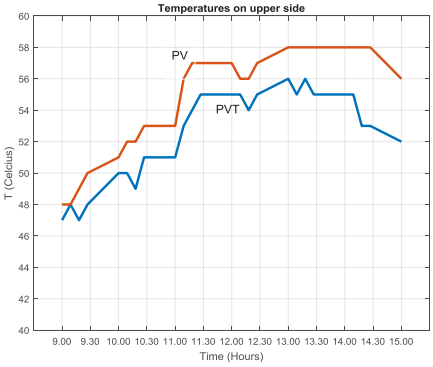


Fig. 4. Temperatures on upper side

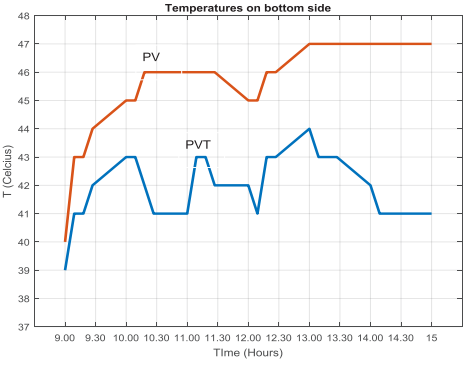


Fig. 5. Temperatures on bottom side

The voltage and current generated by the PVT module are higher than the PV module. It is especially at 13:00, the open-circuit voltage and short-circuit current of the PV module become the lowest at that time. this is shown in Figure 6 and Figure 7.

The high voltage and current on the PVT module compared to the PV module also impact on the power generated. This is shown in Figure 8.

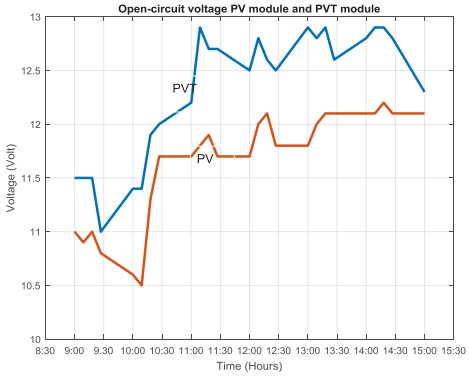


Fig. 6. V_{OC} of PV and PVT modules

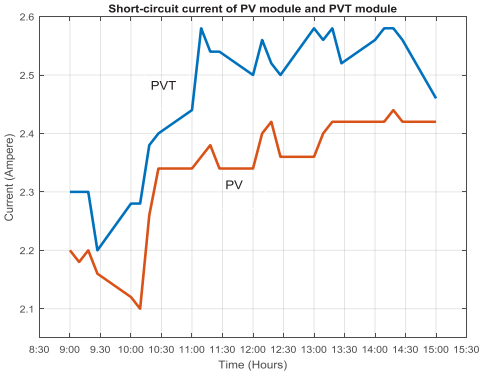


Fig. 7. I_{SC} of PV dan PVT modules

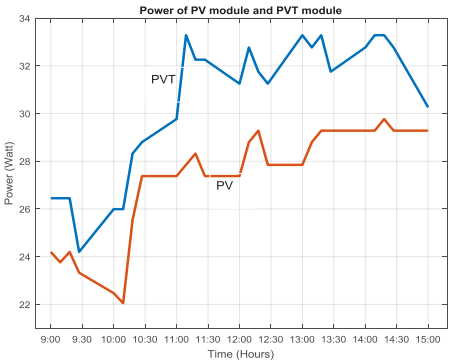


Fig. 8. Power comparison PV and PVT

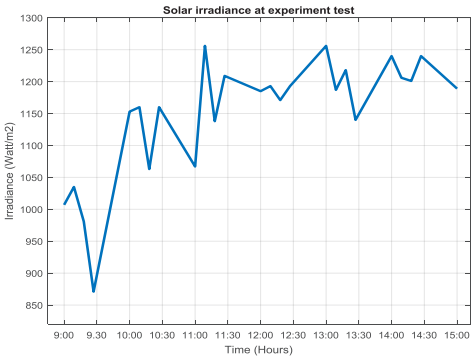


Fig. 9. Solar irradiation at experiment test

The highest solar irradiation is achieved at 13:00, as well as the current generated by the PVT module. At 11:15, the irradiation of light is quite high also close to irradiation at 13.00, but within the time it occurs clouds that reduce irradiation received solar module. This is illustrated in Figure 9.

4 Conclusions

In this paper, the performance of the PV module and PVT module is investigated. Data of temperature around the PV and PVT module, solar irradiation, short circuit current, open circuit voltage of the PV modules are explored. Those data are processed and analyzed for both solar modules. The results show that the PVT module has a better performance in terms of the power generated than the PV module. The liquid or water that passes on the PVT module acts as a coolant or heat absorber from the PV module so that it reduces the temperature of the solar module. The dropping temperature of the solar module can increase the electrical power generated by the module.

Authors gratefully acknowledge the support of Ministry of Research, Technology and Higher Education Republic of Indonesia (KEMENRISTEKDIKTI) for providing financial support under scheme research through PUPT grant No. 855/UN35.2/PG/2018.

References

1. H. G. Teo, P. S. Lee, & M. N. A. Hawlader , Applied Energy, **90** 309-315 (2012)
2. H. C. Hottel, A. Whillier, (1958)
3. L. W. Florschuetz. *Solar Energy*, **22** 361–366 (1979)
4. H. A. Zondag, D. W. de Vries, W. G. J. van Helden, R. J. C. van Zolingen, A. A. van Steenhoven, *Solar Energy* ,113–128 (2002)
5. A. Tiwari, M. S. Sodha, *Solar Energy,* **80** 751–9 (2006)
6. T. T. Chow, *Applied energy*, **87** 365-379 (2010)
7. Y. Tripanagnostopoulos, T. H. Nousia, M. Souliotis & P. Yianoulis, *Solar energy*, **72** 217-234 (2002)
8. P. G. Charalambous, G. G. Maidment, S. A. Kalogirou, & K. Yiakoumetti, *Applied Thermal Engineering*, **27** 275-286 (2007)
9. G. Mittelman, A. Kribus & A. Dayan, *Energy Conversion and Management* **48** 2481-2490 (2007)
10. N. Christandonis, G. A. Vokas & F. Skittides, *WSEAS Transactions on Circuits and Systems* 3 (2004)
11. M. P. Lukman, & J. Junaedy, *Stmik Kharisma Makassar* **2** 34-45 (2017)
12. Mustafa, R. Magga, & Y. Arifin, *Jurnal IPTEK* **19** 67-74 (2015)
13. R. Subarkah & Belyamin, *Poli-Teknologi*, **10** (2013)

MATEC Web of Conferences

Country	France - SIR Ranking of France
Subject Area and Category	Chemistry Chemistry (miscellaneous) Engineering Engineering (miscellaneous) Materials Science Materials Science (miscellaneous)
Publisher	
Publication type	Conferences and Proceedings
ISSN	00002012
Coverage	2012-ongoing
Scope	MATEC Web of Conferences is an Open Access publication series dedicated to archiving conference proceedings dealing with all fundamental and applied research aspects related to Materials science, Engineering and Chemistry. All engineering disciplines are covered by the aims and scope of the journal: civil, naval, mechanical, chemical, and electrical engineering as well as nanotechnology and metrology. The journal concerns also all materials in regard to their physical-chemical characterization, implementation, resistance in their environment... Other subdisciples of chemistry, such as analytical chemistry, petrochemistry, organic chemistry..., and even pharmacology, are also welcome. MATEC Web of Conferences offers a wide range of services from the organization of the submission of conference proceedings to the worldwide dissemination of the conference papers. It provides an efficient archiving solution, ensuring maximum exposure and wide indexing of scientific conference proceedings. Proceedings are published under the scientific responsibility of the conference editors.
	Homepage

18

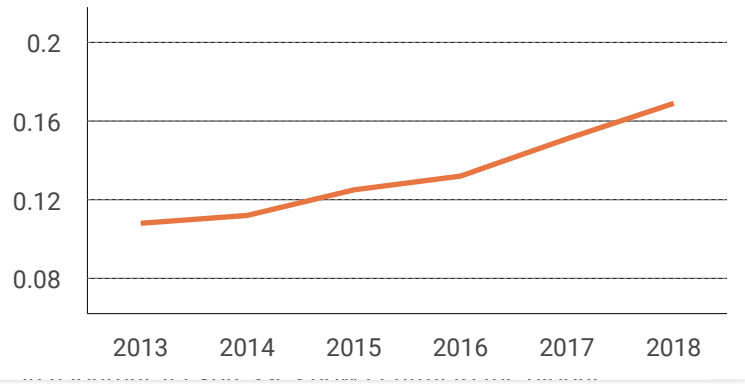
H Index

How to publish in this journal

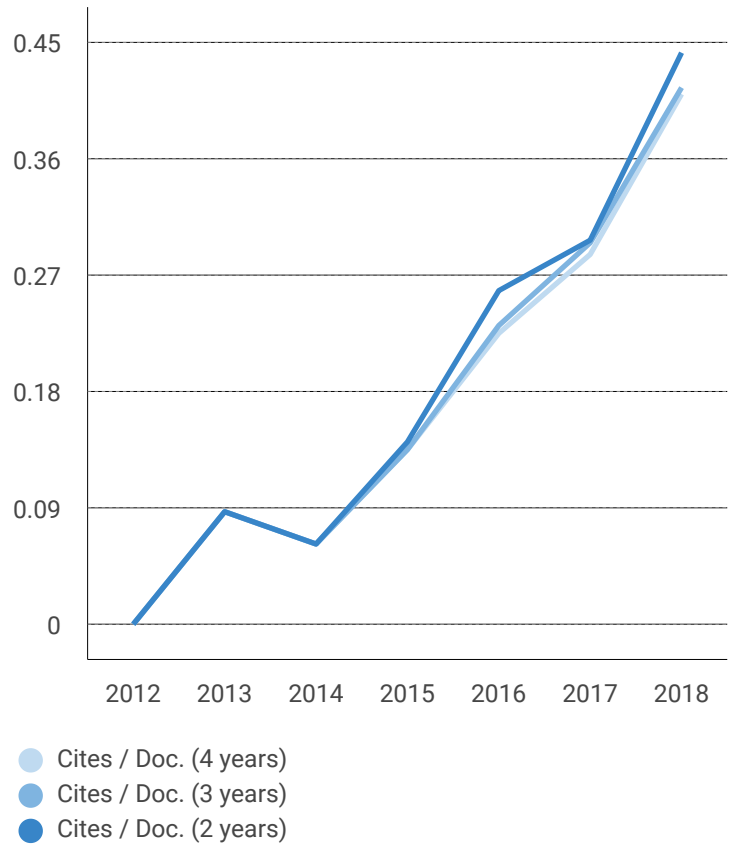
Contact

Join the conversation about this journal

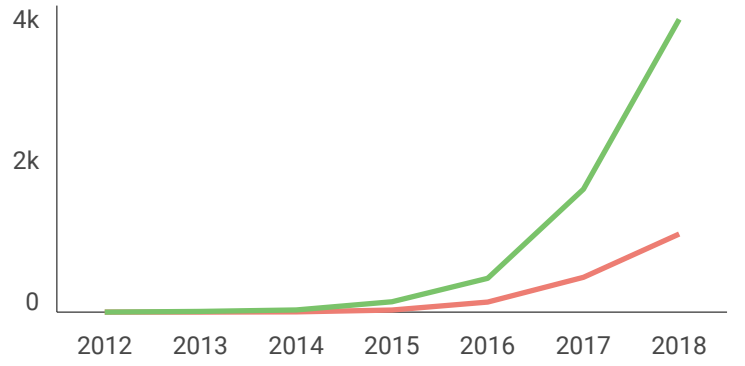
SJR



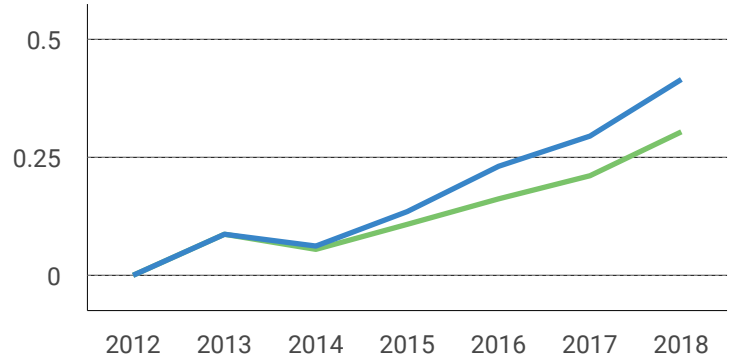
Citations per document



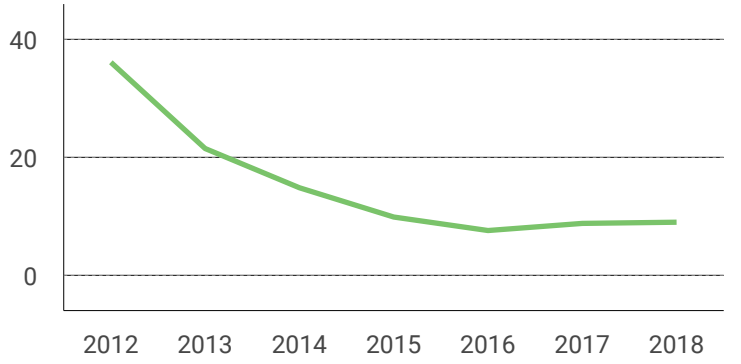
Total Cites Self-Cites



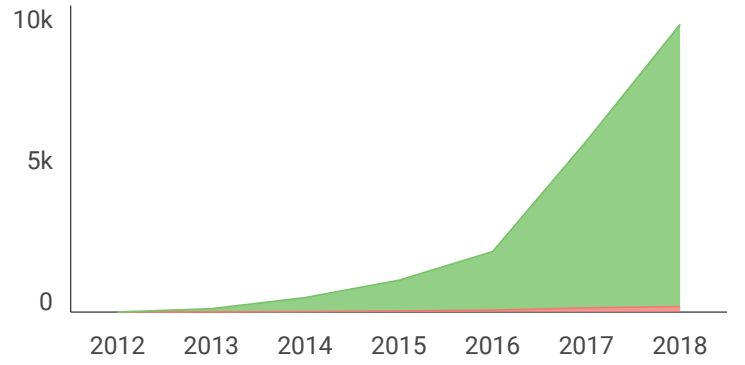
External Cites per Doc Cites per Doc



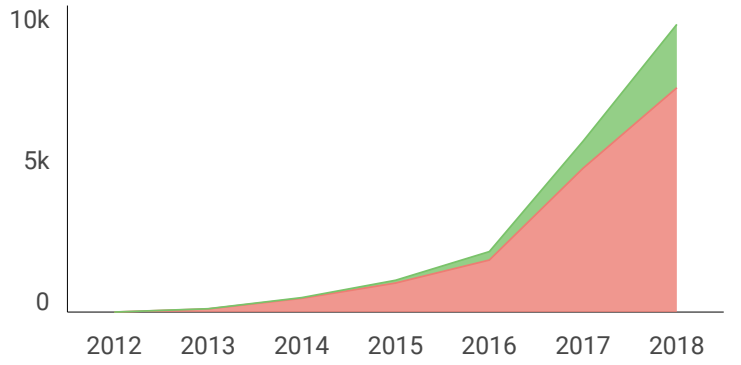
% International Collaboration

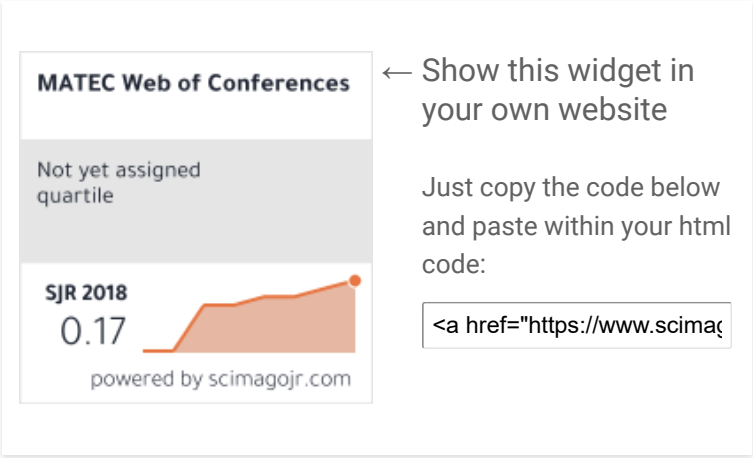


Citable documents Non-citable documents



Cited documents Uncited documents





S **Serhij** 1 month ago

Coverage discontinued in Scopus!

https://www.scopus.com/sourceid/21100316064?origin=resultslist

reply

SCImago Team

Melanie Ortiz 1 month ago

Dear Serhij, thanks for your participation! Best Regards, SCImago Team

K **Kharun** 5 months ago

Hi,
How often does SJR (SCImago Team) update information about Journals and Proceedings?

reply

SCImago Team

Melanie Ortiz 5 months ago

Dear Kharun,
thank you for contacting us.
Our data come from Scopus, they annually send us an update of the data. This update is sent to us around April / May each year. Remember that the SJR is a static image of the Scopus database, which grows daily. Best Regards, SCImago Team