Welcome to the 2nd Joint Conference of The 4th Asia Pacific Conference on Manufacturing Systems and The 3rd International Manufacturing Engineering Conference (APCOMS-iMEC2017). The APCOMS-iMEC2017 is the second collaboration between Bandung Institute of Technology and Universiti Malaysia Pahang. This year, the conference is hosted by Bandung Institute of Technology and co-hosted by Sebelas Maret University in the special region of Yogyakarta, Indonesia. We hope that you will enjoy the surrounding of the city during your stay. If you have any questions or concerns, then please do not hesitate to visit the Registration Desk at the piano room or approach a conference staff member wore a red lanyard. We look forward to a productive meeting.

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apcoms@itb.ac.id
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CONFERENCE COLLABORATORS, PARTNERS and SPONSORS

We are sincerely grateful for the support of the following parties without whom this conference would not be feasible.
VENUE INFORMATION

The APCOMS-iMEC 2017 will take place in the EastParc Hotel, Yogyakarta, Indonesia.

Address:
Jl. Laksda Adisucipto Km 6.5 Seturan Yogyakarta Indonesia 55281
Phone: +62 274 493 2000 / +62 811 257 5444

REGISTRATION DESK

The registration desk is located in the Piano Room on the 1st floor of the EastParc Hotel.

Staff Hours:

- Wednesday, December 6th, 2017 [16:00 – 18:00]
- Thursday, December 7th, 2017 [07:00 – 18:00]
- Friday, December 8th, 2017 [07:00 – 09:00]

On-site registration may be completed at the Registration Desk. Payments can be made with cash.

INTERNET ACCESS

Free wireless internet access is accessible throughout the conference venues via the access point provided by The EastParc Hotel. Please visit the Registration Desk to obtain guest access.

BREAKOUT and LUGGAGE ROOMS

The Piano Room will be available for all conference participants to use as needed to get any information regarding the conference. Assistance with luggage storage may also be found here. The room will be staffed during the staff hours given above.
PARTICIPANT INFORMATION

ON-SITE REGISTRATION

All conference participants need to register to receive the seminar kit. Please come to the Piano Room during the staff hours given in the previously.

Please note that we will need any valid ID or the ID which has been submitted to the website if you pay by using the payment gateway to confirm your registration.

ORAL PRESENTATION

Authors of papers in each oral presentation session should bring their presentation in both .PPT/.PPTX and .PDF formats on a USB drive (.PPTX is preferred). Each presentation should be uploaded during the break immediately preceding the relevant presentation session. A dedicated PC will be used in each session room.

Each presenter is allocated 17 minutes, including Q&A.

If possible, please send your presentation at least one week before the Conference begins so that the volunteer assistants can have them ready on a USB for uploading prior to the start of the Paper Session. Presentations can be sent to apcoms@itb.ac.id.

There will be a volunteer on hand to assist in setting up each presentation.

LUNCH

On Thursday, December 7th, 2017. Lunch will be served from 11:50-13:00 in the Verandah Restaurant in the EastParc Hotel. On Friday, December 8th, 2017. Lunch will be served after the Jum’at praying break from 12:20 – 13:10. The conference staff will guide the place during the tour.
SOCIAL PROGRAM and TOURS

CONFERENCE BANQUET

All participants are invited to attend the conference banquet on the evening of Thursday, December 7th, 2017 at 18:00. The event will take place at the Garden Room in the Eastparc Hotel.

LOCAL INDUSTRY and SIGHTSEEING TOURS

There are two options of local industry visitation and tour, trip A and trip B. Please select one which may suit your preference during on-site registration. We also prepare a late registration for your administration purpose at 7:00 – 9:00 at the piano room.
GENERAL INFORMATION

WEATHER
The average high and low temperature in December is 32°C and 20°C, respectively. Please be advised that during December, Yogyakarta may have high chance of daily precipitation. Conference participants are encouraged to prepare for wet season and bring an umbrella if having a plan to go around.

LOCAL TRANSPORTATION

Taxi – Yogyakarta's taxis are metered, and the minimum fare is IDR6.000. Most trips around the center of town should not cost more than IDR15.000.

Motorcycle Taxi - Motorcycle taxi is one of the most used public transportation here. A simple ride from the airport to city center should be no more than IDR60.000, and you may able to negotiate it down to IDR 30,000. You may also reserve and have a well-pricing by using a mobile application such as Go-Jek, Grab-bike, or Uber.

Trishaw - Traditional three-wheeled and pedal-powered cart, known as Becak which can be found in most part of Yogyakarta. A ride from within the city to the Malioboro shopping precinct should not cost more than IDR10.000.

EMERGENCY PHONE NUMBERS

➢ Emergency Call : 112
➢ Ambulance: 118
➢ Police: 110

Please be advised that the above number only works by using local mobile phone number. Please do remember your hotel address and contact number before you go around Yogyakarta.
VENUE MAP, East Parc Hotel, 1st Floor

The Garden Room: Keynote Session and Banquet

Piano Room
VENUE MAP, East Parc Hotel, 3rd Floor

- Mushalla
- Toilet
- Orchid Room
- Dahlia Room
- Magnolia Room
- Tulip Room
- Carnation Room
- Heliconia Room
CONFERENCE Day 1

Day 1, 7 December 2017 (Thu)

Place: EastParc Hotel

[7:00 – 8:00] Registration at the Piano room and
[8:00 – 8:30] Morning coffee and light breakfast
[8:30 – 9:00] Opening Session (Chair, Rector of ITB, VC Chancellor of UMP)

[9:00 – 11:30] Keynote Session

➢ Prof Zahari bin Taha
➢ Mesdin Simarmata, Ir., M.Sc., Ph.D.
➢ Prof. Shih-Ming Wang, Ph.D.

[11:30 – 13:00] Lunch and Pray Break

[13:00 – 15:00] First session of oral presentation (in 6 rooms) and additional short class by Prof Wang for TI UNS

[15:00 – 15:30] Afternoon Coffee break

[15:30 – 17:50] Second session of oral presentation (in 6 rooms)


[18:15 – 18:45] Gather at the ball room

[18:45 – 21:00] Closing session, Banquet and performance by TI UNS
## CONFERENCE Day 1 (Oral Presentation)

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### 1st Session of Oral Presentation

- **Opening and Keynote Session [8:30 - 11:30]**
  - Production System Design, Planning, and Control
  - Manufacturing Process
  - Materials 1
  - System Design Optimization Technology
  - Ergonomics & Work System Design
  - Supply Chain & Production Networks

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### 2nd Session of Oral Presentation

- Reliability & Maintenance
- Product Design & Quality
- Modeling and Simulation
- Technology management
- Optimization
- Production and Automation
- Materials 2

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### Closing and Banquet [18:10 - 21:00]

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CONFERENCE Day 2

Day 2, 8 December 2017 (Fri)

# TRIP A #
Place: EastParc Hotel, Prambanan Temple, Local Industry (MAK)

[9:00 – 11:00]  Local Industry (MAK)
Jl. Tanjung Tirto 34, Tirtomartani km 13, Kalasan, Tirtomartani, Kalasan, Kabupaten Sleman, Daerah Istimewa Yogyakarta 55571 Phone: (0274) 496393

[11:00 – 13:30]  Jum`at praying break and lunch


[16:30 – 17:30]  Souvenir and gift stopover

# TRIP B #
Place: EastParc Hotel, Prambanan Temple, Local Industry (YPTI)

[8:00 – 11:00]  Prambanan Temple

[11:00 – 13:30]  Jum`at praying break and lunch

Jl. Dhuri, Tirtomartani, Kalasan, Tirtomartani, Sleman, Kabupaten Sleman, Daerah Istimewa Yogyakarta 55571, Phone: (0274) 498282

[15:30 – 16:30]  Souvenir and gift stopover
FIRST SESSION: ORAL PRESENTATION
THURSDAY, DECEMBER 7, 2017
13:00 – 15:00

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<th>Production System Design, Planning and Control</th>
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<tr>
<td>Location:</td>
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Paper ID

703 Determination of Economic Lot Size between Suppliers and Manufacturers for Imperfect Production System with Probabilistic Demand
S Yuniar1, R Wangsaputra1,2, A T Sinaga1

63 Analysis of Container Yard Capacity in North TPK Using ARIMA Method
Sirajuddin, Cut Gebrina Hisbach M, Ratna Ekawati, Ade Irman SM

92 Solving Assembly Sequence Planning using Angle Modulated Simulated Kalman Filter
Ainizar Mustapa, Zulkifli Md. Yusof, Asrul Adam, Badaruddin Muhammad, and Zuwairie Ibrahim

79 An integer batch scheduling model considering learning, forgetting, and deterioration effects for a single machinet o minimize total inventory holding cost
R Yusriski1, Sukoyo2, T M A ASamadhi2, A H Halim2

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A S Indrapriyatna and H Triha

89 Batch Scheduling for Hybrid Assembly Differentiation Flow Shop to minimize Total Actual Flow Time
R Maulidya, Suprayogi, R Wangsaputra, AH Halim

700 A Model of Batch Scheduling for a Single Batch Processor with Additional Setups to Minimize Total Inventory Holding Cost of Parts of a Single Item Requested at Multi-due-date
Abdul Hakim Halim1, Ernawati2, Nita P AHidayat3
Determination of Economic Lot Size between Suppliers and Manufacturers for Imperfect Production System with Probabilistic Demand

S Yuniar1, R Wangsaputra1,2, A T Sinaga1

1Industrial Engineering and Management, Institut Teknologi Bandung, Ganeca Street 10, Bandung, West Java, Indonesia, 40132
2Manufacturing Systems Research Group, Institut Teknologi Bandung, Ganeca Street 10, Bandung, West Java, Indonesia , 40132

suciyuniar7@gmail.com; rwangsa@ti.itb.ac.id; astridtheresia27@gmail.com

Abstract. This study aims to develop a combined economical lot size model between supplier and manufacturer for imperfect production processes with probabilistic demand patterns and constant lead times. The supplier side produces the product within a certain time interval then sent to the manufacturer with a certain amount of lot size. Imperfect supplier production systems are characterized by the probability of defective product ($\gamma$). The model decision variables are the lot size of the manufacturer's ordering, supplier lot size, and the reorder point of the manufacturer. The optimal decision variables are obtained by minimizing the total expected cost of the combined costs between the suppliers and the manufacturers borne by both parties. The model is built compared to the transactional partnership model, in which the supplier does not participate in the efficiency of its inventory system. A numerical example is given as an illustration of the JELS model and the transactional partnership model. Sensitivity analysis of the model is done by changing the parameters aimed at analyzing the behavior of the developed model.
Analysis of Container Yard Capacity in North TPK Using ARIMA Method

Sirajuddin, Cut Gebrina Hisbach M, Ratna Ekawati, Ade Irman SM
Industrial Engineering, University of Sultan Ageng Tirtayasa, Indonesia
sirajd_udin@yahoo.com, gebrinahisbachms@gmail.com, ratna.ti@untirta.ac.id, irman@untirta.ac.id

Abstract. North container terminal known as North TPK is container terminal located in Indonesia Port Corporation area serving domestic container loading and unloading. It has 1006 ground slots with a total capacity of 5,544 TEUs and the maximum throughput of containers is 539,616 TEUs / year. Container throughput in the North TPK is increasing year by year. In 2011-2012, the North TPK container throughput is 165,080 TEUs / year and in 2015-2016 has reached 213,147 TEUs / year. To avoid congestion, and prevent possible losses in the future, this paper will analyze the flow of containers and the level of Yard Occupation Ratio in the North TPK at Tanjung Priok Port. The method used is the Autoregressive Integrated Moving Average (ARIMA) Model. ARIMA is a model that completely ignores independent variables in making forecasting. ARIMA results show that in 2016-2017 the total throughput of containers reached 234,006 TEUs / year with field effectiveness of 43.4% and in 2017-2018 the total throughput of containers reached 249,417 TEUs / year with field effectiveness 46.2%.
Solving Assembly Sequence Planning using Angle Modulated Simulated Kalman Filter

Ainizar Mustapa, Zulkifli Md. Yusof, Asrul Adam, Badaruddin Muhammad, and Zuwairie Ibrahim
Universiti Malaysia Pahang, 26600 Pekan, Pahang Malaysia

Abstract. This paper presents an implementation of Simulated Kalman Filter (SKF) algorithm for optimizing an Assembly Sequence Planning (ASP) problem. The SKF search strategy contains three simple steps; predict-measure-estimate. The main objective of the ASP is to determine the sequence of component installation to shorten assembly time or save assembly costs. Initially, permutation sequence is generated to represent each agent. Each agent is then subjected to a precedence matrix constraint to produce feasible assembly sequence. Next, the Angle Modulated SKF (AMSKF) is proposed for solving ASP problem. The main idea of the angle modulated approach in solving combinatorial optimization problem is to use a function, g(x), to create a continuous signal. The performance of the proposed AMSKF is compared against previous works in solving ASP by applying BGSA, BPSO, and MSPSO. Using a case study of ASP, the results show that AMSKF outperformed all the algorithms in obtaining the best solution.
An integer batch scheduling model considering learning, forgetting, and deterioration effects for a single machine to minimize total inventory holding cost

R Yusriski1, Sukoyo2, TMAASamadhi2, AHHalim2

1Department of Industrial Engineering, Universitas Jenderal Achmad Yani (UNJANI), PO. BOX 807 Bandung, Indonesia

2Department of Industrial Engineering and Management, Institut Teknologi Bandung (ITB), Bandung 40132, Indonesia

E-mail: yusarisaki@yahoo.co.id

Abstract. This research deals with a single machine batch scheduling model considering the influence of learning, forgetting, and machine deterioration effects. The objective of the model is to minimize total inventory holding cost, and the decision variables are the number of batches (N), batch sizes (Q[i], i=1, 2, .., N) and the sequence of processing the resulting batches. The parts to be processed are received at the right time and the right quantities, and all completed parts must be delivered at a common due date. We propose a heuristic procedure based on the Lagrange method to solve the problem. The effectiveness of the procedure is evaluated by comparing the resulting solution to the optimal solution obtained from the enumeration procedure using the integer composition technique and shows that the average effectiveness is 94%.
A Modified Branch and Bound Algorithm for Batch Scheduling in Discrete Manufacture System

A S Indrapriyatna and H Triha
Industrial Engineering Department, Faculty of Engineering, Universitas Andalas, Padang, West Sumatera, Indonesia
ahmadsyaf@ft.unand.ac.id, hadi.06173058@gmail.com

Abstract. Indrapriyatna et al. [1,2] have developed a batch scheduling model. In a model with a discrete batch size, three methods are used to convert batch size to integer. Based on numerical calculations it is found that there is no method that always result in the smallest total cost in every data set. This research is done to try other methods to convert batch size to integer. The approach done is by using the Branch and Bound Algorithm Modification that is adjusted to get scheduling for each batch without changing the number of batch (N) and the number of quantities(q) that are going to be produced. The result is the CSA_BB Algorithm that gets a discrete (integer) batch size. The implementation of CSA_BB Algorithm is done on 7 sets of data from[1,2]. Other than that, CSA_Dis_BB Method (to convert sample size from CSA_BB Algorithm to integer) does not always result in minimum total cost if compared to other conversion methods. This is because each method has different batch size, while in the CSA_Dis Model there are subtraction, multiplication, and power operations for each batch size. This affects the final result, which is the total cost.
Batch Scheduling for Hybrid Assembly Differentiation Flow Shop to minimize Total Actual Flow Time

R Maulidya, Suprayogi, R Wangsaputra, AH Halim
Industrial Engineering Faculty, Institut Teknologi Bandung
JL. Ganeca 10 Bandung, 40132, Indonesia

rahmimaulidya@gmail.com, yogi@mail.ti.itb.ac.id, rachmawati_wangsaputra@yahoo.com, ahakimhalim@mail.ti.itb.ac.id

Abstract. A hybrid assembly differentiation flow shop is a three-stage flow shop consisting of Machining, Assembly and Differentiation Stages and producing different types of products. In the machining stage, parts are processed in batches on different (unrelated) machines. In the assembly stage, each part of the different parts is assembled into an assembly product. Finally, the assembled products will further be processed into different types of final products in the differentiation stage. In this paper, we develop a batch scheduling model for a hybrid assembly differentiation flow shop to minimize the total actual flow time defined as the total times part spent in the shop floor from the arrival times until its due date. We also proposed a heuristic algorithm for solving the problems. The proposed algorithm is tested using a set of hypothetic data. The solution shows that the algorithm can solve the problems effectively. Keywords: batch scheduling, hybrid assembly differentiation flow shop, total actual flow, heuristic algorithm.
A Model of Batch Scheduling for a Single Batch Processor with Additional Setups to Minimize Total Inventory Holding Cost of Parts of a Single Item Requested at Multi-due-date

Abdul Hakim Halim1, Ernawati2, Nita P AHidayat3

1Manufacturing Systems Research Group, Department of Industrial Engineering, Bandung Institute of Technology, Bandung, INDONESIA

2Department of Industrial Engineering, Sekolah Tinggi Teknik Cipasung, Tasikmalaya,INDONESIA

3Department of Industrial Engineering, Jenderal Achmad Yani University, Cimahi, INDONESIA

Email: ahakimhalim@ti.itb.ac.id

Abstract. This paper deals with a model of batch scheduling for a single batch processor on which a number of parts of a single item are to be processed. The process needs two kinds of setups, i.e., main setups required before processing any batches, and additional setups required repeatedly after the batch processor complete a certain number of batches. The parts to be processed arrive at the shop floor at the times coinciding with their respective starting times of processing, and the completed parts are to be delivered at multiple due dates. The objective adopted for the model is that of minimizing total inventory holding cost consisting of holding cost per unit time for a part in completed batches, and that in-process batches. The formulation of total inventory holding cost is derived from the so-called actual flow time defined as the interval between arrival times of parts at the production line and delivery times of the completed parts. The actual flow time satisfies not only minimum inventory but also arrival and delivery just in times. An algorithm to solve the model is proposed and a numerical example is shown. Keywords: batch scheduling, batch processor, actual flow time, inventory holding cost, additional setups.
# First Session: Oral Presentation

**Thursday, December 7, 2017**

**13:00 – 15:00**

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<td>Effect of laser parameters on surface roughness of laser modified tool steel after thermal cyclic loading</td>
<td>Annie Lau Sheng1, Izwan Ismail1, 2, Syarifah Nur Aqida2,3</td>
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<td>Influence of groove size and reinforcements addition on mechanical properties and microstructure of friction stir welded joints</td>
<td>Ravinder Reddy Baridula1*, Abdullah Bin Ibrahim1, Che Ku Mohammad Faizal Bin Che Ku Yahya1, Ratnakar Kulkarni1 and Ramgopal Varma Ramaraju2</td>
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<td>Microstructure and properties of aluminium-aluminium oxide graded composite materials</td>
<td>F F Kamaruzaman1, D M Nuruzzaman2, N M Ismail2, Z Hamedon2, AKMA Iqbal2 and A Azhari2</td>
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<td>Effect of 1.0% Ni on high-temperature impression creep and hardness of recycled aluminium alloy with high Fe content</td>
<td>M Faisal1, Noor Mazni1 and A K Prasada Rao2</td>
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<td>165</td>
<td>Laser surface modification of Yttria Stabilized Zirconia (YSZ) thermal barrier coating on AISI H13 tool steel substrate</td>
<td>M S Reza1, S Naqida1, I Ismail2</td>
</tr>
</tbody>
</table>
Effect of laser parameters on surface roughness of laser modified tool steel after thermal cyclic loading

Annie Lau Sheng1, Izwan Ismail1, 2, Syarifah Nur Aqida2,3
1Faculty of Manufacturing Engineering, University Malaysia Pahang, Malaysia
2Automotive Engineering Centre, University Malaysia Pahang, Malaysia
3Faculty of Mechanical Engineering, University Malaysia Pahang, Malaysia
izwanismail@ump.edu.my

Abstract. This study presents the effects of laser parameters on the surface roughness of laser modified tool steel after thermal cyclic loading. Pulse mode Nd: YAG laser was used to perform the laser surface modification process on AISI H13 tool steel samples. Samples were then treated with thermal cyclic loading experiments which involved alternate immersion in molten aluminium (800°C) and water (27°C) for 553 cycles. A full factorial design of experiment (DOE) was developed to perform the investigation. Factors for the DOE are the laser parameter namely overlap rate ($\eta$), pulse repetition frequency ($f_{PRF}$) and peak power ($F_{peak}$) while the response is the surface roughness after thermal cyclic loading. Results indicate the surface roughness of the laser modified surface after thermal cyclic loading is significantly affected by laser parameter settings.
Influence of groove size and reinforcements addition on mechanical properties and microstructure of friction stir welded joints

Ravinder Reddy Baridula1*, Abdullah Bin Ibrahim1,Che Ku Mohammad Faizal Bin Che Ku Yahya1, RatnakarKulkarni1 and Ramgopal Varma Ramaraju2

1Faculty of Engineering Technology, Department of Manufacturing Engineering Technology, University Malaysia Pahang, Gambang, Malaysia
2Faculty of Technology, Department of Mechanical Engineering, Stanford International College of Business and Technology, Toronto, Canada

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Abstract. The butt joints fabricated by friction stir welding were found to have more strength than the joints obtained by conventional joining process. The important outcome of this process is the successful fabrication of surface composites with improved properties. Thus in order to further enhance the strength of the dissimilar alloy joints the reinforcements can be deposited in to the aluminum matrix during the process of friction stir welding. In the present study the multi-walled carbon nanotubes were embedded in to the groove by varying the width during joining of dissimilar alloys AA2024 and AA7075. Four widths were selected with constant depth and optimum process parameters were selected to fabricate the sound welded joints. The results show that the mechanical properties of the fabricated butt joints were influenced by the size of the groove, due to variation in the deposition of reinforcement in the stir zone. The microstructural study and identification of the elements of the welded joints show that the reinforcements deposition is influenced by the size of the groove. It has also been observed that the groove with minimum width is more effective than higher width. The mechanical properties are found to be improved due to the pinning of grain boundaries.
Microstructure and properties of aluminium-aluminium oxide graded composite materials

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Abstract. In this research works, four-layered aluminium-aluminium oxide (Al-Al2O3) graded composite materials were fabricated using powder metallurgy (PM) method. In processing, metal-ceramic graded composite materials of 0%, 10%, 20% and 30% weight percentage of ceramic concentration were prepared under 30 ton compaction load using a cylindrical die-punch set made of steel. After that, two-step pressureless sintering was carried out at sintering temperature and time 600ºC and 3 hours respectively. It was observed that the sintered cylindrical specimens of 30 mm diameter were prepared successfully. The graded composite specimens were analysed and the properties such as density, microstructure and hardness were measured. It was found that after sintering process, the diameter of the graded cylindrical structure was decreased. Using both Archimedes method and rule of mixture (ROM), the density of structure was measured. The obtained results revealed that the microvickers hardness was increased as the ceramic component increases in the graded layer. Moreover, it was observed that the interface of the graded structure is clearly distinguished within the multilayer stack and the ceramic particles are almost uniformly distributed in the Al matrix.
Stress analysis on the reinforcement particles of the metal matrix composite by Raman spectroscopy

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Abstract. In this research, the stress state of the reinforcing SiC particles in a hybrid MMC is investigated by micro Raman spectroscopy. The experiment was carried out in situ in the Raman spectroscopy. Experimental results show that cracks due to monotonic loading propagate by the debonding of the particle/matrix interface and particle fracture. Moreover, secondary cracks form in front of the main crack tip coalesce with the main crack in subsequent loading and final failure occurs. A high decrease in stress (several hundred in MPa) is observed with the interfacial debonding at the interface and with the particle fracture on the particle. The critical tensile stresses for particle-matrix interface debonding and particle fracture develop in hybrid MMC are also estimated during the crack propagation.
Effect of 1.0% Ni on high-temperature impression creep and hardness of recycled aluminium alloy with high Fe content

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Abstract. Reported work focusses on the effect of 1.0% Ni addition on the microstructure, high-temperature impression creep and thereby the hardness of recycled Al-alloy containing >2wt% Fe, obtained from automotive scrap. Present studies have shown that the addition of 1.0% Ni have suppress the formation of β-phase (Al5FeSi) by supressing the peritectic transformation of α-phase (Al8Fe2Si). Such suppression is found to improve the hardness and high-temperature impression creep of the recycled aluminium alloy.
Laser surface modification of Yttria Stabilized Zirconia (YSZ) thermal barrier coating on AISI H13 tool steel substrate

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Abstract. This paper presents laser surface modification of plasma sprayed yttria stabilized zirconia (YSZ) coating to seal porosity defect. Laser surface modification on plasma sprayed YSZ was conducted using 300W JK300HPS Nd: YAG laser at different operating parameters. Parameters varied were laser power and pulse frequency with constant residence time. The coating thickness was measured using IM7000 inverted optical microscope and surface roughness was analysed using two-dimensional Mitutoyo Surface Roughness Tester. Surface roughness of laser surface modification of YSZ H-13 tool steel decreased significantly with increasing laser power and decreasing pulse frequency. The re-melted YSZ coating showed higher hardness properties compared to as-sprayed coating surface. These findings were significant to enhance thermal barrier coating surface integrity for dies in semi-solid processing.
Effect of Heating Time on Hardness Properties of Laser Clad Gray Cast Iron Surface

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Abstract. This paper presents effect of heating time on cladded gray cast iron. In this study, the effect of heating time on cladded gray cast iron and melted gray cast iron were analysed. The gray cast iron sample were added with mixed Mo-Cr powder using laser cladding technique. The mixed Mo and Cr powder was pre-placed on gray cast iron surface. Modified layer were sectioned using diamond blade cutter and polish using SiC abrasive paper before heated. Sample was heated in furnace for 15, 30 and 45 minutes at 650°C and cool down in room temperature. Metallographic study was conducted using inverted microscope while surface hardness properties were tested using Wilson hardness test with Vickers scale. Results for metallographic study showed graphite flakes within matrix of pearlite. The surface hardness for modified layer decreased when increased heating time process. These findings are significant to structure stability of laser cladded gray cast iron with different heating times.
**First Session: Oral Presentation**  
**Thursday, December 7, 2017**  
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**Optimization of Coolant Technique Conditions for Machining A319 Aluminium Alloy Using Response Surface Method (RSM)**  
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**Study on the effectiveness of Extreme Cold Mist MQL system on turning process of stainless steel AISI 316**  
A S Jamaludin1*, A Hosokawa2, T Furumoto2, T Koyano2, Y Hashimoto2

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**Reverse engineering of wörner type drilling machine structure**  
A Wibowo, I Belly, R Ilhamsyah, Indrawanto and Y Yuwana
Abstract. This paper outlines a simulation study to investigate the characteristic of roughing machining simulation in 4th axis milling processes by utilizing visual basic programming in NX CAM systems. The selection and optimization of cutting orientation in rough milling operation is critical in 4th axis machining. The main purpose of roughing operation is to approximately shape the machined parts into finished form by removing the bulk of material from workpieces. In this paper, the simulations are executed by manipulating a set of different cutting orientation to generate estimated volume removed from the machine parts. The cutting orientation with high volume removal is denoted as an optimum value and chosen to execute a roughing operation. In order to run the simulation, customized software is developed to assist the routines. Operations build-up instructions in NX CAM interface are translated into programming codes via advanced tool available in the Visual Basic Studio. The codes is customized and equipped with decision making tools to run and control the simulations. It permits the integration with any independent program files to execute specific operations. This paper aims to discuss about the simulation program and identifies optimum cutting orientations for roughing processes. The output of this study will broaden up the simulation routines performed in NX CAM systems.
Abstract. The purpose of this study was to improve the accuracy of three-axis CNC Milling Vertical engines with a general approach by using mathematical modeling methods of machine tool geometric errors. The inaccuracy of CNC machines can be caused by geometric errors that are an important factor during the manufacturing process and during the assembly phase, and are factors for being able to build machines with high-accuracy. To improve the accuracy of the three-axis vertical milling machine, by knowing geometric errors and identifying the error position parameters in the machine tool by arranging the mathematical modeling. The geometric error in the machine tool consists of twenty-one error parameters consisting of nine linear error parameters, nine angle error parameters and three perpendicular error parameters. The mathematical modeling approach of geometric error with the calculated alignment error and angle error in the supporting components of the machine motion is linear guide way and linear motion. The purpose of using this mathematical modeling approach is the identification of geometric errors that can be helpful as reference during the design, assembly and maintenance stages to improve the accuracy of CNC machines. Mathematically modeling geometric errors in CNC machine tools can illustrate the relationship between alignment error, position and angle on a linear guide way of three-axis vertical milling machines.
Optimization of Surface Roughness and Wall Thickness in Dieless Incremental Forming Of Aluminum Sheet Using Taguchi

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Abstract. Incremental sheet forming is a versatile sheet metal forming process where a sheet metal is formed into its final shape by a series of localized deformation without a specialised die. However, it still has many shortcomings that need to be overcome such as geometric accuracy, surface roughness, formability, forming speed, and so on. This project focus on minimising the surface roughness of aluminium sheet and improving its thickness uniformity in incremental sheet forming via optimisation of wall angle, feed rate, and step size. Besides, the effect of wall angle, feed rate, and step size to the surface roughness and thickness uniformity of aluminium sheet was investigated in this project. From the results, it was observed that surface roughness and thickness uniformity were inversely varied due to the formation of surface waviness. Increase in feed rate and decrease in step size will produce a lower surface roughness, while uniform thickness reduction was obtained by reducing the wall angle and step size. By using Taguchi analysis, the optimum parameters for minimum surface roughness and uniform thickness reduction of aluminium sheet were determined. The finding of this project helps to reduce the time in optimising the surface roughness and thickness uniformity in incremental sheet forming.
Optimization of Coolant Technique Conditions for Machining A319 Aluminium Alloy Using Response Surface Method (RSM)

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Abstract. The paper discusses about the optimum cutting parameters with coolant techniques condition (1.0 mm nozzle orifice, wet and dry) to optimize surface roughness, temperature and tool wear in the machining process based on the selected setting parameters. The selected cutting parameters for this study were the cutting speed, feed rate, depth of cut and coolant techniques condition. Methods/Statistical Analysis Experiments were conducted and investigated based on Design of Experiment (DOE) with Response Surface Method. The research of the aggressive machining process on aluminum alloy (A319) for automotive applications is an effort to understand the machining concept, which widely used in a variety of manufacturing industries especially in the automotive industry. Findings: The results show that the dominant failure mode is the surface roughness, temperature and tool wear when using 1.0 mm nozzle orifice, increases during machining and also can be alternative minimize built up edge of the A319. The exploration for surface roughness, productivity and the optimization of cutting speed in the technical and commercial aspects of the manufacturing processes of A319 are discussed in automotive components industries for further work Applications/Improvements: The research result also beneficial in minimizing the costs incurred and improving productivity of manufacturing firms. According to the mathematical model and equations, generated by CCD based RSM, experiments were performed and cutting coolant condition technique using size nozzle can reduces tool wear, surface roughness and temperature was obtained. Results have been analyzed and optimization has been carried out for selecting cutting parameters, shows that the effectiveness and efficiency of the system can be identified and helps to solve potential problems
Performance Analysis of Abrasive Waterjet Machining Process at Low Pressure

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Abstract. Normally, a commercial waterjet cutting machine can generate water pressure up to 600 MPa. This range of pressure is used to machine a wide variety of materials. Hence, the price of waterjet cutting machine is expensive. Therefore, there is a need to develop a low cost waterjet machine in order to make the technology more accessible for the masses. Due to its low cost, such machines may only be able to generate water pressure at a much reduced rate. The present study attempts to investigate the performance of abrasive waterjet machining process at low cutting pressure using self-developed low cost waterjet machine. It aims to study the feasibility of machining various materials at low pressure which later can aid in further development of an effective low cost water jet machine. A total of three different materials were machined at a low pressure of 34 MPa. The materials are mild steel, aluminium alloy 6061 and plastics Delrin®. Furthermore, a traverse rate was varied between 1 to 3 mm/min. The study on cutting performance at low pressure for different materials was conducted in terms of depth penetration, kerf taper ratio and surface roughness. It was found that all samples were able to be machined at low cutting pressure with varied qualities. Also, the depth of penetration decreases with an increase in the traverse rate. Meanwhile, the surface roughness and kerf taper ratio increase with an increase in the traverse rate. It can be concluded that a low cost waterjet machine with a much reduced rate of water pressure can be successfully used for machining certain materials with acceptable qualities.
Study on the effectiveness of Extreme Cold Mist MQL system on turning process of stainless steel AISI 316

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Abstract. Cutting process of difficult-to-cut material such as stainless steel, generates immensely excessive heat, which is one of the major causes related to shortening tool life and lower quality of surface finish. It is proven that application of cutting fluid during the cutting process of difficult-to-cut material is able to improve the cutting performance, but excessive application of cutting fluid leads to another problem such as increasing processing cost and environmental hazardous pollution of workplace. In the study, Extreme Cold Mist system is designed and tested along with various Minimum Quantity Lubrication (MQL) systems on turning process of stainless steel AISI 316. In the study, it is obtained that, Extreme Cold Mist system is able to reduce cutting force up to 60N and improve the surface roughness of the machined surface significantly.
Reverse engineering of wörner type drilling machine structure

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Abstract. A product design needs to be modified based on the conditions of production facilities and existing resource capabilities without reducing the functional aspects of the product itself. This paper describes the reverse engineering process of the main structure of the wörner type drilling machine to obtain a machine structure design that can be made by resources with limited ability by using simple processes. Some structural, functional, and the work mechanism analyzes have been performed to understand the function and role of each basic component. The process of dismantling of the drilling machine and measuring each of the basic components was performed to obtain sets of the geometry and size data of each component. The geometric model of each structure component and the machine assembly were built to facilitate the simulation process and machine performance analysis that refers to ISO standard of drilling machine. The tolerance stackup analysis also performed to determine the type and value of geometrical and dimensional tolerances, which could affect the ease of the components to be manufactured and assembled.
FIRST SESSION: ORAL PRESENTATION
THURSDAY, DECEMBER 7, 2017
13:00 – 15:00

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149 Gradient Evolution-based Support Vector Machine Algorithm for Classification
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119 Simulation on Effect of Preform Diameter in Injection Stretch Blow Molding
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115 Forward and Inverse Predictive Model for the Trajectory Tracking Control of a Lower Limb Exoskeleton for Gait Rehabilitation: Simulation modelling analysis
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50 Design logistics performance measurement model of automotive component industry for strengthening competitiveness of dealing
   AEC 2015
   T.G. Amran1 and Mindy Janitra Yose2
Modelling Electrical Energy Consumption in Automotive Paint Shop

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Abstract. Industry players are seeking ways to reduce operational cost to sustain in a challenging economic trend. One key aspect is an energy cost reduction. However, implementing energy reduction strategy often struggle with obstructions, which slow down their realization and implementation. Discrete event simulation method is an approach actively discussed in current research trend to overcome such obstructions because of its flexibility and comprehensiveness. Meanwhile, in automotive industry, paint shop is considered the most energy consumer area which is reported consuming about 50%-70% of overall automotive plant consumption. Hence, this project aims at providing a tool to model and simulate energy consumption at paint shop area by conducting a case study at XYZ Company, one of the automotive companies located at Pekan, Pahang. The simulation model was developed using Tecnomatix Plant Simulation software version 13. From the simulation result, the model was accurately within ±5% for energy consumption and ±15% for maximum demand after validation with real system. Two different energy saving scenarios were tested. Scenario 1 was based on production scheduling approach under low demand situation which results energy saving up to 30% on the consumption. Meanwhile scenario 2 was based on substituting high power compressor with the lower power compressor. The results were energy consumption saving of approximately 1.42% and maximum demand reduction about 1.27%. This approach would help managers and engineers to justify worthiness of investment for implementing the reduction strategies.
Gradient Evolution-based Support Vector Machine Algorithm for Classification

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Abstract. This paper proposes a classification algorithm based on a support vector machine (SVM) and gradient evolution (GE) algorithms. SVM algorithm has been widely used in classification. However, its result is significantly influenced by the parameters. Therefore, this paper aims to propose an improvement of SVM algorithm which can find the best SVMs’ parameters automatically. The proposed algorithm employs a GE algorithm to automatically determine the SVMs’ parameters. The GE algorithm takes a role as a global optimizer in finding the best parameter which will be used by SVM algorithm. The proposed GE-SVM algorithm is verified using some benchmark datasets and compared with other metaheuristic-based SVM algorithms. The experimental results show that the proposed GE-SVM algorithm obtains better results than other algorithms tested in this paper.
Assembly Line Efficiency Improvement by Using WITNESS Simulation Software

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Abstract. In the nowadays-competitive world, efficiencies and the productivity of the assembly line are essential in manufacturing company. This paper demonstrates the study of the existing production line performance. The actual cycle time observed and recorded during the working process. The current layout was designed and analysed using Witness simulation software. The productivity and effectiveness for every single operator are measured to determine the operator idle time and busy time. Two new alternatives layout were proposed and analysed by using Witness simulation software to improve the performance of production activities. This research provided valuable and better understanding of production effectiveness by adjusting the line balancing. After analysing the data, simulation result from the current layout and the proposed plan later been tabulated to compare the improved efficiency and productivity. The proposed design plan has shown an increase in yield and productivity compared to the current arrangement. This research has been carried out in company XYZ, which is one of the automotive premises in Pahang, Malaysia.
Fleet Sizing of Automated Material Handling Using Simulation Approach

Radinal Wibisono1, The Jin Ai1*, Deny Ratna Yuniartha1

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Abstract. Automated material handling tends to be chosen rather than using human power in material handling activity for production floor in manufacturing company. One critical issue in implementing automated material handling is designing phase to ensure that material handling activity more efficient in term of cost spending. Fleet sizing become one of the topic in designing phase. In this research, simulation approach is being used to solve fleet sizing problem in flow shop production to ensure optimum situation. Optimum situation in this research means minimum flow time and maximum capacity in production floor. Simulation approach is being used because flow shop can be modelled into queuing network and inter-arrival time is not following exponential distribution. Therefore, contribution of this research is solving fleet sizing problem with multi objectives in flow shop production using simulation approach with ARENA Software
Simulation on Effect of Preform Diameter in Injection Stretch Blow Molding

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Abstract. Polyethylene terephthalate (PET) is the most common material of resin for manufacturing plastic bottle by injection stretch blow molding due to its excellent properties. As various issues of health and environmental hazards due to the PET use have risen, PET bottle manufacture may be improved by minimizing the wall thickness to reduce the PET use. One of the critical qualifications of the manufacturing process which lead to the wall thickness distribution is the initial preform diameter. In this project, we used the ANSYS Polyflow with aim to evaluate the wall thickness distribution of PET bottle for different diameter of initial preform. As a result, only 4 mm preform diameter presented wall thickness below than 1 mm. On the other hand, at least 6 mm preform diameter can permit the wall thickness 1.3 mm i.e. at the shoulder area.
Abstract. The movement of a lower limb exoskeleton requires a reasonably accurate control method to allow for an effective gait therapy session to transpire. Trajectory tracking is a nontrivial means of passive rehabilitation technique to correct the motion of the patients’ impaired limb. This paper proposes an inverse predictive model that is coupled together with the forward kinematics of the exoskeleton to estimate the behaviour of the system. A conventional PID control system is used to converge the required joint angles based on the desired input from the inverse predictive model. It was demonstrated through the present study, that the inverse predictive model is capable of meeting the trajectory demand with acceptable error tolerance. The findings further suggest the ability of the predictive model of the exoskeleton to predict a correct joint angle command to the system.
Design logistics performance measurement model of automotive component industry for strengthing competitiveness of dealing AEC 2015

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Abstract. As the free trade Asena EconomicCommunity (AEC) causes the tougher competition, it is important that Indonesia’s automotive industry have high competitiveness as well. A model of logistics performance measurement was designed as an evaluation tool for automotive component companies to improve their logistics performance in order to compete in AEC. The design of logistics performance measurement model was based on the Logistics Scorecard perspectives, divided into two stages: identifying the logistics business strategy to get the KPI and arranging the model. 23 KPI was obtained. The measurement result can be taken into consideration of determining policies to improve the performance logistics competitiveness
FIRST SESSION: ORAL PRESENTATION
THURSDAY, DECEMBER 7, 2017
13:00 – 15:00

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Development of an electronic kit for detecting asthma in human respiratory system

Cheow Shek Hong1, Ahmad Shahrizan Abdul Ghani2*, Ismail Mohd Khairuddin3

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Abstract. In this paper, a prototype of a carbon dioxide (CO2) measurement device is designed to detect and used to monitor asthma patients. Nowadays, capnogram device is widely used in monitoring asthma and asthma related medical services. However, capnogram is very costly and unaffordable for patient especially those who are in low income household. Thus, the proposed device is cost effective, affordable, and produced to detect and monitor the severity of asthma. Meanwhile, flow meter will cause patient to have chest pain as they needed maximum effort to blow in the device. To overcome these limitations, this prototype electronic kit is easy to use and suitable for all range patients. This prototype electronic kit consists of MH-Z14A carbon dioxide (CO2) sensor to detect the concentration of carbon dioxide from the user exhaled air. Arduino microcontroller is used to process the data while TFT Display shield is applied for data presentation. In addition, HC-06 Bluetooth module is used to communicate with PC for further analysis of the captured graph. This device was tested with 3 asthmatics and 3 normal users. The results showed that asthmatic user has a different graph pattern compared with normal user and these graphs are clearly differentiated on the device TFT screen. Asthmatic user produces “shark fin”-like pattern whereas normal user produces “square wave”-like pattern. This device has successfully produced distinguished-patterns difference between asthmatic and normal user; therefore, it is suitable for asthma monitoring.
Integrating Kano’s Model into Quality Function Deployment for Product Design: A Comprehensive Review

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Abstract: Many methods and techniques are adopted by some companies to improve the competitiveness through the fulfillment of customer satisfaction by enhancement and improvement the product design quality. Over the past few years, several researcher have studied extensively combining Quality Function Deployment and Kano’s model as design techniques by focusing on translating consumer desires into a product design. This paper presents a review and analysis of several literatures that associated to the integration methodology of Kano into the QFD process. Various of international journal articles were selected, collected and analyzed through a number of relevant scientific publications. In-depth analysis was performed, and focused in this paper on the results, advantages and drawbacks of its methodology. In addition, this paper also provides the analysis that acquired in this study related to the development of the methodology. It is hoped that this paper can be a reference for other researchers and manufacturing companies to implement the integration method of QFDKano for product design.
Improving Quality of Shoe Soles Product using Six Sigma

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Faculty of Industrial Technology, Institut Teknologi Bandung, Bandung 40132, Indonesia
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Abstract. A manufacture in Bandung produce kind of rubber-based product i.e. trim, rice rollers, shoe soles, etc. After penetrating the shoe soles market, the manufacture has met customer with tight quality control. Based on the past data, defect level of this product was 18.08% that caused the manufacture’s loss of time and money. Quality improvement effort was done using six sigma method that included phases of define, measure, analyse, improve, and control (DMAIC). In the design phase, the object’s problem and definition were defined. Delphi method was also used in this phase to identify critical factors. In the measure phase, the existing process stability and sigma quality level were measured. Fishbone diagram and failure mode and effect analysis (FMEA) were used in the next phase to analyse the root cause and determine the priority issues. Improve phase was done by designing alternative improvement strategy using 5W1H method. Some improvement efforts were identified, i.e. (i) modifying design of the hanging rack, (ii) create pantone colour book and check sheet, (iii) provide pedestrian line at compound department, (iv) buying stop watch, and (v) modifying shoe soles dies. Some control strategies for continuous improvement were proposed such as SOP or reward and punishment system.
Taguchi experimental design to determine the taste quality characteristic of candied carrot

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Abstract. Robust parameter design is used to design product that is robust to noise factors so the product’s performance fits the target and delivers a better quality. In the process of designing and developing the innovative product of candied carrot, robust parameter design is carried out using Taguchi Method. The method is used to determine an optimal quality design. The optimal quality design is based on the process and the composition of product ingredients that are in accordance with consumer needs and requirements. According to the identification of consumer needs from the previous research, quality dimensions that need to be assessed are the taste and texture of the product. The quality dimension assessed in this research is limited to the taste dimension. Organoleptic testing is used for this assessment, specifically hedonic testing that makes assessment based on consumer preferences. The data processing uses mean and signal to noise ratio calculation and optimal level setting to determine the optimal process/composition of product ingredients. The optimal value is analyzed using confirmation experiments to prove that proposed product match consumer needs and requirements. The result of this research is identification of factors that affect the product taste and the optimal quality of product according to Taguchi Method.
Cost viability of 3D printed house in UK

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Abstract: UK has been facing housing crisis due to the rising price of the property on sale. This paper will look into the viability of 3D printing technology as an alternative way for house construction on UK. The analysis will be carried out based on the data until the year of 2014 due to limited resources availability. Details cost breakdown on average size house construction cost in UK were analysed and relate to the cost viability of 3D printing technology in reducing the house price in UK. It is found that the 3D printing generates saving of up to around 35% out of total house price in UK. This cost saving comes from the 3D printed construction of walls and foundations for material and labour cost.
Improving student satisfaction of Andalas University Dormitory through Service Quality and Importance Performance Analysis

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Abstract. Residential satisfaction of university dormitories serve as one of the significant aspects in the framework of sustainability in higher education. This research investigated the quality of dormitory services in Andalas University Dormitory based on student’s satisfaction. According to management residential, the enrollment of residential student has increased gradually in Andalas University. In 2016, capacity of residential student is 1686, but only 1081 students can stay at dormitory because some rooms in bad condition. There are a lot of problems and complaints regarding dormitory’s service quality i.e water problems, leaky rooms and bathrooms, cleanliness and inadequate facilities in residential college. In addition, there are 20% of last year student’s residential check out before the time of contract runs out. The aim of this research are understanding the level of GAP exists between expectation and perception students’ residential in the content of service quality and evaluating the improvement priority services using Importance Performance Analysis. This study is measuring service quality by using Responsiveness, Assurance, Empathy, Reliability and Tangible dimension. A negative GAP indicates that the actual services are than what was expected and the GAP is highlighted area for improvement. Based on IPA, management should improve this following dimension services : responsiveness, tangible and assurance dimension.
Abstract. Lacking of problem solving skill techniques and cooperation between support groups are the two obstacles that always been faced in actual production line. Inadequate detail analysis and inappropriate technique in solving the problem may cause the repeating issues which may give impact to the organization performance. This study utilizes a well-structured six sigma DMAIC with combination of other problem solving tools to solve product quality problem in manufacturing of automotive electronics component. The study is concentrated at the stripping process, a critical process steps with highest rejection rate that contribute to the scrap and rework performance. The detail analysis is conducted in the analysis phase to identify the actual root cause of the problem. Then several improvement activities are implemented and the results show that the rejection rate due to stripping defect decrease tremendously and the process capability index improved from 0.75 to 1.67. This results prove that the six sigma approach used to tackle the quality problem is substantially effective.
FIRST SESSION: ORAL PRESENTATION
THURSDAY, DECEMBER 7, 2017
13:00 – 15:00

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<th>Reliability and Maintenance</th>
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705 Bearing Procurement Analysis Method by Total Cost of Ownership Analysis and Reliability Prediction
Wildan Trusaji, Muhammad Akbar, Sukoyo, and Dradjad Irianto

121 Interpretive Structural Model of Key Performance Indicators for Sustainable Maintenance Evaluation in Rubber Industry
E Amrina and A Yulianto

171 Competing risk models in reliability systems, an exponential distribution model with Bayesian analysis approach
I Iskandar

176 Optimal Lease Contract for Remanufactured Equipment
B P Iskandar1, R Wangsaputra1 and H Husniah2

67 A feasibility study in adapting Shamos Bickel and Hodges Lehman estimator into T-Method for normalization
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4 e-Learning Content Design for Corrective Maintenance of Toshiba BMC 80.5 based on Knowledge Conversion using SECI Method: A Case Study in Aerospace Company
Ayu Permata Shabrina1, Rayinda Pramuditya Soesanto1, Amelia Kurniaawati1,2, and Mochamad Teguh Kurniawan 1, Luciana Andrawina1

6 Game-Theoretic Models for Usage-based Maintenance Contract
H Husniah1, R Wangsaputra2, A Cakravastia2 and B P Iskandar2
Bearing Procurement Analysis Method by Total Cost of Ownership Analysis and Reliability Prediction

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Abstract. In making bearing procurement analysis, price and its reliability must be considered as decision criteria, since price determines the direct cost as acquisition cost and reliability of bearing determine the indirect cost such as maintenance cost. Despite the indirect cost is hard to identify and measured, it has high contribution to overall cost that will be incurred. So, the indirect cost of reliability must be considered when making bearing procurement analysis. This paper tries to explain bearing evaluation method with the total cost of ownership analysis to consider price and maintenance cost as decision criteria. Furthermore, since there is a lack of failure data when bearing evaluation phase is conducted, reliability prediction method is used to predict bearing reliability from its dynamic load rating parameter. With this method, bearing with a higher price but has higher reliability is preferable for long-term planning. But for short-term planning the cheaper one but has lower reliability is preferable. This contextuality can give rise to conflict between stakeholders. Thus, the planning horizon needs to be agreed by all stakeholder before making a procurement decision.
Abstract. Sustainable maintenance is a new challenge for manufacturing companies to realize sustainable development. In this paper, an interpretive structural model is developed to evaluate sustainable maintenance in the rubber industry. The initial key performance indicators (KPIs) is identified and derived from literature and then validated by academic and industry experts. As a result, three factors of economic, social, and environmental dividing into a total of thirteen indicators are proposed as the KPIs for sustainable maintenance evaluation in rubber industry. Interpretive structural modeling (ISM) methodology is applied to develop a network structure model of the KPIs consisting of three levels. The results show the economic factor is regarded as the basic factor, the social factor as the intermediate factor, while the environmental factor indicated to be the leading factor. Two indicators of social factor i.e. labor relationship, and training and education have both high driver and dependence power, thus categorized as the unstable indicators which need further attention. All the indicators of environmental factor and one indicator of social factor are indicated as the most influencing indicator. The interpretive structural model hoped can aid the rubber companies in evaluating sustainable maintenance performance.
Competing risk models in reliability systems, an exponential distribution model with Bayesian analysis approach

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Abstract: The exponential distribution is the most widely used reliability analysis. This distribution is very suitable for representing the lengths of life of many cases and is available in a simple statistical form. The characteristic of this distribution is a constant hazard rate. The exponential distribution is the lower rank of the Weibull distributions. In this paper our effort is to introduce the basic notions that constitute an exponential competing risks model in reliability analysis using Bayesian analysis approach and presenting their analytic methods. The cases are limited to the models with independent causes of failure. A non-informative prior distribution is used in our analysis. This model describes the likelihood function and follows with the description of the posterior function and the estimations of the point, interval, hazard function, and reliability. The net probability of failure if only one specific risk is present, crude probability of failure due to a specific risk in the presence of other causes, and partial crude probabilities are also included
Abstract. In the last two decades, the business of lease products (or equipment) has grown significantly, and many companies acquire equipment through leasing. In this paper, we propose a new lease contract under which a product (or equipment) is leased for a period of time with maximum usage per period (e.g. 1 year). This lease contract has only a time limit but no usage limit. If the total usage per period exceeds the maximum usage allowed in the contract, then the customer (as a lessee) will be charged an additional cost. In general, the lessor (OEM) provides a full coverage of maintenance, which includes PM and CM under the lease contract. It is considered that the lessor offers the lease contract for a remanufactured product. We presume that the price of the lease contract for the remanufactured product is much lower than that of a new one, and hence it would be a more attractive option to the customer. The decision problem for the lessee is to select the best option offered that fits to its requirement, and the decision problem for the lessor is find the optimal maintenance efforts for a given price of the lease option offered. We first find the optimal decisions independently for each party, and then the joint optimal decisions for both parties.
A feasibility study in adapting Shamos Bickel and Hodges Lehman estimator into T-Method for normalization

N Harudin *,1,2,a, Jamaludin, K R 1,b, M Nabil Muhtazaruddin 1, Ramlie F 1, Wan Zuki Azman Wan Muhamad 1

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Abstract. T-Method is one of the techniques governed under Mahalanobis Taguchi System that developed specifically for multivariate data predictions. Prediction using T-Method is always possible even with very limited sample size. The user of T-Method required to clearly understanding the population data trend since this method is not considering the effect of outliers within it. Outliers may cause apparent non-normality and the entire classical methods breakdown. There exist robust parameter estimate that provide satisfactory results when the data contain outliers, as well as when the data are free of them. The robust parameter estimates of location and scale measure called Shamos Bickel (SB) and Hodges Lehman (HL) which are used as a comparable method to calculate the mean and standard deviation of classical statistic is part of it. Embedding these into T-Method normalize stage feasibly help in enhancing the accuracy of the T-Method as well as analysing the robustness of T-method itself. However, the result of higher sample size case study shows that T-method is having lowest average error percentages (3.09%) on data with extreme outliers. HL and SB is having lowest error percentages (4.67%) for data without extreme outliers with minimum error differences compared to T-Method. The error percentages prediction trend is vice versa for lower sample size case study. The result shows that with minimum sample size, which outliers always be at low risk, T-Method is much better on that, while higher sample size with extreme outliers, TMethod as well show better prediction compared to others. For the case studies conducted in this research, it shows that normalization of T-Method is showing satisfactory results and it is not feasible to adapt HL and SB or normal mean and standard deviation into it since it’s only provide minimum effect of percentages errors. Normalization using T-method is still considered having lower risk towards outlier’s effect.
e-Learning Content Design for Corrective Maintenance of Toshiba BMC 80.5 based on Knowledge Conversion using SECI Method: A Case Study in Aerospace Company

Ayu Permata Shabrina1, Rayinda Pramuditya Soesanto1, Amelia Kurniawati1,2, and Mochamad Teguh Kurniawan 1, Luciana Andrawina1

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Abstract. Knowledge is a combination of experience, value, and information that is based on the intuition that allows an organization to evaluate and combine new information. In an organization, knowledge is not only attached to document but also in routine value creating activities, therefore knowledge is an important asset for the organization. X Corp is a company that focused on manufacturing aerospace components. In carrying out the production process, the company is supported by various machines, one of the machines is Toshiba BMC 80.5. The machine is used occasionally and therefore maintenance activity is needed, especially corrective maintenance. Corrective maintenance is done to make a breakdown machine back to work. Corrective maintenance is done by maintenance operator whose retirement year is close. The long term experience of the maintenance operator needs to be captured by the organization and shared across maintenance division. E-learning is one type of media that can support and assist knowledge sharing. This research purpose is to create the e-learning content for best practice of corrective maintenance activity for Toshiba BMC 80.5 by extracting the knowledge and experience from the operator based on knowledge conversion using SECI method. The knowledge source in this research is a maintenance supervisor and a senior maintenance engineer. From the evaluation of the e-learning content, it is known that the average test score of the respondents who use the e-learning increases from 77.5 to 87.5.
Abstract. A usage-based maintenance contracts with coordination and non coordination between two parties is studied in this paper. The contract is applied to a dump truck operated in a mining industry. The situation under study is that an agent offers service contract to the owner of the truck after warranty ends. This contract has only a time limit but no usage limit. If the total usage per period exceeds the maximum usage allowed in the contract, then the owner will be charged an additional cost. In general, the agent (Original Equipment Manufacturer/ OEM) provides a full coverage of maintenance, which includes PM and CM under the lease contract. The decision problem for the owner is to select the best option offered that fits to its requirement, and the decision problem for the agent is to find the optimal maintenance efforts for a given price of the service option offered. We first find the optimal decisions using coordination scheme and then with non coordination scheme for both parties.
SECOND SESSION: ORAL PRESENTATION
THURSDAY, DECEMBER 7, 2017
15:30 – 17:50

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197  **Profit Analysis Model of Smart Item Implementation in Integrated Supply Chain Process**
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78   **A Multiple Items EPQ/EOQ Model for a Vendor and Multiple Buyers System in with Considering Continuous and Discrete Demand Simultaneously**
Jonrinaldi2, T Rahman1, Henmaidi2, E Wirdianto2 and D Z Zhang3

181  **Development of an Assessment Model for Sustainable Supply Chain Management in Batik Industry**
G F Mubiena and A Ma’ruf

186  **The Integration of Production-Distribution on Newspapers Supply Chain for Cost Minimization using Analytic Models: Case Study**
Era Febriana Aqidawati, Wahyudi Sutopo, Muh. Hisjam

191  **An integrative multi-criteria decision making techniques for supplier evaluation problem with its application**
D Fatrias*, I Kamil and D Meilani

138  **The Determination of Production and Distribution Policy in Push-Pull Production Chain with Supply Hub as the Junction Point**
A T Sinaga and R Wangsaputra

105  **Comparison of Two Buyer-Vendor Coordination Models**
Ririn Diar Astanti1*, The Jin Ai1, Dah-Chuan Gong2,3 and Hunyh Trung Luong4
Profit Analysis Model of Smart Item Implementation in Integrated Supply Chain Process

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Abstract. Nowadays all links of the entire supply chain need to integrate their different infrastructures and they have better control of them to drive better profits. This integration should offer the ability for companies in order to have an overall and transparent insight to its supply chain activities. An intelligent supply chain which is mainly supported by Smart Items technology can satisfy the need of those integration. By means of Smart Items, a company can benefit some advantages. Those are cost reduction and value creation. However, currently there is no comprehensive Smart Item infrastructure exists yet so it is difficult to calculate the true benefit information. This paper attempts to recommend a model for estimating the benefits of implementing Smart Items in a company which has an integrated supply chain process. The integrated supply chain means that three echelons (supplier, shipper and retailer) of supply chain are belonged to a company. The proposed model was used to determine the shrinkage value and RFID tag price which can give the maximum benefit of Smart Items implementation. A numerical example is also provided to give a better comprehension on model calculation.
A Multiple Items EPQ/EOQ Model for a Vendor and Multiple Buyers System in with Considering Continuous and Discrete Demand Simultaneously

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Abstract. This paper proposed a mathematical model for multiple items Economic Production and Order Quantity (EPQ/EOQ) with considering continuous and discrete demand simultaneously in a system consisting of a vendor and multiple buyers. This model is used to investigate the optimal production lot size of the vendor and the number of shipments policy of orders to multiple buyers. The model considers the multiple buyers’ holding cost as well as transportation cost, which minimize the total production and inventory costs of the system. The continuous demand from any other customers can be fulfilled anytime by the vendor while the discrete demand from multiple buyers can be fulfilled by the vendor using the multiple delivery policy with a number of shipments of items in the production cycle time. A mathematical model is developed to illustrate the system based on EPQ and EOQ model. Solution procedures are proposed to solve the model using a Mixed Integer Non Linear Programming (MINLP) and algorithm methods. Then, the numerical example is provided to illustrate the system and results are discussed.
Abstract. This research proposes a dynamic assessment model for sustainable supply chain management in batik industry. The proposed model identifies the dynamic relationship between economic aspect, environment aspect and social aspect. The economic aspect refers to the supply chain operation reference model. The environment aspect uses carbon emissions and liquid waste as the attribute assessment, while the social aspect focus on employee’s welfare. Lean manufacturing concept was implemented as an alternative approach to sustainability. The simulation result shows that the average of sustainability score for 5 years increased from 65.3% to 70%. Future experiments will be conducted on design improvements to reach the company target on sustainability score.
The Integration of Production-Distribution on Newspapers Supply Chain for Cost Minimization using Analytic Models: Case Study

Era Febriana Aqidawati, Wahyudi Sutopo, Muh. Hisjam
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Abstract. Newspapers are products with special characteristics which are perishable, have a shorter range of time between the production and distribution, zero inventory, and decreasing sales value along with increasing in time. Generally, the problem of production and distribution in the paper supply chain is the integration of production planning and distribution to minimize the total cost. The approach used in this article to solve the problem is using an analytical model. In this article, several parameters and constraints have been considered in the calculation of the total cost of the integration of production and distribution of newspapers during the determined time horizon. This model can be used by production and marketing managers as decision support in determining the optimal quantity of production and distribution in order to obtain minimum cost so that company's competitiveness level can be increased.
An integrative multi-criteria decision making techniques for supplier evaluation problem with its application

D Fatrias*, I Kamil and D Meilani
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Abstract. Coordinating business operation with suppliers becomes increasingly important to survive and prosper under the dynamic business environment. A good partnership with suppliers not only increase efficiency, but also strengthen corporate competitiveness. Associated with such concern, this study aims to develop a practical approach of multi-criteria supplier evaluation using combined methods of Taguchi loss function (TLF), best-worst method (BWM) and ViSe Kriterijumska Optimizacija kompromisno Resenje (VIKOR). A new framework of integrative approach adopting these methods is our main contribution for supplier evaluation in literature. In this integrated approach, a compromised supplier ranking list based on the loss score of suppliers is obtained using efficient steps of a pairwise comparison based decision making process. Implementation to the case problem with real data from crumb rubber industry shows the usefulness of the proposed approach. Finally, a suitable managerial implication is presented
The Determination of Production and Distribution Policy in Push-Pull Production Chain with Supply Hub as the Junction Point

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Abstract. The development of technology causes the needs of products and services become increasingly complex, diverse, and fluctuating. This causes the level of intercompany dependencies within a production chains increased. To be able to compete, efficiency improvements need to be done collaboratively in the production chain network. One of the efforts to increase efficiency is to harmonize production and distribution activities in the production chain network. This paper describes the harmonization of production and distribution activities by applying the use of pushpull system and supply hub in the production chain between two companies. The research methodology begins with conducting empirical and literature studies, formulating research questions, developing mathematical models, conducting trials and analyses, and taking conclusions. The relationship between the two companies is described in the MINLP mathematical model with the total cost of production chain as the objective function. Decisions generated by the mathematical models are the size of production lot, size of delivery lot, number of kanban, frequency of delivery, and the number of understock and overstock lot.
Abstract. This paper develops and compares two mathematical models for describing situation in coordination of buyer and vendor. In this case the vendor which is an Original Equipment Manufacturers (OEMS) of automotive parts, are supplying different type of buyers, i.e. automotive industry, repair shop and automotive dealers. It is well known that automotive industries are operated in Just in Time (JIT) Production Environment, so that the demand behaviour from this buyer has different characteristics than the demand behaviour from other buyers. Two mathematical models are developed in order to depict two different manufacturing strategies as the vendor response dealing with different type of buyers. These strategies are dividing production lot size for each type of buyer and consolidating all buyer’s demand into single production lot size.
Session Title: Ergonomics and Works System Design
Location: Magnolia Room

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55 The identification of high potential archers based on relative psychological coping skills variables: A Support Vector Machine approach
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56 The Identification of Hunger Behaviour of Lates Calcarifer through the Integration of Image Processing Technique and Support Vector Machine
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Ilham Fauzi, Fariz Muharram Hasby, Dradjad Irianto
The identification of high potential archers based on relative psychological coping skills variables: A Support Vector Machine approach

Zahari Tahaa, Rabiu Muazu Musaa,b, Anwar P. P. Abdul Majeeda, Mohamad Razali Abdullahb, Muhammad Aizzat Zakariaa, Muhammad Muaz Alima, Jessnor Arif Mat Jizat a, and Mohamad Fauzi Ibrahime

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bFaculty of Applied Social Sciences, Universiti Sultan Zainal Abidin, 21300 Kuala Terengganu, Terengganu, Malaysia
cResearch and Education Division, National Sports Institute, Kompleks Sukan Negara Bukit Jalil, 57700 Kuala Lumpur, Malaysia

Abstract. Support Vector Machine (SVM) has been revealed to be a powerful learning algorithm for classification and prediction. However, the use of SVM for prediction and classification in sport is at its inception. The present study classified and predicted high and low potential archers from a collection of psychological coping skills variables trained on different SVMs. 50 youth archers with the average age and standard deviation of (17.0 ± .056) gathered from various archery programmes completed a one end shooting score test. Psychological coping skills inventory which evaluates the archers level of related coping skills were filled out by the archers prior to their shooting tests. k-means cluster analysis was applied to cluster the archers based on their scores on variables assessed. SVM models, i.e. linear and fine radial basis function (RBF) kernel functions, were trained on the psychological variables. The k-means clustered the archers into high psychologically prepared archers (HPPA) and low psychologically prepared archers (LPPA), respectively. It was demonstrated that the linear SVM exhibited good accuracy and precision throughout the exercise with an accuracy of 92% and considerably fewer error rate for the prediction of the HPPA and the LPPA as compared to the fine RBF SVM. The findings of this investigation can be valuable to coaches and sports managers to recognise high potential athletes from the selected psychological coping skills variables examined which would consequently save time and energy during talent identification and development programme.
The Identification of Hunger Behaviour of *Lates Calcarifer* through the Integration of Image Processing Technique and Support Vector Machine

Z Taha1, M A M Razman1, F A Adnan1, A S Abdul Ghani1, A P P Abdul Majeed1, R M Musa1, M F Sallehudin2, Y. Mukai2

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**Abstract.** Fish Hunger behaviour is one of the important element in determining the fish feeding routine, especially for farmed fishes. Inaccurate feeding routines (under-feeding or over-feeding) lead the fishes to die and thus, reduces the total production of fishes. The excessive food which is not eaten by fish will be dissolved in the water and thus, reduce the water quality (oxygen quantity in the water will be reduced). The reduction of oxygen (water quality) leads the fish to die and in some cases, may lead to fish diseases. This study correlates Barramundi fish-school behaviour with hunger condition through the hybrid data integration of image processing technique. The behaviour is clustered with respect to the position of the centre of gravity of the school of fish prior feeding, during feeding and after feeding. The clustered fish behaviour is then classified by means of a machine learning technique namely Support vector machine (SVM). It has been shown from the study that the Fine Gaussian variation of SVM is able to provide a reasonably accurate classification of fish feeding behaviour with a classification accuracy of 79.7%. The proposed integration technique may increase the usefulness of the captured data and thus better differentiates the various behaviour of farmed fishes.
Abstract. Occupational noise hearing loss with high level exposure is common occupational hazards. In CNC striping process, employee that exposed to high noise level for a long time as 8-hour contributes to hearing loss, create physical and psychological stress that reduce productivity. In this paper, CNC stripping process with high level noises are measured and reduced to the permissible noise exposure. First condition is all machines shutting down and second condition when all CNC machine under operations. For both conditions, noise exposures were measured to evaluate the noise problems and sources. After improvement made, the noise exposures were measured to evaluate the effectiveness of reduction. The initial average noise level at the first condition is 95.797 dB (A). After the pneumatic system with leakage was solved, the noise reduced to 55.517 dB (A). The average noise level at the second condition is 109.340 dB (A). After six machines were gathered at one area and cover that area with plastic curtain, the noise reduced to 95.209 dB (A). In conclusion, the noise level exposure in CNC striping machine is high and exceed the permissible noise exposure can be reduced to acceptable levels. The reduction of noise level in CNC striping processes enhanced productivity in the industry.
Work-related musculoskeletal disorders (WMDs) risk assessment at core assembly production of electronic components manufacturing company

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Abstract. This study conducted to assess the work-related musculoskeletal disorders (WMDs) among the workers at core assembly production in an electronic components manufacturing company located in Pekan, Pahang, Malaysia. The study is to identify the WMDs risk factor and risk level. A set of questionnaires survey based on modified Nordic Musculoskeletal Disorder Questionnaires have been distributed to respective workers to acquire the WMDs risk factor identification. Then, postural analysis was conducted in order to measure the respective WMDs risk level. The analysis were based on two ergonomics assessment tools; Rapid Upper Limb Assessment (RULA) and Rapid Entire Body Assessment (REBA). The study found that 30 respondents out of 36 respondents suffered from WMDs especially at shoulder, wrists and lower back. The WMDs risk have been identified from unloading process, pressing process and winding process. In term of the WMDs risk level, REBA and RULA assessment tools have indicated high risk level to unloading and pressing process. Thus, this study had established the WMDs risk factor and risk level of core assembly production in an electronic components manufacturing company at Malaysia environment.
Abstract. Musculoskeletal Disorders (MSD) is one of the ergonomic risks due to manual activity, non-neutral posture and repetitive motion. The purpose of this study is to measure risk and implement ergonomic interventions to reduce the risk of MSD on the paper pallet assembly work station. Measurements to work posture are done by Ovako Working Posture Analysis (OWAS) methods and Rapid Entire Body Assessment (REBA) method, while the measurement of work repetitiveness was using Strain Index (SI) method. Assembly processes operators are identified has the highest risk level. OWAS score, Strain Index, and REBA values are 4, 20.25, and 11. Ergonomic improvements are needed to reduce that level of risk. Proposed improvements will be developed using the Quality Function Deployment (QFD) method applied with Axiomatic House of Quality (AHOQ) and Morphological Chart. As the result, risk level based on OWAS score & REBA score turn out from 4 & 11 to be 1 & 2. Biomechanics analysis of the operator also shows the decreasing values for L4-L5 moment, compression, joint shear, and joint moment strength.
Abstract. Awareness of ergonomic risk assessment among workers are getting intense in many industries nowadays. It is essential since most of the workers spend 7 to 8 hours of their time in the workplaces. Previous study shown that spending too much time with static posture in sitting at workplace leads to the problem of Musculoskeletal Disorders (MSDs). The implications are not only harmful to human body but also effect the productivity. Currently, there are no scientific study conducted to assess the conditions of workers in Universiti Malaysia Pahang (UMP). Therefore, the problem of MSDs could not be justified clearly and the top management did not acknowledge this issue. This study aims to present current scenario of ergonomic risk level at UMP by using structured model. It focuses on operational staff from faculties and Human Resources Department (HRD). Initially, three types of assessments are executed based on general working condition, Cornell Muscokeletal Discomfort Questionnaire (CMDQ) and Rapid Office Strain Assessment (ROSA). Based on the findings, 90% of the respondents felt discomfort at workplace but prefer to rectify the issues by themselves. Almost 50% of them evaluated themselves in level 4-5 of discomfort level. The CMDQ result shown the discomfort area at faculties and HRD. The workplace at faculties and HRD had been assessed through ROSA and the overall result shown the risk level is medium level respectively. Therefore, further investigation is requires and improvement of workplace need to be proposed to establish good working condition.
Process Improvement in Outpatient Installation RSUD dr. Soediran Mangun Sumarso Using Lean Hospital Approach

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Abstract. RSUD dr. Soediran Mangun Sumarso is a public hospital in Wonogiri district which has an outpatient installation service. However, the waiting time of some services in outpatient installations exceeds the standard time set by the health minister of the Republic of Indonesia. It is known from the data waiting time in the outpatient installation. The purpose of this study is to provide improvements using lean hospital approach. Proposed improvement is done by eliminating waste that occurs in outpatient installation service. The methodology used in this study consists of four stages. The first stage is describing the service system using a crossfunctional flowchart. The second stage is identifying waste using value stream mapping, observation and interview. The third stage is to determine critical waste by borda method and pareto diagram. The last stage is to provide recommendation improvement using fishbone diagram and FMEA. The result of this research is proposed improvements. The proposed improvements are adding special register counters, implementing an online reservation system, doctors schedule synchronization, adding doctors in polyclinics, fixing queue numbers, applying visual management concepts, making connecting glass in pharmacies and adding multifunction shelves in polyclinics.
Abstract. Although government is able to make mandatory standards that must be obeyed by the industry, the respective industries themselves often have difficulties to fulfill the requirements described in those standards. This is especially true in many small and medium sized enterprises that lack the required capital to invest in standard-compliant equipment and machineries. This study aims to develop a set of measurement tools for evaluating the level of readiness of production technology with respect to the requirements of a product standard based on the quality function deployment (QFD) method. By combining the QFD methodology, UNESCAP Technometric model and Analytic Hierarchy Process (AHP), this model is used to measure a firm’s capability to fulfill government standard in the toy making industry. Expert opinions from both the governmental officers responsible for setting and implementing standards and the industry practitioners responsible for managing manufacturing processes are collected and processed to find out the technological capabilities that should be improved by the firm to fulfill the existing standard. This study showed that the proposed model can be used successfully to measure the gap between the requirements of the standard and the readiness of technoware technological component in a particular firm.
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Paper ID

27  Optimization of PID Parameters Utilizing Variable Weight Grey-Taguchi Method and Particle Swarm Optimization
Nur Iffah Mohamed Azmi1, Kamal Arifin Mat Piah1, Wan Azhar Wan Yusoff1, Fadhlur Rahman Mohd Romlay2

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Optimization of PID Parameters Utilizing Variable Weight Grey-Taguchi Method and Particle Swarm Optimization

Nur Iffah Mohamed Azmi1, Kamal Arifin Mat Piah1, Wan Azhar Wan Yusoff1, Fadhlur Rahman Mohd Romlay2

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Abstract. Controller that uses PID parameters requires a good tuning method in order to improve the control system performance. Tuning PID control method is divided into two namely the classical methods and the methods of artificial intelligence. Particle swarm optimization algorithm (PSO) is one of the artificial intelligence methods. Previously, researchers had integrated PSO algorithms in the PID parameter tuning process. This research aims to improve the PSO-PID tuning algorithms by integrating the tuning process with the Variable Weight Grey-Taguchi Design of Experiment (DOE) method. This is done by conducting the DOE on the two PSO optimizing parameters: the particle velocity limit and the weight distribution factor. Computer simulations and physical experiments were conducted by using the proposed PSO-PID with the Variable Weight Grey-Taguchi DOE and the classical Ziegler-Nichols methods. They are implemented on the hydraulic positioning system. Simulation results show that the proposed PSO-PID with the Variable Weight Grey-Taguchi DOE has reduced the rise time by 48.13% and settling time by 48.57% compared to the Ziegler-Nichols method. Furthermore, the physical experiment results also show that the proposed PSO-PID with the Variable Weight Grey-Taguchi DOE tuning method responds better than Ziegler-Nichols tuning. In conclusion, this research has improved the PSO-PID parameter by applying the PSO-PID algorithm together with the Variable Weight Grey-Taguchi DOE method as a tuning method in the hydraulic positioning system.
Design for Warehouse with Product Flow Type Allocation using Linear Programming: A Case Study in a Textile Industry

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Abstract. Sari Warna Co. Ltd, a company engaged in the textile industry, is experiencing problems in the allocation and placement of goods in the warehouse. During this time the company has not implemented the product flow type allocation and product placement to the respective products resulting in a high total material handling cost. Therefore, this study aimed to determine the allocation and placement of goods in the warehouse corresponding to product flow type with minimal total material handling cost. This research is a quantitative research based on the theory of storage and warehouse that uses a mathematical model of optimization problem solving using mathematical optimization model approach belongs to Heragu (2005), aided by software LINGO 11.0 in the calculation of the optimization model. Results obtained from this study is the proportion of the distribution for each functional area is the area of cross-docking at 0.0734, the reserve area at 0.1894, and the forward area at 0.7372. The allocation of product flow type 1 is 5 products, the product flow type 2 is 9 products, the product flow type 3 is 2 products, and the product flow type 4 is 6 products. The optimal total material handling cost by using this mathematical model equal to Rp43,079,510 while it is equal to Rp 49,869,728 by using the company’s existing method. It saves Rp6,790,218 for the total material handling cost. Thus, all of the products can be allocated in accordance with the product flow type with minimal total material handling cost.
PSO-based PID Speed Control of Traveling Wave Ultrasonic Motor under Temperature Disturbance

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Abstract. Traveling wave ultrasonic motors (TWUSMs) have a time varying dynamics characteristics. Temperature rise in TWUSMs remains a problem particularly in sustaining optimum speed performance. In this study, a PID controller is used to control the speed of TWUSM under temperature disturbance. Prior to developing the controller, a linear approximation model which relates the speed to the temperature is developed based on the experimental data. Two tuning methods are used to determine PID parameters: conventional Ziegler-Nichols (ZN) and particle swarm optimization (PSO). The comparison of speed control performance between PSO-PID and ZN-PID is presented. Modelling, simulation and experimental work is carried out utilizing Fukoku-Shinsei USR60 as the chosen TWUSM. The results of the analyses and experimental work reveal that PID tuning using PSO-based optimization has the advantage over the conventional Ziegler-Nichols method.
Optimization of diesel engine performance by the Bees Algorithm

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Abstract. Biodiesel recently has been receiving a great attention in the world market due to the depletion of the existing fossil fuels. Biodiesel also becomes an alternative for diesel No. 2 fuel which possesses characteristics such as biodegradable and oxygenated. However, there are facts suggested that biodiesel does not have the equivalent features as diesel No. 2 fuel as it has been claimed that the usage of biodiesel giving increment in the brake specific fuel consumption (BSFC). The objective of this study is to find the maximum brake power and brake torque as well as the minimum BSFC to optimize the condition of diesel engine when using the biodiesel fuel. This optimization was conducted using the Bees Algorithm (BA) under specific biodiesel percentage in fuel mixture, engine speed and engine load. The result showed that 58.33kW of brake power, 310.33 N.m of brake torque and 200.29/(kW.h) of BSFC were the optimum value. Comparing to the ones obtained by other algorithm, the BA produced a fine brake power and a better brake torque and BSFC. This finding proved that the BA can be used to optimize the performance of diesel engine based on the optimum value of the brake power, brake torque and BSFC.
A Goal Programming Optimization Model for The Allocation of Liquid Steel Production

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Abstract. This research was conducted in one of the largest steel companies in Indonesia which has several production units and produces a wide range of steel products. One of the important products in the company is billet steel. The company has four Electric Arc Furnace (EAF) which produces liquid steel which must be processed further to be billet steel. The billet steel plant needs to make their production process more efficient to increase the productivity. The management has four goals to be achieved and hence the optimal allocation of the liquid steel production is needed to achieve those goals. In this paper, a goal programming optimization model is developed to determine optimal allocation of liquid steel production in each EAF, to satisfy demand in 3 periods and the company goals, namely maximizing the volume of production, minimizing the cost of raw materials, minimizing maintenance costs, maximizing sales revenues, and maximizing production capacity. From the results of optimization, only maximizing production capacity goal can not achieve the target. However, the model developed in this paper can optimally allocate liquid steel so the allocation of production does not exceed the maximum capacity of the machine work hours and maximum production capacity.
Capacitated set-covering model considering the distance objective and dependency of alternative facilities

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Abstract. We propose a new model of facility location to solve a kind of problem that belong to a class of set-covering problem using an integer programming formulation. Our model contains a single objective function, but it represents two goals. The first is to minimize the number of facilities, and the other is to minimize the total distance of customers to facilities. The first goal is a mandatory goal, and the second is an improvement goal that is very useful when alternate optimum solutions for the first goal exist. We use a big number as a weight on the first goal to force the solution algorithm to give first priority to the first goal. Besides considering capacity constraints, our model accommodates a kind of either-or constraints representing facilities dependency. The either-or constraints will prevent the solution algorithm to select two or more facilities from the same set of facility with mutually exclusive properties. A real location selection problem to locate a set of wastewater treatment facility (IPAL) in Surakarta city, Indonesia, will describe the implementation of our model. A numerical example is given using the data of that real problem.
**Multi Objective Optimization Using Genetic Algorithm of a Pneumatic Connector**

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**Abstract.** The concept of sustainability was first introduced by Dr Harlem Brutland in the 1980’s promoting the need to preserve today’s natural environment for the sake of future generations. Based on this concept, John Elkington proposed an approach to measure sustainability known as Triple Bottom Line (TBL). There are three evaluation criteria’s involved in the TBL approach; namely economics, environmental integrity and social equity. In manufacturing industry the manufacturing costs measure the economic sustainability of a company in a long term. Environmental integrity is a measure of the impact of manufacturing activities on the environment. Social equity is complicated to evaluate; but when the focus is at the production floor level, the production operator health can be considered. In this paper, the TBL approach is applied in the manufacturing of a pneumatic nipple hose. The evaluation criteria used are manufacturing costs, environmental impact, ergonomics impact and also energy used for manufacturing. This study involves multi objective optimization by using genetic algorithm of several possible alternatives for material used in the manufacturing of the pneumatic nipple.
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12  Bridging Technometric Method and Innovation Process: An Initial Study
    A A Rumanti1,2, R Reynaldo3, T M A A Samadhi1, I I Wiratmadja1, A C Dwita3

13  Development of hydropower sustainability assessment method in Malaysia context
    Faiz Mohd Turan1, Kartina Johan1 and Nur Atiqah Omar1

14  A new framework for sustainable hydropower development project
    Kartina Johan1, Faiz Mohd Turan1 and Nur Syazwani Abdul Gani1

195  Framework for Designing The Assessment Models of Readiness SMEs to Adopt Indonesian National Standard (SNI), Case Study: SMEs Batik in Surakarta
     Fakhrina Fahma, Roni Zakaria, Royan Fajar Gumilang

199  Analysis Influence of Managerial Competence, Technical Competence, and Strategic Competence on Firm Performance in Electrical Engineering Company in Bandung
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20  Success Measures Evaluation for Mobile Commerce Using Text Mining based on Customer Tweets
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    M A E Suryono1 and C N Rosyidi2
Bridging Technometric Method and Innovation Process: An Initial Study

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Abstract. The process of innovation is one of ways utilized to increase the capability of a technology component that reflects the need of SME. Technometric method can be used to identify to what extent the level of technology advancement in a SME is, and also which technology component that needs to be maximized in order to significantly deliver an innovation. This paper serves as an early study, which lays out a conceptual framework that identifies and elaborates the principles of innovation process from a well-established innovation model by Martin with the technometric method, based on the initial background research conducted at SME Ira Silver in Jogjakarta, Indonesia.
Development of hydropower sustainability assessment method in Malaysia context

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Abstract. Nowadays, sustainability is becoming one of the crucial requirement to business success today. This requirement is strongly supported by Bursa Malaysia. In their webpage, they stated that an entire way to business management, incorporating economic, environmental, social and governance considerations alongside financial ones, will serve as a sound business model that supports business continuity and long term value creation for stakeholders and society at large (Bursa Malaysia website, 21th April 2016). This proved that companies need to take sustainability as one of their aspect performance as well as an energy company. Apart from that, energy companies in Malaysia are facing problems as there is still no systematic assessment of sustainability. Before this, Malaysia energy companies assess their large projects based on Environmental Impact Assessments (EIAs) requirement. However, the EIAs mostly covers the environmental issues related to the projects. The EIAs give less attention to the social aspects and economical aspects. In addition, there are still not many companies comply all the three aspects together. So, this study is to help the energy companies to discover the systematic assessment of sustainability. In developing sustainable project, they need to include many criteria that cover the environmental, economic and social aspects at all stages. Thus, the new version of Systematic Sustainability Assessment (SSA) that apply the Hydropower Sustainability Assessment Protocol (HSAP) is used as a guideline to achieve sustainability in Malaysia energy companies. This tool will guide the energy company on how to assess the sustainability in their project and see the performance of the project.
A new framework for sustainable hydropower development project

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Abstract. This project studies on the establishment of a new framework for sustainable hydropower development. A hydropower development is listed as one of the prescribed activities under the Environmental Quality Order 1987. Thus, Environmental Impact Assessment (EIA) guidelines must be referred to comply with the Department of Environment (DoE) requirements. In order to execute EIA, an assessment tool that will be utilized in the final evaluation phase must be determined. The selected assessment tool that will be used is Systematic Sustainability Assessment (SSA) which is a new integrated tool to evaluate the sustainability performance. A pilot run is conducted in five different departments within the Energy Company to validate the efficiency of the SSA tool. The parameters to be evaluated are constructed aligned with the Sustainable Development Goals (SDG) to maintain the sustainability features. Consequently, the performance level of the sustainability with respect to People, Planet and Profit (3P’s) is able to be discovered during evaluation phase in the hydropower development for continuous improvement.
Abstract. Since the ASEAN Economic Community (AEC) is released, the opportunity to expand market share has become very open, but the level of competition is also very high. Standardization is believed to be an important factor in seizing opportunities in the AEC’s era and other free trade agreements in the future. Standardization activities in industry can be proven by obtaining certification of SNI (Indonesian National Standard). This is a challenge for SMEs, considering that currently only 20% of SMEs had SNI certification both product and process. This research will be designed a model of readiness assessment to obtain SNI certification for SMEs. The stages of model development used an innovative approach by Roger (2003). Variables that affect the readiness of SMEs are obtained from product certification requirements established by BSN (National Standardization Agency) and LSPro (Certification body). This model will be used for mapping the readiness for SNI certification of SMEs’ product. The level of readiness of SMEs is determined by the percentage of compliance with those requirements. Based on the result of this study, the five variables are determined as main aspects to assess SME readiness. For model validation, trials were conducted on Batik SMEs in Laweyan Surakarta.
Abstract. The industry sectors that have an important role in the era of globalization is the electro engineering sector. The era of globalization led to intense competition. One of the negative effects of the intense competition is declining profits. Drop in profits caused many firms reduces their employees without seeking the root cause of declining profits in detail. Whereas, employee is the important resources to maintain competitive advantage. Competitive advantage can be measured by the performance of which is owned by the firm. The firm's performance can be formed of competencies that is unique, rare, irreplaceable, and difficult to imitate within the firm, one of them is the competence of the individual. According to a competency-based approach and the resource-based approach, individual competence that affect the performance of the firm is managerial competence, technical competence, and strategic competence. Questionnaire is built based on the dimensions of the firm's performance, managerial competence, technical competence, and strategic competence, are processed using partial least squares application. The results indicate that managerial competence negatively impact firm’s performance with weak ties. The technical competence and strategic competence positively affect firm’s performance with moderate ties.
Success Measures Evaluation for Mobile Commerce Using Text Mining based on Customer Tweets

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Abstract. The customer acceptance of mobile commerce application systems is one of the driving factors of a successful mobile commerce implementation. However, there is an increasing number of companies that fail to implement. This shows the need to measure the success in implementing mobile commerce. One of the approach to determine success measures of mobile commerce can use customer perspective through user feedback regarding the application performance. The development of technology allows customers to share their feedback about mobile commerce services through online media without the limitation of time and place, for example using Twitter. Any tweets that contain comments or questions about a service is called a customer tweet. Customer tweets, processed using text mining, facilitate the company to get information about the success measures of a particular service based on customer point of view. Based on previous literature study, research on success measures of mobile commerce from the customer perspective is still in the early stages. Therefore, there are several reasons why this research is important. First, every mobile service has different characteristics, especially in the measurement of success. This shows that many explorations can be done regarding the success measures of mobile commerce. Second, the availability of customer tweets that contain comments about mobile commerce has allowed the data to be collected and processed into information to analyse the success measures of mobile commerce systems. Third, there is very little or no studies that use text mining method to model the success measures for mobile commerce based on customer tweets. Thus, the study reported in this paper aims at developing the success measures for mobile commerce based on customer tweets using text mining approach. The results from data processing indicate that some constructs that represent the success measures for mobile commerce include System Quality, Information Quality, Process Quality, Service Quality, Use, User Satisfaction, Individual Benefit and IT Infrastructure.
Abstract. Human resource is an important factor for a company to gain competitiveness, therefore competencies of each individual in a company is a basic characteristic that is taken into account. The increasing employee’s competency will affect directly to the company's performance. The purpose of this research is to improve the quality of human resources of maintenance staff in manufacturing company by designing competency measurement instrument that aims to assess the competency of employees. The focus of this research is the mechanical expertise of maintenance staff. SECI method is used in this research for managing knowledge that is held by senior employees regarding employee competence of mechanical expertise. The SECI method converts the knowledge of a person's tacit knowledge into an explicit knowledge so that the knowledge can be used by others. The knowledge that is gathered from SECI method is converted into a list of competence and break down into the detailed competency. Based on the results of this research, it is known that 11 general competencies, 17 distinctive competencies, 20 indicators, and 20 item list for assessing the competencies are developed. From the result of competency breakdown, the five-level instrument of measurement is designed which can assist in assessing employee’s competency for mechanical expertise.
Abstract. PT. X used automated machines which work for sixteen hours per day. Therefore, the machines should be maintained to keep the availability of the machines. The aim of this research is to determine maintenance tasks according to the cause of component’s failure using Reliability Centred Maintenance (RCM) and determine the amount of optimal inspection frequency which must be performed to the machine at filling lithos process. In this research, RCM is used as an analysis tool to determine the critical component and find optimal inspection frequencies to maximize machine’s reliability. From the analysis, we found that the critical machine in filling lithos process is laser machine in Line 2. Then we proceed to determine the cause of machine’s failure. Lastube component has the highest Risk Priority Number (RPN) among other components such as power supply, lens, chiller, laser siren, encoder, conveyor, and mirror galvo. Most of the components have operational consequences and the others have hidden failure consequences and safety consequences. Time-directed life-renewal task, failure finding task, and servicing task can be used to overcome these consequences. The results of data analysis show that the inspection must be performed once a month for laser machine in the form of preventive maintenance to lowering the downtime.
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25  PVA/Graphene Nanocomposite: Morphology and its Thermal Properties
    Abu Hannifa Abdullah1*, Zulhelmi Ismail2, Anis Sakinah Zainal Abidin1, and Fadwa Sameeha Ismail1, Kamal Yusoh1.

43  Effect of Processing Variables on Tensile Modulus and Morphology of Polyethylene/Clay Nanocomposites Prepared in an Internal Mixer
    O Ujianto1, M Jollands2, N Kao2

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66  Investigation on the effect of Friction Stir Processing Parameters on Micro-structure and Micro-hardness of Rice Husk Ash reinforced Al6061 Metal Matrix Composites
    N Fatchurrohman1, N Farhana1 and C D Marini1
Abstract. Graphene is known as a wonder materials that can be used to enhance the properties of nanocomposites. In this work, PVA/Graphene nanocomposite was fabricated using simple solution method. The photograph of the nanocomposite samples shown the transparency of the sample reduced as the graphene content increase. The photograph also shown the PVA and the modified graphene are miscible and compatible. The XRD of the samples proved the exfoliation of graphene in the nanocomposite and the result of the thermal property improvement for the sample is confirmed by the TGA.
Effect of Processing Variables on Tensile Modulus and Morphology of Polyethylene/Clay Nanocomposites Prepared in an Internal Mixer

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Abstract. A comparative study on effect of internal mixer on high density Polyethylene (HDPE)/clay nanocomposites preparation was done. Effect of temperature, rotor rotation (rpm), and mixing time, as well as rotor type (Roller and Banbury) on mechanical properties and morphology of HDPE/clay nanocomposites were studied using Box-Behnken experimental design. The model was developed according to secant modulus and confirmed to morphology analysis using Transmission Electron Microscopy (TEM). The finding suggests that there is different mechanisms occurred in each rotor to improve the mechanical properties. The mechanism in Roller is medium shear and medium diffusion, while Banbury is high shear and low diffusion. The difference in mechanism to disperse the clay particles attribute to the different optimum processing conditions in each rotor. The settings for roller samples are predicted around mid temperature, mid speed, and mid mixing time. There is no optimum setting for Banbury within the processing boundaries. The best settings for Banbury are at low, high, low settings. The morphology results showed a hybrid composite structure, with some exfoliations and some intercalations. There was a correlation between better mechanical properties and morphology with more exfoliation and thinner intercalated particles.
Preparation of tin oxide (SnO2) thin films using thermal oxidation

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Abstract. The present research study deals with the preparation of tin oxide (SnO2) nanostructures using thermal oxidation method. At first, Sn thin film was deposited on silicon (Si) substrate by thermal evaporation and then, thermal oxidation of the deposited Sn thin film was carried out at the growth temperature of 100°C with growth time of 1 hour in tube furnace. The structural property of SnO2 nanostructures was investigated by using FESEM and EDX. The FESEM results showed that Sn was successfully grown on Si substrate and the SnO2 nanoparticles with diameters of 97.5nm to 142nm were recorded. It was observed that the particles were agglomerated to form the SnO2 particles. The radiation of sunlight illumination was conducted for four consecutive sunny days and the results showed that the highest reading 189.9 W/m² was recorded at day two for the daytime temperature 38°C. It was also noticed that the highest solar radiation percentage at day two was measured 18.9%.
Rigid Polyurethane Nanocomposites Prepared by Direct Incorporation: Effects of Nanoclay, Carbon Nanotubes and Mixing Speed on Physical and Morphological Properties

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Abstract. Rigid polyurethane (PU) nanocomposites were fabricated via solution mixing of PU, nanoclay and multiwalled carbon nanotubes (MWCNT) according to full factorial DoE. The nanoclay and MWCNT concentration as well as mixing speed were varied. The effects of controlled variables on reduced compressive strength, fire retardancy, hardness and morphological properties were analyzed. In general, the results showed that incorporation of nanofillers into PU matrix successfully elevated nanocomposites performance. The properties changed from -12% to 45% for reduced compressive strength, 9% to 30% for reduced fire retardancy and -32% to 101% for reduced hardness. The results suggested that the improvements were affected by nanoclay dispersion that acted as nucleating agent which resulted in smaller close cells of PU structures.
Flexure and impact properties of glass fiber reinforced nylon 6-polypropylene composites

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Abstract. In recent years, polymer composites are rapidly developing and replacing the metals or alloys in numerous engineering applications. These polymer composites are the topic of interests in industrial applications such as automotive and aerospace industries. In the present research study, glass fiber (GF) reinforced nylon 6 (PA6)-polypropylene (PP) composite specimens were prepared successfully using injection molding process. Test specimens of five different compositions such as, 70%PA6+30%PP, 65%PA6+30%PP+5%GF, 60%PA6+30%PP+10%GF, 55%PA6+30%PP+15%GF and 50%PA6+30%PP+20%GF were prepared. In the experiments, flexure and impact tests were carried out. The obtained results revealed that flexure and impact properties of the polymer composites were significantly influenced by the glass fiber content. Results showed that flexural strength is low for pure polymer blend and flexural strength of GF reinforced composite increases gradually with the increase in glass fiber content. Test results also revealed that the impact strength of 70%PA6+30%PP is the highest and 55%PA6+30%PP+15%GF composite shows moderate impact strength. On the other hand, 50%PA6+30%PP+20%GF composite shows low toughness or reduced impact strength.
Failure Behaviour of Aluminium/CFRP Laminates with Varying Fibre Orientation in Quasi-static Indentation Test

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Abstract. The response of the aluminium/carbon laminate was examined by an experimental work. The investigation on fibre metal laminate behaviour was done through an indentation test in a quasi-static loading. The hybrid laminate was fabricated by a compression moulding technique and used two types of carbon fibre orientations; plain weave and unidirectional. The plain weave orientation is dry fibre, and unidirectional orientation is prepreg type fibre. The plain weave carbon fibre and aluminium alloy 2024-0 was laminated by using thermoset epoxy while the unidirectional carbon fibre was pressed by using a hot press machine and cured under a specific temperature and pressure. A compression moulding technique was used for the FML fabrication. The aluminium sheet metal has been roughening by a metal sanding method which to improve the bonding between the fibre and metal layer. The main objective of this paper is to determine the failure response of the laminate under five variation of the crosshead speeds in the quasi-static loading. Based on the experimental data of the test, the result of 1 mm/min in the plain weave CFRP has lower loading than unidirectional fibre which the value of both was 4.11 kN and 4.69 kN, respectively.
Investigation on the effect of Friction Stir Processing Parameters on Micro-structure and Micro-hardness of Rice Husk Ash reinforced Al6061 Metal Matrix Composites

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Abstract. Friction stir processing (FSP) is an alternative way to produce the surface composites of aluminium alloy in order to modify the microstructure and improve the mechanical properties. In this experiment, Al6061 aluminium alloy has been chosen to be used as the matrix base plate for the FSP. Al606 has potential for the use in advanced application but it has low wear resistance. While, the reinforced used was rice husk ash (RHA) in order to produce surface composites which increased the micro hardness of the plate composites. The Al6061 was stirred individually and with 5 weight % of RHA at three different tool rotational speeds of 800 rpm, 1000 rpm and 1200 rpm. After running the FSP, the result in the distribution of particles and the micro hardness of the specimens were identified. The result showed that Al6061 plate with the existing 5 weight % of RHA reinforced at the highest of tool rotational speeds of 1200rpm has the best distribution of particles and the highest result in average of micro hardness with 80Hv
# SECOND SESSION: ORAL PRESENTATION

**THURSDAY, DECEMBER 7, 2017**

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702 A Framework for the Development of Automatic DFA Method to Minimize the Number of Components and Assembly Reorientations  
Alfadhlani1, T M A Ari Samadhi2, Anas Ma’ruf2, Isa Setiasyah Toha2
Development of Product Availability Monitoring System In Production Unit In Automotive Component Industry

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Abstract. This paper described a methodology to monitor the availability of products in a production unit in the automotive component industry. Automotive components made are automotive components made through sheet metal working. Raw material coming into production unit in the form of pieces of plates that have a certain size. Raw materials that come stored in the warehouse. Data of raw each material in the warehouse are recorded and stored in a database system. The material will then undergo several production processes in the production unit. When the material is taken from the warehouse, material data are also recorded and stored in a database. The data recorded are the amount of material, material type, and date when the material is out of the warehouse. The material coming out of the warehouse is labeled with information related to the production processes that the material must pass. Material out of the warehouse is a product will be made. The products have been completed, are stored in the warehouse products. When the product is entered into the product warehouse, product data is also recorded by scanning the barcode contained on the label. By recording the condition of the product at each stage of production, we can know the availability of the product in a production unit in the form of a raw material, the product being processed and the finished product.
Abstract. This paper explains the development of a comprehensive archery performance monitoring software which consisted of three camera views and five body sensors. The five body sensors evaluate biomechanical related variables of flexor and extensor muscle activity, heart rate, postural sway and bow movement during archery performance. The three camera views with the five body sensors are integrated into a single computer application which enables the user to view all the data in a single user interface. The five body sensors’ data are displayed in a numerical and graphical form in real-time. The information transmitted by the body sensors are computed with an embedded algorithm that automatically transforms the summary of the athlete’s biomechanical performance and displays in the application interface. This performance will be later compared to the pre-computed psycho-fitness performance from the prefilled data into the application. All the data; camera views, body sensors; performance computations; are recorded for further analysis by a sports scientist. Our developed application serves as a powerful tool for assisting the coach and athletes to observe and identify any wrong technique employ during training which gives room for correction and re-evaluation to improve overall performance in the sport of archery.
Abstract. The production characteristic of job-shop industry at which products have wide variety but small amounts causes every machine tool will be shared to conduct production process with dynamic load. Its dynamic condition operation directly affects machine tools component reliability. Hence, determination of maintenance schedule for every component should be calculated based on actual usage of machine tools component. This paper describes study on development of monitoring system to obtaining information about each CNC machine tool component usage in real time approached by component grouping based on its operation phase. A special device has been developed for monitoring machine tool component usage by utilizing usage phase activity data taken from certain electronics components within CNC machine. The components are adaptor, servo driver and spindle driver, as well as some additional components such as microcontroller and relays. The obtained data are utilized for detecting machine utilization phases such as power on state, machine ready state or spindle running state. Experimental result have shown that the developed CNC machine tool monitoring system is capable of obtaining phase information of machine tool usage as well as its duration and displays the information at the user interface application.
**Smart mobile robot system for rubbish collection**

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**Abstract.** This paper records the research and procedures of developing a smart mobility robot with detection system to collect rubbish. The objective of this paper is to design a mobile robot that can detect and recognize medium-size rubbish such as drinking cans. Besides that, the objective is also to design a mobile robot with the ability to estimate the position of rubbish from the robot. In addition, the mobile robot is also able to approach the rubbish based on position of rubbish. This paper explained about the types of image processing, detection and recognition methods and image filters. This project implements RGB subtraction method as the prior system. Other than that, algorithm for distance measurement based on image plane is implemented in this project. This project is limited to use computer webcam as the sensor. Secondly, the robot is only able to approach the nearest rubbish in the same views of camera vision and any rubbish that contain RGB colour components on its body.
Control of wheeled mobile robot in restricted environment

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Abstract. This paper presents a simulation and practical control system for a wheeled mobile robot in restricted environment. A wheeled mobile robot with 3 wheels is fabricated and controlled by proportional derivative active force control (PD-AFC) to move in a pre-planned restricted environment to maintain the tracking errors at a zero level. A control system with two loops, outer by PD controller and inner loop by Active Force Control, are designed to control the wheeled mobile robot. Fuzzy logic controller is implemented in the Active force Control to estimate the inertia matrix that will be used to calculate the actual torque applied on the wheeled mobile robot. The mobile robot is tested in two different trajectories, namely a circular and straight path. The actual path and desired path are compared.
Design of conveyor utilization monitoring system: a case study of powder coating line in sheet metal fabrication

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Abstract. Conveyor is a very useful equipment to replace manpower in transporting the goods. It highly influences the productivity, production capacity utilization and eventually the production cost. This paper proposes a system to monitor the utilization of conveyor at a low cost through a case study at powder coating process line in a sheet metal fabrication. Preliminary observation was conducted to identify the problems. The monitoring system was then built and executed. The system consists of two sub systems. First is sub system for collecting and transmitting the required data and the second is sub system for displaying the data. The system utilizes sensors, wireless data transfer and windows-based application. The test results showed that the whole system works properly. By this system, the productivity and status of the conveyor can be monitored in real time. This research enriches the development of conveyor monitoring system especially for implementation in small and medium enterprises.
A Framework for the Development of Automatic DFA Method to Minimize the Number of Components and Assembly Reorientations

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Abstract. Assembly is a part of manufacturing processes that must be considered at the product design stage. Design for Assembly (DFA) is a method to evaluate product design in order to make it simpler, easier and quicker to assemble, so that assembly cost is reduced. This article discusses a framework for developing a computer-based DFA method. The method is expected to aid product designer to extract data, evaluate assembly process, and provide recommendation for the product design improvement. These three things are desirable to be performed without interactive process or user intervention, so product design evaluation process could be done automatically. Input for the proposed framework is a 3D solid engineering drawing. Product design evaluation are performed by: minimizing the number of components; generating assembly sequence alternatives; selecting the best assembly sequence based on the minimum number of assembly reorientations; and providing suggestion for design improvement.