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Design implementation of lean supply chain management: A case study on loading process of fertilizer at PT Petrokimia Gresik port

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Abstract

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

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Preface: 3rd International Materials, Industrial, and Manufacturing Engineering Conference (MIMEC2017)

AIP Conference Proceedings 1902, 010001 (2017)
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Preface: 3rd International Materials, Industrial, and Manufacturing Engineering Conference (MIMEC2017)

Welcome to Miri, Malaysia for the 3rd International Materials, Industrial, and Manufacturing Engineering Conference (MIMEC2017) which is held on 6 – 8 December 2017. The international conference returns with exciting features for facilitating participants in publishing and networking/research dissemination. We are pleased to have our returning participants as well as to get new participants across 5 continents of the world in MIMEC2017. We are indeed very happy for the response given to MIMEC conference series.

For facilitating publication of papers from our participants, we are partnering with AIP Conference Proceedings to publish selected papers from MIMEC2017. In this proceedings, we have 60 papers from all three tracks of the conference.

For this proceedings, we would like to thank all paper contributors, International Scientific and Advisory Board members, Keynote Speakers, Invited Speakers, Guest Editors, and Reviewers for their support.

We are grateful to our sponsors for their contribution to MIMEC2017. Support from the Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Faculty of Engineering and Science, Curtin University Malaysia, and Department of Industrial Engineering, Sebelas Maret University is very much appreciated.

Enjoy the conference and your stay in Miri, Malaysia! Until we meet again in the next MIMEC conference series in 2019.

Thank you and best wishes,

Wahyudi Sutopo, Wakhid Ahmad Jauhari, Fethma M. Nor and Denni Kurniawan
Editors

Issues

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Issue 7 November - Volume 1902, Issue 1

PRELIMINARY

Preface: 3rd International Materials, Industrial, and Manufacturing Engineering Conference (MIMEC2017)

AIP Conference Proceedings 1902, 010001 (2017) doi: https://doi.org/10.1063/1.5010617

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ARTICLES

Sound absorption properties of kenaf bamboo particleboard at various mixing ratio and density

J. W. Wong; W. S. Yeo; M. T. Paridah

AIP Conference Proceedings 1902, 020001 (2017) doi: https://doi.org/10.1063/1.5010618

Abstract | View article | PDF

A joint inventory policy under permissible delay in payment and stochastic demand (Case study: Pharmacy Department of Pariaman Hospital)

Jonrinaldi; M. Yugo Primadi; Rika Ampuh Hadiguna

AIP Conference Proceedings 1902, 020002 (2017) doi: https://doi.org/10.1063/1.5010619

Abstract | View article | PDF

A supply chain model to improve the beef quality distribution using investment analysis: A case study

Alessandra Lupita; Sabrina Heriza Rangkuti; Wahyudi Sutopo; Muh. Hisjam

AIP Conference Proceedings 1902, 020003 (2017) doi: https://doi.org/10.1063/1.5010620

Abstract View article PDF

A collaborative inventory model for vendor-buyer system with inspection errors, unequal sized shipment, and repairable item

Irfan Hilmi Hamdani; Wakhid Ahmad Jauhari; Cucuk Nur Rosyidi

AIP Conference Proceedings 1902, 020004 (2017) doi: https://doi.org/10.1063/1.5010621

Abstract View article PDF

Joint decision of pricing and order quantity by considering product substitution in dual channel supply chain

Erwin Widodo

AIP Conference Proceedings 1902, 020005 (2017) doi: https://doi.org/10.1063/1.5010622

Abstract View article PDF

A mixed integer linear programming model for operational planning of a biodiesel supply chain network from used cooking oil

Jonrinaldi; Rika Ampuh Hadiguna; Rades Salastino

AIP Conference Proceedings 1902, 020006 (2017) doi: https://doi.org/10.1063/1.5010623

Abstract View article PDF

Load allocation of power plant using multi echelon economic dispatch

Wahyuda; Budi Santosa; Ahmad Rusdiansyah

AIP Conference Proceedings 1902, 020007 (2017) doi: https://doi.org/10.1063/1.5010624

Abstract View article PDF

Optimal manpower allocation in aircraft line maintenance (Case in GMF AeroAsia)

V. E. Puteri; Yuniaristanto; M. Hisjam

AIP Conference Proceedings 1902, 020008 (2017) doi: https://doi.org/10.1063/1.5010625

Abstract View article PDF

Location and allocation decision for supply chain network of Cajeput oil (Case in XYZ company)

F. A. Mahardika; M. Hisjam; B. Widodo; B. Kurniawan

AIP Conference Proceedings 1902, 020009 (2017) doi: https://doi.org/10.1063/1.5010626

Abstract View article PDF

Multi-objective problem of the modified distributed parallel machine and assembly scheduling problem (MDPMASP) with eligibility constraints

I. Amallynda; B. Santosa

AIP Conference Proceedings 1902, 020010 (2017) doi: https://doi.org/10.1063/1.5010627

Abstract View article PDF

Yarn supplier selection using analytical hierarchy process (AHP) and standardized unitless rating (SUR) method on textile industry

M. H. Erfaisalsyah; A. Mansur; A. U. Khasanah

AIP Conference Proceedings 1902, 020011 (2017) doi: https://doi.org/10.1063/1.5010628

Abstract View article PDF

Measurement framework for product service system performance of generator set distributors

Tanika D. Sofianti

AIP Conference Proceedings 1902, 020012 (2017) doi: https://doi.org/10.1063/1.5010629

Abstract View article PDF

Risk analysis using AS/NZS 4360:2004, Bow-Tie diagram and ALARP on construction projects of Banyumanik Hospital

Diana Puspita Sari; Darminto Pujotomo; Nadira Kusuma Wardani

AIP Conference Proceedings 1902, 020013 (2017) doi: https://doi.org/10.1063/1.5010630

Abstract View article PDF

Fine particles flotation of the Moatize coal/Mozambique

Amilton Castro; Irineu A. S. de Brum

AIP Conference Proceedings 1902, 020014 (2017) doi: https://doi.org/10.1063/1.5010631

Abstract View article PDF

Application of carbon nanotubes in perovskite solar cells: A review

Thet Tin Oo; Sujan Debnath

AIP Conference Proceedings 1902, 020015 (2017) doi: https://doi.org/10.1063/1.5010632

Abstract View article PDF

An analysis of e-business adoption by Indonesian manufacturing SMEs: A conceptual framework

Singgih Saptadi; Hanggar Pratama; Iman Sudirman; Atya Nur Aisha; Brav Deva Bernadhi

AIP Conference Proceedings 1902, 020016 (2017) doi: https://doi.org/10.1063/1.5010633

Abstract View article PDF

Development of the industrial zone base local wisdom in Madurese Indonesia

Rachmad Hidayat

AIP Conference Proceedings 1902, 020017 (2017) doi: https://doi.org/10.1063/1.5010634

Abstract View article PDF

A game theory model for stabilizing price of chili: A case study

Ari Wardayanti; Afgan Suffan Aviv; Wahyudi Sutopo; Muh. Hisjam

AIP Conference Proceedings 1902, 020018 (2017) doi: https://doi.org/10.1063/1.5010635

Abstract View article PDF

Design implementation of lean supply chain management: A case study on loading process of fertilizer at PT Petrokimia Gresik port

Agus Tri Wibowo; Naniek Utami Handayani

AIP Conference Proceedings 1902, 020019 (2017) doi: https://doi.org/10.1063/1.5010636

Abstract View article PDF

The analysis of market knowledge competence effect and research & development (R&D) toward the policy making of new product development

Bambang Purwanggono; Agung Sesuko; Wiwik Budiawan

AIP Conference Proceedings 1902, 020020 (2017) doi: https://doi.org/10.1063/1.5010637

Abstract View article PDF

Technical feasibility for commercialization of lithium ion battery as a substitute dry battery for motorcycle

Indah Kurniyati; Wahyudi Sutopo; Roni Zakaria; Evizal Abdul Kadir

AIP Conference Proceedings 1902, 020021 (2017) doi: https://doi.org/10.1063/1.5010638

Abstract View article PDF

Open pit mining profit maximization considering selling stage and waste rehabilitation cost

B. I. A. Muttaqin; C. N. Rosyidi

AIP Conference Proceedings 1902, 020022 (2017) doi: https://doi.org/10.1063/1.5010639

Abstract View article PDF

Concept of economic readiness levels assessment

Yuniaristanto; W. Sutopo; A. Widiyanto; A. S. Putri

AIP Conference Proceedings 1902, 020023 (2017) doi: https://doi.org/10.1063/1.5010640

Abstract View article PDF

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

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

AIP Conference Proceedings 1902, 020024 (2017) doi: https://doi.org/10.1063/1.5010641

Abstract View article PDF

Errors prevention in manufacturing process through integration of Poka Yoke and TRIZ

Syed Ahmad Helmi; Nur Nashwa Nordin; Muhammad Hisjam

AIP Conference Proceedings 1902, 020025 (2017) doi: https://doi.org/10.1063/1.5010642

Abstract View article PDF

Make or buy decision model with multi-stage manufacturing process and supplier imperfect quality

Mega Aria Pratama; Cucuk Nur Rosyidi

AIP Conference Proceedings 1902, 020026 (2017) doi: https://doi.org/10.1063/1.5010643

Abstract View article PDF

Developing weighted criteria to evaluate lean reverse logistics through analytical network process

Teuku Yuri M. Zagloel; Inaki Maulida Hakim; Rike Adyartie Krisnawardhani

AIP Conference Proceedings 1902, 020027 (2017) doi: https://doi.org/10.1063/1.5010644

Abstract View article PDF

A closed-loop supply chain inventory model for manufacturer - Collector system with inspection, waste disposal and price-quality dependent return rate

Anissa Rianda Putri; Wakhid Ahmad Jauhari; Cucuk Nur Rosyidi

AIP Conference Proceedings 1902, 020028 (2017) doi: https://doi.org/10.1063/1.5010645

Abstract View article PDF

Dynamic supplier selection problem considering full truck load in probabilistic environment

Sutrisno; Purnawan Adi Wicaksono

AIP Conference Proceedings 1902, 020029 (2017) doi: https://doi.org/10.1063/1.5010646

Abstract View article PDF

Extended value stream mapping to enhance sustainability: A literature review

Sri Hartini; Udisubakti Ciptomulyono; Maria Anityasari

AIP Conference Proceedings 1902, 020030 (2017) doi: https://doi.org/10.1063/1.5010647

Abstract View article PDF

The development of an integrated Indonesian health care model using Kano's model, quality function deployment and balanced scorecard

Jonny; Teuku Yuri M. Zagloed

AIP Conference Proceedings 1902, 020031 (2017) doi: https://doi.org/10.1063/1.5010648

Abstract View article PDF

Operating room scheduling using hybrid clustering priority rule and genetic algorithm

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

AIP Conference Proceedings 1902, 020032 (2017) doi: https://doi.org/10.1063/1.5010649

Abstract View article PDF

Kanban system implementation in cardboard supply process (Case study: PT. Akebono Brake Astra Indonesia - Jakarta)

Pringgo Widyo Laksono; Christina Ayu Kusumawardani

AIP Conference Proceedings 1902, 020033 (2017) doi: https://doi.org/10.1063/1.5010650

Abstract View article PDF

The robust corrective action priority-an improved approach for selecting competing corrective actions in FMEA based on principle of robust design

Agung Sutrisno; Indra Gunawan; Iwan Vanany

AIP Conference Proceedings 1902, 020034 (2017) doi: https://doi.org/10.1063/1.5010651

Abstract View article PDF

Integrating the analytic hierarchy process and importance-performance analysis into ISO 14001 framework for assessing campus sustainability

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

AIP Conference Proceedings 1902, 020035 (2017) doi: https://doi.org/10.1063/1.5010652

Abstract View article PDF

Multi-objective optimization model of CNC machining to minimize processing time and environmental impact

Aulia Hamada; Cucuk Nur Rosyidi; Wakhid Ahmad Jauhari

AIP Conference Proceedings 1902, 020036 (2017) doi: https://doi.org/10.1063/1.5010653

Abstract View article PDF

Implementing Lean Six Sigma to achieve inventory control in supply chain management

Chen Hong

AIP Conference Proceedings 1902, 020037 (2017) doi: https://doi.org/10.1063/1.5010654

Abstract View article PDF

Researches in agri-food supply chain: A bibliometric study

Muhammad Hisjam; Wahyudi Sutopo

AIP Conference Proceedings 1902, 020038 (2017) doi: https://doi.org/10.1063/1.5010655

Abstract View article PDF

Original observations-based control charts for monitoring the mean of auto-correlated processes: A comparison among modified Shewhart, modified EWMA, and ARMAST charts

M. Mujiya Ulkhaq; Favian Dewanta

AIP Conference Proceedings 1902, 020039 (2017) doi: https://doi.org/10.1063/1.5010656

Abstract View article PDF

CIMOSA process classification for business process mapping in non-manufacturing firms: A case study

Effi Latiffianti; Nurhadi Siswanto; Stefanus Eko Wiratno; Yudha Andrian Saputra

AIP Conference Proceedings 1902, 020040 (2017) doi: https://doi.org/10.1063/1.5010657

Abstract View article PDF

How SEIPS can be used as a model for macroergonomic approach in subunit healthcare (Case study: The nurse perception of fatigue in surgery ward unit)

Irwan Iftadi; Rahmaniyah Dwi Astuti; Ardian Ade Pristiyana

AIP Conference Proceedings 1902, 020041 (2017) doi: https://doi.org/10.1063/1.5010658

Abstract View article PDF

Modification of working conditions based on ergo THK reducing workload, muscle tension, and fatigue of rice milling workers in J village

L. P. Ruliati; N. Adiputra; I. D. P. Sutjana; I. M. Sutajaya

AIP Conference Proceedings 1902, 020042 (2017) doi: https://doi.org/10.1063/1.5010659

Abstract View article PDF

Improving the work position of worker based on manual material handling in rice mill industry

Rahmaniyah Dwi Astuti; Susy Susmartini; Ade Putri Kinanthi

AIP Conference Proceedings 1902, 020043 (2017) doi: https://doi.org/10.1063/1.5010660

Abstract View article PDF

Environmental impact analysis of batik natural dyes using life cycle assessment

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

AIP Conference Proceedings 1902, 020044 (2017) doi: https://doi.org/10.1063/1.5010661

Abstract View article PDF

New product development: A batik multifunctional chair

Sri Indrawati; Nias Sukmaningsih

AIP Conference Proceedings 1902, 020045 (2017) doi: https://doi.org/10.1063/1.5010662

Abstract View article PDF

Capitalized design of smart medicine box for elderly person based on quality function deployment (QFD)

Brina Cindy Lestari; Dyah Santhi Dewi; Rusminto Tjatur Widodo

AIP Conference Proceedings 1902, 020046 (2017) doi: https://doi.org/10.1063/1.5010663

Abstract View article PDF

Tribological evaluation of hexagonal boron nitride in modified jatropha oil as sustainable metalworking fluid

Norfazillah Talib; Erween Abd. Rahim; Ramdziah Md. Nasir

AIP Conference Proceedings 1902, 020047 (2017) doi: https://doi.org/10.1063/1.5010664

Abstract View article PDF

Conceptual design of wearpack with physiology detector feature based on wearable instrumentation

Melani Sukirman; Pringgo Widyo Laksono; Ilham Priadythama; Susy Susmartini; Bambang Suhardi

AIP Conference Proceedings 1902, 020048 (2017) doi: https://doi.org/10.1063/1.5010665

Abstract View article PDF

Management system of health and safety work (SMK3) with job safety analysis (JSA) in PT. Nira Murni construction

Melliana; Armen; Yusrizal; Syarifah Akmal

AIP Conference Proceedings 1902, 020049 (2017) doi: https://doi.org/10.1063/1.5010666

Abstract View article PDF

Work climate and work load measurement in production room of Batik Merak Manis Laweyan

Bambang Suhardi; Sry Yohana Simanjutak; Pringgo Widyo Laksono; Dewanto Herjunowibowo

AIP Conference Proceedings 1902, 020050 (2017) doi: https://doi.org/10.1063/1.5010667

Abstract View article PDF

A proposed power assisted system of manual wheelchair based on universal design for eldery

Susy Susmartini; Ilham Pryadhitama; Lobes Herdiman; Cindy Wahyufitriani

AIP Conference Proceedings 1902, 020051 (2017) doi: https://doi.org/10.1063/1.5010668

Abstract View article PDF

Enhancing laboratory development program in university through knowledge conversion: A case study

Pramuditya Soesanto; Amelia Kurniawati; Luciana Andrawina; Damanhuri Nurul Huda; Burhanuddin Yamani

AIP Conference Proceedings 1902, 020052 (2017) doi: https://doi.org/10.1063/1.5010669

Abstract View article PDF

Evaluate the use of tanning agent in leather industry using material flow analysis, life cycle assessment and fuzzy multi-attribute decision making (FMADM)

Salman Alfarisi; Sugoro Bhakti Sutono; Wahyudi Sutopo

AIP Conference Proceedings 1902, 020053 (2017) doi: https://doi.org/10.1063/1.5010670

Abstract View article PDF

The evaluation of criteria and subcriteria of research proposals using ANP method

Karina Muryastuti; Cucuk Nur Rosyidi; Pringgo Widyo Laksono

AIP Conference Proceedings 1902, 020054 (2017) doi: https://doi.org/10.1063/1.5010671

Abstract View article PDF

SCOR based key success factors in cooking oil supply chain buyers perspective in Padang City

Fatimah Zahara; Rika Ampuh Hadiguna

AIP Conference Proceedings 1902, 020055 (2017) doi: https://doi.org/10.1063/1.5010672

Abstract View article PDF

Evaluation and selection of 3PL provider using fuzzy AHP and grey TOPSIS in group decision making

Annisa Kesy Garside; Thomy Eko Saputro

AIP Conference Proceedings 1902, 020056 (2017) doi: https://doi.org/10.1063/1.5010673

Abstract View article PDF

Universities innovation and technology commercialization challenges and solutions from the perspectives of Malaysian research universities

Amran Rasli; Tan Owee Kowang

AIP Conference Proceedings 1902, 020057 (2017) doi: https://doi.org/10.1063/1.5010674

Abstract View article PDF

Investigating effect of different reflective surfaces on solar thermal collector

Yaw Long Chua; Kiat Keong Chin; Tee Tiong Tay

AIP Conference Proceedings 1902, 020058 (2017) doi: https://doi.org/10.1063/1.5010675

Abstract View article PDF

The sustainability and performance measurement on supply chain in services industry: A literature review

Eko Budi Leksono; Suparno; Iwan Vanany

AIP Conference Proceedings 1902, 020059 (2017) doi: https://doi.org/10.1063/1.5010676

Abstract View article PDF

Procedure for determining aqueous medium absorption in biopolymers

Angela Andrzejewska; Mateusz Wirwicki; Marek Andryszczyk; Patryk Siemianowski

AIP Conference Proceedings 1902, 020060 (2017) doi: https://doi.org/10.1063/1.5010677

Abstract View article PDF

Setup time reduction in a CNC production facility through redesign of jigs and fixtures

Pei Xian Lam; Joshua Prakash; Koon Chun Lai

AIP Conference Proceedings 1902, 020061 (2017) doi: https://doi.org/10.1063/1.5010678

Abstract View article PDF

Effect of elevated temperature on the tensile strength of Napier/glass-epoxy hybrid reinforced composites

M. J. M. Ridzuan; M. S. Abdul Majid; M. Afendi; A. Z. Ahmad Firdaus; K. Azduwin

AIP Conference Proceedings 1902, 020062 (2017) doi: https://doi.org/10.1063/1.5010679

Abstract View article PDF

Failure envelope modelling of glass/epoxy composite pipes using system identification method

Ang Jia Yi; M. S. Abdul Majid; Azuwir Mohd Nor; Sazali Yaacob; M. J. M. Ridzuan

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Abstract View article PDF

Design Implementation of Lean Supply Chain Management: A Case Study on Loading Process of Fertilizer at PT Petrokimia Gresik Port

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Abstract. Petrokimia Gresik is one of the largest fertilizer producer in Indonesia which has a cross-country network of supply chain and distribution throughout the archipelago, either in bulk fertilizer or in bag fertilizer. This research was conducted at PT. PG port which is the main point of the logistics activities in the firm itself, either loading or unloading. This research focus on the process of loading the in bag fertilizer. Problems that occur in this process are due to the inefficiency of the flow of the Supply Chain, caused by the presence of waste and non-value-added activities. The purpose of this study was to determine what kind of waste that occurs during the process, as well as suggestions for improvements using the concept of Lean Supply Chain and Value Stream Mapping, and look for the cause of the problem using the 5 Whys method. The most influential types of waste during the process stream is Waiting Time (20.42%), and Non-Value Added activies of 51.9%. By using 5Whys, the largest cause of waste found are the length of the truck waiting for the cargo, numbers of crane are already inproper, and the absence of the scheduling and charge allocation. Recommended solutions are scheduling and allocation, creation of special line in the warehouse, and supplying cranes with appropriate load speed. Based on improvement suggestions, total NVA predicted to be reduced to 59.8%.

INTRODUCTION

Competition between firms is directly related to the firm's success in market competition, where several factors play role in firm's ability to survive in the competition [1]. These factors include the level of effectiveness and efficiency in a firm [2]. One of the components or parts of the firm PT. PKG itself that needs to be highlighted in both cases is the Department of Ports or so-called TUKS (Terminal Untuk Kepentingan Sendiri) in the internal environment of the factory. TUKS for PT. PKG is one vital component because the flow of the supply chain begins and ends at TUKS. The initial activity occurred is the process of raw materials unloading from suppliers' ship, while the end of the process is loading the finished fertilizer on the distribution vessel.

In the loading process, there are still many wasteful processes. With Value Stream Mapping, waste that happens in the process of this port can be viewed [3]. From types of waste existed, identification will be conducted to identify waste that are most often occur, the type of waste that is the most difficult to handle, and the type of waste that is most harmful, so the type of waste that are most influential in the process flow of in bag fertilizer will be identified. Then, required improvements will be designed and eliminate the waste to create effective and efficient work flow [4].

According to observation data in the form of a questionnaire deployed in several Ministries related to the process flow, such as the Department of Management of Ports, Port Planning, Stevedoring Supervisor, Port Administration, Distribution Region II, and the Department of Distribution Region I, it was found that the largest types of waste are Waiting Time (20.42%) followed by Transportation Time (17.14%), waste Inventory (16.43%), Defect (14.79%), Over processing waste (12.21%), Overproduction Waste (11.27%), and Waste Movement (7.75%).

Therefore, with many waste still occurred at TUKS, it is needed for research that can improve the productivity of firms in terms of effectiveness and efficiency, especially in the process of loading, to increase the activity that has

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Sound Absorption Properties of Kenaf Bamboo Particleboard at Various Mixing Ratio and Density

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Abstract. This study investigated the acoustic properties made by various different ratio of kenaf core (KC) and bamboo betung (BB). The particleboard were manufactured at density of 400 kg/m^3 and 600 kg/m^3 with four different mixing ratio of 100:0 (KC:BB), 70:30 (KC:BB), 50:50 (KC:BB) and 0:100 (KC:BB) respectively. The absorption coefficient of the samples was measured using the standing wave method. The characteristic curves of sound absorption coefficients of the samples demonstrated a linear increment with frequency, peak at 2000 Hz and decreased gradually thereafter. The sound absorption properties were investigated by comparing the noise reduction coefficient (NRC). Overall, particleboard with density of 400 kg/m^3 exhibited better sound absorption properties as compared with 600 kg/m^3 density of particleboard for all mixing ratio. Also, particleboard made with higher amount of BB particles exhibited better sound absorption properties. In addition, results showed a consistent reduction of NRC values with the amount of BB used.

INTRODUCTION

Trees and forests provide a wide range of wood products to support our daily life. The wood extracted from forest were utilized as fuel, building material, furniture, paper, clothing, adhesive and many others. However, the rapid expansion of wood product aroused serious concerns about the shortage of lignocellulosic material to support the industry's demands [1]. Therefore, fast growing plants such as kenaf, bamboo and acacia were being explored to produce engineered wood in order to balance the shortage of forest resources [2, 3].

Exploration in utilizing alternative materials to manufacture acoustic panel especially in the reduction of noise level were carried out extensively. In today's market, the conventional loose-fill insulation used in building construction were fiberglass, cellulose and mineral wool. However, they can be hazardous to human health if their fibers were inhaled. According to European Council Directive on dangerous substances 67/548/EEC [4], these fibers can lay down in the lung alveoli once inhaled and cause skin irritation. Therefore, natural fibers were explored as alternative materials because they were cheap, abundant and very low in toxicity which is good to protect the environment [5].

Over the years, researches have focused on non-wood natural fibers as a supplement or substitute for wood in wood composite where studies were conducted to investigate the feasibility for a wide range of species. These fibers existed for decades and humans collected them from the wild to use as ropes or textile in the past. Some examples of these natural fibers were kenaf [6], acacia [7], sunflower husk [8] and sugarcane [9]. In general, the advantages of natural fibers included biodegradable, ease of procurement, low cost, low density and abundance [10,11]. Rapid growth rate was also one of the pros of non-wood natural fibers as most of them reached its maturity at a shorter period of time as compared to wood which needs an average of 25 years to be harvestable [12]. The objective of the research was to evaluate the sound absorption properties of kenaf and bamboo particleboard at various mixing ratio and density by using the standing wave method.

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Implementing Lean Six Sigma to Achieve Inventory Control in Supply Chain Management

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Abstract. The inventory cost has important impact on the production cost. In order to get the maximum circulation of funds of enterprise with minimum inventory cost, the inventory control with Lean Six Sigma is presented in supply chain management. The inventory includes both the raw material and the semi-finished parts in manufacturing process. Though the inventory is often studied, the inventory control in manufacturing process is seldom mentioned. This paper reports the inventory control from the perspective of manufacturing process by using statistical techniques including DMAIC, Control Chart, and Statistical Process Control. The process stability is evaluated and the process capability is verified with Lean Six Sigma philosophy. The demonstration in power meter production shows the inventory is decreased from 25% to 0.4%, which indicates the inventory control can be achieved with Lean Six Sigma philosophy and the inventory cost in production can be saved for future sustainable development in supply chain management.

INTRODUCTION

The inventory is very important in logistics management in supply chain because the material cost impacts the production cost greatly in facility running. In some cases, the cost of inventory can take up to 40% of total production cost [1]. This means the inventory cost must be reduced in order to minimize the total production cost and improve the cash flow of the company [1]. The excess on material will cause the material stock and the shortage on material will interrupt the production in supply chain. Thus the inventory control is very important in logistics of Supply Chain Management (SCM). The target of the inventory control is the zero stock. There are two elements that contribute to the inventory cost in production: one is the raw material quantity, another is how to deliver the semi-finished goods efficiently [1]. The information of these two elements can be viewed in manufacturing process. The inventory control is studied from the perspective of the manufacturing process in this paper.

There are reports about the quantity recording of material, such as, the part numbering system cable of correctly describing the features of a part is considered to overcome the disadvantages of a traditional part numbering system [2]. The lean logistics operating model based on RFID was discussed [3]. It is by establishing a mathematics model with the demand, takt time, and cycle time as variables, the best batch size, the number of batches, and the raw material quantity in each station to obtain the lower cost [1]. A service-oriented cloud manufacturing system aimed at efficiency, low consumption, knowledge-based networks and agile manufacturing is published [4]. The software of Material Control System is reported on the material governing [5]. There is objective of the model to minimize the cost associated with a given shift by production planning and work-in-process (WIP) assignment [6]. However, the fundamental management task is to provide direction and make decisions [7]. It is known that the raw material and the semi-finished goods are the input in manufacturing process and the output is the finished goods to be shipped out. The inventory control happens on the every step from the beginning to the end of the manufacturing process. It is very necessary to have the systematic and overall process control in manufacturing site that the human resource, machine, material, method and environment are involved in the management. Fortunately, there is Lean Six Sigma philosophy. Lean system is useful to make sure production process to run smoothly without any interruption in a manufacturing company [8]. The Six Sigma approach starts with a business strategy and ends with top-down implementation. If successfully deployed, it should impact the profit significantly [9]. When combining

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Procedure for Determining Aqueous Medium Absorption in Biopolymers

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Abstract. ISO standards describe procedures for determining the amount of water absorbed by polymer specimens of defined dimensions, when immersed in water or when subjected to humid air under controlled conditions (ISO 62:2008). The study was to customize the standardized procedure for determination of aqueous medium absorption. The influence of the amorphous specimens pre-conditioning was also determined.

INTRODUCTION

Polymer chains can be damaged as a result of one of three processes: depolymerization, destruction, or degradation. During the depolymerization, high temperature leads to polymer chains decomposing into small monomers. Destruction, meanwhile, is a process where low molecule compounds are released. In this process, destruction factors are: heat, light radiation, high energy radiation or chemical substances, such as alkaline substances, acids, oxygen. The last process of damaging polymer chains is their degradation, when polymer chains are distributed not so much into small monomers, but rather large amounts of polymer chains of a lower molecular weight [1].

Biological, chemical, physical and environmental agents are featured in polymer degradation. During biological degradation, the damage factors are enzymes of microorganisms, while the chemical degradation agents are oxygen, water, alkaline substances, acids and solvents. A special variety of chemical degradation is hydrolytic degradation. Another type of degradation is physical degradation. This type of degradation is characterized by mechanical, thermal, photochemical factors. The last one kind of degradation is atmospheric degradation. In this process, thermal oxidation or photooxidation occurs [2]. Table 1 presents different types of degradation and the main degrading factors.

TABLE 1. The types of degradation.

Degradation type	Agent e.g.
Biotic, biological	enzymes, bacteria, mold, fungus
Chemical	oxygen, water
Physical	mechanical strength, high energy radiation, sunlight
Atmospheric, Environmental	temperature changes, rain, snow, wind

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