Operational Factors Analysis and Performance Values of Green Manufacturing at Brewing Company Using Green SCOR Method - A Case Study

Danang Pinardi Putra
Industrial Engineering Department
BINUS Graduate Program - Master of Industrial Engineering
Bina Nusantara University
Jakarta, Indonesia 11480
danang.putra001@binus.ac.id

Rienna Oktarina
Industrial Engineering Department
Bina Nusantara University
Jakarta, Indonesia 11480
rienna.oktarina@binus.ac.id

Alfonz Lawrenz Kilay
Industrial Engineering Department
BINUS Graduate Program - Master of Industrial Engineering
Bina Nusantara University
Jakarta, Indonesia 11480
alfonz.kilay@binus.ac.id

Abstract

The competition in the manufacturing industry continues to increase, along with the shifting demand of consumers who are increasingly aware of environmental sustainability. In order for companies to be able to profit and compete competitively but also pay attention to environmental factors, one of the most important things that needs to be done is to develop the concept of green supply chain management in business processes. GSCM is defined as environmentally friendly activities, which include green procurement, green manufacturing, green distribution, and reverse logistics. Green manufacturing is one of the most important concepts that must be considered by companies as a form of response to environmental issues. This study aims to analyze green manufacturing activities at one of brewery in Indonesia using the Green SCOR model. The result of the study shows that green activities in the brewery include management of clean water sources, energy savings, and waste minimization concepts such as reduce, reuse, and recycle. Based on the result of the study, it was determined that the company's performance measure in terms of green is 62.37. It means that the company's performance is included in Good category. However, 6 of the 17 KPIs need improvement. Improvements can be made by forming a manufacturing excellence team that will conduct an audit every 3 months.

Keywords

Green Supply Chain Management, Green Manufacturing, Green SCOR, Green Brewery.

1. Introduction

The manufacturing industry faces the challenge of complying with strict environmental rules relative to the limitation or scarcity of natural resources, global warming, and waste management. Nowadays, awareness about environmental aspects has increased, and that has encouraged the industry to become a green industry by implementing the concept of Green Manufacturing (GM). Nevertheless, the company implementing green manufacturing was still very small.

Most of the company leaders considered the application of green manufacturing as a hindrance to profit, rather than an opportunity for improvement and development. It constitutes one of the obstacles to the application of green manufacturing in the world, including Indonesia. Another obstacle to the adoption of green manufacturing is its limited awareness of "green" culture, limited access to the literature on green manufacturing, a lack of knowledge about green manufacturing, and a complete lack of information on how to implement green manufacturing in the company (Mittal & Sangwan, 2014a).

The selection and use of environmentally friendly products demonstrates citizens' awareness of the need to respond to environmental changes. Waskito and Harsono (2011) studies found that a growing awareness of people was increasing towards environmentally friendly products. This requires businesses to adopt a concept of care for the environment in their business processes, including the supply chain, which makes the environment a very important factor for the company. The ward management system was developed to provide basic guidelines to keep business activities familiar with the environment. Supply chain management points out a unified pattern as to the flow of products from sculptures, manufacturing, and retailers to the end consumer (Worship, 2005; Chopra and Meindl, 2004). In the concept of supply chain management, the range of activities between sectors and the final consumer represents a single, larger whole chain that works together to become more competitive (Chopra and Meindl, 2004). All parties in one supply chain should cooperate with one another to the fullest extent possible to improve their service. Thus, goods and services can be distributed in the right amount, at the right time, and location to minimize costs in order to meet consumer needs.

The aim of this study was to determine the value of green manufacturing activities at one of the breweries in Indonesia and provide improvement recommendations based on the measurement of performance. The approach method used to perform the measuring of green manufacturing performance was a green supply chain operation reference. By using this method, it is possible to know the relationship between the company's purpose and the management of the stock chain in all manufacturing operations by evaluating the performance of green manufacturing.

2. Review Study

Supply chain is a network that works together to create and deliver a product to end-customers from upstream to downstream. The term supply chain management was first proposed by Oliver and Weber in 1982. If the supply chain refers to the network, supply chain management is a method, tool, or approach in its management (Pujawan, 2010). According to Suparno (2004), Supply Chain Management is a group of approaches applied to efficiently integrate activities from a supply chain network from upstream (inbound) to downstream (outbound) so that products can be produced and distributed in the right quantities, in the right locations, in the right time, and minimum cost. Green Supply Chain Management is a process of integrating supply chain management with environmental concepts which includes product design, material supply and selection, manufacturing processes, distribution processes to consumers and product management after the period of use (Srivastava, 2007). According to Dheeraj (2012), Green Supply Chain Management is an innovative supply chain application that is integrated in the environmental context including the activities of reducing, recycling, reusing and replacing the materials used. According to Ninlawan (2010) GSCM can also be defined as environmentally friendly procurement activities (Green procurement), environmentally friendly manufacturing activities (Green manufacturing), distribution activities that are also environmentally friendly (Green distribution) and reverse logistics.

Green manufacturing (GM) was a method of manufacturing that minimized the waste and pollution attained through research and process design. It supports and sustains a renewable way of producing products and/or services that do not harm the consumer or the environment, which helps save unnecessary costs. The objective of green manufacturing was to look after the management of natural resources to make sure they were preserved for future generations (prasad and Sharma, 2014). According to Melnyk and Smith (1996), green manufacturing was a system that integrated manufacturing issues and conducted control to identify, quantify, assess, and manage waste streams into the environment in order to reduce and minimize the effect of production processes on the environment while trying to achieve efficiency from resources. One of the strategies of green manufacturing was 3 R (manufacturing, reuse, and recycling), including reducing the volume of dangerous waste, minimizing refrigeration consumption during the machinery process, and calculating the proper mixture of energy use to ensure a sustainable energy source (Dornfeld, et al., 2013).

SCOR is a model developed by the supply chain council that has been developed from versions 5.0 to 11.0 (SCC, 2012). In its explanation, SCC (2012) set out that as SCOR version 5.0 to version 11.0, many things were added, from

increased metric, metric renewal, to modeling that considered the concept of green supply chain as a new concept in supply chain management. According to Cash (2003) and Wilkerson (2003), the green SCOR model was a modified model of scor that included environmental elements in the process from planning to return (Cheng, Law, Bjornsson, Jones, & Sriram, 2010). The application of green SCOR have five primary components because it is developed based on a SCOR model that adds environmental issues to the mix. Cash (2003) and Wilkerson (2003)

3. Methodology

3.1 Data's Collection

Based on the data was obtained through direct field observations and interviews (primary data). Direct observation is made through observation. The aim of direct observation was to get a clear figure of the problem and instructions on how to solve it. This direct observation took place in one of the breweries in Indonesia. Interviews were conducted with a reliable source or the expert.

This research also used a secondary data. Secondary data is indirectly acquired as a backup in this study (Table 1). The secondary data used in this study is the historical data of the 2021 period company. The steps in this study could be illustrated in the diagram (Figure 1).

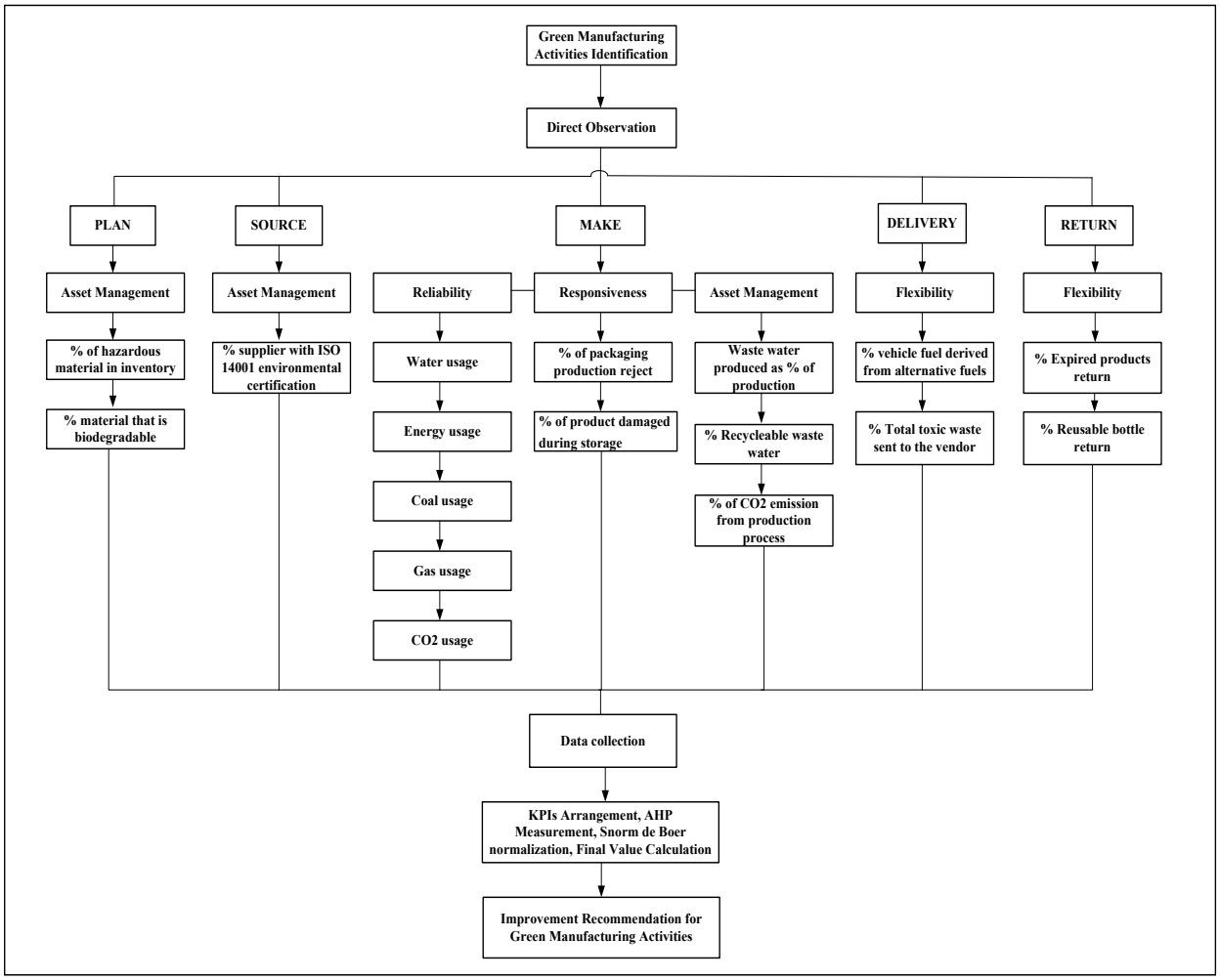


Figure 1. Green Manufacturing Activities Block Diagram

Table 1. Brewery Operation Green Manufacturing Indicators

Green Objectives	KPI
Minimize using resource, such as: water, energy, coal, gas and CO_2	Water usage
	Energy usage
	Coal usage
	Gas usage
	CO_2 usage
Packaging, storage dan product handling	% of packaging production reject
	% of product damaged during storage
Environmentally friendly shipping	% of vehicle fuel derived from alternative fuels
The amount of toxic waste sent to suppliers for processing according to procedures	% The amount of toxic waste sent to suppliers for processing according to procedures
Return of expired packaging and products for processing to the WWTP installation	% Product returns in expired conditions
	% Return of Bottle Packaging for Reuse (reuse)
Selection supplier who carry out waste treatment	% of suppliers with ISO 14001 environmental certification
Natural recources optimization with 3R (reduce, reuse & recycle)	Waste water produced as % of product production
	% Recycleable waste water
	% of CO2 emission from production process
Ability to track hazardous materials used in the production process	% of hazardous material in inventory
	% materials that is biodegradable

3.2 Snorm de Boer Normalization

Since each indicator has varying weights with different parameters, normal parameters are needed. The normal process is done with the normal standardized DE Boer formula. Normalization plays a considerable role in achieving the final value of a performance measurement. The following are similarities to snorm DE Boer (trienekens, J. H. & Hvolby, H. H., 2000) follows:

For *Larger is Better*

Snorm (score)= $\frac{SI-Smin}{Smax-Smin}$ x 100

For *Lower is Better*

Snorm (score)= $\frac{Smax-SI}{Smax-Smin}$ x 100

Information :

SI : Actual indicator value that has been achieved

S max : The value of achieving the best performance from performance indicators

S min : The value of the worst performance achievement of the performance indicators

Each scale of the indicator is converged into a certain value interval of 0 to 100. The value of 0 is by far the worst, whereas the value of 100 is said to be the best, so the parameters of each indicator are the same.

4. Results and Discussion

This section contains the collection and processing of data that is used for data analysis and integers, so it is possible to determine the desired results of the study according to the issues.

4.1KPIs Identifying

The KPI formulations are based on the green objectives that were identified. There are already 17 KPIs with a preliminary design in the performance measurement process. Table 2 shows the results of the KPI identified. The transaction was conducted by the manufacturing committee. The design is divided into five key processes, which are: plan, source, make, deliver, and return. The smart criteria of KPI validation (Rusli, 2010) are specific, measurable, repaired, relevant, and time-framed (table 2).

Table 2. KPIs Identify

Proses	KPI	
Plan	KPI 1	% of hazardous material in inventory
	KPI 2	% materials that is biodegradable
Source	KPI 3	% of suppliers with ISO 14001 environmental certification
Make	KPI 4	Water usage
	KPI 5	Energy usage
	KPI 6	Coal usage
	KPI 7	Gas usage
	KPI 8	CO2 usage
	KPI 9	% of packaging production reject
	KPI 10	% of product damaged during storage
	KPI 11	Waste water produced as % of product production
	KPI 12	% of recycleable waste water
	KPI 13	% of CO2 emission from production process
Deliver	KPI 14	% of vehicle fuel derived from alternative fuels
	KPI 15	% of total toxic waste sent to the vendor
Return	KPI 16	% of expired product return
	KPI 17	% reusable bottles return

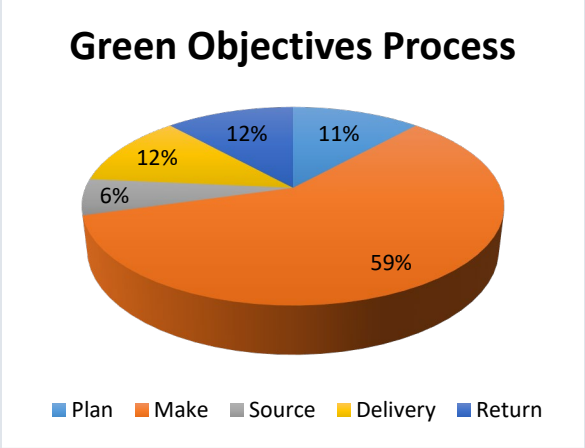


Figure 2. Green Objective Process Diagram

According to the validation by the company's leaders, the results shown were valid by the owner and can be used to demonstrate the operation of Green Manufacturing processes. Overall, the company had data that could be used as a measurement of Green Manufacturing's performance if it was historically recorded in one clean entity.

From the 17 identified KPIs, there are 2 KPIs at risk: materials in inventory and biodegradables, for which companies do not have data to measure the KPIs. However, it is still a feasible tool to obtain through an approach based on the processes contained within. The breakdown of raw materials and support materials was a better approach to creating a unit of product.

4.2 KPIs Property Disposition with Taffic Light System

In a company, a KPI that serves as a representation of a company's performance must be clearly defined in writing so that there is no misunderstanding or difference in perception in the attainment and evaluation efforts of a KPI. That's why it needs property to clarify the KPI with the supporting information it contains. The content of the KPI property includes a KPI description that explains its purpose, a target of achievement, and a rating system where both lower is better and higher is better. The formulas or formulas for measuring the KPI, the frequency of measurement, and the responsiveness of the KPI are given table 3.

Table 3. Traffic Light System

Category	Score	Indicator
Very Good	≥ 80	Green
Good	60-80	Yellow
Poor	≤ 60	Red

In order to simplify which KPI needs to be repaired, we will use the light system for this discussion. The traffic light system uses a three-color indicators, red, yellow, and green, based on the snorm DE Boer's score. The red light indicator gives the KPI score ≤ 60, which means performance is poor. whereas the KPI with score 60–80 means it falls into the good category, which is yellow. As for giving the green color, the KPI performance score must ≥ 80 it means very good (table 4).

Table 4. KPIs Achievement Calculation

KPI	Aktual (Si)	Min	Max	Snorm
% of hazardous material in inventory	0.05	0.00	1.00	94.65
% materials that is biodegradable	99.36	95.00	100.00	86.00
% of suppliers with ISO 14001 environmental certification	35.00	20.00	70.00	30.00
Water usage	8.27	4.50	14.06	60.51
Energy usage	33.13	21.20	55.32	65.05
Coal usage	10.21	7.98	13.60	60.25
Gas usage	0.05	0.02	0.10	61.56
CO_2 usage	5.01	4.04	6.11	53.13
% of packaging production reject	2.53	2.00	3.10	52.20
% of product damaged during storage	0.02	0.01	0.10	95.10
Wastewater produced as % of product production	15.31	10.00	25.00	64.59
% Recycleable waste water	7.43	5.16	20.00	15.32
% of CO_2 emission from production process	15.81	10.00	20.00	58.11
% of vehicle fuel derived from alternative fuels	25.00	20.00	70.00	10.00
% of total toxic waste sent to the vendor	98.59	90.00	100.00	85.89
% of expired products return	0.03	0.00	0.10	67.00
% reusable bottles return	88.86	80.00	92.00	73.82

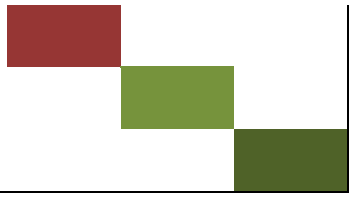
4.3. Improvement Recommendation for Green Manufacturing Activities

This implementation can be implemented after three months since Manufacturing Excellence Department established. The implementation of improvement in green manufacturing activities can be started since manufacturing excellence team member established, training of team members, identification of green objectives, analysis of green objectives according to the KPIs, improvement of green manufacturing activities, socialization and monitoring in all departments. More specific, there are 6 KPIs in the red light indicators, it means under company expectation. The 6 KPIs are % of suppliers with ISO 14001 environmental certification (S-1), CO2 usage (M-5), % of packaging production reject (M-6), % Recycleable waste water (M-9), % of CO2 emission from production process (M-10) and % of vehicle fuel derived from alternative fuels (D-1) (Table 5).

Table 5. Time Schedule Improvement for Green Manufacturing Activities

No	Item	Week											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Establishment of Manufacturing Excellence Department												
2	Training of Team Members												
3	Green Objectives Identification												

4	Analysis Green Objectives according to KPIs
5	Improvement of Green Manufacturing Activities
6	Socialization & Monitoring All Departments



The purpose of implementating Manufacturing Excellence Department can be achieved, if the management has a strong commitment. Commitment from management is needed, because the improvements initiated from manufacturing Excellence Department can be successful if they are carried out top down and involve relevant stakeholders. Department heads from all department must also active participate and routinely evaluate the achievement of KPIs in each Department.

4.3.1. Improvement recommendation of % suppliers with ISO 14001 environmental certification (S-1)

The number of suppliers who have ISO 14001 certification is still in the red category with a Snorm value is 30.00. From a total of 20 suppliers, only 7 have been certified ISO 14001, while 13 others supplier don't have ISO 14001 certification.

The initial stage for improvement is by conductiong socialization. The socialization conducted by production planning and inventory control department (PPIC). The next stage is a follow up from procurement department regarding agreement with all suppliers to have ISO 14001 certification.

4.3.2. Improvement recommendation of CO2 usage (M-5)

CO2 usage for production process is still in the red category with a Snorm value is 53.13. It can be affected by utilization of CO2 recovery has not been maximized from the fermentation process. There are many factors, the one is about the reliability of equipments/tools is still not accordance with the amount of CO2 produced during the fermentation process, so that some CO2 gas is not recovered and released into atmosphere.

The proposed improvement is to increase capacity of the CO2 recovery equipments/tools plant in accordance with the observation data field, so we can measure the amount of CO2 gas from fermentation process and maximized the efficiency of CO2 recovery plant. The second recommendation is doing preventive maintenance (PM) regularly for equioments/tools, so the reliability of CO2 recovery plant can be increase.

4.3.3. Improvement recommendation of % packaging production reject (M-6)

Packaging production reject is still in the red category with a Snorm value is 52.20. The proposed improvement recommendation is doing preventive maintenance (PM) regularly for production equipments. The second recommendation is about quality check from Quality Assurance (QA) Department based on Standard operating procedure (SOP) and Work instruction (WI).

4.3.4. Improvement recommendation of % Recyclable wastewater (M-9)

Recyclable wastewater is still in the red category with a Snorm value is 15.32. The proposed improvement recommendation is to recycle the effluent from waste water process for cleaning in place (CIP) production process facilities. Effluent is the final result of waste water treatment plant (WWTP) process, so that the water produced is clean water accordance with the quality standards of the ministry of environment. Recycle water for cleaning in place (CIP) need additional facilities through water treatment plant (WTP). The facilities such as multimedia filter and softener tank, so the quality of the water recycle can meet the requirements of clean water standards.

4.3.5. Improvement recommendation of % CO2 emission from production process (M-10)

CO2 emission from production process is still in the red category with a Snorm value is 58.11. The proposed of improvement recommendation is to increase the capacity of the CO2 equipments/tools based on data observation so the reliability of CO2 recovery plant can be increase.

4.3.6. Improvement recommendation of % Vehicle fuels derived from alternatives fuels (D-1)

Vehicle fuels derived from alternatives fuels is measure the number of forklifts in the factory that use diesel fuel. The Snorm value is 10.00 and still in the red category. The proposed improvement recommendation is give information to the top management about green energy in vehicles.

5. Conclusion

The objective of this research was to analyze green manufacturing activities at a brewery in Indonesia using the Green SCOR model. There are 17 KPIs that have been identified that are used to measure green manufacturing activities. Because each object has a different weight, the calculation of KPIs is done by normalization, namely Snorm de Boer normalization. After normalization, the data calculation of the achievement from KPIs is carried out by compiling KPIs based on the traffic light system. A traffic light is a method used to measure the activity of a performance. The measurement process is based on color indicators. There are green, yellow, and red. The result was determined that 4 KPIs were in very good condition, 7 KPIs were in good condition, and 6 KPIs were in poor condition. The results of the study showed that the company's performance measure in terms of green was 62.37 that means the company's performance was included in the good category. However, from the 17 KPIs, there are 6 that need improvements. Improvements can be made by forming a manufacturing excellence team that will conduct an audit every 3 months. This research has both theoretical and practical contributions. On the other hand, the insights from the enabler factors indicate that the support and commitment from top management to implement the environmentally friendly production process is very necessary. Further research is highly recommended to further validate the outcomes of this study.

References

Amaranti, R. d.,Green Manufacturing : Kajian Literatur. *Seminar dan Konferensi Nasional IDEC*, 171-181.2017

Arkerman, Y. U. ,Integrasi Model SCOR dan Fuzzy AHP Untuk Perancangan Metrik Pengukuran Kinerja Rantai Pasok Sayur. *Jurnal Manajemen dan Organisasi*, 148-161.2010

Aviasti, R. A., Berbagi Pengetahuan pada Penerapan Green Manufacturing di Kawasan Industri. *Prosiding SNAPP Sains dan Teknologi*, 7 (2) : 363-371.2017

Buglass. ,. Handbook of Alcoholic Beverages: Technical, Analytical and Nutrition Aspects. *Wiley*, Vol 1, Page 3.2011

Christine Natalia., R. A.,Penerapan Model Green SCOR untuk Pengukuran Kinerja Green Supply Chain. *Jurnal Metris*, 97-106.2015

Deif, A.,A System Model Green for Green Manufactuing. *Advances in Production Engineering & Management Journal*, 1 : 27-36.2011

Divisi Hubungan Korporasi. , *Laporan Keberlanjutan Multi Bintang.* Jakarta: Publikasi Multi Bintang.2019

Dornfeld, D. , Introduction to Green Manufacturing. *US SPringer*.2012

Hendra Saputra., P. F. ,. Perancangan Model Pengukuran Kinerja Green Supply Chain Pulp dan Kertas. *Jurnal Optimasi Sistem Industri Vol 11 No.1*, 193-202.2013

I.D Paul., G. B.,. A Review on Green Manufacturing : It's important, Methodology and its Application. *Procedia Materials Science*, 1644-1649.2014

Irvan Fauzi Fortuna. Yeni Sumantri, R. Y., Perancangan Sistem Pengukuran Kinerja Aktivitas Green Supply Chain Management (GSCM) Studi Kasus KUD"Batu". *Jurusan Teknik Industri Universitas Brawijaya*, 551-562.2020

Johan K.Runtuk., A. L. , Pemilihan Pemasok Dengan Mempertimbangkan Produksi Bersih.Green Manufacturing Pada Industri Otomotif. *Jurnal Rekayasa Sistem Industri*, DOI: https://doi.org/10.26593/jrsi.v9i1.3654.33-44.2020

Lazuardian, A. W., Implementasi Sistem Pengukuran Kinerja Aktivitas Green Supply Chain Management (GSCM) Studi Kasus : KUD "DAU". *Jurnal Akuntansi AKRUAL*, 44-61.2016

Much.Djunaidi., M. A. , Identifikasi Faktor Penerapan Green Supply Chain Management Pada Industri Furniture Kayu. *Jurnal Teknik Industri*, https://doi.org/10.22219/JTIUMM.Vol19.No1.1-10.2018

Muhammad Hanifuddin Hakim., A. M. ,. Analisis Kinerja Lingkungan dan Produktivitas Dengan Menggunakan Konsep Green And Lean Productivity. *Journal Teknik Industri*, Vol 17, 31-41.2016

Neeraj Bhanot., P. V.. Enablers and Barriers of Sustainable Manufacturing : Result from a Survey of Researchers and Industry Proffesionals. *Elsevier.ScienceDirect*, 562-567.2015

Poernomo, P. &., Single SCore Performance Measurement in Supply CHain DIvision PT XYZ. 2014

Prasad, S. d. ,. Lean and Green Manufacturing : Concept and its Implementation in Operations Management. *International Journal of Advanced Mechanical Engineering*, 4 (5) : 509-514.2014.

Pujawan, I. &.,S*upply Chain Management* . Surabaya: Guna Widya. 2010

Rejaningrum, L. , Perancangan Sistem Pengukuran Kinerja Supply Chain dengan Pendekatan SCOR Model di PT Kubota Indonesia. 2011

Reni Amaranti., D. I., Green Manufacturing : Kajian Literatur. *Seminar dan Konferensi Nasional IDEC* , ISSN : 2579-6429. 2017

Rizal, R.,*Manufaktur Berkelanjutan/Manufaktur Hijau.* Jakarta: Buku Ajar.Edisi Ketiga.Lembaga Penelitian dan Pengabdian Masyarakat Universitas Pembangunan Nasional Veteran. 2017

Sangwan, K. &., A Bibliometric analysis of Green Manufacturing and Similar Frameworks. *Management of Environmental Quality : An International Journal*, 26 (4), 566-587. 2015

Saputra, H. &.,Perancangan Model Pengukuran Kinerja Green Supply CHain Pulp dan Kertas. *Jurnal Optimasi Sistem Industri, XI(1)*, 193-202. 2012

Surjasa, I. W, Pengukuran Kinerja Supply Chain Management Menggunakan Metode SCOR (Supply Chain Operation Reference), AHP (Analytical Hierarchy Process) dan OMAX (Objectivr Matrix) di PT. X. *Jurnal Teknik Industri*, Vol 8 No.1. 37-41. 2018

Susanti, A. &. , Penilaian Implementasi Green Supply Chain Management di UMKM Batik Pekalongan dengan Pendekatan Green SCOR. *Jurnal Ilmiah Teknik Industri*, 16, 55-63. 2017

Varinder Kumar Mittal, K. S., Prioritizing Barriers to Green Manufacturing : Environmental, SOcial and Econimic Perspective. *Procedia CIRP*, Pages 559-564. 2014

Wahyuniardi, R., Pengukuran Kinerja Supply Chain dengan Pendekatan Supply Chain Operation References (SCOR). *Jurnal Ilmiah Teknik Industri*, 16, 123-132. 2017

Wisma Soedarmadji., S. E. ,. Penerapan Konsep Green Manufacturing Pada Botol Minuman Kemasan Plastik. *JEMIS VOL.3 NO.2*, 76-81. 2015

Biographies

Danang is currently a student at the University of Bina Nusantara - Faculty of Master Industrial Engineering, Bina Nusantara Graduate Program. His research interests are mainly concerned with Supply Chain Management, Green Manufacturing, and Green Supply Chain Operation Reference (SCOR). From 2015 until 2022, he worked as a professional in the fields of the manufacturing sector in the food and beverage industry. Currently, he is implementing the knowledge gained from his research into the industry that he works in.

Rienna Oktarina is a Faculty Member and Subject Content Coordinator for Supply Chain Engineering at Department of Industrial Engineering, Bina Nusantara University. She earned PhD in Industrial Engineering from Institut Teknologi Bandung (ITB), Indonesia. Her research interests include logistics, supply chain management, humanitarian logistics, warehousing, transportation and distribution.

Alfonz is currently a student at the University of Bina Nusantara - Faculty of Master Industrial Engineering, Bina Nusantara Graduate Program. His research interests are mainly concerned with Supply Chain Management, Digitalization Supply Chain and SMEs. From 2018 until 2022, he worked as a professional central banker in Indonesia. Currently, he is implementing the knowledge gained from his research into the industry that he works in.