

# Production Optimization through Selection of Online Wells at Oil-and-Gas-Well Network Facilities

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**Abstract**—Oil and gas production facility that has been operating for more than 40 years must have undergone significant changes from its initial operational system, so it is necessary to adjust the system in order to obtain the most economical and optimal production. Brev Flowstation as one of the ONML Block production field which has been operating since 1971, has 84 oil and gas wells, and uses gas lift injection method to lift the oil production through 2 train compression system (low and high pressure, 2 units each). Under certain circumstances, such as maintenance or operational efficiency in which the compression system applies 1 or 1.5 compressor train only, the amount of gas lift production injected to the well and the suction capability of the compressor will be affected; so that some wells must be turned off in order to meet the minimum requirements. This research optimized oil and gas well production in Brev Flowstation by using binary programming method, that resulted in combination of 70 online wells on 1 train compressor system with gained profit of USD 18,748.78 per day and 78 online wells on 1.5 train compressor system with gained profit of USD 7,869.06 per day. By comparing compressor operating cost and optimal profit, it is concluded that 2 train compressor system is the most profitable system, with profit deviation of USD 47,099.63/day compared to the 1 train system and USD 7,101.21/day compared to the 1.5 train system.

**Keywords**—oil and gas well; gas lift; gas compressor; optimization; binary programming

# Managing Subsea Pipeline Risks in the New Patimban Port Shipping Lane using The Kent Muhlbauer Method and Analytic Hierarchy Process

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**Abstract**—This paper describes risk management of three subsea oil and gas pipelines in the Arjuna field that lie across the new shipping lane of the Patimban port, West Java. The Kent Muhlbauer semi-quantitative risk assessment method is used using four indices related to the failure of the subsea pipeline system: the Third-party Damage Index, Corrosion Index, Design Index, and Incorrect Operations Index. This assessment identified which subsea pipeline in risk operation impact by the port and which index that needs to be treated in order to reduce the risk. Then, it is combined with the Multi Criteria Decision Making tools of Analytic Hierarchy Process (AHP) on selecting the best alternative risk treatment to prevent or mitigate failures of the subsea pipeline system, based on prioritization criteria that have been established. There are seven criteria and five alternative options to be used in the AHP method. The risk assessment result shows that 16” MOL FPRO-ECOM pipeline will potential high risk from third party damage, especially in the KP 16-20. The priority ranking result from AHP method shows that installation of concrete mattress as pipeline strengthening is the best alternative of pipeline protection system compared to installation of rock beam, pipeline buried, pipeline relocation, and leave the pipelines just as it is. By choosing this best alternative, it is proven that the risk can be lowered into tolerable region or As Low As Reasonable Practicable (ALARP). The risk result and best alternative mitigation actions will be communicated to all parties related to the Patimban Port development as part of risk management process. Then it is expected after all risks can be mitigated or controlled, both operations of the Arjuna field and the shipping transportation activities in the Patimban Port can run safely.

**Keywords**—*AHP; Analytic Hierarchy Process; Kent Muhlbauer; Risk Management; Subsea Pipeline*

# Lean Sigma Method Implementation for Scaffolding Usage Cost Efficiency in Construction Departement of PT. RST

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**Abstract**—PT. RST is one of the oil and gas company in Indonesia which has been in operating for more than 40 years. PT. RST covered by Northren and southern area that consist of Offshore & Onshore. Construction department is performing fabrication, modification, repair and Engineering calculation. One of Procedure and steps in construction department is Scaffolding management which including main or supporting components. Currently, the need for Scaffolding usage was absorbed Costly. Therefore this study attempts to find a solution an alternative so that the use of scaffolding can be steady and will lead to a decrease in the cost of technical scaffolding both in the manpower and the cost. The research began with a Lean Six Sigma approach where the Lean concept applied to identify waste and the activities of non value added. To improve the process ability is perform the Six Sigma approach. A tool that is used to analyze the waste is using Define Measure Analyze Improve Control (DMAIC). Improvements criteria accordance Value Stream Mapping (VSM) result as the company's consideration, and generating cost savings that can be seen with the decrease in Cost of Poor Quality (COPQ). The research results are pupossed to perform optimization and cost saving expenses per year. From data processing and analysis resulting the most activities from scaffolding usage process impied Non Value Added category is engage the external contractors. By removing the contribution of external contractors (External Resources) in replace to maximize the contribution of internal resources/inhouse impacted to cost savings expenditure per year.

**Keywords**—*Scaffolding; Lean Six Sigma; VSM; DMAIC; COPQ*

# Developing SOD Criteria for Failure Mode and Effect Analysis for Application in Oil & Gas Laboratory

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**Abstract**—A critical part of FMEA process, which was commonly improved by many researchers, is the prioritization method for identified failures. This part is now widely modified to replace traditional Risk Priority Number (RPN) method since some shortcomings of RPN have been identified. Nevertheless, all modified methods mostly still use score of Severity, Occurrence and Detection (SOD) as variables to calculate the level of failure criticality. The score of SOD is decided by evaluating and matching failures characteristic with any levels of given SOD criteria. The criteria of SOD, which is developed at the beginning of the failure analysis, should be suitable for the analyzed subject. Using of the unsuitable criteria will give unfit analysis result and produce false prioritization of failures. Therefore, developing of SOD criteria is also one of critical part of FMEA and should be formulized carefully and systematically. This research was conducted to develop SOD criteria which will be suitable to be used for the application of FMEA in a testing laboratory of PT. XYZ, one of the oil and gas company operated in Indonesia. With its certain reliability and safety requirement, oil and gas laboratory may need specific approach in failure evaluation. Utilizing its Subject Matter Experts, Focus Group Discussion (FGD) was applied to develop the best fit of SOD criteria for oil and gas laboratory. The result showed that it requires four parameters of severity, which are safety, accuracy, Turn Around Time (TAT) and customer's response. Meanwhile, Occurrence provide three (qualitative judgment, historical and probability) and Detection require two only (qualitative judgment and probability of detection). The scenario was developed by combining linguistic and quantitative terms to rank SOD of the failures and set all levels as linier as possible. The main objective is the SOD criteria shall be relevant and suitable to be used for any failures occurred at each work step and in all conditions.

**Keywords**—*FMEA; oil and gas; laboratory; SOD criteria, failure evaluation*

# The Application of House of Risk (HOR) Model to Reduce The Contract Making Risks in PT. KLO

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**Abstract**—Contract development of procurement process at Oil Company as PT. KLO should follows many regulations of contract development. At the other side, there are some near misses/failure contracts because of unable to anticipate the risk earlier. Research to categorize the risk order and strategy to mitigate the risk is not exist. This research aim is to identify risk events, identify risk agents, and mitigation strategy of contract development process with House of Risk (HOR) method. The core of supply chain process to make contract already analyzed to identify the risk potential and effect resulted. Risk agents and related probabilities also already analyzed. Aggregate of risk potential was defined for each risk agents to know the damage level. This method was applied at department of contract & buying of PT. KLO Company, one biggest operator of oil and gas exploration in Indonesia through cooperation with Oil and Gas institution of Indonesia Republic. The research findings identify thirty four (34) risk agents and twelve (12) the main mitigation actions that significantly effective to reduce the contract making risks in PT.KLO

**Keywords**—*contract making; risk cause; House of Risk; regulation of goods procurement*

# Fouling Problem Analysis on Centrifugal Compressor by Six Sigma Approached Oil and Gas Application

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**Abstract**—Turbine gas compressor as transportation of gas production is widely used in the oil field for its simple package and large capacity. In fact, the operation often has many problems, one of which is occurred fouling on the blades of centrifugal compressor that performance decrease drastically before the time of maintenance. This situation resulted in a decrease in companies performance actual was often suffered losses, financial and cause of waiting process for other work related to the use of compressors. This research is purposed to eliminate the decline of turbine gas compressor performance that caused of fouling by using Six Sigma method approached. The study was conducted in the oil and gas field of TKC Indonesia (gas lift compressor C-303B). Stages of DMAIC (Define, Measure, Analyze, Improve and Control) are used as the process stages to solve the problem. The result of this research found that the critical factors of fouling problem occurred on the centrifugal compressor is corrosion inside process piping so that the corrosion product was carried to compressor. Improvement has been conducted by injecting the chemical corrosion inhibitor into compressor and field-testing the corrosion inhibitor at upstream. Compressor performances were increased from  $1.62\sigma$  to  $2.47\sigma$  and lead to increase turbine gas compressor productivity, which had an effect on increasing company's profits.

**Keywords**—*Oil and Gas; Fouling; Turbine Gas Compressor; Six Sigma*

# Analysis of Overall Equipment Effectiveness to Increase Turbine Gas Effectiveness (Case Study of Turbines MARS-Compressor Set)

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**Abstract**—Since the end of August 2016 has been marked by the success of Indonesia Deepwater Development (IDD) project at Gas Field of Bangka by PT Human Energy. The project demands the role of Turbine Mars-Compressor Set to spearhead the achievement of production targets. Therefore, this equipment must always be in good condition and have a high effectiveness. There are three (3) units of equipment that spearhead to achieve the production of 115 MMSCFD gas ie CAE-1410, CAE-1510, and CAE-1610. Constraints faced by the unit is still often the emergence of problems (bad actor). Problems that have effect on losses (losses). Losses reduce the effectiveness of the use of equipment in production process activities. For that we need to evaluate the performance of the equipment using the method of Overall Equipment Effectiveness (OEE). The global standard of OEE values is 85%. The measurement data shows that the average value of all units of equipment with availability rate is 97.6%, performance rate is 76%, yield rate is 99%, and OEE is 63.9%. Not yet optimal OEE values on equipment are reviewed with RCA (Root Cause Analysis) tools, and FMEA (Failure Mode and Effect Analysis). RCA determines the worst actor of some bad actors. FMEA gives an alternative weight of improvement. Based on RPN, we get weighted to performance criteria to determine the best solution alternative. The result of the research which become the causal factor is the vibration on the compressor which has effect on the operation of the machine with speed below optimum. Identifying the worst actor of some bad actors in the equipment, will increase the value of OEE (increasing the effectiveness of the equipment).

**Keywords**—FMEA; OEE; RCA; Solar Turbin Mars-Compressor Set; Worst Actor

# Shipbuilding Risks Analysis

(Case Study of New Build Pertamina Tanker 3.500 DWT  
on PT. Dumas Tanjung Perak Shipyards)

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**Abstract**—Shipbuilding process is a complex activity. Start from contract signing, fulfillment of contract requirements, design and engineering process, making of production drawings, materials & equipment procurement and production process. Done with the production process, it will be continued with testing-commissioning, sea trial and ship delivery as the final process. All of those activities have potential risks that influenced one to another. Those risks could cause to the delay of ship delivery which has penalty implication or even termination of the contract. The aim of this study is to perform risk analysis on three non production departments which is influenced to the delay of shipbuilding project. The three departments are Finance, Design & Engineering and Purchasing Department. From this study can be identified 12 risk events. Questionnaire I is developed to find the weight of risks by using Failure Mode and Effect Analysis method. There are 4 risk events with a high Risk Priority Number that affect the delay of the shipbuilding. The risk events are: Difficulty Fulfill Contract Requirement (RPN= 501.15), Material Delays (RPN= 370.73), Long Custom Clearance Process (RPN = 310.22) and Delay of Drawing (RPN= 305.56). Fourteen mitigation steps for the above risk events are obtained through the Focus Group Discussion. By these 14 mitigation steps, Questionnaire II was prepared by using pairwise comparison method to find out priority of mitigation step that need to be done. By using Analytical Hierarchy Process method is obtained priority order of mitigation steps. The highest priority mitigation step is Requesting to the owner to use the standard ship design and not to change the design. By using a standard ship design will make easier for shipyard in shipbuilding and it can be reduce the risk of delay. With a standard ship will make easier for operation, maintenance, and repair of ships, and encourage the development of local component industry with high economic scale.

**Keywords**—*Delays on shipbuilding; Risk Analysis; Failure Mode and Effect Analysis; Analytical Hierarchy Process*



# Influence of Internal Audit on Health, Safety, and Environment (HSE) Performance of High Rise Building Project

Case Study: PT Adhi Persada Gedung Projects

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**Abstract**—In general, the HSE management system includes the organizational structure, planning, implementation, procedures, processes, and resources required in the context of risk control on work activities in order to create a safe, efficient, healthy, and productive working situation. Health, Safety and Environment (HSE) is a very important factor in achieving the target of the project objectives. Maximum results in cost, quality, and time control are meaningless if the safety level is neglected. According to the data, 32% of total work accidents in Indonesia occurred in the construction services sector. Therefore, efforts to reduce the level of accidents through the implementation of HSE systems continue to be done. One of the things done to keep the HSE performance good is to conduct internal audits on a regular basis. This research will discuss about the influence of internal audit at PT Adhi Persada Gedung (APG) on the performance of HSE in PT APG projects. The research is conducted by taking samples on the projects in PT APG which routinely conducts internal audit every month. Data are taken in the form of questionnaires and results of HSE performance assessment during the last 5 months and interview technique to obtain more in-depth information is also used. The data which have been collected are then processed for analysis. The results of data analysis are expected to be able to answer the formulation and research objectives such as what are the HSE factors that become the assessment material in the internal audit, the influence of internal audit on the performance of the HSE, and how efforts and programs implemented by each project to minimize the risks and danger related to HSE. Methods of data analysis in this research will include validity test, reliability test, regression analysis, and hypothesis testing. After all of the data have been analysed we can concluded that the Implementation of Internal Audit had a significant and positive effect on the Health, Safety, and Environmental Performance.

**Keywords**—*Health; Safety; and Environment (HSE); high rise building; internal audit*

# Risk Management and Asset Security Analysis Integration to Minimize Loss and Failure Risk on Security Operation

(Case Study: Yakin Unmanned Platforms at CICO)

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**Abstract**—Oil and gas industry on offshore operation has a high risk to asset in upstream and downstream where these risks include the financial aspects, accidents, fires, explosions or occupational diseases and environmental impacts. Some of the risks that often occur in offshore operation are boat collisions, associated pipe by illegal anchor, and some theft of assets such as pipes, valves, cables, and navigation lights that causing losses and potentially endanger the safety of workers. *Chevron Indonesia Company* (CICO) as one of the operators of oil and gas industry in the East Kalimantan through KLO Security Department (*Kalimantan Operation*) makes efforts to anticipate such risks. The efforts include in applying Government Regulations on entering offshore work area for vessel or other object in the restricted and prohibited areas of CICO, implementing security operation i.e.: guarding, patrols, surveillance, as well as cooperating with the military and police. This research aims to develop a model of risk assessment in accordance with the conditions of CICO offshore operation area, so that the result will make a significant contribution to the company in making policies related to asset security. Some of methods used in the approach to risk assessment, among other *Crime Prevention Through Environmental Design* (CPTED), *Failure Mode and Effect Analysis* (FMEA) to generate a *risk priority number*, *Seven Tools*, *Layer of Protection Assets* (LOPA) by considering *Risk Assessment* method which has been using by CICO ie *Assets characterization*, *likelihood of the Act*, *Likelihood of Success*, *Risk Evaluation and Treatment*. This tesis is expected to identify and assess the risks associated with the assets in the offshore operational area of CICO, generate precise *analysis of assets security* as well as create a risk management model that is appropriate for use in securing assets in the offshore operational area of CICO. This study identifies the greatest frequency of asset security disturbances as theft nor robbery, work accidents, theft of material destruction, marine traffic accidents, area blockade, protests, asset hostage and sabotage. By FMEA method, it is obtained that theft / robbery has the highest average RPN (Risk Priority Number) value which is 81,5, then the marine traffic accident with the average value of RPN 65 and the work accident with the average value of RPN 57,5.

**Keywords**—*risk; assessment; asset security; failure; layer*

# Analysis of Interface Problems in the Execution Phase of Offshore Oil and Gas Construction Project with Partial Least Square

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**Abstract**—Rapid development of technology and the increasing size of construction project, made the involved parties are required to pay more attention to various interface problems. This study aims to identify critical interface problems during the execution phase of Indonesian offshore oil and gas construction projects. According to previous study, the interface problems during the execution phase have the greatest contribution loss impact compared to other phases in the project. The Partial Least Square method (SmartPLS Ver. 3.2.6) was applied to analyze questionnaire data, which was collected using a structured questionnaire gleaned from the literatures. The results showed that the factor causes of interface problems: methods/processes (METP), project documentation (DOKP), and project management (MANP) significantly affected project delays. And the fit model is able to explain up to 78.6% variation or change in project time performance (KWPR) with the coefficient of determination ( $R^2$ ) of 0.786.

**Keywords**—oil and gas project; interface; partial least square

# Service Quality Analysis and Improvement of Purchasing Department in Oil and Gas Company (Case Study: PT.A)

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**Abstract**—As one of the Oil and Gas Company operated in Indonesia, the company operates with its suppliers through contract agreement. The needs of the purchasing in this industry are determine by the user, and following related government regulation. Refer to the satisfaction survey, the service quality of Purchasing Department is lower than expectation; therefore this study intends to analyze and improve Service Quality of Purchasing Department. The research also involves senior supply chain specialist and it began with data that are taken from the survey to user. After the data are tested and proven valid and reliable, next step is to identify the gap level of service quality using SERVQUAL and River Model. Final step for improvement initiative using TRIZ based on the result from HoQ. There are 3 top biggest gaps effecting the users' satisfaction that identified: The procurement process already included in the business framework; Knowledge on Know-How on the operation in OG applied in the procurement process; Fastest procurement lead- time. To improve the gap that identified, there are 11 Technical Characteristics as priority that potentially bring up Service Quality satisfaction, such as: Conduct regular DUET meeting, Conduct C&P staff competency assessment, Socialization of related regulation, Sharing Knowledge (Contact), Survey/Visit Field/ Workshop/ Supplier premises. After having the technical characteristics priorities, then using Altshuller's principles, to improve the technical characteristics, considering the aspect of improving and worsening from Altshuller's principles. Some of the example are: conduct regular DUET meeting using Principle 19 periodic action; Conduct C&P staff competency assessment using Principle 20 continuity of a useful action; Socialization of related regulation using Principle 2 taking out only necessary practical objectives; Survey/Visit Field/ Workshop/ Supplier premises using Principle 25 self service to be proactively proposed. These actions plan for improvements are recommended to be implemented, closely monitor, and to recommence the objective of Purchasing Department in order to improve the Service Quality.

**Keywords**—*Oil and Gas; Contract and Procurement; Service Quality; River Model; QFD; TRIZ*

# Integration of Lean Six Sigma and Maintenance Concept to Waste Minimize and Cost Evaluation in Crane Maintenance Department (Case Study: Chevron Indonesia-Balikpapan)

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**Abstract**—To produce a productive production process, the company must understand the problems that are directly related to production. Many Aspects of waste in the company are often not well identified, so the problem are not solve clearly. It was including in the utilization of lifting aids (cranes). Increasing age of cranes, and long running hours made more varied the damage occurs. The concept of Reactive Maintenance which if there is new damage will be handled even with improper improvements considered ineffective and inefficient because there are still frequent damage in other parts. This research used Six Sigma method with DMAIC concept (Define, Measure, Analyze, and Improve) in Department of Crane Maintenance Team of Chevron company. The six sigma maintenance recommendations include reliable selection of crane operators, proper training for crane operator, crane maintenance team, and technicians in dealing on damage or replacement of crane spare parts, specified technicians were scheduled to maintenance crane work for a certain time, scheduled and structured of Crane cleaning, lubrication, light adjustment or other maintenance process by crane technician with reward and punishment system and also create crane related indicator which shows that crane has electrical or mechanical problematic.

**Keywords**—*six sigma; maintenance; preventive; crane*

# Implementation of Lean Manufacturing to Minimize Non Value Added in Fine Flexible Packaging Production Process

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**Abstract**—PT KSA is a manufacturing industry based on make to order which is engaged in flexible packaging. Efforts to manage production systems more effectively and efficiently through the identification of value added activities, reducing waste and shortening lead time. Based on preliminary observations on the production process of fine flexible packaging found the waste problems that occur are: inventory, defect, transportation and movement. Implementation of lean manufacturing helps companies become more competitive, especially in terms of reducing waste that occurs in the production process. In the identification of waste using waste assessment model (WAM) consisting of waste relationship matrix (WRM) and waste assessment questionnaire (WAQ). This model is able to contribute to the achievement of accurate results in the identification of the root causes of waste. Based on the WAQ results obtained by the results of the waste priority ranking of the top three are: motion of 27.26%, defect of 18.63% and inventory of 13.52%. Analyze the root cause of priority waste by using fishbone diagram. Recommendation of improvement by using U-shape cell layout and 5S in eliminating waste motion, poka yoke method in eliminating waste defect and economic order quantity (EOQ) method in eliminating waste inventory.

**Keywords**—*Lean Manufacturing; Waste Assessment Model (WAM); Waste Relationship Matrix (WRM); Waste Assessment Questionnaire (WAQ); U-Shape Cell Layout; 5S*

# Implementation of Lean Thinking on Corrective Maintenance Process to Improve Customer Satisfaction in Information Communication Technology Service Company PT. AL

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**Abstract**—One measure of the performance on Information Communication Technology services company is the level of customer satisfaction in providing services to customers. Customer satisfaction is obtained when the Service Level Agreement (SLA) can be fulfilled. At this time not all network services in PT. AL meet the SLA, so speed handling on corrective maintenance becomes important. Lean Thinking method used in this study aims to eliminate waste in the process of corrective maintenance. After getting the most dominant type of waste that is: unclear communication: 21%, delay: 19% and unnecessary movement: 16%, then with Value Stream Mapping Tools (VALSAT) got the Process Activity Mapping method as the mapping tool. Furthermore, by the method of solving the problem: five (5) Whys, found the root of the problem and by mapping the process of the current condition to the future condition, obtained the reduction of corrective maintenance time from 510 minutes to 345 minutes, VA value increased from 76% to 85%, NVA down from 14% to 7.25% and NNVA decreased from 10% to 7.25%.

**Keywords**—*Information Communication Technology service company; Lean Thinking; Value Stream Mapping Tools; VALSAT.*

# Improvement of Efficiency Delivery Service in CV. XYZ with Lean Service Approach

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**Abstract**—CV XYZ is a freight forwarding company focused on delivering medicines. To be able to compete in this time, where all order held by online auction by customer, CV XYZ have to clean and can show the best service. During this CV XYZ has 2 problems that could affect the delivery service business. Among other things that exceed the due date where with the condition CV XYZ must pay a penalty of 5% each day of delay. Second is the existence of damaged goods in the hands of the customer and with the condition CV XYZ must replace the production cost of the goods. Both of these issues resulted in the company having to incur additional costs. The bigger problem is that both of these are allowed to decrease the competitiveness of CV XYZ. Based on the problems that occur, it can be indicated that the process of sending CV XYZ there is still waste (waste). Lean service approach using Service Value Stream Mapping, Process Activity Mapping (PAM), Borda Count Method (BCM), Root Cause Analysis (RCA) and risk management analysis for determine priority of roots that cause critical waste that need refinement. Based on analysis with management risk approach obtained that the roots that cause waste in extreme level those are variation, defects, and delay. Refinement recommendation that is proposed are for variation is to make SOP to give penalty for indiscipline drivers, for the roots that cause defect the refinement recommendation is with new clause in contract with the vendor. For the last roots that cause waste which categorize as delay the recommendation are to make recording system of packing tools inventory, then utilize AHP methods to choose best shipping methods, and the last recommendation is improvement on the most efficient layout for CV XYZ.

**Keywords**—*lean service; PAM; borda count method; root cause analysis; risk management analysis*



# Production Planning with Overtime, Sub Contract, and 2<sup>nd</sup> Shift Addition Consideration at PT SWS

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**Abstract**—PT SWS, as the branch of PT SWI, is a multi-national company that engaged in the field of ink for commercial packaging in Indonesia. As time goes by, the ink demand is increasing. Besides, there is a new challenge in 2017 that obliges PT SWS have to fulfill their production order independently, both for paste and liquid ink, which so far still being supported by PT SWI. Business development requires PT SWS to do addition for existing production capacity. The output of this research is determining other alternative ways that can be used by PT SWS to fulfill demand. Production capacity options such as overtime, sub contract, and adding 2nd shift are alternative options beside regular basis. Monthly sales data since January 2015 until December 2016 is used as the basis for forecasting demand in 2017 by using ARIMA method and supported by Minitab 17 software. Labor cost, maintenance cost, asset depreciation, and electricity cost are needed to calculate for production cost structure. The feasible volume of finished good ink volume per day for each capacity option are needed to calculate production capacity. These two data are calculated to get cost per kilogram. The objective function of this model is minimizing cost per unit and the constraints are monthly forecasted demand, regular basis volume capacity priority and maximum volume for each production capacity option. Optimization have been done by using two scenarios, regular basis-overtime-sub contract and regular basis-2nd shift-sub contract. It was calculated by using linear programming with simplex method and supported by LINGO 11.0 software. The result showed that the 1st scenario is giving cheaper production cost than 2nd scenario for both, Rp297.307.603,14 for paste ink and Rp491.361.682,05 for liquid ink.

**Keywords**—*ARIMA; forecasting; optimization; production capacity; production cost structure*

# Implementation of Analytic Hierarchy Process (AHP) and Failure Mode and Effect Analysis (FMEA) Methods in the Tube Extractor Selection at PT XYZ Energy

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**Abstract**—Frequent damage on a tube bundle heat exchanger after maintenance activity carried out, one of the reasons is because of the use of tube-extractor that does not meet the standard of good engineering and the absence of risk assessment failure. This research aims to conduct the selection of Tube- Extractor and an assessment of potential failure on the tube- extractor before the work begins. Priority decision making to select tube-extractor used the Analytic Hierarchy Process approach and assessment of potential failure of selected tube-extractor using the Failure Mode and Effect Analysis. Set out three alternative, four criteria and seven sub criteria. Decomposed problems and create a hierarchical structure decision. The pair wise comparison matrix use to assess the importance of the one criterion is more important than other. Alternative which is the first priority to be selected has a highest ranking and the Consistence Index (CI) < 10%. Process capability analysis of a tube bundle heat exchanger obtained the Cp ratio of 5.04 means that the process capability is optimum (Cp > 1), the ratio of Cpk 2.86 means that the process is in compliance with the specifications. Potential failure analysis of selected tube-extractor using FMEA worksheet then created the Pareto diagram of the causes of potential failure. Repair a Risk Priority Number (RPN) > 200 by adding prevention control equipment. RPN can be decreased and selected tube-extractor recommended for use.

**Keywords**—*Analytic Hierarchy Process; Failure Mode and Effect Analysis; CI; Cp; Cpk; RPN*

# Risk Analysis Based on ISO 31000:2009 Risk Management Concept in the Floating Storage Offloading (FSO) Project

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**Abstract**—Indonesia still has the potential in the world's oil market. Indonesia currently sits at the 24<sup>th</sup> in the list of world's oil exporter countries with its production capacity of 825,000 barrels per day (BP, 2016). With such capacity, the country requires large crude oil before it is distributed to the end consumers through the supply chain. For offshore operation, a floating facility called Floating Storage Offloading (FSO) is used for crude oil storage. As part of the efforts to ensure the integrity of the facility and to comply with the current regulations on the FSO, it requires regular maintenance and repair for every five years. The maintenance and repair project involves significant danger and risks. Therefore, research with risk management approach of ISO 31000:2009 is required. This research used Failure Mode Effect Analysis (FMEA) method and risk matrix to analyze and determine the control needed to risk that may present during the execution of the project to minimize the harmful effects.

**Keywords**— *Risk Management; Floating Storage Offloading (FSO); Risk Register*

# Improvement of Production Process using Lean Manufacturing Method in PT. ABC

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**Abstract**—In conducting its business, a manufacturing company often has a challenge to increase the production process. The company is faced with the demand of increase productivity. It is also the case in PT. ABC, the packaging industry that uses rotogravure printing technology. From the initial field observations, there are some weaknesses in the packaging products. This has lead the company loosing of Rp 227.583.319. This study helps the company to solve the problems by investigating the cause of the identified wastes. The waste investigations are conducted by mean of Big Picture Map while the efectiveness of any activities during the production process are identified using Value Stream Map. Borda Count Method is also used to determine waste criticality. The reaseh shows that the 2 largest wastes in PT. ABC respectively, are defect and waiting. Based on the fishbone diagram it is known that the cause of waste defect is due to the material, human, and machine factors. The material factor used from suppliers is cylinders received rough and thin, so that the return to the supplier. Human factors exist in the expertise of the operator to make the settings so that the image striped, misprint, not standart and discipline them in complying with work instructions and sop that has been made. While for waste waiting that is material problem, human, machine downtime, working method and environment.

**Keywords**—*Lean Manufacturing; Big picture Mapping; Borda Count Method Process Activity Mapping; Waste*

# HACCP Implementation Management Initiation in PT. Susanti Megah Approach to Enterprise Risk Management ISO 31000:2009

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**Abstract**—The implementation of food safety management system HACCP (Hazard Analysis and Critical Control Point) in the industry, especially the food industry has become imperative given the many events that harm consumers due to the implementation of the food safety system is not optimal run by a company. This study will discuss the implementation of food safety management system HACCP initiation in PT. Susanti Megah approach to Enterprise Risk Management ISO 31000: 2009. This study is important because it can identify the various hazards of contaminants associated with a state at the time of manufacture, processing or preparation of raw materials to finished products as well as be able to assess the risks involved, and determine the activity in which the control procedures will function optimally so that the company can produce good quality salt according to the specifications of industrial consumers, are safe for consumption by customers and will certainly have an impact on the decrease in customer complaints and product recall caused by the presence of contaminants in the products delivered to the customer. Determination of critical control point in every chain of the production process is done by using decision tree method and the cost-benefit analysis, this study will provide recommendations to management regarding the importance of the implementation of HACCP food safety management system in PT. Susanti Megah.

**Keywords**—*HACCP, Enterprise Risk Management; ISO 31000:2009; Decision Tree; Cost Benefit-Analysis*

# Service Quality System Improvement of Timber Legality Verification Certification in PT ABC with Lean Service

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**Abstract**—This study examines the impact of lean service approachment on service quality system improvement of timber legality verification certification in PT ABC. PT ABC is a company that provide certification service for timber legality verification. Most of customer of PT ABC complaint about periode of certificate issued in process of timber legality verification service (SVLK). This problem exist due to waste of non value adde activity through the entire process. Lean service approachment applied to eliminate or minimize those waste. Therefore, the company is expected to increase value added ratio to those waste with it. The study give conceptual and appropriate company policy to solve their problem and improve service quality system.

**Keywords**—*lean service; waste; value added activity; value added ratio; service quality system*

# Selection of Market Competition Strategy of Transformer Products Using AHP and QFD Method

(Case study on Transformer Industry at PT. BCD Surabaya)

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**Abstract**—The market demand of transformer in Indonesia is attractively increase. In line with this, market competition becomes more attractive. Therefore, companies important to understand customer needs and establish the right strategy to compete. The right answer of this issue is, by competitive strategies appropriate that suits the market demand. This research focus on determining what is the right strategy to face the competition. Three alternative competitive strategies are under study: *cost leadership, differentiation, and focus*. The competition challenges come from the five elements of competition, there is: rivals, new product threats, substitute product raids, supplier bargaining positions, and customer bargaining power. The purpose of this research is to understand the customer needs and to choose the appropriate strategy to face competition. The Quality Function Deployment (QFD) and Analytical Hierarchy Process (AHP) methods are used together to mapping customer needs and choose the appropriate alternative competitive strategies. Thus, the company is able to win the competition. The study was conducted in two stages. First, dig the customer voice who are purchase BCD's products and also used competitor's product, then data proceed by QFD. The second phase, discussion with BCD's management in a focus group discussion to determine alternative strategies by creating a fair-wise comparison matrix from three alternative strategies according to Porter. Output of the QFD becomes input of AHP processing. The results of QFD study indicate that customer needs spread over 14 attributes. AHP data processing explained that the *Differentiation strategy* is the best choice to face the competition. The second alternative strategy is Cost Leadership by optimizing process efficiency and removing all potential waste. Hopefully with this strategy BCD will come out as the winner.

**Keywords**—*Strategy of competition; QCD, Transformer; Quality Function Deployment (QFD); Analytical Hierarchy Process (AHP)*

# Gas Lift Optimization on Oil Wells Wells with Limited Injection Gas Availability (A Case Study)

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**Abstract**—In oil and gas industry, the size of hydrocarbon reserves and type of the reservoir is important for design method and lifting the hydrocarbon for further processes. Gas Lifts is one of the most common artificial lifting techniques, to remove the fluid from the well requires decreasing the flow gradient in the tubing to provide additional energy in the well to push the fluid to the surface. PT ABC uses the gas lift injection design to lift oil content from the reservoir. To solve the optimization problem related with gas injection distribution at each production wells on PT. ABC, Prosper software used to obtain modeling of gas lift injection curves on the oil rate. Cross entropy (CE) methods were used in this study to solve the above optimization problem, the other optimization using particle swarm optimization (PSO) is also used for comparison. Maximum result of oil obtained after optimization with gas lift injection limitation of 8000 Mscfd with PSO method 1572.2 BOPD with gas lift injection at each wells (in Mscfd) are 393, 654, 593, 707, 709, 728, 663, 121, 715, 652, 730, 360, 310 and 655. While the CE optimization method successfully obtained maximum oil result of 1582 BOPD with gas lift injection at each wells (in Mscfd) are 599, 760, 719, 530, 629, 548, 481, 601, and 435. An additional maximum profit that can be obtained by the company are US\$ 17,397 per day which obtained by using CE method.

**Keywords**—*reservoir; gas lift; prosper modeling; particle swarm optimization; cross entropy*



# Field Operational Contractor Selection using Analytic Network Process (ANP) Method: A Case Study

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**Abstract**—Selection of contractors is one of the main activities in a business process/company operations. In oil and gas industries, the prequalification stage in selection of the contractor for the operation of the field is a stage that is positioned to ensure companies get a contractor who is competent and meets the desired quality. In this research, the Delphi approach is proposed to identify the criteria for selecting the contractor to fit the needs of the company. Priority weighting on the criteria is also proposed using the Analytic Network Process (ANP) method, so that the results of the decision can achieve the company's objectives optimally. Criteria for the selection of contractors are technical capacity, organizational capability, financial capacity, occupational safety and health and experience and performance. Each criterion also has sub criteria that are related to each other. Therefore, using the ANP method allows interdependent interdependencies between the criteria (dependent) to be determined in the model and identified the linkage so as to produce the best decision. The results obtained from this study is a system that produces a percentage of contractor performance appraisal that can be used as decision support in determining the selection of contractors based on the criteria that have been obtained. From the 5 contractors from the prequalification process this research has been chosen a contractor with the highest percentage value as the contractor who will operate the field. From the results of this system analysis, ANP method can be applied as a method in solving the problem of contractor performance appraisal to determine the competent contractor to operate the field according to the criteria desired by the company.

**Keywords**—*field operational contractor; contractor selection; oil and gas; Delphi; analytic network process*

# Integer Programming Application for Optimizing Line Balancing as Output Function in Bogie Carset Making Industry

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**Abstract**—PT. BI is a company engaged in the manufacture of bogie carset. At the company each work activity does not have the same operating time and there is no standard time for each of its operations. Therefore there is often an imbalance in each work station. This is done continuously can lead to ineffective and inefficient production line. Determination of production output is not well planned and only based on trial and error also participate in the low efficiency of the line. An integer mathematical program will be used to determine the placement of activities on each work station and to determine the optimal output that can improve the efficiency of the line. This technique will be applied by taking a product from the company under study. With the proper placement of work activities at each work station and optimal output penetration using binary integer programming, a production process can be produced that is capable of increasing the efficiency of the line.

**Keywords**—*Line balancing; line efficiency; production process; standard time; integer programming*

# Prediction Model Development for Onshore Crude Oil Production based on Offshore Production using Regression and Data Windowing

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**Abstract**—An old fact of the oil and gas industry is the difference in daily production figures between onshore and offshore. This study aims to provide a model to reduce the difference, by processing offshore data to predict daily onshore production. The method used is regression and developed with data windowing. The data used are daily data of offshore production and BSW (Base sediment and water) number in 2013 until 2016. The results show that the best prediction period from the observations made is the windowing period of 60 days. This research is important because the error of production data given to stakeholders will be fatal. Data errors will lead to a collapse of the company's reputation, and strongly impact business activity in general.

**Keywords**—*crude oil production figures; prediction model; regression; data windowing*

# Port Land Optimization with Green Port Concept using Linear Programming Method

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**Abstract**—Port operational activities, in addition to loading and unloading activities, there are also other business activities, such as land rental business. Land port leased to service users to support loading and unloading activities at the dock. Therefore, land leasing business is the supporting business that plays a vital role for the operation of the port. Land leased to customers based on zoning designation. There is a major zoning to support the needs of dock activities and additional zoning to support other maritime business. A suitable zoning area will help operations and increase revenue from land leases. Efficient land use will also reduce the need for reclamation for port development. Where reclamation is now considered a move that has a negative impact on the ecosystem of the environment. The problem that occurs in zoning design for harbor land use is the mismatch of land zoning planning with the needs of land users. A lot of land is empty because it is not in accordance with the zoning that land users needs, thus causing financial loss impact for the company. An optimization model is needed to maximize the benefits of land use. In this study, profit is used as an objective function, while the regulation and projection of land demand as a constraint. With the use of linear programming as an optimization method, this study is expected to establish the optimal land allocation for each land zoning in order to maximize revenue without ignoring existing regulations.

**Keywords**— *Optimization; Land use; Port; Linear programming Introduction*

# Design Mix Optimization of Heavy Weight Concrete by Box-Behnken

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**Abstract**—Optimization of mix proportions of water, cement, crushed stone, and iron ore coarse aggregates for use in heavy weight concrete was attempted using Box-Behnken Design (BBD) to produce a concrete minimum density of 3040 kg/m<sup>3</sup> and a 28-days compressive strength of 40 MPa. The minimum cost of material per ton of concrete is the optimization goal. Twenty seven runs were held according to the BBD table. Using Minitab 17 statistical software the results were analyzed and an optimum composition having minimum cost of materials was achieved. The optimum design mix in volume proportion of its element are 0,081 (water), 0,231 (cement), 0,443 (crushed stone), and (0,246) iron ore. The minimum cost is 60,04 USD/Ton which is 18,5% less than the existing design mix.

**Keywords**—*Concrete Weight Coating; Heavy Concrete; CWC, heavy aggregate; Box-Behnken*

# The Suitability Evaluation Analysis of Lecturer Management Information System (SIMDOS) with User and Management Needs (Case Study: Udayana University)

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**Abstract**—Lecturer Management Information System or known as SIMDOS is a system that functions in order to manage lecturer data and measure the performance of lecturers at Udayana University. The application of this system which has been running for two years has not been evaluated yet in order to find out the suitability of the system to user and management needs. The aim of conducting this study is to evaluate the suitability of the system to user and management needs at Udayana University. The model applied in this evaluation is Human, Organization and Technology Fit (HOT- Fit). HOT-Fit model is modified regarding to the existing models in previous studies. This quantitative study is done by questionnaire test. Then, Structural Equation Modeling (SEM) using software AMOS 18 is applied as technique of analyzing data. The result stated that the application of the system, SIMDOS has already required by user needs and management at Udayana University. It can be seen from significant correlation among SIMDOS variable with user variable and SIMDOS variable with management variable. In addition, it is found that SIMDOS has been successfully applied. However, the benefit of the system has not been achieved the maximal value yet. It is showed from among those three variables that have significant correlation with Net Benefit from the system.

**Keywords**—*HOT Fit Model; Lecturer Management Information System; Structural Equation Modeling; System Evaluation*

# Generalized Cost Model to Determine Suitable Inland Transportation Method

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**Abstract**—Multi modal inland transportation has been a logistics answer used widely especially in the USA and Europe. However, Indonesia has a different geographical condition, being an archipelago countries, so far Indonesia relies heavily on combination of trucking and sea freight transportation. This often creates problem with road congestion. This paper is hoped to be able to answer whether or not multi modal inland transportation can be applied widely in Indonesia, especially in the main Java Island. In this study, the generalized transportation cost model has been used to determine in which routes we can use multi modal transportation instead of road transportation. The result suggest that Jakarta-Surabaya, Serang-Surabaya and Bandung-Surabaya should use multi modal transportation while Semarang-Surabaya and Yogyakarta-Surabaya should use road transportation

**Keywords**—Multimodal transportation; logistics; generalized transportation cost

# Information Technology Governance Audit at PT. Pelabuhan Indonesia III (Persero) with Cobit 5 Framework

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**Abstract**—PT Pelabuhan Indonesia III (Pelindo 3) is currently improving its services for customers by developing IT solutions. Subdit TIK Pelindo 3 implements IT Governance that has regularly evaluated with the aim of optimizing and aligning the solution developed to the company's business strategy. This research aims to obtain a measure of current and expected capabilities of IT process specifically in Subdit TIK Pelindo 3, and to get recommendations to align IT governance with the Pelindo 3's business strategy. The research method used is COBIT 5 framework. The collected data is processed by using a weighting method on RACI Chart, combined with a median value method for IT capability value. The result shows that IT management capability level implemented in Subdit TIK Pelindo 3 mostly reaches only level 1 while the anticipated capability in 2018 is level 3. This means the company has not currently implemented a defined process or failed to achieve the objectives of the process. In this research, recommendations are developed to improve process capabilities in order to achieve the targeted capability level of the IT management.

**Keywords**— *Audit IT; COBIT 5; IT Governance*



# Implementing Mixed Integer Programming in Optimizing Production Facilities Layout in PT. XYZ

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**Abstract**—Fulfill order or demand fulfillment is one of the main activities of the business process to achieve the vision and mission of a company or a business. Order fulfillment consists of several processes or elements such as production process, production planning process and product distribution process. One of the most important elements in order fulfillment is the layout of production facilities. The level of effectiveness and efficiency of the use of equipment, raw materials, human resources, energy and the flow of production processes is determined by how effective the existing condition of the plant layout. Poor layout conditions will result in disruption to the production flow that will directly impact on the completion of the work. These problems can be solved by implementing re-layout planning process. PT. XYZ is a company engaged in the production of exhaust components. There are many variants of exhaust components produced by PT. XYZ where each type of component requires different machining processes. The increasing demand every year encourages PT. XYZ to evaluate the company's performance in fulfilling the demand. Evaluation is done to the current condition layout of PT. XYZ which is an important element in supporting the company's performance in meeting the demand. The condition of production layout of PT. XYZ shows that during the machining process of front flange component back tracking processes occurs three times. Backtracking that occurs will result in less smoothness of the production process and can lead to delays in completion of work. Improvement to the current condition layout of PT. XYZ needs to be done to reduce back tracking in the production process flow. Improvements are made using the Mixed Integer Programming optimization approach which is expected to be obtained by more efficient and effective layout of machinery.

**Keywords**— *Fulfil Order; Layout, Backtracking; Mixed Integer Programming*

# Technical and Financial Feasibility Analysis for Gas Plant Operating Scenario Selection by using Discounted Cash Flow (DCF) Method

*(Analisis Kelayakan Teknis dan Finansial  
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dengan Menggunakan Metode Discounted Cash Flow (DCF))*

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**Abstract**—Fossil fuels (oil, coal, gas) are still the most important energy source in the world. However, within the last three years, the price of oil, followed by natural gas prices experienced a significant price reduction from 6.17 USD/MMBTU in February 2014 to 1.64 USD/MMBTU in March 2016. Natural decline in production from old oil wells adds to the list of problems facing the gas processing plant. Under these conditions, it needs a comprehensive technical and financial study to determine gas processing plant operating scenarios that can increase the economic value of the plant. This research use quantitative case study research analysis to evaluate gas plant operating scenario located in East Kalimantan. Research method used is a combination of technical and financial analysis. Technical analysis to determine the doable alternative operating scenarios and to estimate production rate by using process simulation tools and then continue with design engineering. Furthermore, based on the results of technical analysis, financial analysis is performed by making a financial model (profit & lost projection, cash flow projection, free cash flow) considering the investment costs (CAPEX), operating costs (OPEX) and the sale of production for each scenario. The result showed that operating scenario that can provide the best level of control / value for the Company at base case is scenario #1 gas plant efficiency improvement project. The results obtained from financial modeling are Net Present Value (NPV) is \$ 41,532,518, Payback Periods (PP) in 466 days and Internal Rate of Return (IRR) is 49%. Based on sensitivity analysis on production rate decline and gas price, scenario #1 still become the best alternative to give highest incremental NPV for production rate decline range 5% - 12.5% and gas price range \$8-\$10/MMBTU.

**Keywords**—*gas plant; operating scenario; process simulation; financial modeling*

# Study of Decision Making in The Selection of Wastewater Treatment Plant at Onshore Processing Facility Balongan

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**Abstract**—Balongan Onshore Processing Facility (OPF Balongan) is located in Balongan District, Indramayu Regency, is the first onshore gas processing and dehydration facility owned by PT. PHE ONWJ with gas production of 30 MMSCFD and Condensate of about 150 BCPD, as well as wastewater produced. Furthermore, the volume of wastewater produced is increasing and needs to be peeled well. In the framework of environmental compliance based PERMEN LH no.19 of 2010, OPF Balongan made Wastewater Treatment Plant. Selection of the right type of Wastewater Treatment Plant is a concrete manifestation of OPF Balongan which is committed to become environmentally friendly gas processing and dehydration facilities, and also contributes to the efficiency program implemented by PT. PHE ONWJ. Therefore, it is done by using Analytical Hierarchy Process (AHP) method in the selection process. This study begins with a study of literature, completion of primary data from experts who can be selected in determining factors that influence the selection of wastewater treatment plants in OPF Balongan, so that the wastewater treatment plant is very environmentally friendly and can accommodate for the development of other projects. The outcomes of this research are the development of the main criteria and sub criteria and its weight for the right type of Wastewater Treatment Plant and provide recommendations for the best units. From the calculation of weight or relative importance, cost with weight 51,7%, followed by Safety (35,9%), Specification (12,4%). From WWTP type calculations using Expert Choice software, Portable WWTP is considered the best choice because it meets CR 0.1 and with global weight as follows: Portable WWTP (47.1%), Permanent WWTP (35.4%), and PPLI WWTP (17.5%).

**Keywords**—*component; Onshore Process Facility; Analytical Hierarchy Process; Expert Choice; Wastewater Treatment Plant*

# The Assessment Design of System Performance Supplier with Analytical Hierarchy Process Methode (AHP) (Case Study – PT. CPY Kalimantan)

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**Abstract**—The global competition, hence the role of supplier is a thing so essential for the success of the organization .Standardization era demanding supplier to always better is not enough. Super supplier is able to show her best performance is not come suddenly and swiftly, should be a comprehensive system which is able to measure the performance of supplier so that the performance of supplier always for the better and finally being super supplier. The problem in PT. CPY Kalimantan to the department maintenance is the absence comprehensive the assessment system of spare parts supplier performance has been assumed only from the technical s specifications. The assessment design of system performance supplier important as evaluation which will can be used to improve their performance or for consideration should not find alternative supplier. This research in a method Delphi and Analytical Hierarchy Process (AHP) assisted by with software expert choice. The results of design by using the method AHP produce 5 main criteria are, price, quality, services, shipping and warranty and 14 sub criteria / performance indicators supplier. Of the research results of the importance criteria for the performance evaluation of supplier produce the priority scale / weight as follows : priority I quality (0,480), priority II warranty (0,203), priority III service (0,132), priority IV delivery (0,126) and priority V cost (0.059) the last. The assessment to PT. ABC spare parts supplier control DCS using form of research results it has total 1605 which means PT. ABC has a very good performance.

**Keywords**—*Analytical Hierarchy Process (AHP); Delphi method; assessment system; best supplier; department maintenance; comprehensive*

# Organization Development using AHP Method with Blue Ocean Strategy Implementation in PT PLN (Persero) Distribution East Java

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**Abstract**—In line with government policies that provide opportunities for the private sector in the business of electricity supply through Law No.30 of 2009 and Industrial Industrial Development Plan (RIPIN) which establishes industrial zones and special economies, PLN's organizational units are at the forefront of direct contact with changes The business environment is the distribution field especially PT PLN (Persero) Distribution East Java. The objective of this research is to obtain the organizational structure of PT PLN (Persero) Distribution East Java in the form of enrichment in break down of existing organizational structure and the addition of new elements in the parent structure through internal and external approach by applying the blue ocean strategy then perform quantitative judgment using AHP (Analytical Hierarchy Proses). As a result of AHP calculations from both internal and external perspectives that have been intervened by the application of strategy canvas on the blue ocean strategy, the existing organizational breakdowns formed in the Division of Asman Services and Administration include Marketing Intelligence, Key Account Management, Sharing Resource Team, Geographic electrical team. Modest Networking division includes Team Flikrs industrial customers.

**Keywords**—*Organizational Development; Blue Ocean Strategy; AHP (Analytical Hierarchy Process); Enrichment; Marketing Intelligence; Key Account Management; Sharing Resource Team*

# Maintenance Strategy Selection Based on FMECA & DEMATEL AHP (A Case Study)

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**Abstract**—Maintenance strategy of plant equipment has a significant role in production process. High reliability and availability are importance for production process in order to run continuously, free of incident, high productivity and maintaining low production cost. The objective of this paper is to propose a framework for selecting maintenance strategy using FMECA, DEMATEL and AHP. The equipment is first classified through FMECA. The criteria for maintenance selection are derived from DEMATEL then selection of the best maintenance strategy is conducted using AHP. This proposed method has offered a more structured approach in designing maintenance strategy.

**Keywords**—*MCDM; DEMATEL; FMECA; AHP; Maintenance Strategy*

# Operational Risk Management of Onshore Processing Facility using Risk Failure Mode and Effect Analysis and Fault Tree Analysis

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**Abstract**— Onshore Processing Facility (OPF) is one of the natural gas processing fields, the gas is dried and distributed to the consumer. The ideal condition of a process plant is to be able to operate continuously until the planned maintenance time. However, unexpected various operational failure problems exist during operation, The impact of operational failures occurred not only on the OPF itself, but also on the RU Operation process, which may disrupt of fuel distribution in West Java and it can becomes a national issue. A research is needed to determine the critical risks of various modes of operational failure is needed. Finding the critical risk will hopefully simplify the search for the cause of failure without having to analyze all modes of failure that have occurred. By using RFMEA method, it is obtained a critical risk which is then analyzed further using FTA to get basic event, then specific treatment of risk could be proposed. 45 failures modes has been identified from operational data. Based on this research resulting 5 failures modes categorized as critical; *Pilot Failure, Air Intake problems, AO / DO Modules that often hang, Shut Down caused by GEG Hunting, and broken glycol pump*. By using FTA, the cause of these critical risks can be recognized, so that mitigation plans as a risk response plan for known critical risks can be sought. And the proposed mitigation plan is expected to reduce the occurrence of operational failure or reduce the impact of the failure.

**Keywords**— *Risk Management; Onshore Processing Facility; Risk analysis; FMEA; RFMEA; FTA*

# Determination of Interval Time of Preventive Maintenance on Gas Compression System Equipment in PT Pertamina Hulu Energi

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**Abstract**—PT. Pertamina Hulu Energi (PHE) is working on Offshore North West Java (ONWJ) block which ranged from Seribu Archipelago until the north beach of Cirebon. It has been operating since 1971 until now, so it can be said that the equipments are relatively old. One of the methods to lift the crude oil from this field is by using gas lift. This method exploits the gas pressure which produced by Gas Compression System (GCS). This compressed gas is injected into annulus (space between tubing and casing) then inserted to tubing production. This high compressed gas causing the aeration process which impacted to the decreasing of fluid weight in tubing column production. This process causing pressure at reservoir that can push the fluid from well to production facility on the surface. GCS has 5 main parts, they are suction & discharge scrubber, gas turbine, compressor, interstage cooler and support & others. From the downtime data taken, those five parts have components with high failing rate. By those explained reason, this research is aimed to determine the time interval for preventive maintenance ( $T_p$ ) from those five parts with minimum maintenance cost and availability value set by the company. There were three steps to determine the optimum  $T_p$ . The first step was to obtain the best distribution of time between failures (TBF) and time to repair (TTR). The second step was to iterate the operating time ( $T_i$ ) and  $T_p$  to determine the minimum preventive maintenance cost rate, reliability and maintainability. This iteration was applied to parts of GCS that posseses a series system.  $T_p$  at the lowest rate of preventive maintenance costs was an optimum  $T_p$ .

**Keywords**—*reliability; maintainability; preventive maintainance cost rate; preventive maintenance time interval*



# Design of Enterprise Architecture in PT. XYZ using Togaf ADM Method

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**Abstract**—PT. XYZ is a distributor of Y brand motorcycle for East Java area. Since 2013, PT. XYZ has used Microsoft Dynamics Axapta (AX) enterprise resource planning (ERP) software as an operational support system. But there are many obstacles that impede the business process effectively, leading to decreased job performance and not achieving company targets. Within the next 3 years, IT solutions are needed to support the development of the company's business. Application of Enterprise Architecture will be expected to be the answer for PT. XYZ where in the next 3 years, the company can be more productive and growing, the alignment between business strategies owned by the company to optimize the utilization of information systems and information technology owned by PT. XYZ. The design of Enterprise Architecture using TOGAF ADM method because it has the privilege of having a complete methodology, clear and structured stages, so that the design and specification becomes easier and minimize the risk of implementation by PT. XYZ. From the design of enterprise architecture, the result in Business Architecture produces 24 new business service, 60 new SOPs and 11 SOPs that require improvement. While the Architecture Data generated 1 new entity and its relation and 2 data that can accommodate 13 future business functions. For the Application Architecture, the result is 37 new application designs, and on the Architecture of Technology produced the design of hardware and software that support the future business development.

**Keywords**—*Enterprise Architecture, TOGAF ADM, Business Architecture, Information Architecture, Technology Architecture*

# Predicting Student Performance Using Support Vector Machine for Management of Higher Education

(Case Study: Magister Study Program, Department of Statistics ITS)

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**Abstract**—The success of any higher educational institutions is often seen from the success of their student achievement. One of the steps needed is to predict academic performance for students. These student performance predictions can be used to improve the quality of managerial decisions and to impart quality education. Magister study Program at Department of Statistics ITS Surabaya does not have the tools to predict the performance of their students yet. Therefore, researchers conduct this paper to make modeling of Prediction Student Performance for Management of Higher Education at Magister Study Program, Department of Statistics ITS using Support Vector Machine (SVM). The dataset comprises of 318 student records that provided information about student demographics and previous academic standings in which 12 significant variable of students were extracted for experimentation in the study. Training and system testing is done by 10-fold Cross Validation method by measuring accuracy, precision and recall. Based on comparative performance Kernel function for SVM, the result show that Linear Kernel is the most suitable Kernel function to produce the most optimal prediction for student performance. From the experiments performed, the application of SVM has a better accuracy, precision and recall calculation results when compared with the use of logistic regression method. Based on the test of the influence of each variable, the quality of student performance can be improved significantly by considering some student indicator they are work status, toefl score, TPA score, accreditation of institution before, GPA, study duration and waiting time of student from graduate to join magister program.

**Keywords**—*Prediction; Student Performance; Support Vector Machine*