Pilot Project Analysis Model Just In Time (Jit) In Order To Improve The Performance Of Time Construction Process Of Gathering Station In Tarakan, East Kalimantan, Indonesia

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Abstract: Scheduling the project has the scope of the start of activity definition, activity sequencing, activity duration estimating, schedule development and schedule control. To manage and control the time on the project must first understand the definition of project, sequence of work, duration of works including the relationship between the activities stated in the time schedule so it is easy to monitor the progress of work for each given period, resource planning is also required in project time management in order to know for sure productivity the performance of a production system on time (Just in time production System) was originally developed and promoted by Toyota Motor Corporation in Japan. Many studies in various countries have attempted to introduce Just in time / JIT in construction projects particularly in the oil and gas industry for reap the same benefits. This study focused on the implementation of JIT in construction projects Gathering Station (GS) in Tarakan, East Kalimantan, Indonesia with the aim of improving the performance and competitiveness of the company to achieve profits. This study discusses the current state of which occurred in the construction industry in the oil and gas sector in Indonesia; and reviewing the results of the analysis of a random sample of the pilot project to assess the implementation of JIT in order to improve the performance of a construction implementation Gathering Station in East Kalimantan, Indonesia. These results indicate that the government and construction companies should play a major role as spearhead the implementation of JIT in the construction industry in Indonesia.

Keywords: Just-in-time (JIT), project scheduling, gathering station (gs), construction, performance time.

PRELIMINARY

Just In Time (JIT) is a construction system that is designed to increase productivity, get quality, reduce costs, and achieve delivery time as efficiently as possible by eliminating all types of waste contained in the construction process so that companies are able to submit their projects on time according to the will of consumers.

The need for energy, particularly fuel oil in Indonesia is increasing, in 2016 to +/- 1.6 Million barrels of oil / day, while the national production of +/- 850 thousand barrels of oil / day, it is necessary to discovery of new reserves by oil drilling and processing facilities setup crude oil / gathering station facilities consisting of oil storage tank with its supporting equipment. Based on data from frequent delays in the completion of development projects gathering station, causing a significant loss (Media Indonesia, July 29, 2016).

The construction industry in Indonesia will continue to play an important role in the Indonesian economy. However, the construction industry in the oil and gas sector in Indonesia is still under development for many construction projects still delay in its completion because of low productivity, low quality of construction product yield, low profit margins and poor conditions of work culture. Therefore, the construction industry oil and gas sector in Indonesia needs to become more competitive and change its image in a positive way.

Role gathering station in the oil production process is very important and can affect the whole production system. Crude oil out of the ground was mixed with water and gas it needs a system to process crude oil from the oil and water separation.
and oil to gas, this process is in a place called the gathering station (GS). In addition to oil and water separation process in the GS a process of oil production test, the rest of the produced water (separation performance) is injected again into injection wells to maintain pressure called pressure maintenance wells. The gas produced through the separation process utilized to supply to the Power Plant Tarakan via the gas network and used for the operation as a generator plant, pump drive and illumination of public facilities.

Study of JIT that are discussed in this paper is to accelerate the development gathering station where the equipment tank which is quite a lot and the capacity is big enough not take long in its execution, as well as a limited area (confined space) to accelerate the schedule of work is not possible if only to add manpower, hours workplace and work equipment only. Need JIT election proper methods and technologies in its execution and in terms of procurement, especially procurement longlead items (pumps, generators, electrical and instrument system). Major items in the manufacture of storage tanks that welding work, the use of double-V groove welding method used takes twice as long in practice, yet in case it is necessary to repair welding defects that require a longer time as well so as to cause a delay of the completion of the project. Thus the selection of the appropriate method JIT can speed up the implementation of the completion of the project gathering station / GS, so GS can be immediately operated in accordance with the capacity plan.

Gathering Station is designed for a capacity of liquid / oil and gas BLPD 16MMSCFD 30,000, with an area of +/- 7.2ha (consisting of several equipment: scrubbers, 3 phase separator, tank testing, storage tanks, transfer pumps, generators, instrumentation and fire protection system), the design life time of 25 years. Storage tank is a critical item in the construction of GS, because there a lot and work a long time. There are some requirements, types, standard storage tank used in Indonesia. For construction work oil tank is generally located at a remote location so that the necessary preparations and methods in more detail in order to achieve time, cost, and quality as per the specifications required. Tank construction broadly divided into two types: Type bolted Tank (moveable) and Type Welded Tank (fix), generally a tank capacity of over 12,500 barrels using a welded tank (type fix) and the diameter of the tank above 20 m length work takes 10 s / 12 months of total project.

The most important indicator in the Just In Time (JIT) Gathering Station Construction Project of reducing the variety of waste material and activities that are not necessary that serve as the collecting station which separates oil, water and gas perfectly. Work GS includes site preparation (land clearing), soil investigation (sondir), construction of foundation (on piles), the construction of the tank (bottom plate, shell wall, roof) and fire protection systems, Gathering Station are generally located in remote areas close to wells production plays an important role in the whole process of crude oil processing for the output produced must meet the specifications set out that oil is actually already separate with water as well as gas is not wet, so ready to be transferred to Power plant Tarakan, if the drilling is completed, but the oil and gas can be produced then there is no meaning anything and if there is a failure in GS production, will lead to disruption of oil processing at a later stage which eventually disrupt the overall system. Study Just In Time covered in this research is to accelerate the development Gathering Station where equipment tank which is quite a lot and the capacity is big enough not take long in its execution, as well as a limited area (confined space) and are located in remote areas should be the selection of methods and technologies precise in its execution and in terms of procurement, especially procurement longlead item (pump, generator and instrument system) and the construction process of a major item in the manufacture of storage tanks that welding work using welding methods double v groove that used to take two times longer in the implementation, yet in case it is necessary to repair welding defects that require a longer time as well so may result in delays in the project schedule. Thus the selection of appropriate methods to accelerate the implementation of the project completion gathering station so it can be operated in accordance with the capacity plan.

JIT is a set of principles, tools and techniques that allow the company to produce and deliver products with short lead times to meet customers on time according to the requirements.

This study operational model based on the existing problems which prevent delays in the project with the use of Just In Time (JIT) to accelerate the completion of projects started gathering station of the issues by outlining the problem of research study outlines collect data, factors and variables influence important JIT via a questionnaire taken by the viewpoint of the assignor followed by data processing and data is data qualitative quantitative resulting in recommendations for improved performance JIT project time gathering.

RESEARCH ISSUES.

This study has the problem as follows: 1. How does the analysis of the role of gathering
station / collecting station in the oil production process in particular in Tarakan, East Kalimantan?  
2. What are the factors and variables are important in the Just In Time (JIT) construction project gathering station / oil collecting station in Tarakan, East Kalimantan?  
3. How do the results of analysis of the influence of Just In Time (JIT) to improve the performance of a construction project execution Gathering Station in Tarakan, East Kalimantan?

**RESEARCH METHODOLOGY**

In this study, we want to know the constraints that occur that affect the performance of the time so in getting factors and variables to be included in the questionnaire study. The study involved owner who acts as the assignor in implementing development Gathering Station in Tarakan, East Kalimantan. Qualitative and quantitative approach adopted in this study. The study began with a review of the literature JIT with the aim of proposing appropriate recommendations for potential implementation of JIT by various stakeholders in the construction process GS. This research process is divided into three (3) stages: start the preparation, the analysis phase (pilot project with 10 respondents) and the stage of research findings. The preparation phase to identify the problems of research looking for the factors that affect achievement of the performance time on the job Gathering Station, reviewed the literature refers to bebarapa theory of Just In Time (JIT) and Time Management in the construction process from the viewpoint of the assignor (owner) and journals relevant research, set a goal of research by identifying important factors and variables that affect the achievement of the performance JIT time GS construction process, draft survey- questionnaires, data collection and determine the grading scale by means of expert interviews and distributing questionnaires as many as 70 variables to the assignor (owner) randomly. Perform data processing and analysis include: reliability and validity of the data analysis, correlation analysis, intercorrelation analysis, factor analysis, linear and multiple regression analysis, model test F, t, D. Continued discussion stage research results that show changes with the implementation of JIT and provide ongoing recommendations.

**Figure 1: Process Research**

Factors that influence the research of Just In Time (JIT) is divided by a number of factors in the construction process, among others: JIT project preparation / project initiation, JIT planning, JIT implementation, JIT monitoring, JIT evaluating and improvement as well as JIT project close outs that affect the performance time. Important variables generally consist of two parts: The dependent variable (dependent variable), represented by “Y” is a variable-time performance on the job Gathering Station in Tarakan, East Kalimantan. The independent variable (independent variable), represented by “X” in the form of variable - Just In Time variables that affect the achievement of the performance period.

**ANALYSIS**

Project Network Integration is important, especially the impact of the activity on the time schedule. Activities undertaken in the field requires resources, among others (money, manpower, construction material and machinery / construction
& operational equipment) should all be contained within the time schedule which includes the cash flow chart: cash in and cash out, manpower loading: manpower required, availability and productivity, material (bill of items and quantities), delivery schedule, machinery: mobilization and demobilization dates. Feed back is given from the Engineering, Procurement & Construction will affect the scheduling of time planning the project. Time management if executed well, it can be used to monitor project status, updates and management of change. The iteration process will take place before the scheduled time of balanced and integrated and project implementation plan is achieved. A graphical display of effort cumulative / Resources (eg: costs, labor hours / mandays, or another number), plotted against time. The name is derived from the S shape like of the curve (flat at the beginning and end, steeper in the middle) produced on a project that starts slowly, accelerates, and then finished. In addition to time management strategies to control the project schedule are still opportunities to accelerate the completion of the study period by applying the Just In Time (JIT) capable of suppressing waste-waste as well as results that result in causing terkendalanya completion of the project. Many previous studies on the benefits of JIT in improving productivity in manufacturing. Instead, researchers and practitioners from the construction industry increasingly explored the possibility of applying the knowledge gained in the construction industry to solve the problem at the time of construction procession (Bresnen and Marshall, 2001; Bates et al., 1999; Bertelsen, 2002). This framework is shown in Figure 2.

![Figure 2. Framework JIT in Construction Process.](image)

Benefits and Disadvantages Research of JIT

If the JIT was applied to the results that can reduce labor who have less expertise / minimize poor labor skills and provide adequate training to workers to improve their competence in accordance with their fields, project management commissioned have experience / flight hours is sufficient, the organizational structure in the form of lean / slim each personal able to do multitasking, managing material balance to support construction activities, able to control the price of construction materials, improving the relationship between the supplier mutually support each other to complete the work ahead of schedule, many use the material / component prefabricated to shorten the time, further empowering the role of contractor specialist, eliminating congestion and inconvenience caused to the environment by means of mitigating the risk. Improving the company's competitive advantage in terms of consistent and continuously meet customer needs.

Obstacles in the implementation of JIT

JIT can not be achieved without the initial investment for example: reducing setup time requires more sophisticated equipment, high technology and more skilled employees will result in higher training costs. Some companies have failed to implement the concept of JIT because of various problems. In this study seeking variable factors JIT that affect the performance of a good cause of the failure and success of JIT obtained through surveys and questionnaires to some experts and practitioners construction from the viewpoint of the assignor (owner), widely obstacle implementation of JIT classified in two categories: government regulation such as: lack of regulatory certainty and building standards are used, local regulations vary from one region to another for their autonomy, licensing (environmental impact assessment, permit, certificate of improper functioning) are rigid and slow, scheduling JIT irrational and human resource issues involved in the construction process (such as contractors, specialist contractors, suppliers and owner). JIT implementation of awareness and limited support from the government is very low and does not promote the implementation of JIT in the construction of Gathering Station and work culture are conservative and hard to accept the changes.

Role Assignment giver (owner) Facilitate the implementation of JIT

Assignor / owner very important role in determining the successful implementation of the method of Just In Time (JIT) on the construction of gathering station, as assignor in addition to having the benefit of the project is completed on time in terms of planned capacity can be achieved. The role of the assignor should start from the JIT feasibility study that reviews of various aspects such as market aspect, technical, legal, economic / financial and cultural so that the project can
actually run, investments earn significant profits and not lose money, JIT design stage to plan simultaneous and comprehensive scope of work that is detailed, quality plan planned and measured, JIT stage of an auction to determine the contractor who is competent and procurement strategies longlead items, JIT construction phase to minimize the factors and variables that cause the waste that affect the performance of the time (especially JIT the selection method of construction using the latest technology, resources allocation, utilization, and resources leveling, construction schedule, construction cost, product and process quality and construction sequences), JIT Monitoring and evaluating project by EVM (Earn Value method), JIT Project closing at the time of handover team to operation maintenance none of the constraints and the availability of sufficient financial is required by the assignor to be cash flow of contractors are not obstructed so that the method of Just In Time workable and runs well and can provide useful recommendations for the next project.

CONSTRUCTION INDUSTRY IN INDONESIA

Construction industry growth in Indonesia is getting better and has been following the development of technology in the world. Thus, we must know in advance the conditions of the construction industry in Indonesia, especially in the field of oil and gas in its entirety before making recommendations for the implementation of JIT Obstacles often happens that delays in the completion of projects of oil and gas sector due to the low productivity of human resources and lack of project management experience, projects that generated not consistently applying TQM so that the resulting quality is not maximized the impact on the company's profitability is low.

The results and recommendations were JIT: Analysis Correlation

Correlation analysis is used to measure the relationship between independent variables and the dependent variable. In this study, correlation analysis was used to select 70 independent variables in the factors causing delays in the Project Construction Development Project Gathering Station to delay. In the correlation analysis, the independent variables are correlated with the dependent variable is declared if the correlation coefficient \( r \geq 0.4 \), while the independent variables that have a correlation value \( r < 0.4 \) will be dropped from the model and excluded from further analysis phase. Obtained results of 70 independent variables were analyzed only JIT ie there are 15 variables X1, X2, X4, X5, X17, X22, X24, X33, X43, X45, X51, X55, X61, X63, X67 that affect the performance of a construction project execution Gathering Station in Tarakan, East Kalimantan

Analysis Intercorrelation

Intercorrelation analysis was conducted to determine the relationship between the independent variable of one over the other independent variables were selected from the results of correlation. In intercorrelation analysis, the independent variables that cause a high correlation to the other independent variables (the correlation \( r \geq 0.4 \)) will be eliminated from the model. Based on the test results intercorrelation, of 15 independent variables correlation analysis to qualify the remaining variables intercorrelation \( r < 0.4 \) there are six independent variables X1, X4, X24, X33, X45, X61 In the early stages of research, the research instruments must first be tested keabsahananya to test the validity and reliability, followed by testing the research instrument against 10 respondents randomly to test that the instruments used can be used to determine the variable JIT which plays an important role in improving the performance of the Project Construction Gathering Station development.

Based on the results of research conducted on the pilot phase of the test showed that the JIT variables that most influence on the performance of the projects were the construction of Gathering Station is X1, X4 and X45 with a value of R Square of 0.814. Companies need to pay attention to three important processes in the implementation of construction projects Gathering Station in Tarakan, East Kalimantan is in the process of project preparation, implementation and project close-out / handover. To improve the performance of the projects were the construction of Gathering Station in Tarakan, East Kalimantan then in the process of preparation, implementation feasibility study and making of administrative procedures for contracts in the auction process should be timely, then in the process of implementation, procurement, storage, maintenance and installation of equipment, materials, supplies and equipment provided by the owner and JIT procurement process starting from the selection of candidates for contractor until the appointment of a winner takes quite a long time during the process of the auction to get a contractor who has the credibility that is good, it needs a special strategy for the procurement of long lead items (generators, pumps, panels electrical and instrument equipment) as this is critical in the
regulation of the procurement process relating to the inter-state at the time of export-import process it is necessary to maintain harmony, as well as long-term cooperation for mutual benefit with some contractors and suppliers sehing a gain competitive price and timely delivery. Escalation of prices and exchange rates in the procurement process must be managed properly in order to improve the profitability of the company, so that when the project is closed out when the initial operation of equipment such as start-up, testing, adjusting and balancing system that worked well right.

- Monitoring and Evaluating

Monitoring and evaluating indispensable every stage of the construction process, the JIT project monitoring and evaluating can use EVM (Earn Value Method) so that the current condition of the project can be seen very quickly to determine the appropriate steps to speed up the project, carry out periodic inspection and the proposed continuous improvement is needed.

CONCLUSION

Based on the results of research conducted on the pilot phase of the test showed that the JIT variables that most influence on the performance of the projects were the construction of Gathering Station is X1, X4 and X45 with a value of R Square of 0.814.

Based on this research there is potential for the application of JIT in tackling low productivity, low profitability and quality issues in the construction industry in Indonesia.

State owned enterprises can be a precursor to commit to increase awareness of the benefits that can be obtained from the JIT in addition to training for the application of JIT is also important to reward and recognize companies that perform, JIT implementation simplifies the process of licensing bureaucracy.

JIT study aims to analyze the role of GS in the process of oil production, suggesting an important indicator in construction projects Just In Time Gathering Station and provide JIT study results in improving the performance time of the acceleration of project construction purposes GS in improving performance overall oil production cycle. The role of the assignor, government and educational institutions should be aware of the importance of JIT and provide training that facilitates the implementation of JIT in the construction industry in Indonesia, especially oil and gas sector. Implementation of the feasibility study, creation of contract administration procedures and procurement of long lead items (generators, pumps, electrical panels and instrument equipment) is an important variable that determines the acceleration of the completion of the gathering station project.

REFERENCE

[7] Manoochehri. Suppliers and the Just In Time Concept. 16–21


