DEVELOPING NEW DISTRIBUTION PIPELINE PROJECT BY IMPLEMENTING COST EFFICIENCY STRATEGY USING CAPITAL BUDGETING MODEL A CASE STUDY IN GREENLAND INTERNATIONAL INDUSTRIAL CENTER (GIIC) BLOCK A

Dyah Agitarini
Wiwiek Mardawiyah Daryanto

ABSTRACT

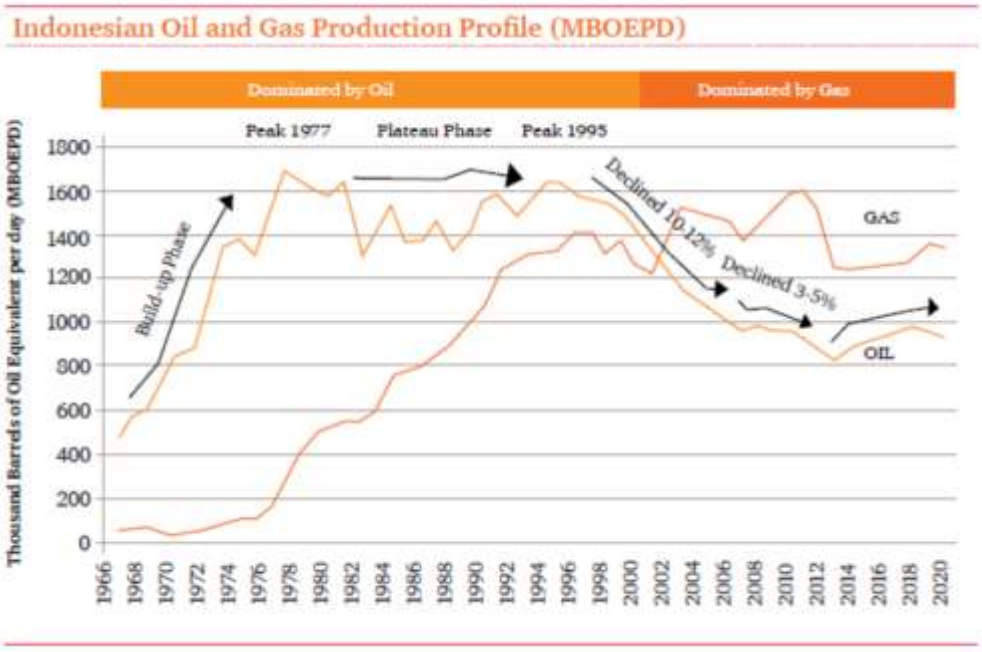
*Oil and gas industry has an important role in developing economies all over the world including Indonesia. This industry gives huge contribution in the country revenues. However, the contribution from this industry has decreased significantly during 2014 to 2015, since 2015 the revenues has decreased significantly from 14.11% in year 2014 to 4.46% in 2015 (PwC Indonesia, 2018). This condition is caused by the dropping of crude oil price, since the end of years 2015 the crude oil price dropping significantly from about 100 USD per barrel in years 2011 until 2014 changes to 30 USD per barrel in 2015 (MIGAS, 2015). That condition has impacted the oil and gas industry in Indonesia, many companies have to reconstruct their spend and also delaying the new development projects that is not economical anymore. PT XYZ ("**XYZ**") as a subsidiary of one state-owned company that specialized in the gas distribution and natural gas industries facing the same conditions with other oil and gas companies. The revenue of XYZ decreased from USD 2,896 million in 2014 to USD 2,571 million in 2015 and to USD 2,499 million in 2016. In order to increase the revenue, XYZ has to develop the potential market by developing new distribution pipeline project with cost efficiency. In 2016, XYZ has an option whether to install the existing pipeline which is steel pipeline, polyethylene pipeline or polyamide pipeline system for the future project, the object of the project location is in Greenland International Industrial Center ("**GIIC**"). The purpose of this study is for analyzing and evaluating which options results cost efficiency for XYZ using a steel pipe or by using another pipeline system which polyethylene pipeline or polyamide pipeline system. The data are analysed by using a capital budgeting model with these criteria: 1) Payback Period; 2) Return on Investment; 3) Net Present Value; 4) Profitability Index; 5) Discounted Payback Period; 6) Internal Rate of Return and the data that used for this analysis is collecting by XYZ in 2016. The analysis and calculation result showed that by using a polyethylene pipeline, XYZ will generates more cost efficiency for the company.*

Keywords: Oil & Gas, revenue, cost efficiency, capital budgeting, Payback Period

INTRODUCTION

Indonesia is a large archipelago with rich in natural resources including natural oil and gas, it is also known as one of the world's oil producing countries. Oil and gas industry has an important role in developing economies all over the world, including Indonesia. This industry gives huge contribution including job creation, taxation, investment and also energy security. In the period of 1979-1984 the oil and gas industry made a large contribution to the country revenues, its contributed 62.88% for the country revenues (Gewati, 2017). The contribution of oil and gas to Indonesia's national revenue experienced decline sharpest during the oil crisis which occurred during 2014 to 2015, since 2015 the revenues has decreased significantly from 14.11% in year 2014 to 4.46% in 2015 (PwC Indonesia, 2018) and in average of the revenue for the government and the income keeps on dropping to 4,99% in 2017 (Dolya, Sastry, Tamboto, & Rahman, Boston Consulting Group, 2017). This condition is caused by the decline of the crude's oil price, since the end of years 2015 the crude's oil price dropping significantly from about 100 USD per barrel in years 2011 until 2014 changes to 30 USD per barrel in 2015 (MIGAS, Laporan Tahunan 2015, 2015).

Figure 1: Performance of crude oil and gas



Source: SKK MIGAS Annual Report 2017

The volatility of oil price has been affected by the limited production and high demand. Figures 1 gives information about performance cruder oil and gas production in Indonesia between year 1966 to year 2017, from that figure its known that oil production in Indonesia has a sharp decline. This unpredictable condition has affected the business sectors in Indonesia in many ways including the oil and gas industry, many companies that rely on oil revenue end up collapse and many others have to reconstruct their spend and also delaying the new development projects that isn't economical anymore. In addition to that, although the volatility of oil price gives a huge impact to the economy and business sectors, oil and gas industry still remains the main source for the revenue of the country.

According to this condition, oil and gas companies should take an action to adjust its performance, they have to find ways to reduce costs while increasing operational efficiency so that they can survive in these conditions. The companies need to consider the main factors that might affect operational efficiency such as reducing the cost of Capex and Opex for the future projects. According to Axel Pierru and Denis Babusiaux (Pierru & Babusiaux, 2000) various methods are available for valuing future investment projects, project valuation is necessarily based on an implicit or explicit assumption about the project's financing that can influence the choice of the method used. In related with that condition XYZ as a subsidiary of one state-owned company that specialized in the gas distribution and natural gas industries, facing the same conditions with other oil and gas companies, the revenue of XYZ decreased from USD 2,896 million in 2014 to USD 2,571 million in 2015 and to USD 2,499 million in 2016. In year 2016 XYZ faced several challenges that required cost efficiency by reducing the cost of Capex and Opex, to face that challenges and in order to increase the revenue, XYZ has to develop the potential market in Block A - GIIC by developing new distribution pipeline project with cost efficiency, using another pipeline material besides steel pipeline as the standard material which is by using polyethylene pipeline or polyamide pipeline, the analysis will be calculated using capital budgeting model. According to Walter Meigs and Robert Meigs (Meigs & Meigs) Capital budgeting decisions are crucial to the long run financial health of a business enterprise, companies may benefit from good capital budgeting decisions and suffer from poor ones for many years.

The purpose of this study is for analyzing and evaluating which option is creating cost efficiency for the future project in Block A - GIIC based on capital budgeting model criteria in terms of: 1) Payback period; 2) Return on Investment; 3) Net Present Value; 4) Profitability Index; 5) discounted Payback Period; 6) Internal Rate of Return. The outcome of this study will facilitate the students and the academicians to assess the future projects develop by the company and it is also important for the management of the company to assess the development of the new projects by using capital budgeting model in order to guide them before making the decision.

LITERATURE REVIEW

1.1. NATURAL GAS INDUSTRY IN INDONESIA

Indonesia has the largest proven natural gas reserves in the Asia Pacific region, the country produces natural gas higher that that it consumes. Indonesia is ranked 10th in terms of global gas production, with proven reserves of 102 Trillion Cubic Feet (TCF)

in 2016. Indonesia's natural gas production market share actually decreased in in 2016 from 2.0% to 2.6% in 2014 (PwC Indonesia, 2018). National natural gas reserves are spread throughout Indonesia, the total natural gas reserves in 2015 is 150.39 TSCF (Dewan Energi Nasional, 2016). Some natural gas production is used for the industrial sector, power plants, commercial, transportation and households. In addition to the domestic needs, natural gas also used as an export commodity in the form of pipeline and LNG. During the period of year 2005 - 2015, the number of natural gas exports almost reached half of the total production or approximately the same as domestic gas consumption.

The use of domestic gas in 2015 showed a decline caused by the influence of the decline in crude oil prices. The low utilization of domestic natural gas is primarily due to the purchasing power of domestic prices that have not reached economic value so that the utilization of natural gas is prioritized to fulfill export contracts. In addition, the development of new gas sources is far from the center of the user and the development of infrastructure that is still minimal causes gas distribution to experience major handicap. However, the Indonesian government aims to limit the country gas exports to secure domestic supply while encouraging the use of natural gas as a fuel source for industrial and personal consumption. PT Pertamina (Persero) as a state-owned enterprise has only few part in gas production in this country and the rest of them dominated by the foreign company. In addition to that, XYZ that specialized in the gas distribution and natural gas industries have built a network transmission and distribution pipeline in Indonesia which has reached more than 7278 Km. The business activity of XYZ starts from front to end business process which includes planning, construction, production development, distribution of processed gas, and transmission to industrial, commercial, transportation and household users.

1.2. GAS PIPELINE MATERIAL

Pipeline network is one of the modes of transportation to carry gas from the gas source to the users, this kind of transportation is designed to quickly and efficiently transport the gas from the source to the users. There are two major types of gas pipelines along the transportation route: gas transmission pipeline and gas distribution pipeline. Gas Pipeline is a conduit made from pipes connected end-to-end for long-distance gas transport, material for gas pipeline must be able to maintain the structure of the pipe under certain environmental conditions, chemically in accordance with the fluid being distributed, and meet the requirements according to the application.

According to Alireza (Alireza Bahadori, 2017) the decision of what type of the pipeline the company want to use is depending on the type of the fluid to be transported, especially its corrosivity, flow regime, temperature and pressure. The selection of pipeline material type can become a fundamental issue which should be decided at the conceptual design stage of a pipeline project. The selection of pipeline material should be made after careful consideration of all conditions to ensure that the pipeline can remain fit-for-purpose throughout its life time. The most frequently used pipeline materials are metallic, especially carbon steel, however periodically new materials are proposed for use for pipe in natural fuel gas distribution system such as polyethylene pipe and polyamide pipe.

The service life of a metallic system is largely determined by its corrosion resistance and by the effectiveness of the cathodic protection system. The durability of a plastics system may be limited by the effect of time, temperature, and environment on each strength and other properties when evaluating the potential performance of a plastic system this effects and others must be considered. Compare to their metal counterparts plastics pipe has lower tensile strength and is less rigid and more temperature sensitive. However, plastic do over sufficient strength and stiffness for the job. The combination of these properties gives a system that satisfied the long-term performance requirement of most fuel gas piping application in a cost-effective manner (American Gas Association, 2006)

1.2.1. STEEL PIPE

Steels are the material of choice when fabricating pipes for the economic transmission of natural gas from remote regions to populated areas where the fuels are exploited in the generation of energy. Steel pipe still the only option for real high-pressure gas transportation at 50 bar or higher. Steel pipeline is the most commonly used material because it is easy to install. In gas installations every joint, transition, tee, and other is a critical point. Welding of steel pipes and the quality control of welds are well established. However, steel pipeline has corrosion problems hence it needs corrosion-resistant coatings to protect the pipe surface from corrosion hazards.

1.2.2. POLYETHYLENE PIPE

Polyethylene is a plastic or resin prepared by the polymerization of the ethylene as essentially the sole monomer. Ethylene, which has the chemical formula of C_2H_4, is an alkene or olefin; that is, it is an aliphatic hydrocarbon that has a carbon-carbon double bond on its molecular structure. Ethylene used in in the polymerization to polyethylene is a product of natural gas or oil refining. Polyethylene pipe performance properties have improved significantly since the last revision to the polyethylene pipe material classification. There are several types of polyethylene such as Lower Density Polyethylene (LDPE), Medium Density Polyethylene (MDPE), and High Density Polyethylene (HDPE), as the latest development of HDPE received the approval for operating pressures up to 10 bar.

1.2.3. POLYAMIDE PIPE

Polyamide are the thermoplastics produced in a condensation reaction. The polymer is produced from one of three types of commercially available monomers. The monomers are joined by amide links hence the name polyamide. The frequency or

density of this amide links will determine the type of polyamide. The most common polyamide are types 6 and 66. Because of the wide range of formulations for polyamides, there physical/chemical properties can also vary. In general, polyamides over excellent chemical and temperature resistance and good mechanical strength. For more than 20 years Polyamide pipes have been evaluated as a pipe material for gas distribution and for more than 10 years Polyamide pipes have been used in many countries, in recent years Polyamide pipe is being investigated for operation pressures above 10 bar.

1.3. CAPITAL BUDGETING

According to John and Jacques (John D. Stowe & Gagne, CFA, 2012) capital budgeting is the process that companies use for decision making on capital projects with a life of a year or more. Capital budgeting process started with generating the ideas, analyzing the project proposal, and planning the capital budgeting. According to Jerry, Paul and Don, the capital budgeting decision depends in part on a variety of considerations: the availability of funds, relationships among proposed projects, the company basic decision making approach and the risk associated with a particular project (Jerry J. Weygandt Phd, Kimmel Phd, CPA, & Kieso Phd, CPA, 2015). Actually, capital budgeting is critical to the business because the investment affect operations for many years and usually require large sum of cash (Tracie L. Miller-Nobles, Mattison, & Matsumura, Phd, 2016). According to Wiwiek (DR. Wiwiek M. Daryanto, 2014) there are six capital budgeting criteria decision tools including the techniques: 1) Payback Period; 2) Return on Investment; 3) Net Present Value; 4) Profitability Index; 5) Discounted Payback Period; 6) Internal Rate of Return.

1. Payback Period
   Payback period is the number of years required to recover the original investment in a project. The payback period may also be used as an indicator of project liquidity. Project with shorter payback period give an organization more flexibility because fund for another projects become available sooner. The Payback Period formula is as follow:

$$PP = \frac{\text{Amount invested}}{\text{Expected annual cashflow}}$$

2. Return on Investment (RoI)
   RoI is a performance measure, used to evaluate the efficiency of an investment or compare the efficiency of a number of different investments. ROI measures the amount of return on an investment, relative to the investment's cost. If an investment's ROI is not positive, or if other opportunities with higher ROIs are available, these signals can help organization/company eliminate or select the best options (Investopedia Website, 2018). The ROI formula is as follow:

$$ROI = \frac{\text{Accounting Profit}}{\text{Initial Investment}} \times 100\%$$

3. Net Present Value (NPV)
   NPV is capital investment analysis method that measure the net difference between the present value of the investment's net cash inflow and the investment initial cost. The difference between the present value of the cash inflows and the amount of investment is called the NPV. If the NPV is non-negative amount, the proposal of the project is accepted (Anthony, Hawkins, & Merchant, 2011). The NPV formula is as follow:

$$NPV = \sum_{t=0}^{N} CF_t / (1 + r)^t$$

N = Holding Period
t = Number of Periods in Years
CF = Cash Flow
r = Discount Rate (or Interest Rate)

4. Profitability Index (PI)
   PI is the present value of the project's future cash flows divided by the initial investment. PI is closely related to the NPV, whenever the NPV is negative, the PI will be less than 1.0. The PI indicates the value that receiving in exchange for one unit of currency invested. The PI formula is as follow:

$$PI = \frac{\text{PV of Future Cash Flow}}{\text{Initial Investment}} = 1 + \frac{\text{NPV}}{\text{Initial Investment}}$$

5. Discounted Payback Period

Discounted payback period partially addresses the weakness of the payback period. The discounted period does account for the time value of money and risk within the discounted payback period, but it ignores cash flow after the discounted payback period is reached. The discounted payback period formula is as follow:

DPP = Year before the DPP period occurs + (cumulative cash flow in year before recovery/discounted cash flow in year after recovery)

6. Internal Rate of Return (IRR)

IRR is the discount rate that makes the present value of the future after tax cash flows equal that investment outlay. IRR is considered one of the easier methods by which to develop an immediate idea of the percentage of return that will be returned in each alternative (Galli, 2017). The higher the IRR, the more desirable the project. The IRR formula is as follow:

$$\text{IRR} = \text{iNPV Positive} + \frac{\text{NPV Positive}}{(\text{NPV Positive} - \text{NPV Negative})} \text{ x } (\text{iNPV Negative} - \text{iNPV Positive})$$

METHODOLOGY

To accomplish this study, capital budgeting analysis used to analyze and evaluate which option is creating cost efficiency for XYZ using a steel pipe or by using another pipeline system for developing the future project in Block A - GIIC. Block A – GIIC. The steps are I) calculate the capital budgeting by using in six criteria: 1) Payback period; 2) Return on Investment; 3) Net Present Value; 4) Profitability Index; 5) discounted Payback Period; 6) Internal Rate of Return; and II) Determine which option is creating cost efficiency for XYZ to be implemented in Block A – GIIC, whether to use polyamide pipeline or polyethylene pipeline. In this research and the data that used for this analysis is collecting by XYZ in 2016.

RESULT AND DISCUSSION

The assumption used for capital budgeting calculation of using the three pipe material between steel pipe as a standard and polyethylene also polyamide pipe for developing future projects in block A – GIIC are: 1) period of time is 20 years from year 2017-2037; 2) the economic life is 20 years; 3) for the depreciation type is double declining combined with straight line at the half-end; 4) for terminal value is zero; 5) for the IRR when the NPV value is zero and money from investment came from XYZ; 6) the tax is 25%; 7) exchange rate used in USD 1 = IDR 13,350; 8) gas price per BBTUD is USD 8.57; and 9) discount rate at Present Value Factor = 11%.

Table 1: Capital Budgeting Calculation Summary

Item	Steel Pipeline (standard)		Polyethylene Pipeline		Polyamide Pipeline	
	Value	Unit	Value	Unit	Value	Unit
Payback Period	6.04	years	3.54	years	4.83	years
Return on Investment	19.72	%	29.82	%	22.38	%
Net Present Value	4.087.537.550	Rp	3.266.353.655	Rp	1.259.150.766	Rp
Profitability Index	9.15	%	8.40	%	2.98	%
Discounted Payback Period	9.03	years	4.59	years	6.78	years
Internal Rate of Return	12.91	%	14.16	%	11.87	%

Table 1 shows that capital budgeting calculation summary for steel pipeline as a standard pipeline in XYZ, Polyethylene pipeline and Polyamide pipeline. From the calculation for three pipeline system all of them have positive NPV, the result NPV for steel pipeline is Rp 4.087.537.550, for polyethylene pipeline is Rp 3.266.353.655 and for the polyamide pipeline is Rp 1.259.150.766, from the three pipeline NPV calculation, steel pipeline has the highest NPV. However, the polyethylene pipeline has the shortest payback period which is 3.54 years compare to steel pipeline 6.04 years and polyamide pipeline 4.83 years. The PI for steel pipeline is 9.15 % and polyethylene pipeline is 8.40 % and polyamide pipeline is 2.98 %, although the PI for polyethylene pipeline is lower than steel pipeline, polyethylene pipeline has the highest IRR compare to steel pipeline and polyamide pipeline,

the IRR for polyethylene pipeline is 14.16 % and steel pipeline is 12.91 % and polyamide pipeline is 11.87 %. Polyethylene pipeline also has the lowest discounted payback period which is 4.59 years compare to steel pipeline 9.03 years and polyamide pipeline 6.78 years and the percentage of the RoI for the three pipeline is RoI for steel pipeline 19.72 % RoI for polyethylene pipeline is 29.82 % and RoI for polyamide pipeline is 4.83, therefore polyethylene pipeline has the highest RoI.

Since the efficiency was the point of view of measuring which one is generates more efficiency and with reference to XYZ book of standard for the pipeline (PT Perusahaan Gas Negara, 2018), therefore the calculation result shows that polyethylene pipeline usage generated more efficiency for the XYZ compare with the usage of steel pipeline as a standard that used in XYZ or compare with the polyamide pipeline.

LIMITATION

This study has expanded the literature about capital budgeting model in the real working world. In near future, it is suggested to carry out research with many companies from gas industry to get more generalizes result. Since the focus is on one industry, it is worth to explore it on a wider scale and find out if different company yields the same result. In addition, the study only focuses on financial aspects. It is suggested to measure in other aspects such as technical and operational.

CONCLUSION AND RECOMMENDATION

The purpose of this study is for analyzing and evaluating which option is creating cost efficiency for XYZ using a steel pipe or by using another pipeline system which polyethylene pipeline or polyamide pipeline system. The data are analysed by using a capital budgeting model with these criteria: 1) Payback Period; 2) Return on Investment; 3) Net Present Value; 4) Profitability Index; 5) Discounted Payback Period; 6) Internal Rate of Return and the data that used for this analysis is collecting by XYZ in 2016. The analysis showed that by using a polyethylene pipeline, it will generate more efficiency for XYZ. The company is ready to execute the future project in block A – GIIC by using polyethylene pipeline, the company had longtime experienced in the gas pipeline projects and strong commitment on business innovation by continuously updating the pipeline technologies such as this polyethylene pipeline system. From the capital budgeting calculation, it is also shows that polyethylene pipeline generates more cost efficiency compare to steel pipeline and polyamide pipeline. It is suggested that in the long run, XYZ should prepare with the internal regulation to consider the used of other pipeline material than steel pipeline as the recent standard pipeline in the company. XYZ should also build long-term partnership with pipeline supplier, such as polyethylene pipeline supplier and polyamide pipeline supplier and benchmarking on the other experienced companies and/or other countries to gain more perspective on treating the issues related the used of polyethylene pipeline system.

REFERENCES

PwC Indonesia. (2018, May). *PwC Indonesia.* Retrieved from PwC Web site: https://www.pwc.com/id/en/energy-utilities-mining/assets/oil-and-gas/oil-and-gas-guide-2018.pdf

MIGAS, S. (2015). *Laporan Tahunan 2015.* Jakarta: SKK MIGAS.

Gewati, M. (2017, May 30). *Kompas*. Retrieved from Kompas.com: https://ekonomi.kompas.com/read/2017/05/30/151700226/indonesia.negeri.kaya.minyak.dan.gas.

Dolya, A., Sastry, A., Tamboto, E., & Rahman, F. (2017, November 6). *Boston Consulting Group*. Retrieved from Boston Consulting Group Website: https://www.bcg.com/publications/2017/upstream-oil-gas-energy-environment-indonesia-billion.aspx

Pierru, A., & Babusiaux, D. (2000). Capital Budgeting and Cost of Capital: A Unique Formulation of the Main Investment Decision Methods. *WP EFMA Athens 2000*, 1.

Meigs, W. B., & Meigs, R. (n.d.). *Accounting: The Basis For Business Decisions.* USA: McGraw-Hill Book Company.

Dewan Energi Nasional. (2016). *Outlook Energy Indonesia 2016.* Jakarta: Sekretariat Dewan Energi Nasional.

Alireza Bahadori, P. C. (2017). *Oil and Gas Pipelines and Piping Systems.* United Kingdom: Gulf Professional Publishing.

American Gas Association. (2006). *Plastic Pipe Manual For Gas Service.* Washington: American Gas Association.

John D. Stowe, C., & Gagne, CFA, J. R. (2012). *Corporate Finance A Practical Approach* . New Jersey: John Wiley & Sons, Inc.

Jerry J. Weygandt Phd, C., Kimmel Phd, CPA, P. D., & Kieso Phd, CPA, D. E. (2015). *Managerial Accounting Tools for Business Decision Making.* Singapore: John Wiley & Sons.

Tracie L. Miller-Nobles, C., Mattison, B. L., & Matsumura, Phd, E. M. (2016). *Financial & Managerial Accounting.* America: Pearson, Always Learning and My Accounting.

DR. Wiwiek M. Daryanto, S.-A. M. (2014). *Financial Management for Non-Finance Personnel.* Jakarta.

(2018). Retrieved from Investopedia Website: https://www.investopedia.com/terms/r/returnoninvestment.asp

Anthony, R. N., Hawkins, D. F., & Merchant, K. A. (2011). *Accounting: Text and Cases.* America: McGraw-Hill.

Galli, B. (2017). The Economics of Lean Six Sigma in Healthcare. *Industrial Management*, 26-30.

PT Perusahaan Gas Negara. (2018). *Standar Teknis dan Material Pipa.* Jakarta: PT Perusahaan Gas Negara.

Dolya, A., Sastry, A., Tamboto, E., & Rahman, F. (n.d.).

MIGAS, S. (2016). *Laporan Tahunan 2016.* Jakarta: SKK MIGAS.

Dyah Agitarini
Sekolah Tinggi Manajemen IPMI, Jakarta 12750, Indonesia
Email: dyah.agitarini@ipmi.ac.id,

Wiwiek Mardawiyah Daryanto
Sekolah Tinggi Manajemen IPMI, Jakarta 12750, Indonesia
E-mail: wiwiek.daryanto@ipmi.ac.id