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STRATEGIC BUSINESS ANALYSIS ON INVESTMENT METHOD FOR COAL TRANSSHIPMENT (CASE STUDY OF PT. KPC)

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Abstract— The economic slowdown in 2012 has exerted a significant impact on the coal industry. The fluctuation of demand for thermal coal, particularly from a large and growing market, forces producers to revise production plans set long before. Imposing a cost-saving mode throughout its operations, KPC can still maintain its sales volume for customers, while pursuing its strategy to increase coal production. According to Gede Ngurah Ambara, Manager of Business Performance Improvement at KPC, presenting at the 11th Annual Coal Market Conference 2013, KPC plans to produce a total of 66,66 Mt coal this year, still on track towards a 70 Mt production target in 2014. However, the capacity limitation of its coal loading facilities has impelled KPC to upgrade existing infrastructure. With total throughput of 42.5 Mt in 2012, there is a gap of around 27.5 Mt to be considered in 2014. While the main loading facility, Tanjung Bara Coal Terminal (TBCT), is being upgraded, transshipment could be the optimal alternative solution to ensure continuity of the coal supply chain. Playing an important role as an alternative to and complement of the TBCT operation, there must be intelligent selection of transshipment facilities. Thus, this project aims to decide on a suitable transshipment option to fill the gap in coal production. Options include an additional Floating Crane (FC), Floating Transfer Station (FTS) or Floating Coal Storage (FCS). The main factor governing the selection is maintaining a reliable coal supply to oceangoing vessels, avoiding bottlenecks, along with continued efforts to reduce demurrage. In the comparison of the methods, both a quantitative and qualitative assessment will be applied. The quantitative assessment used is an investment analysis of NPV, IRR, with WACC derived from Bumi Resources' financial statement of 2012, while for the qualitative one, a concept from LD Ports & Logistics, elaborating a Transshipment Solution Decision Model, will cover operational, environmental and other important factors impacting coal loading operations, as applied to KPC. With the assumption of 15 Mt of additional production to be handled by transshipment operations (while the remaining gap will be handled by developed TBCT), it is clear that in the KPC context, Floating Coal Storage is the optimal choice, compared to other options, as buffer storage of around 60,000 t will ensure the reliability of transshipment to oceangoing vessels, and will shorten turnaround and laycan time, thus minimizing any demurrage penalties. Comparing the calculation of lease vs. purchase options for Floating Coal Storage (FCS), along with the consideration of points from the KPC Transshipment Solution Decision Model, it is clear that leasing the facility is a wiser option for the remainder of the CCoW (Coal Contract of Work) period, terminating in 2021. As an additional aspect of this research, Porter's 5 Forces and a SWOT analysis of the company are to be conducted, with the intention of providing a broader perspective on both the coal industry and company performance, which will assist in determining whether this project is feasible for implementation.

Keywords : transshipment, reliability, bottleneck, demurrage, throughput

1. Introduction

Nowadays coal has become one of the most economical solutions for the energy sector, as it reduces the nation's heavy dependency on oil and gas. For the last several years, the coal business has placed Indonesia as one of the top global players. Benefitting from its ideal geographic position, and with total resources of 105 bn tons and reserves of 21 bn tons (according to Directorate General of Mineral and Coal 2013), Indonesia has become the world's biggest exporter of thermal coal. With the strategic proximity to fulfill growing demand of Asian importer countries like China, India, Japan, Taiwan and

South Korea, Indonesian coal has the advantage of lower transport charge and faster delivery to destinations. Further, simple truck and shovel mining techniques significantly contribute to lower costs for exploration and mine development in Indonesia.

To ensure the smooth flow of coal from mining site, an Overland Conveyor (OLC) of 13,2 km are used. Upon arrival at the TBCT, coal could be either stacked at stockpiles or directly loaded to the ocean going vessel. In Indonesia there are only several big producers that have dedicated coal port handling facilities, capable of transferring products directly onto ocean going vessels like KPC. Though, the ports has capacity limitation or maximum troughput a year. To anticipate the increasing production with port capacity constraints the common alternative solution is using transshipment facilities. A brief overview of transshipment activities of the big producers in Indonesia is shown on the *Figure 1* below :

PT Kaltim Prima Coal (KPC)

Year	Production	Floating Crane	Geared Vessel	Total
2010	40 Mt	9.1 Mt	3.4 Mt	12.5 Mt
2011	40.5 Mt	4.9 Mt	3.3 Mt	8.2 Mt
2012 E	43 Mt	6.7 Mt	2.5 Mt	9.2 Mt

PT Adaro Indonesia

Year	Production	Floating Crane	Geared Vessel	Total
2010	42.5 Mt	23.1 Mt	4.8 Mt	27.9 Mt
2011	42 Mt	29.2 Mt	5 Mt	34.2 Mt
2012 E	48 Mt	31 Mt	5.5 Mt	36.5 Mt

PT Berau Coal

Year	Production	Floating Crane	Geared Vessel	Total
2010	17 Mt	12.8 Mt	4.2 Mt	17 Mt
2011	20 Mt	17.6 Mt	2.4 Mt	20 Mt
2012 E	20.5 Mt	18.7 Mt	1.8 Mt	20.5 Mt

PT Indo Tambang Raya Megah

Year	Production	Floating Crane	Geared Vessel	Total
2010	22.2 Mt	0.5 Mt	0.4 Mt	0.9 Mt
2011	21 Mt	4.5 Mt	0.5 Mt	5 Mt
2012 E	35 Mt	5 Mt	0.6 Mt	5.6 Mt

PT Kideco Jaya Agung

Year	Production	Floating Crane	Geared Vessel	Total
2010	29.2 Mt	17.3 Mt	8.4 Mt	25.7 Mt
2011	25.5 Mt	21.3 Mt	6.6 Mt	27.9 Mt
2012 E	35 Mt	23 Mt	6.9 Mt	29.9 Mt

Figure 1. Total Transshipment of Big Producers (2010-2012)
Source : Iffan Nugroho's Presentation

2. Business Issue Exploration

Coal transshipment simply means the transfer of coal to a mother vessel, using floating facilities, normally carried out at the anchorage point. Parties involved in the process are tug/bargemasters, jetty coordinators, loading masters, surveyors, etc. In short, there are two types of transshipment:

1. Direct loading to geared vessel by stevedoring
2. Indirect loading to ungeared vessel, using intermediate facilities, such as: Floating Crane, Floating Transfer Station, or Floating Coal Storage.

For the whole coal supply chain at KPC, the total volume of throughput are as follows :

1. Tanjung Bara Coal Terminal, handling capacity of 80,000 tpd, annual throughput of 24 Mt
2. Floating Transfer Station, handling capacity of 1500 tph (24,000 tpd), annual throughput of 6.8 Mt
3. Floating Crane / gearless vessel, handling capacity of 2000 tph, annual throughput of 6.7 Mt
4. Barging / Geared vessel, capacity of 8,000 tpd, annual throughput of 2.5 Mt

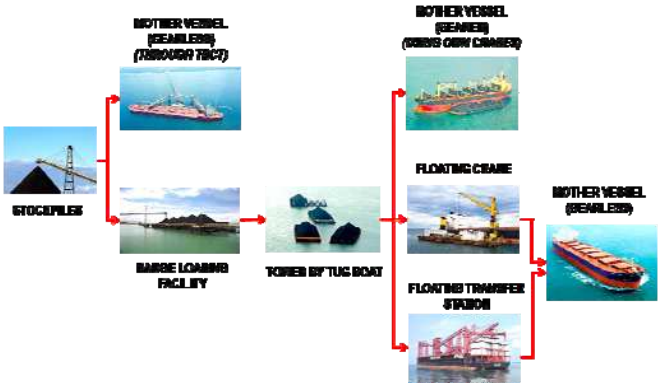


Figure 2. KPC's current coal loading operations

Problem statement :
The total coal loading capacity of all existing infrastructures is 40 Mtpa. Therefore, with a production plan of 70 Mt in 2014, means that there are around 30 Mt additional throughput a year. To address this issue, KPC has engaged in the expansion strategy by duplicating the Overland Conveyor (OLC) and building a second shiploader to double TBCT throughput. With the additional throughput of 30 Mt, the option to add transshipment facility is considered as an alternative. For the purpose of this project, the throughput capacity that is planned to be handled by proposed transshipment facility is 15 Mt.

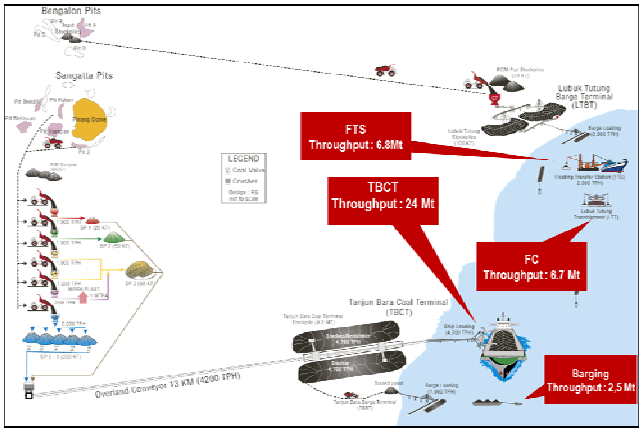


Figure 3. Total Throughput at KPC Coal Loading Operations

Research question : What kind of transshipment method is the most suitable to handle the additional 15 Mt coal production at KPC?

II.1 Research Objective
The objectives to be achieved in this final project is to compare three transshipment methods consists of Floating Crane, Floating Transfer Station and Floating Coal Storage using Qualitative and Quantitative Assessment and select which option is the most suitable to handle the additional production of 15 Mt at PT. KPC

II.2 Methodology
The research conducted in this final project is based on qualitative and quantitative assessment.
II.2.1 Method of Data Collection
Data used in this final project is gathered from Literature, Brainstorming and Interview with key personnel that involved in the transshipment operation and those with background in coal mining industry.
II.2.2 Types of Data Collected

Data collected are mostly secondary data from company's internal database, annual reports, data published during seminars, conferences, investor presentations as well as from websites and magazines. The data collected is related to the technical ability of Floating Crane, Floating Transfer Station, Floating Coal Storage and latest development in the industry

II.3. Conceptual Framework

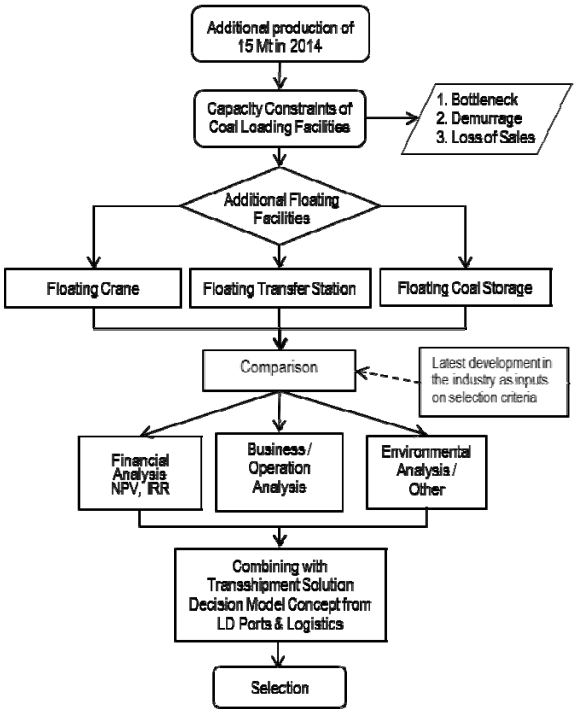


Figure 4. Conceptual Framework

The main problem of this project is the gap between increasing production and the capacity limit of the loading infrastructures. With the additional production being added to the flowrate with its maximum handling capacity, there will be congestion and bottleneck at the supply chain. If this happen, the volume of shipment will reduce from its optimum capacity and will yield to demurrage or even worse the loss of coal sales. This conceptual framework shows the alternative solutions by selecting the best option between three floating facilities which will be compared through combination of quantitative and qualitative assessment.

3. Business Solution

III.1 Methods of Coal Transshipment

According to PT. Mitra Bahtera Segara Sejati (MBSS), the definition of coal transshipment is the transfer of coal from barge to mother vessel, which can be executed in two ways:

1. Stevedoring – transfer of coal by using geared vessel.
2. Intermediate facilities – floating crane.

These methods are widely used nowadays, as the solution to port congestion and capacity constraints experienced by coal producers..

Following advances in design, several methods have become available in the industry, such as:

a. Floating Crane
b. Floating Transfer Station
c. Floating Coal Storage / Transshipment Vessel

The characteristics of each method are shown in the following table:

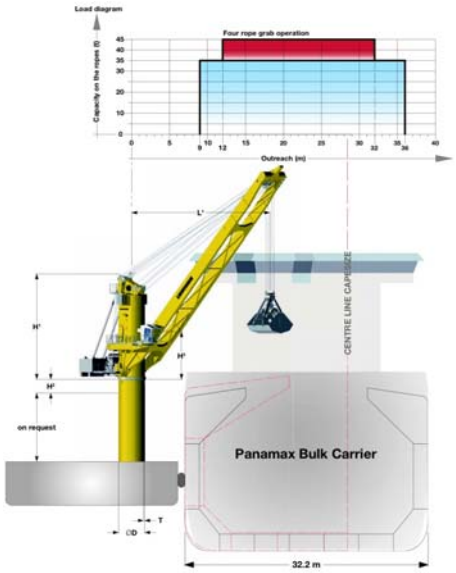
	Grab	Stationary Shiploader (Conveyor)	Travelling Shiploader	Onboard Cargo Storage	Gravity Reclaim
Floating Crane	√				
Floating Transfer Station	√	√			
	√	√		√	
Transshipment Vessel	√	√		√	
	√	√	√	√	
	√	√		√	√
	√		√	√	√

Source : LD Ports & Logistics

Figure 5. Transshipment Methods

III.2. Review of the floating crane (FC) Method

According to the *Bureau of Transportation Statistics Dictionary*, a floating crane is a crane mounted on a barge or pontoon, which can be towed from place to place or is self-propelled



Source : CBG Floating Cargo Cranes, Liebherr

Figure 6. Floating Crane

III.2.1 Benchmarking on the latest development in the industry *(FC. Princesse Abby)*

Source : PT. MBSS

Figure 7. FC Princesse Abby

Built at Subic Shipyard and Engineering, Philippines, under the supervision of Logmarin and Interprogetti, FC. Princesse Abby is a single crane on a pontoon which is used to unload coal from a barge and load it onto an oceangoing vessel, up to Capsize. Having a hull structure with a duly-

reinforced longitudinal frame and other features makes this facility able to operate in adverse weather conditions. Based on specifications on *Dry Cargo Magazine, February 2009 edition*, advantages of this floating crane are:

a. Double independent electrical generator sets, which can be run in shifts, to ensure 24-hour operation
b. High hoisting winches and slew bearings fitted with triple rollers and four motors to minimize potential breakdowns
c. A highly fuel-efficient and economical combustion system
d. 3,000 tonnes of buffer storage

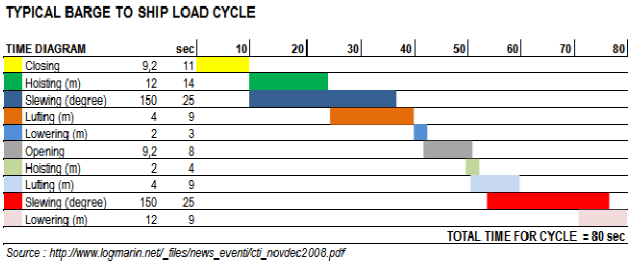


Figure 8. Typical Barge to Ship Load Cycle of Floating Crane (FC)

Using technical data from *Figure 8*, several characteristics of the Floating Crane with barge to ship load cycle time of 80 seconds can be seen from *Figure 9* below :

Typical barge to ship load cycle	80	seconds
Number of cycle per hour	45	
Volume of grab	24,3	m3
Specific gravity of coal	1089,5	kg
Total tonnage per grab	26,5	tonnes
Grab filing capacity	0,95	
Productivity	0,85	
Capacity per hour	962	tph
Physical Availability	90%	(20% is down due to maintenance)
Utilization Availability	43%	*(assumption made based on historical data for FC Princesse Abby by Georgre Edmunds)*
Effective working hours	9,3	hour/day
Total Loading Capacity per day	8.935	tonnes
Total Loading Capacity per year	3.216.720	tonnes

Source : http://www.logmarin.net/_files/news_eventi/cti_novdec2008.pdf

Figure 9. Total Capacity of Floating Crane (FC)

With the total throughput of **3,216,720** tonnes per year, the number of Floating Crane required to handle 15 Mt additional production is **5** units.

III.2.2. Investment Credentials

According to *Mario Terenzio's Presentation at floating Coal Terminal Conference*, the investment and operational datas of FC. Princesse Abby are described as follows:

a. Capital Expenditure: US$ 10,5 milion
b. Operational Expenditure : aboutUS$ 0,5/tonne
c. Annual throughput: > 3,800,000 tonnes
d. Daily loading rate (actual)
   - Average from day 1: 26,725 tonnes
   - Best: 28,080 tonnes
e. Fuel consumption: < 0,1 liter x tonnes of coal loaded (lower cost and emissions)

III.3 Review of the Floating Transfer Station (FTS) Method

A Floating Transfer Station is a floating facility usually supported by 2 cranes, hopers, conveyors and other feature including for sampling lab that is used to transship dry bulk from barge to ocean going

vessel up to Capsize. This facility is also completed with storage room for the dry bulk. A patent design of Floating facility by Mario Terenzio is shown at *Figure 5* below :

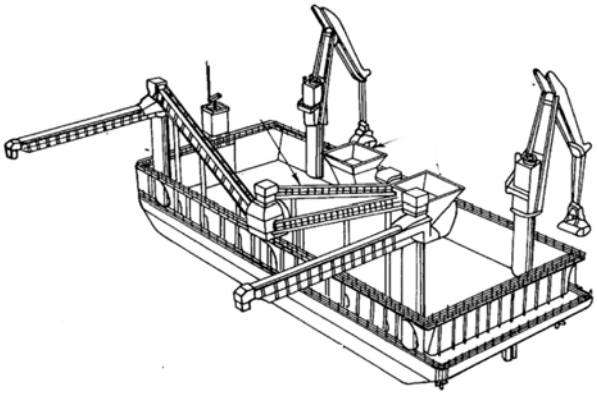


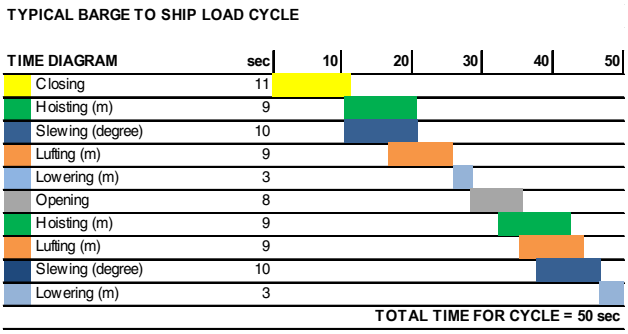
Figure 10. *Floating Facility equipped with crane, Patent no EP 1350716 A1 Mario Terenzio*

III.3.1 Benchmarking on the last modern Floating Transfer Station (FTS. Princesse Chloe)
FTS. Princesse Chloe having several characteristics as follows :

a. Daily loading rate of 50,000 tpd
b. Can load up to Capzise
c. Availability of buffer storage
d. Supported with Telescopic ship-loader with 2,200 tph capacity and 42 meters outreach
e. Sampler and Trimming chute
f. Can load from both vessel's side

Source : PT. MBSS
Figure 11. FTS Princesse Chloe

The typical barge to ship load cycle of a Floating Transfer Station is shown on the *Figure 12* below :



Source : Developed from Typical Barge to Ship Load Rate of Floating Crane by Logmarin
Figure 12. Typical Barge to Ship Load Cycle for Floating Transfer Station (FTS)

With the total throughput of **7,205,453** tonnes per year, the number of Floating Crane required to handle 15 Mt additional production is **3** units.

III.3.2. Investment Credentials

According to *Mario Terenzio's Presentation at Floating Coal Terminal Conference*, the investment and operational datas of FTS. Princesse Chloe are described as follows:

a. Capital Expenditure: US$ 17 milion
b. Operational Expenditure: about US$ 0,5/mt
c. Annual throughput > 7,000,000 t
d. Daily loading rate (actual)
   - Average from day 1: 46,973 t
   - Best: 54,243 t
e. Fuel consumption: < 0,1 liter x t of coal loaded (lower cost and emissions)
f. Best trimming – No dead freight

III.4 Review of the Floating Coal Storage (FCS) Method

A Floating Coal Storage is a large bulk with storage capacity between 60,000 – 280,000 tonnes, that provides an additional service of buffer storage, blending, sampling, weighing. The features for cargo handling consists of a combination of cranes,grabs, hoppers, conveyor belts and shiploader.

Source : Mario Terenzio Presentation, BLL on Floating Coal Terminals 2012

Figure 13. Floating Coal Storage / Floating Hub

III.4.1 Benchmarking on the last modern Floating Coal Storage (FTS. Mara)

FCS. Mara has several characteristics as follows :

a. Daily loading rate of 50,000 tpd (4 cranes)
b. Can load up to Capzise
c. Buffer storage of 60,000 t

Source : Rock Tree Logistics

Figure 14. FCS Mara

III.4.2 Investment Credentials

The investment and loading rate information of the facility according to *Mario Terenzio Presentations, Bulk Blogistics Landmark at the Floating Coal Terminals 2012 are :*

a. Capital Expenditure : US$ 40 milion
b. Operational Expenditure : about US$ 0,5/mt
c. Annual throughput : 18,000,000 t
d. Daily loading rate (actual)

- Average from day 1 : 50,000 t
- Buffer Storage : 60,000 t

e. Sampling and Blending Possibility

III.5 Quantitative Assessment

III.5. 1. Financial Analysis

Determining the Weighted Average Cost of Capital (WACC)

Using PT. Bumi Resources Tbk Financial Statement per March 2013, several components of WACC are listed below :

Total Liabilities US$ 6,969,008,115
Total Equity US$ 321,437,672
WACC = $(D/V)(r_d)(1 - T) + (S/V)r_{sL}$
CAPM = $r_{sU} = r_{RF} + b_U(RPM)$

Proportion of Debt in capital structure =(D/V) =
Total Liabilities : (Total Liabilities + Total Equity =
US$ 6,969,008,115 : US$ 7,290,445,787 = 95,6%

Proportion of Equity in capital structure = (S/V) =
1 – (D/V) = 1 – (95,6%) = 4,4%

Cost of Debt (r_d) = 15% *(assumption is taken from the average of long term debt + short term debt in US$ and Rp from the Financial Statement per March 2013)*

Using CAPM for Cost of Equity for levered firm (r_{sL}) =
$r_{RF} + b_U(RPM)$
r_{RF} = 1% (using LIBOR, London Inter Bank Offered Rate)
b_U = 1,95 (taken from www.reuters.com, Bumi Resources Tbk PT (Bumi.JK)
RPM = (Risk Premium – r_{RF}) ; risk premium is assumed to be 7,15% = (7,15% - 1%) = 6,15%

(r_{sL}) = $r_{RF} + b_U(RPM)$ = 1% + 1,95 (6,15%)
= 1% + 11,99% = 13%

Put all components to the equation of WACC =
$(D/V)(r_d)(1 - T) + (S/V)r_{sL}$
results in WACC = 95,6% x 15% x (1 – 30%) + 4,4% (13%)
= (0,956 x 0,15 x 0,7) + (0,044 x 0,13)
= 0,10038 + 0,00572
= 10,6%

To perform financial analysis of the three alternatives, several assumptions used in the calculations are as follows :

a. Annual Operating Expenses
1. Maintenance cost : 2% of the Capital Cost
2. Labor cost : 3,5% of the capital cost and having an increase of 10%/year
3. Fuel cost : Unit fuel consumption is set at 0,52 litre per tonne. Fuel price is fixed at US$1,2 per litre for 8 years)
4. Miscelaneous : Miscelanous cost is assumed to be 2,5% of annual maintenance, labor and fuel cost

b. Depreciation time is assume to be the same (8 years) with no salvage value (fully depreciated)
c. Coal price is set at US$ 65/t (the same for the next 8 years)
d. The scenario used is 8 years until the end of CCoW period in 2021

e. Coal price assumed to be US$ 65/ton for 8 years
f. Discount rate of 10,6%
g. The revenue is total sales of additional 15 Mt coal production

III.5.2 Initial Investment of Floating Crane (FC)

The capital cost per unit of FC. Princesse Abby as benchmark is US$ 9,300,000. Therefore, for 5 units of floating crane with daily loading rate of **8,935 tpd** the capital cost needed is **US$ 46,500,000**

Initial Investment	**46.500.000**	*(5 units of floating crane used, with assumption based on Princesse Abby's price US$ 9,300,000/unit)*
Annual Operating Expenses:		
Maintenance	930.000	*(assume to be at 2% of capital cost)*
Labor	1.627.500	*(assume to increase at 10% rate per year)*
Fuel	9.360.000	*(unit fuel consumption is set at 0.52 litre per tonne. Fuel price is fixed at $1.2 per litre for 8 years)*
Miscellaneous	297.938	*(miscellaneous cost is assumed to be 2.5% of annual maintenance, labor and fuel cost)*
Total Operating Expenses	**12.215.438**	
Depreciation of Floating Crane	**5.812.500**	*(assume equipment is fully depreciated in 8 years with no salvage value)*

Figure 15. Initial Investment of Floating Crane (FC)

With a discount rate of 10,6% and factored over a 8-year scenario, the calculation of the Floating Crane is:

Net Present Value (NPV) = **US$ 733,347,039**
Internal Rate of Return (IRR) = **340%**
Pay Back Period (PBP) = **0,29 year**
Profitability Index (PI) = **25**
Floating crane cost rate = **US$ 1.25/tonne**

III.5.3 Initial Investment of Floating Transfer Station (FTS)

The capital cost per unit of FTS. Princesse Chloe as benchmark is US$ 17,000,000. Therefore, for 3 units Floating Transfer Station with daily loading rate of **20,015 tpd** is **US$ 51,000,000**

Initial Investment	**51.000.000**	*(3 units of floating transfer station used, based on Ashok Mitra's presentation)*
Annual Operating Expenses:		
Maintenance	1.020.000	*(assume to be at 2% of capital cost)*
Labor	1.785.000	*(assume to increase at 10% rate per year)*
Fuel	9.360.000	*(unit fuel consumption is set at 0.52 litre per tonne. Fuel price is fixed at $1.2 per litre for 5 years)*
Miscellaneous	304.125	*(miscellaneous cost is assumed to be 2.5% of annual maintenance, labor and fuel cost)*
Total Operating Expenses	**12.469.125**	
Depreciation of FTS	**6.375.000**	*(assume equipment is fully depreciated in 8 years, with no salvage value)*

Figure 16. Initial Investment of Floating Transfer Station (FTS)

With a discount rate of 10,6% and according to a 8-year scenario, the calculation of the Floating Transfer Station is:

Net Present Value (NPV) = **US$ 728,588,818**
Internal Rate of Return (IRR = **310%**
Pay Back Period (PBP) = **0,32 year**
Profitability Index (PI) = **23**
Floating Transfer Station cost rate = **US$ 1.31/tonne**

III.5.4 initial Investment of Floating Coal Storage (FCS)

The capital cost per unit of Floating Coal Storage from Logmarin with daily loading rate of **50,430 tpd** is **US$ 40,000,000.**

Initial Investment	**40.000.000**	*based on Mario Terenzio's presentation from Logmarin*
Annual Operating Expenses:		
Maintenance	800.000	*(assume to be at 2% of capital cost)*
Labor	1.400.000	*(assume to increase at 10% rate per year)*
Fuel	9.360.000	*(unit fuel consumption is set at 0.52 litre per tonne. Fuel price is fixed at $1.2 per litre for 5 years)*
Miscellaneous	289.000	*(miscellaneous cost is assumed to be 2.5% of annual maintenance, labor and fuel cost)*
Total Operating Expenses	**11.849.000**	
Depreciation of FCS	**5.000.000**	*(assume equipment is fully depreciated in 8 years, with no salvage value)*

Figure 17. Initial Investment of Floating Coal Storage (FCS)

With the discount rate of 10,6% and uses 8 years scenario, the calculations of Floating Coal Storage are :

Net Present Value (NPV) = **US$ 740,220,024**
Internal Rate of Return (IRR) = **396%**
Pay Back Period (PBP) = **0,25 year**
Profitability Index (PI) = **30**
Floating Transfer Station cost rate = **US$ 1,16/tonne**

The summary of all calculations is shown in *Figure 18* as follows :

METHOD / CATEGORY	Floating Crane	Floating Transfer Station	Floating Coal Storage
Capital Expenditure	US$ 9,300,00	US$ 17,000,000	US$ 40,000,000
Operational Expenditure	US$ 12,215,438	US$ 12,469,125	US$ 11,849,000
Number of unit(s) required	5	3	1
Total Capital Expenditure	US$ 46,500,000	US$ 51,000,000	US$ 40,000,000
Net Present Value @ 15%	US$ 733,347,039	US$ 728,588,818	US$ 740,220,024
IRR	340%	310%	396%
PBP	0,29	0,32	0,25
PI	25	23	30
Cost / tonne	US$ 1,25/t	US$ 1,31/t	US$ 1,16/t

Figure 18. Financial and Investment Indicators

III.6. Qualitative Assessment

For qualitative assessment the concept used is Transshipment Solution Decision Model by LD Ports & Logistics. Applying that concept to KPC context, the results are as follows :

Figure 19. KPC Floating Coal Loading Selection

The explanation of *Figure 19* is as follows :

1. *Volume and ramp-up* :
   The selection method will be used to handle medium volume of coal (additional 15 Mt) and the ramp-up of transshipment facility is necessary to have the economies of scale.
2. *Cargo* :
   With the density between 673-913 kg/m^3 and low breakability, the proposed handling crane is heavy duty grabs for excellent penetration and good filling. While for the blending requirement, it is recommended if the process can be performed on board
3. *Regulatory Environment* :
   To own and become the operator of floating facilities the company must hold SIUPAL (Surat Ijin Usaha Perusahaan Angkutan Laut) from Ministry of Transportation. There are several requirements but the most important one is the company must have fleets to be used in the sea transportation. In this case, KPC is not having the line of business in shipping, so the best option is to hire from other licensed operator.
   Regarding the port management, KPC has more flexibility in cordination as the port are dedicated for private use of KPC, means that the communication is basically among internal departments.
   The other consideration on regulation is the end of Coal Contract of Work (CCoW) in 2021. Though KPC is still in the negotiation process with Government to extend the CCoW, the policy, strategy, investment plans and other crucial decisions must be consider this issue before being implemented.
4. *Shipping* :
   With draft of 18 anchorage point means there is no draft limitation to transshipment facilities and Mother Vessel. The other advantage is short distance from Barge Loading Facility to anchorage point that could increase the number of barge cycle to transport the coal.
5. *Labor* :
   With the high mining seasons where many new coal companies start operation, the need for labor also increase. Particularly on the floating facilities, the use of contractor crews or operators is considered the best solution since KPC has no expertise in this area also lack of skilled manpower in transshipment operation.
6. *Local operational condition* :
   The latest development of floating facilities has the ability to be less sensitive to adverse weather condition, yet the other factor such as barge breakdown, facility breakdown could also arise. In this section, the ability of spare parts is important to ensure the continuity of operation. Thus, the selection of facility must consider the availability of the spare parts both from local operators to foreign shipbuilders and also the expertise to handle the maintenance.

Having all parameters listed, the analysis of this concept will be used later in comparison of three transshipment methods available.

4. Conclusion and Implementation Plan

IV.1 Conclusion

Quantitative Assessment :

1. Comparing the alternatives of floating coal loading facilities for 8 years (the remaining time until CCoW expiration in 2021), the Floating Coal Storage results in higher NPV IRR, PBP, PI than FC and FTS.
2. Using buying and leasing scenario for 8 years with 10% discount rate for Floating Coal Storage, shows that leasing will have higher NPV with difference of US$ 3,903,692 than purchasing.
3. The use of Floating Coal Storage with capacity of storage 60,000 tonnes will simply ensure the reliability of supply to Ocean Going Vessels. This selection is considered the best among others to deal with uncertainty problems.

4. FCS with loading rate capacity of 50,000 tpd will need shorter time for loading operations compared to other options. Resulting in shorter laycan period means that demurrage potential cost has been avoided. Instead the despatch clausul will be applied where the company receives an amount of bonus as stipulated on the contract.

Qualitative Assessment :

1. Using Transshipment Decision Solution Model, the components that should be emphasize are :

a. Cargo : the possibility of blending process on board to meet the buyer's requirement and the sampling process to maintain the quality of the coal

b. Regulatory environment : - To operate the floating facilities a company should posses a SIUPAL (Surat Ijin Usaha Perusahaan Angkutan Laut). This factor should also become the consideration in purchasing or leasing the facility.

- The remaining period of CCoW in 2021 (8 years time) should be considered in the decision making process of the investment analysis

c. Labor : The availability of skilled labor and the expertise to handle the floating facilities are one of the important factors to be prioritized.

2. From the environmental analysis, the proposed facility should be geared with the environmentally friendly attachments such as closed conveyor, hopers, grabs that could minimize the spilage during coal loading/unloading.

3. From the operational analysis, the availability of buffer storage on board is an advantage as it could ensure the reliability rate of transshipment in the event of barge changing or barge breakdown so as to minimize waiting time. Another operational issue is the risk or potential hazards that could happen during the operation of the facility.

IV.2 Recommendation

Summarizing the results of Qualitative and Quantitative Assessment of the three proposed transshipment methods it is obvious that Floating Coal Storage is the most suitable solution for the purpose of handling additional 15 Mt of coal production. Using the leasing and purchasing scenario, the leasing method yield to better NPV with the **US$ 3,903,692** difference from purchase option. Taken into account the qualitative assessment where KPC has no expertise and lack of skilled labor to handle transshipment operations, the remaining CCoW period in 2021, the risk regarding owning the asset, the unavailability of SIUPAL license, so it is recommended for KPC to lease the equipment. Considering the lead time until the facility being delivered to site for operation, KPC should start to procure the FCS unit which is approved and classed with an appropriate and internationally recognised classification society and also registered as required by the law of flag and the Local Law, and seaworthy.

IV.3 Implementation Plan

Considering the increasing transshipment activities in Indonesia, the demand for transshipment facilities also increase. The company should start to implement this project by consulting the suppliers in industry for the procurement. The implementation plan is listed on the following steps :

A. <u>Pre-Implementation Stage</u>

1. Feasibility Study on selected platform
   - 1.1 Technical review on selected platform
   - 1.2 Platform selection (size, specification, capacity, and maintenance)
2. Project Procurement and Management
   - 2.1 Project team establishment
   - 2.2 Project preparation (administration, scheduling, and support)
3. Tender process
   - 3.1 Invitation to tender

3.2 Vendor selection (based on administration, price offered, payment terms, financing, maintenance and technical supports)

4. Equipment or Platform Preparation
   - 4.1 Technical preparation
   - 4.2 Non-technical preparation (permits and licenses)
   - 4.3 Manpower preparation

B. Implementation Stage

5. Equipment or Platform Construction and Erection at Selected Site
6. Equipment or Platform Commissioning at Selected Site
7. Equipment or Platform Fully Operational by KPC's Operators.

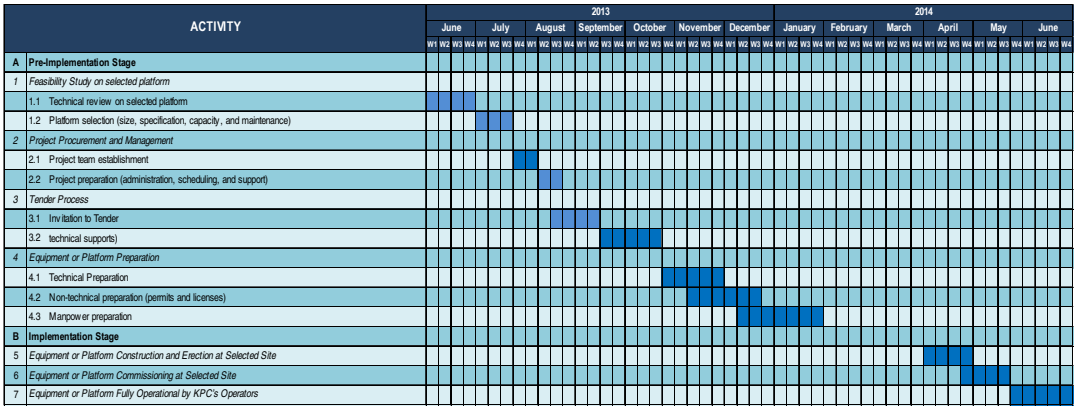


Figure 17. Implementation Plan

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