Financial Feasibility Study for Poly Aluminum Chloride Plant

Hery Dwiputranto[1],Hermanto Siregar[2], Hendro Sasongko[3]

[1]Business Management, Bogor Agriculture University, Indonesia
[2]Business Management, Bogor Agriculture University, Indonesia
[3]Business Management, Bogor Agriculture University, Indonesia

Abstract- Indonesian government issued a mining law no.4 of 2009 on the prohibition of the ore export. PT Antam (Persero)Tbk as a mining company is affected by the implementation of this regulation. PT Antam (Persero)Tbk has abundant and high quality resources of ore especially nickel and bauxite ore that can't be utilized. Ore resources have to be processed or refined to get more added value and benefit.The objective of this research is to evaluate the feasibility PAC plant project. The basic idea of this study is to utilize alumina tryhidratfrom bauxite ore made by Antam's subsidiary to have more added value.In carrying out this feasibility study four aspects were discussed; marketing, technical especially location, and financial aspect. Study on marketing aspect consists of study on product, price, distribution, promotion, and end users in Indonesia. Study on technical aspect consists of study on production process, production equipment, and lay out. Study on location aspect is to find best location for its project. In the financial aspect, some calculations were done. To calculate the financial feasibility study, author uses Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period(PBP) and Profitability Index (PI). The total project cost required for this PAC Plant with capacity of 15,000 tons per year wasIDR57,056,494,423.

Index Terms- Feasibilitystudy, Poly Aluminium Chloride, Net Present Value.

I. INTRODUCTION

PT Antam (Persero)Tbk is a state-owned company whose shares are 65% owned by the government of the Republic of Indonesia and the rest shares are owned by the public, and is engaged in the exploration, exploitation, processing, refining, and marketing of nickel ore, ferronickel, gold, silver, bauxite, coal, and noble metal refining services. In 2009, the government has issued a ban on the export of raw minerals or mineral downstream as indicated on mining law No. 4 of 2009, stating the holder of IUP (Mining Permit) production operations is required to do the mining processing and purification in the country. Potential reserves of raw mineral of PT AntamTbk, which are abundant and high quality especially nickel and bauxite ore, can't be maximally utilized due to the needs of the processing plant of PT Antam (Persero)Tbk, which at present can only process limited capacity and other processing plants in Indonesia are also very limited.

Strategy that PT Antam (Persero) Tbk uses to overcome this is to build processing plants for its mineral reserves to be processed into raw materials, auxiliary materials, or even a finished products.The demand of some industries for PAC in Indonesia increased steadily, domestic production has not been able to cover the needs of PAC in Indonesia, to cover the deficit some industries importthe material from countries like China and India.

Research Purposes

The purposes in conducting this study are:

1. To analyze the investment feasibility of the PAC plantsfrom the marketing aspects.
2. Determine the location of the PAC plants
3. To analyze the investment feasibility of thePAC plants from the financial aspects and the sensitivity of the PAC plants investment on the factors affecting the production.

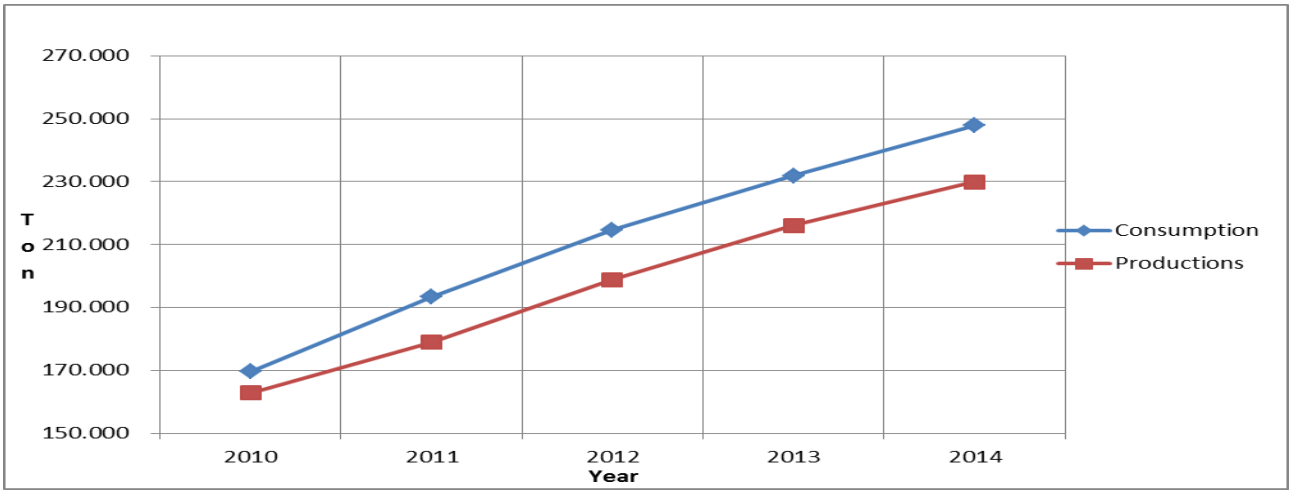
II. METHODOLOGY

There are 6 mayor step in doing this research which are: problem identification, sourcing from literature, data collection, evaluation by observation, data processing, and analyzing. The above were used to assess the three aspect of feasibility study namely market, location, and financial. Evaluation by observation applied mainly to assessing the suitable the proposed PAC plant location in terms of its proximity to raw materials & market, infrastructure availability, public facilities availability, labour, and Product Domestic Regional Bruto. The feasibility of the project whether this project is feasible or not based on NPV, IRR, PBP, and PI.

III. RESULT

1. Marketing Aspect

Marketing aspects in the feasibility study are used to view the market potential of the PAC product to be manufactured. The demand of AC in Indonesia continues to increase from year to year, it grew from 169 thousand tons in 2010 to 247 thousand tons in 2014. The demand of PAC in Indonesia still can't be met by domestic production, therefore Indonesia imports PAC. Productions and consumption PAC in Indonesia can be seen in figure 1.



Source : Data Survey 2015

Figure 1 Production and demand of Poly Aluminum Chloride in Indonesia

Market Characteristics of PAC

PAC is a commodity that follows certain quality standard (SNI) so that buyers, especially large buyers, require the fulfillment of the quality standards. The quality requirementsbecomes a "passing grade" for the admissibility of the suppliers' offers. The price of PAC is relatively cheap but it is used in large quantities, therefore low shipping cost, short delivery time, and the availability of storage or warehouse will be highly consideredto PAC buyers.

ProductandPrice of PAC

There are two typesof manufactured PAC products;solid and liquid. The solid type consists of several forms: powder, granules, crystals, and lump. PAC productshavevarious specifications based on the levels of Aluminum Oxide (Al2O3). The most widely known and most widely used PAC specifications in the marketcontains Al2O3 with 10% -12% liquid form.Meanwhile for the solid type, the most widely used contains Al2O3 with 30% solid form. Based on the use, PAC in liquid form is more widely used than PAC in solid form. The use of liquid PAC in industry is about 87% and the remaining is solid form. Types of product PAC and price in Indonesia can be seen in table 1.

Table1Price of Poly Aluminium Chloride in Indonesia in 2015

Types of Product	Content of Al_2O_3	Price (IDR/kg)
Liquid	10% - 12%	3,500 – 4,500
Liquid	17% - 18%	8,500 – 9,500
Liquid	30%	10,000-12,000
Solid	30%	11,000 – 12.,000

Source : Data Survey 2015

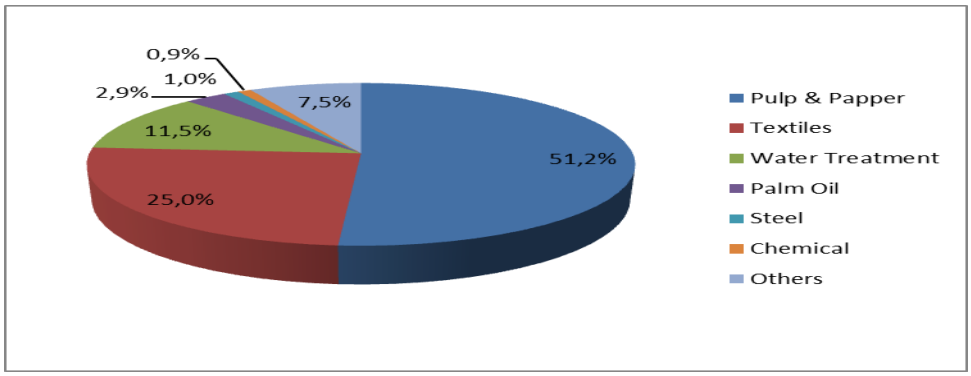
Distribution

PAC distribution system applied by PAC plants is divided into small-scale, medium and large plants. Small scale plants haveproduction capacity below 5,000 tons per year. In general, small-scale plantsdirectly supply PACto its consumers. PAC consumers or buyers and small-scale PCA plants are usually geographically in the same region. Medium-scale plants which aremedium category haveproduction capacity from 5,000 to 20,000 tons per year. Medium-scale plants have distribution system similar to small-scale plants, selling directly to consumers, but with a greater capability medium-scale lants can supply greater consumers with continuous supply such as the water company. The large-scale plants, with production capacity above 30,000 tons

per year generally distribute their products directly to large users with continuous needs such as local water company, paper industries, textile industry, and they do not sell its products to small users. Some of their products are also distributed through distributors. From distributors, some products are distributed directly to the users and the rest through traders.

End User Industries of PAC

The largest users ofPAC in Indonesia are paper and pulp industries, then followed consecutively by textiles, drinking water treatment, and cooking oil industries. Those four industriesconsume about 90% of total PAC consumption in Indonesia.



Source : Data Survey 2015

Figure 2 End User Industries of PAC

2. Location Aspect

Analysis to determine the location of the PAC plants uses Factor Rating method based on three alternative potential sites. The first stage of this method is to determine the key factors that are relevant and do a weightingadjustment to each factor that indicates the level of importance to other factors. Specify a value on all of the factors in each of the alternative location, then the value is multiplied by the weight of each factor. There are three alternatives location for PAC plant. The location are Krakatau Industrial Estate Cilegon (KIEC), Maspion Industrial Estate Gresik (MIE) and Tayan West Kalimantan.The chosen location, with the highest score, is Krakatau Industrial Estate Cilegon(KIEC). The result of factor rating method for location can be seen in table 2.

Table2The Recapitulation of location alternatives rating

No	Faktor	Weight	KIEC	MIE	Tayan
1.	Production Support Facilities	34	275	261	56
2.	Social and Public Facilities	10	100	100	54
3.	Labour	10	75	75	70
4.	Produk Domestik Regional Bruto	8	48	66	14
5.	Distance from Plant	38	248	238	124
	Total Score		746	740	318

3. Financial Aspect

Cash Planning

Expenditures flow or operating expenses consist of fixed costs and variable costs, fixed costs such as labor costs, maintenance costs of the plant, marketing, land lease, research and development, administration, and insurance. Variable costs include raw material costs, fuel costs, electricity costs, and transportation services.

Income flow (cash inflow) is the cash flow that occurs from transactional activities that bring in the cash income to the company, such as the sale of products, sales of assets, loans from other parties, rental receipts and other incomes. Income for the project of PAC is only obtained from the sale of products and byproducts of gypsum. The data can be seen in table 3.

Table3Cash Planning

Year	Production		Revenue (IDR)	Total Revenue (IDR)	Operating Expenses (IDR)
2018	PAC	11,000	49,500,000,000	59,400,000,000	(52,597,177,813)
	Gypsum	3,300	9,900,000,000		
2019	PAC	15,000	70,875,000,000	85,050,000,000	(71,688,316,369)
	Gypsum	4,500	14,175,000,000		
2020	PAC	15,000	74,418,750,000	89,302,500,000	(75,272,732,187)
	Gypsum	4,500	14,883,750,000		
2021	PAC	15,000	78,139,687,500	93,767,625,000	(79,036,368,797)
	Gypsum	4,500	15,627,937,500		
2022	PAC	15,000	85,510,864,688	101,373,221,250	(83,832,740,427)
	Gypsum	4,350	15,862,356,563		
2023	PAC	15,000	89,786,407,922	106,441,882,313	(88,024,377,449)
	Gypsum	4,350	16,655,474,391		
2024	PAC	15,000	94,275,728,318	111,763,976,428	(92,425,596,321)
	Gypsum	4,350	17,488,248,110		
2025	PAC	15,000	102,999,750,938	120,729,216,264	(97,518,136,582)
	Gypsum	4,200	17,729,465,325		
2026	PAC	15,000	108,149,738,485	126,765,677,077	(102,394,043,411)
	Gypsum	4,200	18,615,938,592		
2027	PAC	15,000	113,557,225,410	133,103,960,931	(108,179,265,386)
	Gypsum	4,200	19,546,735,521		
2028	PAC	15,000	119,235,086,680	139,759,158,978	(113,588,228,656)
	Gypsum	4,200	20,524,072,297		
2029	PAC	15,000	132,038,198,447	152,818,821,648	(119,857,820,050)
	Gypsum	4,050	20,780,623,201		
2030	PAC	15,000	138,640,108,369	160,459,762,730	(125,701,791,911)
	Gypsum	4,050	21,819,654,361		
2031	PAC	15,000	145,572,113,787	168,482,750,867	(131,986,881,507)
	Gypsum	4,050	22,910,637,079		
2032	PAC	15,000	152,850,719,477	176,906,888,410	(138,586,225,582)
	Gypsum	4,050	24,056,168,933		
			Total	1,826,125,441,894	(1,480,689,702,447)

Financing

Study on PAC plant investment for the most profitable financing schemes alternative needs to be done. Financing alternatives are financed entirely by own capital or equity, providedmostly bybank loans, provided mostlyby own capital, and provided by both loans and own capital in balance proportion. Four alternative financings for investment projects for 15 years are:

a. Alternative 1 (100% equity)
b. Alternatve 2 (35% equity)
c. Alternative 3 (65% equity)
d. Alternative 4 (50% equity)

WACC (Weighted Average Cost of Capital) is a weighted average of the cost of equity (CoE) and the cost of debt (CoD). WACC calculation is obtained from the calculation of cost of capital based on the portion of debt and equity. CoE is the return rate expected by investors, one way to estimate this is to use CAPM (Capital Asset Pricing Model). The formula of CoE is:

ri = rf + (β x Rp)

where,
ri = required return for asset i
rf = risk free rate of return
β = beta coefficient
Rp = risk premium

CoD = loan interest x (1 – tax rate)

WACC formula is :$WACC = CoE\left(\frac{E}{E+D}\right) + CoD\left(\frac{D}{E+D}\right)$

Table4 WACC calculations of the four financing alternatives

	Alternatif 1	Alternatif 2	Alternatif 3	Alternatif 4
rf (*Risk Free Rate)*	6.80%	6.80%	6.80%	6.80%
β (*Beta)*	0.795	0.795	0.795	0.795
Rp (*Risk Premium*)	10.23%	10.23%	10.23%	10.23%
CoE (*Cost of Equity)*	14.93%	14.93%	14.93%	14.93%
CoD (*Cost of Debt)*	0	7.00%	7.00%	7.00%
Equity Ratio	1	0.35	0.65	0.5
Debt Ratio	0	0.65	0.35	0.5
WACC	14.93%	9.78%	12.16%	10.97%
NPV (IDR)	21,477,588,580	22,895,283,616	22,024,922,145	22,410,163,533

Financing for PAC plant constructions based on the calculation of four alternatives above, wherein the second alternative has the highest NPV value therefore the funding scheme is 65% providedby the banks, while 35% of the investment will be financed by own capital with WACC 9.78%.

NPV, IRR, PBP, and PI Calculation

NPV is zero, it indicates that the project's cash flows is sufficient to pay the cost of the capital invested. If NPV is positive, it means the project will be profitable. The result of the calculation of NPV is Rp 22,895,283,616 (profitable).

The feasibility of an investment project can be known by comparing IRR to the cost of capital, if the IRR is greater than the cost of capital then the project is feasible. The result of the IRR calculation is 14.16% (feasible).PBPis 7,218 years, and PI is 1,4. it is considered feasible based on the payback period of the establishment of the PAC plant becausepayback period is shorter than the project's life and PI is more than 1. The calculation results can be seen in table 5.

Table5NPV, IRR, PBP and PI Calculation

Year		Cash Flow	WACC 9,78%		PV of Cash Flow
0	IDR	(57,056,494,423)			
1	IDR	476,130,253	0.91091	IDR	433,713,111
2	IDR	5,249,058,198	0.82976	IDR	4,355,469,081
3	IDR	5,898,442,060	0.75584	IDR	4,458,283,057
4	IDR	6,571,208,868	0.68850	IDR	4,524,310,117
5	IDR	8,719,391,037	0.62717	IDR	5,468,522,742
6	IDR	9,515,032,800	0.57130	IDR	5,435,893,395
7	IDR	10,341,370,405	0.52040	IDR	5,381,650,733
8	IDR	13,233,985,042	0.47404	IDR	6,273,426,699
9	IDR	14,228,097,766	0.43181	IDR	6,143,810,371
10	IDR	14,796,966,016	0.39334	IDR	5,820,233,548
11	IDR	15,851,055,295	0.35830	IDR	5,679,403,046
12	IDR	20,785,830,123	0.32638	IDR	6,784,044,004
13	IDR	22,225,433,512	0.29730	IDR	6,607,669,264
14	IDR	23,623,687,426	0.27082	IDR	6,397,680,055
15	IDR	25,082,767,788	0.24669	IDR	6,187,668,817
		Total PV of Cash Flow		IDR	79,951,778,040
		Total Initial Invesment		IDR	(57,056,494,423)
		NPV			**22,895,283,616**
		IRR			**14.16%**
		PI			**1.4**
		PBP			**7.218**

Sensitivity Analysis

This analysis aims to test the sensitivity of the project to the various factors that can affect it. Sensitivity analysis reveals that the testing reached maximum change of 15.00%. Projects are most sensitive to changes in PAC selling prices and raw material prices.

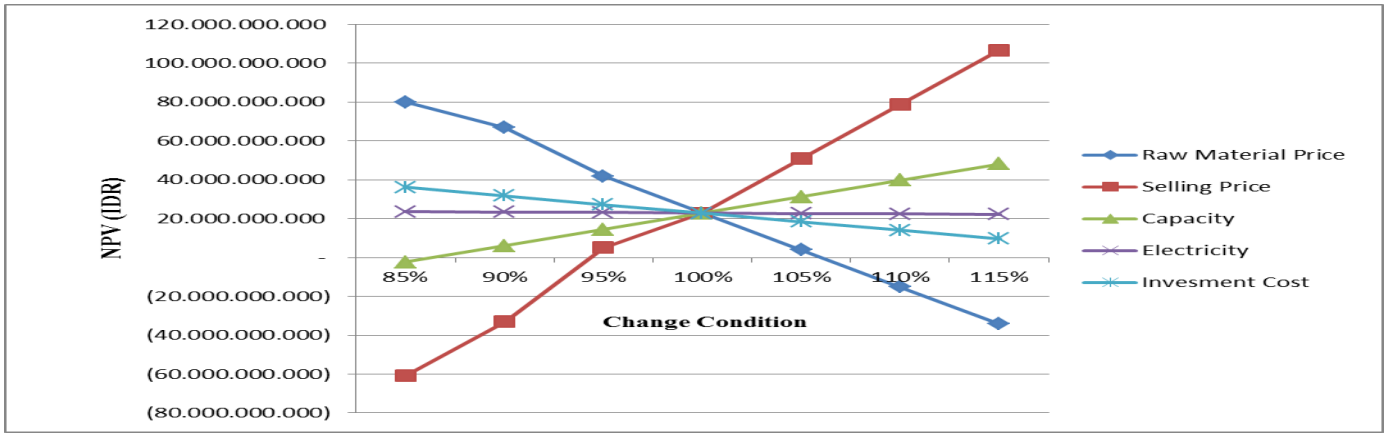


Figure 3 Sensitivity Analysis

IV. CONCLUSION

Based on the marketing aspect it can be concluded that the establishment of the PAC plants is feasible because the needs for PAC in the country increases each year, if calculated withthe Coumpound Annual Growth Rate (CAGR) method in the year 2010 to 2014 obtained the value of 9.95%. Until now, domestic production can't meet the needs of end user industries, and to meet the shortage Indonesia still imports PAC from several countries with China as top exporter. The production of end user PAC industries, such as paper industries, textile, water treatment company, and palm oil companies, continues to increase every year.

Based on the location aspect, Krakatau Industrial Estate Cilegon (KIEC) is considered the most feasible of all three location alternatives (two other locations alternatives are Maspion Industrial Estate Gresik and in the Tayan district Sanggau West Kalimantan province). This is due to the availability of complete supporting production facilities such as electricity, water, land, a

first-class roads, land, harbor with large capacity and public facilities and social facilities around Industrial Estate Cilegon. Availability of skilled labor in Cilegonis also one of the important considerations.

Based on the financial aspect, of the establishment of PAC plants with 15,000 tons per year production capacity, 15 years project period and funding schemes with 65 % provided bybank loans and the rest provided by own capital (the highest NPV and IRR from the four alternative schemes). The calculation result is feasible because the NPV is positive and IRR value is greater than the discount rate, consecutively Rp. 22,895,283,616 and 14.16%. The payback period ofPAC plant project is 7.218 years. Profitability Index is 1.4.The sensitivity analysis shows that the most sensitive are changes in raw material prices and product prices.

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AUTHORS

First Author– Hery Dwiputranto, Business Management, Bogor Agriculture University, email :hery.dwiputranto@antam.com
Second Author– HermantoSiregar, Business Management, Bogor Agriculture University.
Third Author – HendroSasongko, Business Management, Bogor Agriculture University.