CHAPTER I
INTRODUCTION

1.1. Background

At this moment, one of the Indonesian industries mainly being developed is the defensive industry because it is vital for Indonesia's existence. Indonesian Minister of Defense Juwono Sudarsono hopes that national defense industry program can be started in 2007, so gradually Indonesia can reduce the dependency on other countries in providing main device of defense system (Media Indonesia, 2005).

Nitric acid is one of the most important chemicals used as raw materials for many industries. The largest use for nitric acid is for fertilizer and explosives. Other uses of nitric acid are for nitration of organic compounds to make derivatives such as nitrobenzene, dinitrotoluene, and nitropropane. It is also used as an oxidizing agent and as a highly active acid for a multitude of purposes. Thus, it is essential for fertilizer, plastics, pharmaceuticals, dyes, synthetic fibers, insecticides, fungicides, and military aerospace materials. Unfortunately, the amount nitric acid produced in Indonesia is not sufficient compared to the amount of the industrial needs. This makes Indonesia still has this nitric acid imported. This is showed in the data below:

Supply of Nitric Acid in Indonesia (tones)

	1997	1998	1999	2000	2001	2002
Production	29796	55265	66766	27415	28058	29461
Import	3123	7031	4345	9118	7548	6632
Export	-	32052	39459	95	3	-
Supply	32919	30244	31652	36438	35603	36093

Source: Statistic Center Bureau

This preliminary plant is expected to help the development of nitric acid industry in Indonesia so that in the future our country can supply this nitric acid by itself, without importing them. Therefore, preliminary plant analysis is needed.

Nowadays, nitric acid is made by oxidizing ammonia over Pt-Rh alloy gauzes at 1073 – 1223 K to form NO, (NO yields of 94 – 96% and 4 – 6% of by products (N_2O and N_2)). However, the major drawbacks of this process are:

- High production cost
- Metal lost in the form of volatile oxides

- Formation of N_2O

(Perez-Ramirez and Vigeland, 2005)

N_2O gas is harmful for environment and causing the greenhouse effect and serious problem of ozone depletion.. Nitrous oxide traps about 300 times more heat than carbon dioxide. The concentration of nitrous oxide in the atmosphere has increased 17 percent over preindustrial levels (2004). Nitric acid production is the largest single source of N_2O in the chemical industry (125 Mtones CO_2-eq. per year), and the development and implementation of abatement technology for this gas is required.

In this preliminary plant design, it is proposed a technology that more environment friendly for the production of nitric acid by using lanthanum ferrite perovskite membrane catalyst. The advantages of using this catalyst are:

- NO selectivity up to 98%
- No formation of N_2O

(Perez-Ramirez and Vigeland, 2005)

1.2. Raw Material and Product

Raw materials used in this plant are ammonia and air. The liquid ammonia which is used has the >99.5% purity. The air used is ordinary air taken from atmosphere.

The nitric acid produced has concentration 60 wt %. Nitric acid is one of the most important chemicals used as raw materials for many industries. The largest use for nitric acid is for fertilizer and explosives. Nitric acid is used mostly as the raw material of ammonium nitrate. Ammonium nitrate is a material needed to make explosives. This 60 % nitric acid content is high enough as raw material in producing ammonium nitrate because it just needs 59 wt % HNO_3 for manufacturing ammonium nitrate. (Meyer, 1986)

Other uses of nitric acid are for nitration of organic compounds to make derivatives such as nitrobenzene, dinitrotoluene, and nitropropane. It is also used as an oxidizing agent and as a highly active acid for a multitude of purposes. Thus, it is essential for fertilizer, plastics, pharmaceuticals, dyes, synthetic fibers, insecticides, fungicides, and military aerospace materials

The Gross Profit Margin for this plant is between Rp. 10,374,121,423.00 and Rp. 13,916,216,632.00 per year. This data is observed more thoroughly from economic calculation in chapter 9.

1.3. Market Analysis

Based on Statistic Center Bureau, for 1997-2002, Indonesia still imports nitric acid in a relatively large amount. This is very worrying because nitric acid industry is one of strategic industry that should have been provided by the country itself.

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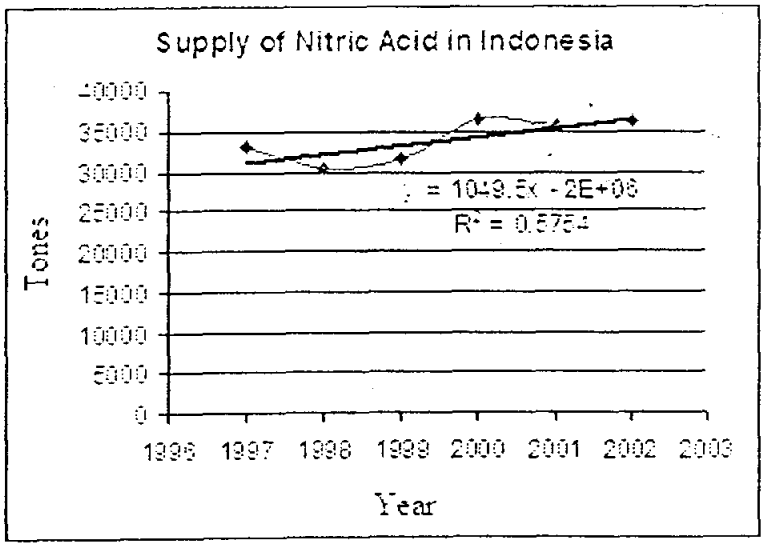

From linearization, it can be estimated that amount of nitric acid supply for the next years as follow:

2003	37498
2004	38547.5
2005	39597
2006	40646.5
2007	41696
2008	42745.5

Nitric acid plant needs ammonia as raw material. From the data about the availability of raw material in Indonesia, actually Indonesia has very large ammonia production capacity.

Supply of Ammonia in Indonesia (tones)

	1997	1998	1999	2000	2001	2002
Production	4350000	4352000	4199000	4785000	4959500	5058690
Import	323	1	271	6404	5583	391
Export	462770	555217	435392	882740	1110626	1060483
Supply	3887553	3796784	3763879	3908664	3854457	3998598

At this moment, ammonia domestic supply is sufficient enough, because there are seven plants produce ammonia. Those companies are:

Company	Capacity ($^{tones}/_{year}$)
PT Pupuk Sriwidjaja	1499000
PT Pupuk Kaltim	1749000
PT Pupuk Kujang	383000
PT Pupuk Iskandar Muda	366000
PT Asean Aceh Fertilizer	386100
PT Petrokimia Gresik	445000
PT Kaltim Parna Industri	500000
Total	5328100

From the table, it can be found that raw material for producing nitric acid, ammonia, is produced domestically in Indonesia abundantly.

Nitric acid is used mostly as the raw material of ammonium nitrate. To the 2003, PT Multi Nitro Kimia is the only one ammonium nitrate producer in Indonesia. Therefore, at this year of 2005, there are two ammonium nitrate plants is being built in Indonesia. They are PT Pupuk Kaltim Parna Amonium Nitrat (PKPAN), which is a joint venture between PT Pupuk Kaltim and PT Parna Raya Group, and the company cooperation between PT Dahana, PT Armindo, and PT MNK. These two companies plan to build ammonium nitrate plant with the production capacity 22000 tonnes per year.

If in 2005, these ammonium nitrate plants have been operated, nitric acid demand in Indonesia will increase whereas only one producer of nitric acid in Indonesia. It is PT Multi Nitrotama Kimia (MNK), with the production capacity

33000 tonnes per year. If there is no enough supply of nitric acid, PT Parna Raya Group has to import nitric acid.

Supply of Ammonium Nitrate in Indonesia (tones)

	1997	1998	1999	2000	2001	2002
Production	-	14542	26279	27673	30000	32000
Import	81732	107457	79027	91746	106320	164374
Export	2	-	5	-	-	5992
Supply	81730	121999	105301	119419	136320	190382

Considering the nitric acid demand in Indonesia, new ammonium nitrate plants developing, and the maximum capacity of PT MNK, the capacity of 22000 tones/year of a preliminary nitric acid plant is proposed to cover the nitric acid demand in Indonesia and to reduce nitric acid import.

1.4. Location Selection

- Plant Location

  Selection of plant location is crucial for the company. Plant location will determine the cost (especially raw material cost), marketing, energy availability, employee availability, transportation, and climate. Improper selection of plant location can lead to higher product price, because of higher production cost. For that reason, the plant will be located in Cikampek, West Java.

- Energy availability

  Energy availability consists of electric power and fuel power. The main source of electric power is supplied by PLN and generator set supplies the reserved source of electric power. Electric power is easily available because the plant location is located in industrial site.

- Fuel availability

  Fuel availability for the company will be supplied by Pertamina thus the company will not get any difficulties for fuel supply.

- Transportation facilities

  Transportation in Cikampek highly supports the marketing of nitric acid because Cikampek is located near the city that has good transportation facilities.

- Water supply

  Water supply for the company is supplied by PDAM because of its location in industrial site. The water supply for process water and cooling water that is

supplied by PDAM will get a treatment first so that the water can be used for the plant purpose.

- Labors supply

  Labors are from the area around the company. The nitric acid plant will help providing employment, reducing unemployment rate.

- Community factor

  The community can accept establishment of nitric acid plant since it will provide new employment and it will not produce hazardous waste after the treatment.

- Flood and fire protection

  The plant location in Cikampek is not in danger of flood, because it is located in highland. To anticipate fire hazard, hydrant and fire extinguishers will be used.

The plant location is considered based on raw material, market, employee availability, and utility. As explained above, nitric acid is the essential raw material for ammonium nitrate; the important chemical substance to make explosive material. To choose the location, it is better to consider the HNO_3 distribution rather than look for near NH_3 source. The storage of HNO_3 is complicated and expensive than NH_3 storage.(Meyers 1986)

In this nitric acid preliminary plant, the main plant location consideration is based on the market. PT Multi Nitrotama Kimia in Cikampek, West Java, will later use the product as raw material. That is why this nitric acid plant is considered to be established in Cikampek. Fortunately, ammonia as raw material can be bought from PT Pupuk Kujang Cikampek, which is in Cikampek as well. Cikampek is an industrial site. Therefore there is sufficient utility availability. Cikampek is also close to motorway Jakarta-Cikampek. So, there is a good transportation facility as well.