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Evaluasi Rekayasa dan Ekonomi Produksi Partikel Nano Fe3O4

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ABSTRACT

Makalah ini bertujuan mengkaji kelayakan ekonomi produksi nanopartikel Fe3O4 dari skalalaboratorium menjadi skala industri. Evaluasi dilakukan menggunakan 2 model studi kelayakan, yaitu: analisis teknik dan evaluasi ekonomi. Analisis teknik memberikan informasi potensi produksi berskala besar dan hasil proses ini dapat diterapkan menggunakan peralatan yang tersedia secara komersial dan murah. Evaluasi ekonomi dilakukan berdasar perbandingan grafik Cumulative Net Present Value pada keadaan ideal dan grafik pada saat dilakukan perubahan parameter (seperti perubahan nilai kurs dollar, kuantitas produk penjualan, dan besar nilai gaji karyawan). Dari hasil evaluasi, semua perubahan parameter memberikan nilai positif yang menunjukkan bahwa proyek ini layak dijalankan secara komersial dan dalam skala besar. Hal ini karena hasil evaluasi memberikan kestabilan indeks keuntungan pada beberapa perubahan nilai parameter. Studi ini menunjukkan bahwa fabrikasi Fe3O4 dapat memberikan laba yang menjanjikan di negara berkembang dan dapat menarik investor asing untuk bekerja sama dalam fabrikasi Fe3O4.

Kata kunci: Evaluasi ekonomi, Fe_3O_4, rekayasa.

Pendahuluan

Fe3O4 nanoparticles are one of the nanoparticles that are widely used in the field of water purification to analysis in the medical field. Its magnetic properties are widely used as magnetic resonance imaging material for clinical diagnosis [1] and also as an adsorbent for purification of wastewater [2]. Fe3O4 nanoparticles have many benefits that can continue to be developed to facilitate human affairs, thereforeresearchers develop the best and easiest wayto synthesize Fe3O4 nano particles.

Several researchers have reported how to synthesize Fe3O4 from various methods, basic materials and media used. Synthesis of Fe3O4 can be carried out by the hydrothermal method [3], diffusion of ammonia vapor and ultrasonic radiation [4] and thermal decomposition of acetyl acetate iron in organic media [6]. And its synthesis can be done with a variety of basic ingredients for example using a mixture of Fe3Cl2.6H2O and FeSO4.7H2O using the hydrothermal method [5], (NH4)2Fe(SO4)2 and FeCl3 [7]. Although there are many reports that confirm prospective methods for producing Fe3O4 nanoparticles, it is found that the most effective method is the synthesis of Fe3O4 based on Rajput [8]. But, there are no reports on economic analysis for feasibility studies on a large scale.

Information on economic analysis for the feasibility study of Fe3O4 production on a large scale can provide better prospective ideas for practitioners in the industry to apply the method realistically. Based on our previous studies [9-12], therefore, the aim of this study is to analyze economically the feasibility of the Fe3O4 synthesis method. This method was evaluated using two main perspectives of Fe3O4 nanoparticle production, namely technical and economic evaluation and then variations were made to see the feasibility of the synthesis method in various circumstances. We vary the effect of changes in the value of the dollar

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exchange rate against the rupiah on the value of fabricated Fe3O4 nanoparticle fabrication benefits, the effect of daily sales quantity on the fabrication benefits of Fe3O4 nanoparticles, and the effect of employee salary increases on the sustainability of Fe3O4 fabrication.

Metode Penelitian

The method used in this research is based on the analysis of prices of materials and equipment, as well as equipment specifications sourced from online websites such as Alibaba.com. Stochiometry calculations are used based on the following reactions [8]:.

$2Fe_2+ + Fe^{3+} + 8OH^- \rightarrow 2Fe(OH)_3 + Fe(OH)_2\ Fe_3O_4\ (s) + 4H_2O_{(l)}$

Data processing is calculated based onsimple mathematical calculations using the Microsoft Excel application to obtain economic evaluation parameters: Gross Profit Margin (GPM), Payback Period (PBP), and Cumulative Net Present Value (CNPV). Calculation of this parameter is based on the literature presented in the formulation:

- GPM parameter is obtained by reducing sales (S) with raw materials (R). GPM = S - R
- PBP isthe calculation carried out to predict the length of time required to restore the total initial price. The simplest way to get PBP is determined from the CNPV / TIC curve, which is when the zeropoint value is achieved for the first time.
- CNPV is the calculation of the total Net Present Value (NPV) value from the start of construction of the plant to the end of the plant's operation. In short, CNPV can be obtained from the cumulative amount of financial flows each year. CNPV = $\sum$ NPV
- Net Present Value (NPV) is the value obtained as income and expenses as a company. The calculation of the thirst NPV takes into account the value of the discount rate (i). In addition, NPV can alsobe used to estimate future cash flows (CF). NPV is obtained by NPV = CF.i
- TIC is the initial capital cost that must be provided at the beginning of production. TIC is predicted based on Lang Factor (estimated ratio of the total cost of creating a process within a plant).

Some assumptions based on the process are illustrated in Figure 1:

- All chemical compositions in the reaction, such as Iron (III) Cloride Hexahydrate (FeCl3.6H2O), Iron (II) Cloride Tetrahydrate, Ammonium Hydroxide (FeCl2.4H2O), Tetramethyl Ammonium Hydroxide ((CH3)4NOH) and distilled water used to produce Fe3O4 nanoparticles were increased by 4000 times and calculated based on literature[8].

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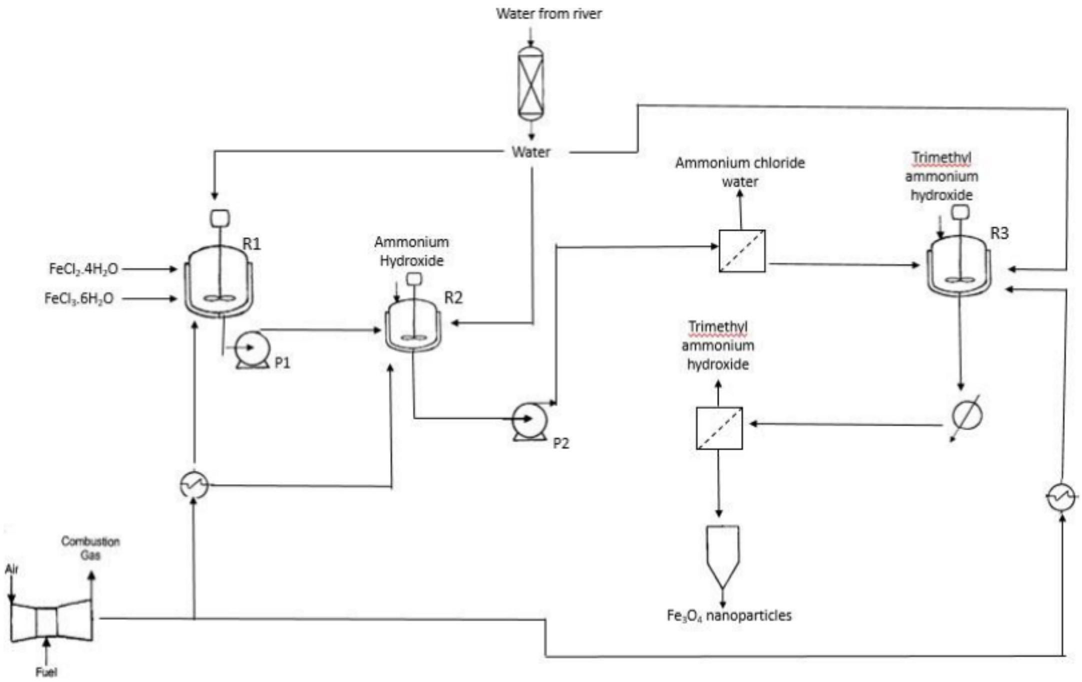

Figure 1. Process flow diagram of Fe3O4 nanoparticles.

- There is a possibility that 5% of the intermediate product yield in this reaction is wasted.
- The assumption conversion rate for all reaction is 100%.
- Fe3O4 nanoparicles are obtained with 100% purity.
- The level of production is based on smallscale industry

Some factors that can be assumed to analyze the economic perspective are:

- The exchange rate of USD (United States currency) against IDR (Indonesian currency) is set at 1 USD = Rp.14.1650,00.
- Prices of all raw materials and equipment are based on Alibaba.com prices, whichare the prices of Iron (III) Cloride Hexahydrate (FeCl3.6H2O), Iron (II) Cloride Tetrahydrate (FeCl2.4H2O), Ammonium Hydroxide (NH4OH)), and Tetramethyl Ammonium Hydroxide ((CH3)4NOH) are 5 USD / kg, 3.5 USD / kg, 11.5 USD / L, and 75 USD / kg, respectively.
- The total investment cost (TIC) is calculated based on the Lang Factor.

The production process is carried out under the purchased land. Therefore, the land is calculated as an industry initial cost and is recovered after the project (project end). Direct depreciation type is used to calculate depreciation:

- This process takes 6 hours to produce 19 kg of Fe3O4 nanoparticles based on the stoichiometry calculation.
- In one day there is only one Fe3O4 production cycle.
- Minimum product purchase is one package (1 kg).

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- The water distillation process is carriedout in the morning.
- Working days in one year are 300 days and the remaining days are used forcleaning
- The basic electricity cost is 0.098 USD/kWh based on the PLN Indonesia electricity tariff.
- The total workforce is assumed to get a fixed value of 232 USD/day
- Discount rates and income taxes are 15 and 10% every year.
- The project operation length is 10 years.

Then the feasibility test for this economic evaluation by varying 3 aspects:

1. The price of raw materials in 6 conditions of fluctuations in the exchange rate of dollar against Rupiah (Rp. 16,000, Rp. 18,000, Rp. 20,000, Rp. 22,000, Rp. 24,000, and Rp. 26,000).
2. Quantity of product sales every day in 5 circumstances namely (11, 13, 15, 17, 19) packs/day.
3. Increase in employee salaries in 5 circumstances namely (increase of 500 thousand rupiahs, 1 million rupiahs, 1.5 million rupiahs, 2 million rupiah, and 2.5 million rupiah).

Hasil dan Pembahasan

1. Engineering Perspective

Figure 1 describes the project flow from the beginning to the end. There are 3 reactors, 1 filtration reactor and 1 evaporator. From one reactor to another reactor is connected with pump to transport the reaction results except from reactor 2 to reactor filtration can be moved manually. There are 5 types of compounds used in this project, namely solid FeCl3.6H2O and FeCl2.4H2O, water, NH4OH solution and (CH3)4NOH. The time needed for making Fe3O4 nano particle once is 8 hours.

Reactor 1 which is a stainless steel reactor can hold 1000 L material in one mixing. There is dissolution and reaction of solids FeCl3.6H2O with FeCl2.4H2O in a 2:1 mole ratio in reactor 1. Both solids are dissolved in water obtained from river water treatment using a water treatment machine.

After 1 hour, the results of the reaction in the reactor 1 are moved using a pump to reactor 2. In reactor 2, there will be another pump used as a place to flow the NH4OH solution which will be dripped on thereaction results from reactor 1. The process on reactor 2 is carried out for 3 hours. The result of the reaction in reactor 2 are the solid Fe(OH)3 and Fe(OH)2 which are still wet due to the presence of H2O and NH4Cl in the form of solution. Therefore, the transfer is carried out using human power because it avoids the pump congestion due to the presence of solids Fe(OH)3 and Fe(OH)2 in it.

At the filtration reactor, the solids of Fe(OH)3 and Fe(OH)2 are separated with their impurity solution. The solid is washed with running water and flowed with a special pump to the reactor 3. The filtration process runs for 2 hours. At the reactor 3, tetramethylammonium is added and then pumped back to the evaporator to remove the solvent in it.

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The improvement process is possible from a technical point of view, this is because the process can be applied commercially and the equipment used can be obtained at a low price. The availability of a variety of tools and ease of reaction carried out on an industrialscale without any special treatment that must be applied to obtain the product. Furthermore, the results of the project calculation with 300 processing cycles per year. This scheme is prospective enough to produce 5700 kg of Fe3O4 per year and requires 13.9 tons of FeCl3.6H2O plus 5.1 tons of FeCl2.4H2O per year as shown in Table 1. The value of the mass of each material is obtained from a stochiometric calculation to get the exact amount of each ingredient.

These three ingredients are essential ingredients for making Fe3O4 nanoparticles. Furthermore, the total equipment purchase analysis is USD 38432,52 as shown in Table 2. As shown in Figure 1, the used reactor is a reactor that can hold as much as 1000 L material and stainless steel is used to avoid any reaction with raw materials in it. The pump used for this project is a water pump because the solvent used is still using water so it can easily use a water pump.

Table 1. Several raw material used

$FeCl_3.6H_2O$ (kg)	**$FeCl_3.4H_2O$ (kg)**	NH_4OH (L)	Reaction Conv. (%)
13900	5100	4496	100

Table 2. Prices of equipments

No	Item	Price	Items	Total Prices (Rupiah)	Total Prices (Dollar)
1	Reactor	28,380,000.00	2	56,760,000.00	4,007.06
2	Filtration	21,228,000.00	3	63,684,000.00	4,495.87
3	Nitrogen Storage	22,089,600.00	1	22,089,600.00	1,559.45
4	Reactor of Filtration	110,682,000.00	1	110,682,000.00	7,813.77
5	Oven	113,080,000.00	1	113,080,000.00	7,983.06
6	Pump	19,789,000.00	9	178,101,000.00	12,573.31
	Total	**315,248,600.00**	**17**	**544,396,600.00**	**38,432.52**

Adding Lang Factor to the calculation, TIC must be less than USD 171,615 to get PBP on the 4 th year based on the excel calculation. This value is economically relevant and this project requires less investment funds. Ideally, the project could reach 300 days of processing cycles per year, which could possibly produce 5.7 tons of Fe3O4 per year. Adding to the calculation for 10 years from the project's life time, the results show that the entire project could produce 57 tons of production ideally.

2. Economic Evaluation

2.1. Ideal Conditions

Figure 2 shows the relationship between CNPV/TIC values on the Y axis and project life time on the X axis under ideal conditions. In the curve, it can be found a negative CNPV/TIC (%), value below 0%, in the first year to the 4th year. The lowest CNPV/TIC value occurred in the second year which is

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worth -84,324% but after that, the curve rises again up to the first year 10 reached a value of 237,269%.

There is no profit from the 1st year to the 4th year. This is because the initial capital costs such as the tools needed during the process of producing Fe3O4 nanoparticles but after 4th year obtaining an increase in profit. The similar PBP prediction is alsoshown in Table 3, which presents the CNPV value each year to see when capital reversal occurs. In Table 3, the CNPV value is negative from the first to the 4th year and then the CNPV is positive again in the 5th year with a value of Rp 662,588,586 and continues to increase until the 10th year with value of Rp 5,744,011,906. Thus, the production of Fe3O4 nanoparticles can be considered profitable projects. This is in linewith previous studies where there was a decrease in CNPV/TIC value below 0 in the initial 2 years to restore the total initial expenditure on the project. But after that,there will be an increase in CNPV/TIC value to a positive value in economic parameters [11].

Table 3. Annual CNPV values in ideal

Tahun	CNPV (Rupiah)
0	0
1	-982,754,210
2	-2,038,204,405
3	-1,369,980,741
4	-353,696,077
5	662,588,586
6	1,678,873,250
7	2,695,157,914
8	3,711,442,578
9	4,727,727,242
10	5,744,011,906

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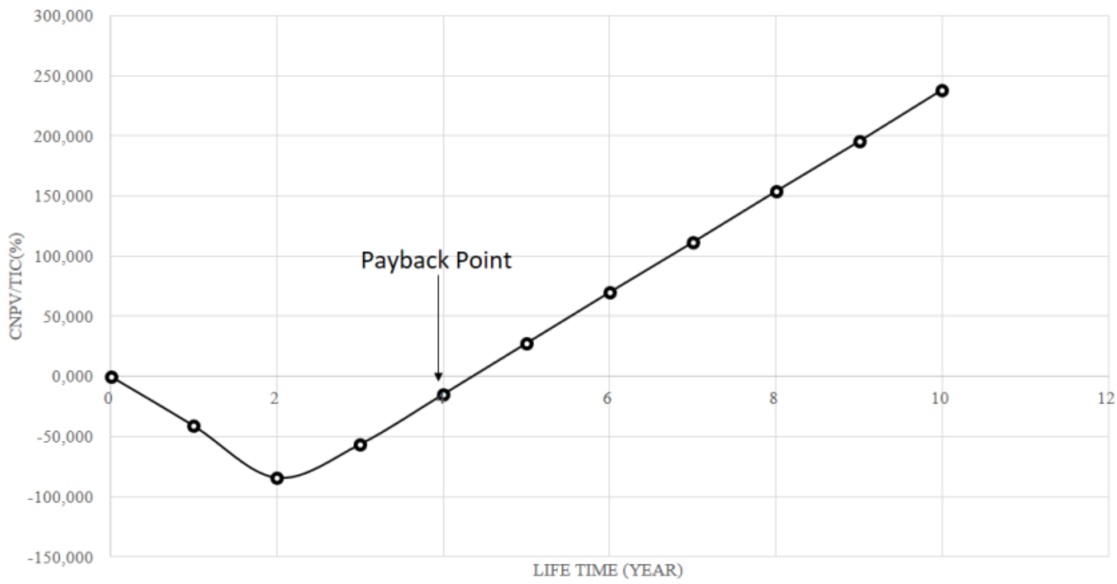

Figure 2. CNPV/TIC graph for lifetime year under ideal conditions.

2.2. The effect of the dollar exchangerate

Figure 3 shows the relationship between the increase in the exchange rate of the dollar against the rupiah on the X axis and thevalue of the GPM on the Y axis. On the X axis, the value varies is the exchange rate of the dollar against the rupiah made in the range of 14,000-26,000 and on the Y axis, the results of GPM are calculated for each change in exchange rates dollars that affect raw material prices. There are 2 curves in this graph. Yellow linear graph shows the value of GPM in ideal conditions where the exchange rate of the dollar against the rupiah is worth 14,000. The curve is made linear in one value to facilitate comparison in the graph. The blue curve shows the relationship between the exchange rate of the dollar exchange rate which varies from 14,000– 26,000. The value of GPMdecreased from 1,117,198,213 at the value of the dollar exchange rate against the rupiah of 14,000 to the value of -42,353,942.14 at the exchange rate of the dollar to the rupiah of 26,000. The curve in Figure 3 follows the equation y = -97022x + 2.109 and has a value of R 2 = 0.999.

Based on the blue curve, the GPM value in this project will decrease along with the increase in the exchange rate of the dollar against the rupiah and the project will no longer benefit if the exchange rate of the dollar against the rupiah has reached a value of 26,000, then this project will benefit if the exchange rate of the dollar against the rupiah below the value of 26,000. From the analysis to evaluate the effect of raw material prices on the value of GPM by increasing the price of raw materials based on the dollar exchange rate as a whole or it can be said that all raw material prices are raised simultaneously but with a fixed sales value.

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The results show that the increase in material prices, the standard has a negative impact on the value of GPM.

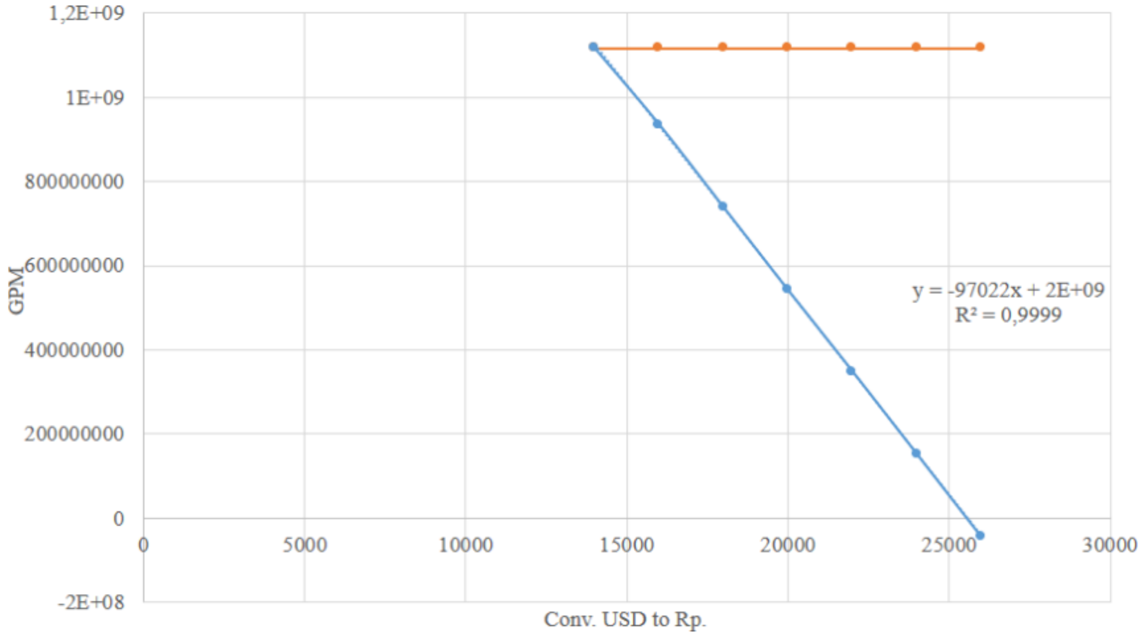

Figure 3. Graphs of the relationship of the value of GPM to changes in the conversion of dollars in rupiah.

Based on this, the changing value of raw material prices can affect the value of CNPV as shown in Figure 4, which shows the relationship between the values of CNPV/TIC on the Y axis to life time on the X axis under various conditions of dollar exchange rates against different rupiahs. The increase in the value of the dollar exchange rate against the rupiah is made to rise gradually by 2,000 rupiah from a range of 14,000 to 26,000 rupiah. In the first to fourth years, there was a decrease in the value of CNPV in every condition of the dollar exchange rate. This is consistent with the comparison curve of CNPV/TIC (%) value with life time year in ideal conditions which also experienced a decrease in CNPV/TIC value (%) and will increase in the 5th to 10th year. CNPV/TIC value (%) continues to decline along with the increasing of the dollar exchange rate, so that the highest CNPV/TIC (%) value is when the dollar exchange rate is at 14,000 or ideal conditions, and continues to fall until it reaches a negative value at the dollar exchange rate at 24,000. There is a difference between the curve in Figure 4 that reaches a negative GPM value of 26,000, because on the graph only takes into account the effect of raw material prices. While on the CNPV curve, other values also affect thesize of the CNPV value that will affect the shape of the comparison curve CNPV/TIC (%) of life time year.

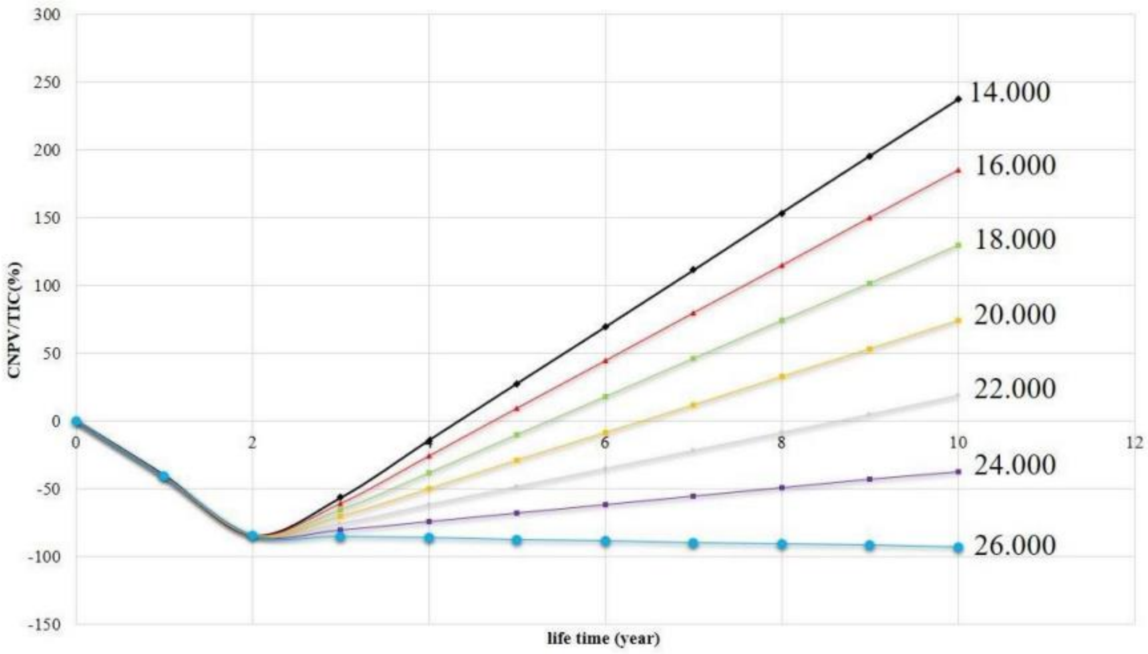

Figure 4. Graph of the relationship of the NPV/TIC value to the life time of each change in the conversion value of the dollar in rupiah.

Raw material prices depend on the dollar exchange rate affect company profits so it must be predicted how long the factory can maintain market prices if there is an increase in the dollar price. This has been studied previously where costs affect project profitability. The decrease in variable costs results in a high final CNPV value. However, by increasing variable costs, the CNPV value decreases so when the variable costs are lower, the effectiveness of the project to generate profits will be high [10]. An increase in raw material prices results in a decrease in the final CNPV value, so that, when variable costs are higher, the effectiveness of the project to generate profits decreases. The results of the analysis show that Fe3O4 production will not reach a loss if the exchange rate of the dollar againstthe rupiah has risen to the value of 24,000 sothat prices must be made on the products to maintain production continuity.

2.3. Effect of Number of Products Sales per day

Figure 5 shows the correlation curve between the profit value on the Y axis and the sales value on the X axis. On the X axis, the number of goods produced marketed per day varies from 11-19 with the range of each variation being 2 and the Y axis is a project year profit of each variation in the amount of goods sold per day in Rupiah. There are 2 curves in Figure 5, namely red curves and blue curves. The blue colored curve shows profit of the ideal situation, which is when there are sales of 15 goods every day. The profit value is Rp. 1,009,135,488. The curve is made linear to make it easier to read the curve and compare its value with the blue curve which is the result of the variationcurve of the number of marketing products per day.

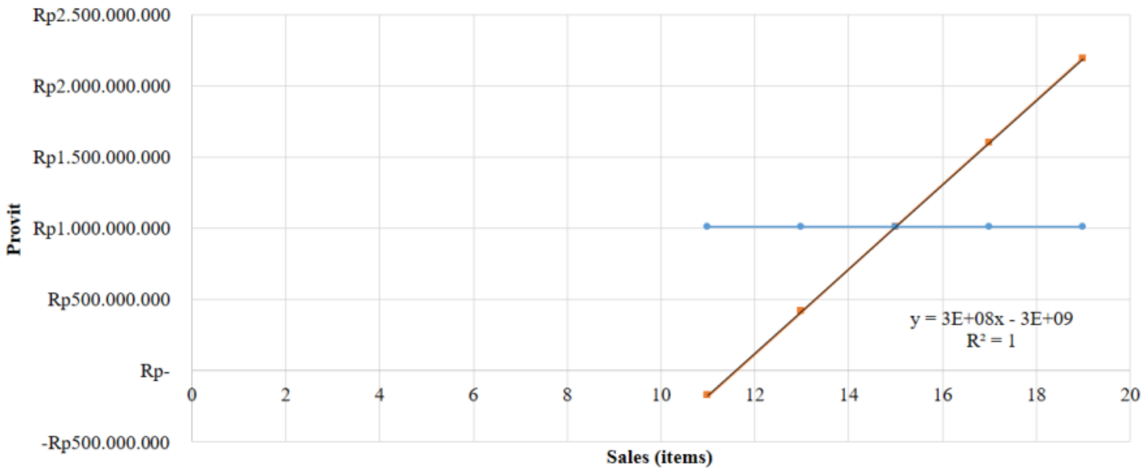

Figure 5. Graph of the relationship between profit value and the number of goods sold per day.

The red curve showsthe relationship between the value of profit and the number of goods sold per day. In this graph, other variable costs outside of the amount of goods sold per day are not taken into account. Profit value is at value of -Rp. 175,386,912 when the number of goods produced per day is 11 and continues to increase along with the increase in the number of goods sold per day. If in one day, 19 kg of Fe3O4 nanoparticles is produced, then the variation of 19 means that all produced are sold out and have a profit value of Rp. 2,193,657,888 in one year of production. This profit value is the highest profit value in the curve. Based on Figure 5, the project will start to get positive profit if every day, producers can sell more than 11 pack products.

From the evaluation analysis of the effect of goods sold each day on the value of profit, varying the value of the number of goods sold every day, the results show that an increase in the number of items sold every day will have a positive effect on the valueof profit. Based on the evaluation analysis, we begin to analyze the effect of the number of items sold each day on the CNPV/TIC curve (%) on life time as shown in Figure 6. Figure 6 shows the relationship between the CNPV/TIC value on the Y axis on life time at X axis in some conditions variations in the number of products sold each day. The value of the goods sold every day is made to increase gradually by 2 items from a range of 11 to 19. In Figure 6, it is explained that in the sale of 19 packs per day there was an increase in the value of CNPV/TIC which affected the payback period which only lasted up to 3 years. It means that the company can reap net profit in the 4th year different in an ideal situation where the net profit is obtained by the company after the 4th year. The similar also occurred in the variation of sales of 17 packs per day, which in the 4th year, the CNPV/TIC value has a positive value which means the company has raked in net profit. Meanwhile, in

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variations 15, 13 and 11 in 4 th year, the CNPV/TIC value is still negative, which shows that the company has no incoming profit due to irreplaceable initial production costs. There is a decrease in the curve belowthe value of 0 in the first 3 years, which corresponds to the CNPV/TIC curve (%) towards life time (years) under ideal conditions, and in the fifth year, the value is positive except for the 11 package sales curve variation value of CNPV/TIC remains negative, so the project does not generate a profit at the value of sales of goods at the value of 11 packages/day. This is consistent with the profit value relationship curve tothe number of goods sold per day.

Profit is one of the big factors that affect the final CNPV value. If profit is negative, itcan be ascertained that the CNPV value of the project will be negative even if it is carried out within 10 years. This means that there must be an increase in the price or quantity of product sales every day to avoid losses.

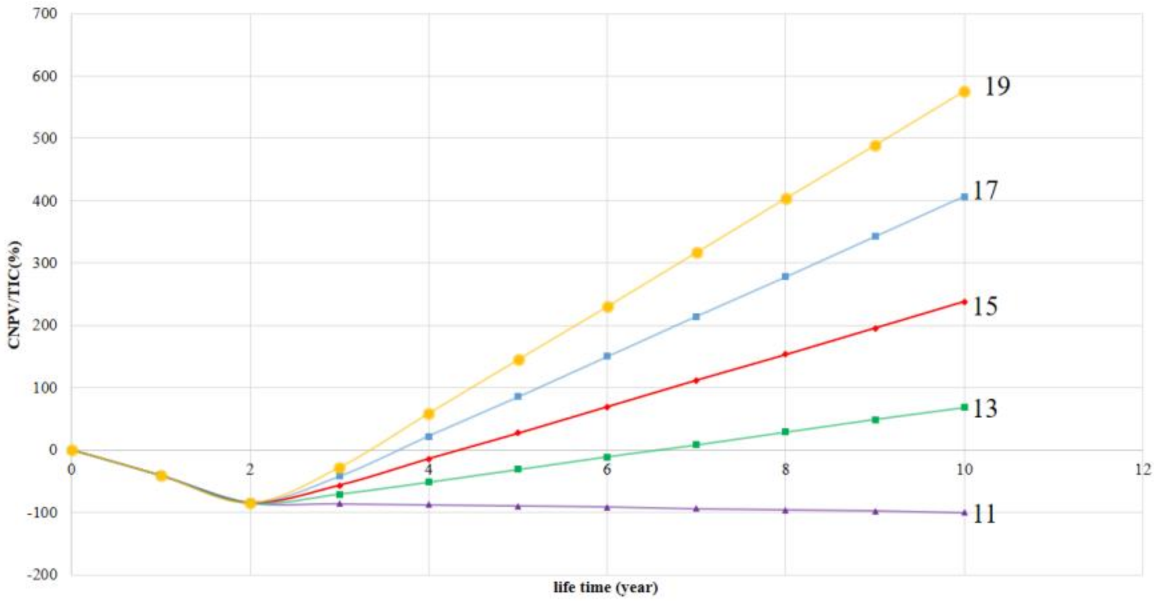

Figure 6. Graph of the relationship of CNPV/TIC (%) value to life time (year) of each variation in the quantity of product sales everyday.

2.4. Effects of Increased Employee Salaries

Table 3 explains the breakdown of employee salaries based on job position. There are 4 types of jobs found in the Fe3O4 nanoparticle manufacturing plant, namely workers in the QC field amounting to 3 workers, water filtration totaling 4 workers, packing materials amounting to 2 workers and also laboring amounting to 2 workers. Employee salaries are determined based on the field of work, in ideal circumstances shown in Table 4 row A. The salarydisplayed in the table is the monthly salaryof employees, the total salary of employees in ideal conditions is 36,000,000.00 rupiah. Row B displays employee salary data if there is a salary increase of five hundred andthousand rupiahs to each division simultaneously, this results in a change in the value of total employee salaries to be paid by the company to 41,500,000rupiah/month. Row C shows the breakdown of employee salaries of one million rupiah

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simultaneously in each division and has a total of 47,000,000 rupiah/month. In row D, the breakdown of employee salaries isshown to be increased by one million five hundred thousand rupiahs and the total salary of all employees per month is 52.500.000 rupiahs.

Row E shows the breakdown of employee salaries when there is an increase of two million rupiahs with a total salary of 58.000.000 rupiahs and the last is column F which shows the breakdown of employee salaries with an increase of two million five hundred thousand rupiahs and the total monthly salary of employees is 63.500.000 rupiahs.

Table 4. The Unit of Salary

Division	Labor	QC	FW	P
Amount of Worker	**2**	**3**	**4**	**2**
A	Rp 10,000,000	Rp 9,000,000	Rp 12,000,000	Rp 5,000,000
B	Rp 11,000,000	Rp 10,500,000	Rp 14,000,000	Rp 6,000,000
C	Rp 12,000,000	Rp 12,000,000	Rp 16,000,000	Rp 7,000,000
D	Rp 13,000,000	Rp 13,500,000	Rp 18,000,000	Rp 8,000,000
E	Rp 14,000,000	Rp 15,000,000	Rp 20,000,000	Rp 9,000,000
F	Rp 15,000,000	Rp 16,500,000	Rp 22,000,000	Rp 10,000,000

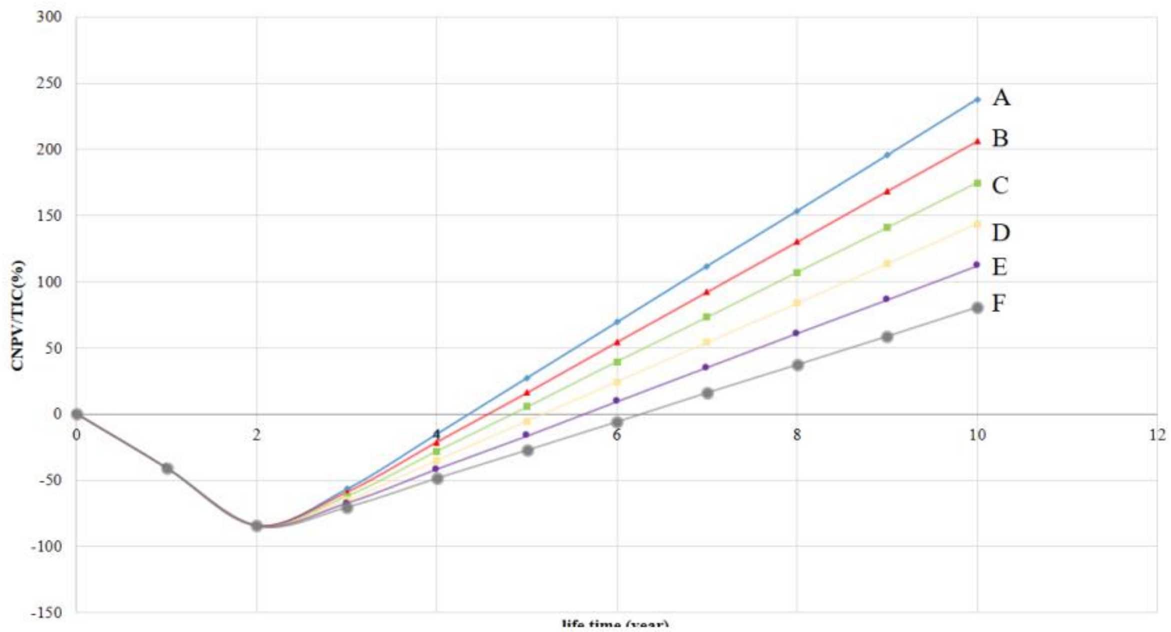

Figure 7. Graph analysis of CNPV/TIC (%) of life time (year) for each variation in the value of an employee's salary increase.

We analyzed the effect of increases in employee salary on the CNPV/TIC (%) chart on a company's life time (year) to predict the company's profit and stability if an employee salary increase occurs. Figure 7 shows the relationship of CNPV/TIC (%)value on the Y axis to life time (year) on the X axis under conditions of variations in the value of employee salary increases ranging from Rp. 500,000.

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Figure 7 present the graph of changes in CNPV/TIC values along with the increase in employee salaries is represented by the alphabet A-E where A is the ideal state and variation of B-E is the variation in employee salary in the range of 500.000 to 2.500.000 with a range of 500.000 rupiah. The decrease in CNPV/TIC affects the payback point for each variation, which if referring to the ideal conditions in Figure 2, the payback point occurs in year 4. However, based on Figure 7 if there is a salary increase above one million rupiah, it is certain that the payback point time will occur in the 5th to 6th years which means the company will notget a full profit until the 6th year but there is still an increase that varies until the 10thyear so the company can still make a profit. However, the profit is not as much as the salary value of the employee in ideal state shown by graph A, so the company must change the value of other variable costs in production to suppress changes that are too significant in the CNPV/TIC value if maintaining the payback point value still occurs in the year to 4.

Labor is included in the variable costs of the CNPV and PBP curve analysis. The results of the analysis reported show that variable costs play an important role on project profitability [12]. Therefore, if there is a large increase in employee salary costs, it will directly affect the continuity of the project, so that employee salaries must be maintained in ideal conditions and avoid employee salary increases above one million rupiah to maintain the company's payback point in the 4th year until the year 5^{th}.

2.5. Result from Economic Analysis

Based on the economic analysis, the project can be carried out in a variety of conditions. However, this conclusion was drawn only based on changes in prices of raw materials and the quantity of product sales per day.

The results will be different when there are changes to other parameters of this economic evaluation.

All analyzes were compared with the condition of banks and the Indonesian currency. A detailed explanation of the specific conditions based on the analysis is explained as follows:

- The project makes a profit if the increase in the dollar exchange rate is below Rp 22,000. If it exceeds the exchange rate of the dollar against the rupiah of 22,000,the project can suffer losses.
- Product sales can be done at a fixed market price even though the dollarexchange rate has increased. • Minimum product sales per day are 13 packs with the price of 1 pack is Rp. 1,061,400.00.
- The maximum increase in employee salaries is Rp. 1,000,000.00.
- Utility costs, taxes and other economic parameters are kept ideal because onlythe effects of changes in raw material prices

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and quantity of sales of products per day are considered in this analysis.

Kesimpulan

Based on the analysis of the Fe3O4 nanoparticles project is prospective from both points of view; engineering and economic analysis. The project generates profits with the condition of the dollar exchange rate against the rupiah below 22,000 rupiah. The minimum product sales per day is 13 pack with an increase in employee salaries under one million rupiah.

Referensi

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