



Feasibility Analysis of Electroplating Facilities for Caliper Assy Manufacturing Using Investment Methods at PT. XYZ

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Abstract. This research was initiated after a fire incident at PT. XYZ's electroplating facility, disrupting its operations and those of its client, PT. ADM. As a long-term plan, PT. XYZ aims to rebuild the facility, but for now, they are outsourcing the electroplating process. This temporary solution, however, has led to lower profits compared to in-house operations, prompting the need to assess whether rebuilding the facility or continuing to outsource is the better option to restore profitability. The goal of this study is to evaluate the investment value and benefits of PT. XYZ constructing a new electroplating facility compared to outsourcing the process. The analysis uses investment criteria such as Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP). The study compares an in-house investment of IDR 15.95 billion with outsourcing costs of IDR 1.15 billion. The results show that in-house investment is more feasible, with a positive NPV of IDR 4.73 billion, an IRR of 18.23%, and a PP of 3 years and 4.5 months, all of which meet the project's criteria. In contrast, outsourcing results in a negative NPV of -IDR 128.56 million, an IRR of 4.63%, and a PP of 4 years and 10 months, making it a less attractive option.

Keywords : Investment Feasibility, NPV, IRR, PP

I. INTRODUCTION

In vehicle manufacturing, PT. ADM is committed to producing vehicles that are both safe and comfortable for drivers and passengers. To support this goal, PT. ADM collaborates with key suppliers to produce vehicle components.

One critical component for driving safety is the brakes. In this regard, PT. ADM works closely with PT. XYZ as a primary supplier of brakes due to its proven track record in quality, pricing, delivery, and manufacturing systems, which have consistently been excellent. This excellence is further demonstrated by PT. XYZ receiving the Industry 4.0 Award.

Unfortunately, in 2021, PT. XYZ experienced a fire that affected its environment and several production facilities. The fire, suspected to have been caused by an electrical short circuit in the plating section, disrupted the production processes at both PT. XYZ and PT. ADM, one of its customers. To prevent further losses, PT. XYZ outsourced its plating processes to subcontracted suppliers as a

temporary risk management solution. For the long term, PT. XYZ plans to rebuild the plating machine that was destroyed in the fire.

The issue arising from this short-term risk management is a reduction in the company's profits compared to operating independently. As a result, the decrease in PT. XYZ's profits highlights the need to evaluate the investment value and benefits of rebuilding the electroplating facilities independently (in-house) versus continuing to subcontract the electroplating process (outsourced). From these two alternatives, PT. XYZ must determine which investment is more viable.

Given the circumstances and facts outlined, the author is interested in conducting a study on the feasibility of investing in electroplating facilities within the company, considering PT. XYZ's role as the primary brake supplier for PT. ADM.

The purpose of this study is to analyze and determine the feasibility of investment made by PT. XYZ in the redevelopment of electroplating facilities when compared to the electroplating process which is carried out subcontracted (outhouse) when viewed from a financial aspect using investment analysis

Investment analysis conducted using investment criteria Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP). The author hopes that with the conduct of this thesis research PT. ADM can determine the suitability of prices to avoid unexpected price increases and can help PT. XYZ to find out the level of feasibility of the investment made compared to the profit that will be obtained in the future.

II. RESEARCH METHODS

1. Methods and Units of Analysis

The method used by the author to obtain data in writing this final report is as follows:

- a. Field research is research conducted by means of interviews and observations in order to obtain reliable data tailored to the needs needed to support the writing of the final project.
- b. Library research is a literature study related to the topic to be discussed by the author including investment feasibility analysis methods such as Net Present Value (NPV), Benefit Cost Ratio (BCR), Payback Period (PP), or Internal Rate of Return (IRR).

In addition, in conducting this study, the author collected data and information in the form of primary and secondary data. The data in question are:

- a. Primary data, is data obtained directly from the field. In this case, the author conducted interviews with marketing, engineering, maintenance and purchasing PT. XYZ
- b. Secondary data, is data that has been processed previously and the author only cites existing data from company documentation.

2. Research Data

The data used in this thesis research are as follows:

Primary Data, including:

- a. Investment data on the redevelopment of electroplating facilities of PT. XYZ
- b. Subcontracting electroplating process investment data
- c. Subcontracting electroplating process price
- d. Subcontracted shipping prices
- e. Electroplating material
- f. Electroplating facility maintenance

Secondary Data, including:

- a. Forecast request PT. ADM to PT XYZ
- b. Prime lending rate of local banks
- c. Self-electroplating process price
- d. DKI Jakarta minimum wage data 2018 – 2023
- e. PLN electricity tariff data for industry 2018-2023

3. Data Collection Procedure

Data is needed as a basis for conducting research. The stages carried out at the time of data collection include:

- a. Observation
- b. Interview
- c. Documentation

4. Data Analysis Methods

The formula used to calculate each benefit value:

- *Net Present Value (NPV)*
- *Internal Rate of Return (IRR)*
- *Payback Period (PP)*
- *Benefit Cost Ratio (BCR)*
-

III. Data Processing

1. Company Profile

PT. XYZ was established in 1981 which is a joint venture company between Indonesia and Japan specializing in brakes (brakes) for various applications both cars and motorcycles.

2. Product

The caliper assy parts that go through the electroplating process are caliper bodies and support mounting.

3. Electroplating Procedure

The electroplating procedure is as follows [18]:

- a. Checking, at this stage the goods to be plating are prepared and checked both in quality and quantity. If there are non-standard items, they will be issued. Goods that meet the standards will be placed on shelves and then put into tubs.
- b. Then these items will be cleaned with water through 2 stages or also called the Water Rine process.
- c. The next stage is the Zinc Plating process, which is the process of coating metal goods with zinc concentration of 9.5 gr / l at a maximum temperature of 28 ° C.
- d. Next, the plated goods will be dried in the oven / heater at a temperature of 60 ° C to 80 ° C.
- e. After the plating process is complete, a check will be carried out on the product. Products that have met the established standards will be packaged. If NG (Not Good) Products are found in the checking process, the product will be collected and reprocessed (Replating). The stages of the replating process carried out are the same as the stages of the production process from beginning to end.

4. Preliminary Research Data

Independent Company Investment

Table 1. Investment Independent company

No	Jobs and Investment	Total	No	Jobs and Investment	Total
1	Labfor & Insurance Process	Rp10,000,000	17	Roof ventilator installation	Rp38,000,000
2	Building structure investigation & measurement	Rp38,000,000	18	Clean water plumbing installation	Rp550,000,000
3	Structural reinforcement design drawings	Rp120,000,000	19	Waste water plumbing installation	Rp500,000,000
4	<i>Ex-plating building demolition</i>	Rp250,000,000	20	Cable tray installation	Rp300,000,000
5	Creation of temporary fences	Rp20,000,000	21	Electrical installation	Rp600,000,000
6	Water supply and working electricity	Rp6,000,000	22	Addition of <i>grounding</i> to the scrubber fan impeller housing	Rp150,000,000
7	Quarry and Urugan Works	Rp95,000,000	23	Heat detector installation on scrubber system	Rp300,000,000
8	Floor work	Rp440,000,000	24	Addition of <i>fire extinguisher (dry powders)</i> in each <i>electroplating area</i>	Rp3,000,000
9	Install work area & embankment protection	Rp116,400,000	25	<i>Pokayoke installation</i> for <i>water level scrubber tank</i>	Rp180,000,000
10	Dismantling of building steel structure and Steel Fabrication	Rp186,400,000	26	Installation of <i>water flow sensor</i> on piping scrubber <i>pump</i>	Rp300,000,000
11	Steel mobilization	Rp40,000,000	27	Atotech Tricotect Auxiliary systems for zinc electroplating	Rp8,967,857,143
12	<i>Erection steel structure building plant</i>	Rp100,000,000	28	Electroplating Body	Rp690,000,000
13	Painting of steel structures and plant buildings	Rp20,000,000	29	Iron module	Rp726,611,616
14	Gutter installation	Rp200,000,000	30	Hanger	Rp54,788,226
15	Installation of <i>insulation</i> and roof of buildings	Rp200,000,000	31	Separator	Rp140,528,850
16	Installation of <i>louvre jack roof</i>	Rp110,000,000	32	Miscellaneous	Rp500,000,000
				Total	IDR 15,950,000,000

Subcontracted Company Investment

Table 2. Subcontracted Company Investment

No	Investment and Consumables	Total
1	Iron Module	Rp726,611,616
2	Palette	Rp30,708,000
3	Separator	Rp140,528,850
4	Plastic Cover Module	Rp37,338,583
5	Plastic bag cover	Rp950,437
6	Separator deveider	Rp103,380,354
7	Spacer pad	Rp120,035,583
Total		Rp1,150,000,000

5. Project Life and Investment

Based on internal company documents PT. XYZ investment life of the facilities and machines used is 10 years. With a service life of 5 years after which it will be removed from the system. This is based on the age of the PT. ADM. This is taken from the age of the latest project model of PT. ADM where mass production starts in November 2022.

6. Product price

The price of electroplating implemented from PT. XYZ to PT. ADM is divided into 2 types according to the size of the type of vehicle. For MPV, SUV, and Low SUV vehicles, the electroplating process costs Rp8,476 while for Pick Up, City Car and Low MPV, the plating process costs Rp3,661. The price is obtained from internal documents of PT. ADM

7. Subcontracted Transport Pricing

Transport prices from PT. XYZ to subcontracted suppliers is Rp220 per piece. Calculation of transport prices based on internal documents of PT. XYZ. Details of transport calculations can be seen in the appendix.

8. Interest

In this study, the interest rate refers to Bank BCA's Prime Lending Rate for corporate loans of 7.90%

9. Investment Depreciation

Self-Depreciation

From the data, it can be seen that the remaining investment value in the 10th year is Rp1,1712,618,209. While the residual value at the 5-year project life is Rp5,226,496,000.

Subcontract Depreciation

From the data, it can be seen that the remaining investment value in year 5 is IDR 89,424,000.

10. Company Expenses

Self-Process Expenses

$$\text{Total Company Incurred} = \text{salary} + \text{electricity} + \text{maintenance} + \text{material}$$

Based on this formula, the costs incurred by the company each year are as follows:

- a. 1st year = Rp5,425,360,706
- b. 2nd Year = Rp5,590,006,684
- c. 3rd Year = Rp5,759,846,763
- d. 4th Year = Rp5,935,051,608
- e. 5th year = Rp6,115,797,858

Subcontracting Process Expenses

Of all the factors that have been described, the company's annual expenses for the *electroplating* process by subcontracting are as follows:

$$\text{Total Company Expenses} = \text{electroplating cost} + \text{delivery} + \text{handling}$$

Based on this formula, the costs incurred by the company each year are as follows:

- a. 1st year = Rp10,263,923,891
- b. 2nd Year = Rp10,387,501,653
- c. 3rd Year = Rp9,676,576,626
- d. 4th Year = Rp10,826,067,404
- e. 5th year = Rp7,302,838,177

11. Company Profit

Income PT. XYZ comes from the sale of caliper assy components to PT. Astra Daihatsu Motor. The selling price of the electroplating process of these components is divided into 2 prices according to the segment of the vehicle produced. For MPV, SUV, and Low SUV vehicles, the plating process costs Rp8,476 while for Pick Up, City Car and Low MPV, the plating process costs Rp3,661.

The company's total profit is calculated based on the multiplication between projected demand and pieces prices. The following is a calculation of the company's income from year 1 to year 5.

Table 3. Company income

Year	Income
2023	IDR 10,450,178,009
2024	IDR 10,565,085,768
2025	IDR 9,823,573,020
2026	IDR 11,007,005,472
2027	IDR 7,865,388,312

12. Calculation of Investment Criteria

12.1. Independent NPV Calculation

Table 14. Self-contained PV calculation

Actual Year	Revenue (F)(c = a - b)	DF (P/F, i, n); i = 7.90% (d)	PV = F (P/F, i, n)(e = c * d)
2023	IDR 5,024,817,303	0.927	IDR 4,656,920,578
2024	IDR 4,975,079,084	0.859	IDR 4,273,238,174
2025	IDR 4,063,726,257	0.796	IDR 3,234,894,421
2026	IDR 5,071,953,864	0.738	IDR 3,741,877,070
2027	IDR 1,749,590,454	0.684	IDR 1,196,269,905
	5,226,496,000	0.684	IDR 3,573,579,095
PV Total			IDR 20,676,779,242

$$NPV = Total\ PV - Nilai\ Investasi$$

$$NPV = Rp20,676,779,242 - Rp15,950,000,000 = Rp4,726,779,242$$

12.2. Subcontracted NPV Calculation

Table 4. Subcontracted PV Calculation

Actual Year	Balance (F)(c = a - b)	DF (P/F, i, n) ; I = 7.9% (F)	PV = F (P/F, i, n)(g = e * f)
2023	IDR 186,254,118.00	0.927	IDR 172,617,348
2024	IDR 177,584,114.88	0.859	IDR 152,532,092
2025	IDR 146,996,394.41	0.796	IDR 117,015,219
2026	IDR 180,938,067.68	0.738	IDR 133,488,597
2027	IDR 562,550,135.10	0.684	IDR 384,639,614
	89,424,000	0.684	IDR 61,143,018
PV Total			IDR 1,021,435,886

$NPV = Total\ PV - Investment$

$NPV = -Rp128,564,114$

3. IRR calculation

3.1 Self-Paced IRR Calculation

Try with 15% interest rate

$NPV = PV\ proceed\ Total - Investment$

$NPV = Rp1,221,500,844$

The result of the calculation using an interest rate of 15%, the NPV value is positive.

Tried with an interest rate of 19%

$NPV = PV\ proceed\ Total - Investment$

$NPV = -Rp350,209,664$

From the calculation using an interest rate of 19%, the NPV value is negative.

To find the value of the interest rate, the interpolation calculation is carried out as follows:

$$IRR = 15\% + \frac{Rp1,221,500,844}{(Rp1,221,500,844 - (-Rp350,209,664))} (19\% - 15\%)$$

$IRR = 18.23\%$

3.2. Subcontracting IRR Calculation

Try with 5% interest rate

$NPV = PV\ proceed\ Total - Investment$

$NPV = -Rp24,863,095$

The result of the calculation using an interest rate of 5%, the NPV value is negative.

Try with a 4% interest rate

$$NPV = PV \text{ proceed Total} - \text{Investment}$$

$$NPV = Rp\ 14,496,087$$

The result of the calculation using an interest rate of 4%, the NPV value is positive.

To find the value of the interest rate, the interpolation calculation is carried out as follows.

$$IRR = 4\% + \frac{Rp\ 14,496,087}{(Rp\ 14,496,087 - (-Rp24,863,095))} (5\% - 4\%)$$

$$IRR = 4.632\%$$

4. Payback Period Calculation

4.1 Payback Period Mandiri

The calculation of the payback period is done by finding the time when the amount of investment spent will be paid back. The calculation is done with the help of Microsoft Excel to get the cumulative Net Profit

Table 5. Cumulative NCF Standalone

Year	Net Cash Flow(c = a - b)	NCF Cumulative
2023	IDR 5,024,817,303	IDR 5,024,817,303
2024	IDR 4,975,079,084	IDR 9,999,896,388
2025	IDR 4,063,726,257	IDR 14,063,622,644
2026	IDR 5,071,953,864	IDR 19,135,576,509
2027	IDR 1,749,590,454	IDR 20,885,166,963
	Total	20,885,166,963

From the table above, it can be seen that the investment made of IDR 15,950,000,000 will run out between 2025-2026. The difference in investment value with cumulative NCF in 2025 is:

$$Gap = Rp15,950,000,000 - Rp14,063,622,644$$

$$Gap = Rp1,886,377,356$$

After obtaining the selish, a calculation is carried out to find the PP:

$$PP = 3 \text{ years} + \frac{Rp1,886,377,356}{Rp5,071,953,864} \times 1 \text{ year}$$

$$PP = 3 \text{ years} + (0.372 \times 12 \text{ months}) = 3 \text{ year } 4.5 \text{ months}$$

So the value of the investment issued will return at 3 years and 4.5 months.

4.2 Payback Period Subcontracting

Table 5. Cumulative NCF Subcontracting

Year	Net Cash Flow(c = a - b)	NCF Cumulative
2023	IDR 186,254,118	IDR 186,254,118
2024	IDR 177,584,115	IDR 363,838,233
2025	IDR 146,996,394	IDR 510,834,627
2026	IDR 180,938,068	IDR 691,772,695
2027	IDR 562,550,135	IDR 1,254,322,830
	-	IDR 1,254,322,830

From the table above, it can be seen that the investment made of IDR 1,150,000,000 will run out between 2026-2027. This can be seen because in year 5, cumulative *Net Cash Flow* has exceeded the investment value.

The difference in investment value with cumulative NCF year 3 is:

$$Gap = Rp1,150,000,000 - Rp691,772,695 = Rp458,227,305$$

After obtaining the selish, a calculation is carried out to find the PP:

$$PP = 4 \text{ years} + \frac{Rp458,227,305}{Rp562,550,135} \times 1 \text{ year}$$

$$PP = 4 \text{ years} + (0.814 \text{ year} \times 12 \text{ month})$$

$$PP = 4 \text{ years} + 10 \text{ months}$$

So the value of the investment issued will return in 4 years and 10 months.

IV. CONCLUSION

From the results of investment analysis independently (inhouse) and investment subcontracted (outhouse) reviewed with investment analysis methods, it can be concluded that investment independently (inhouse) is feasible while investment for the subcontracting process (outhouse) is considered less feasible. This can be seen from the positive NPV value found in inhouse investments of Rp4,726,779,242 while the NPV value generated by subcontracted investments (outhouse) -Rp128,564,114 is negative. In addition, the IRR value for inhouse investments is 18.23% greater than MARR 7.9% (referring to the interest rate used), while investments in subcontracts (outhouse) 4.63% are smaller than MARR 7.9%. Payback periods in inhouse investments of 3 years and 4.5 months take a faster time when compared to investments in subcontracts (outhouse) of 4 years and 10 months even though both are still under the project life of 5 years.

SUGGESTION

From the available data, it can be seen that the residual value and life of the electroplating facility investment are still very possible to use. Increasing the volume of ongoing projects or new projects

is highly recommended to maximize the value of investments that have been made. Further research can be done by continuing the feasibility analysis apart from the financial aspect.

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