

## STRATEGIC ACQUISITION OF AUTOMATED STACKING MACHINE FOR BUILT CORE PRODUCTION: A CASE STUDY OF PT TRAFCOMP INDONESIA PERKASA

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### ABSTRACT

By the end of 2021 electrification ratio in Indonesia reached 99.45%, to achieve the 100% ratio, meaning an even electricity distribution in all provinces in Indonesia, it is needed to increase the capacity of power generation, transmission, and distribution system. One of the key components linking these systems is the transformer, of which a minimum of 20.000 units is needed for a year. The objective of the study is to measure the feasibility of PT. Trafcomp Indonesiaperkasa, a local company that produce magnetic core for transformer component, to acquire an automatic machine for built core production with consideration of expansion, cost reduction, safety and increase quality by combining mixed method: strategic analysis using SWOT Analysis and Porter's Five Forces, capital budgeting analysis using elements such as: Payback Period, Discounted Payback Period, Return on Investment (ROI), Net Present Value (NPV), NPV Index, Internal Rate of Return (IRR), Weighted Average Cost of Capital (WACC), sensitivity analysis using Monte Carlo Analysis, and non-monetary analysis using the Sustainable Development Goals to assist the company in making decision whether the acquisition of automated machine is feasible (or not) to execute. The finding showed that project is feasible for PT Trafcomp Indonesiaperkasa to acquire automated stacking machine, which the Capital Budgeting Calculation shows positive income to the company, Monte Carlo simulation performed a positive Net Present Value, and moreover by acquiring the machine, possibility of woman involved in the workforce is higher.

**Keywords:** Strategic Analysis; Capital Budgeting; Monte Carlo Simulation; Sustainable Development Goals; Automation; Transformer; Built Core.

### INTRODUCTION

Electricity is one of the essential factors to support human daily life and business. According to Gusti (2019), Indonesia is the largest country in the Association of Southeast Asia Nations (ASEAN) in terms of energy consumption. Moreover, according to worldometers (2022) Indonesia holds the rank four of the largest population in the world with a total of 280 million per November 2022 creating a demand for electricity supply and distribution. Up until 2021 the electrification ratio has already reached 99.45% from the government target to reach 99.99% by 2021.

Table 1 – Electrification Ratio Growth in Indonesia

Year	2017	2018	2019	2020	2021
Ratio	95.35%	98.30%	98.99%	99.20%	99.45%

Source: Biro Pusat Statistik, 2022 & Mahdi, 2022

However, the distribution is still not equal where the electrification ratio is increasing but power distribution still falls short of the government's target. In order to accelerate the demand for electricity and to decrease the electrification ratio growth gap, there is a need to increase the capacity of power generation, transmission, and distribution systems to fulfill the demand. One of the key components that links these systems is the transformer.

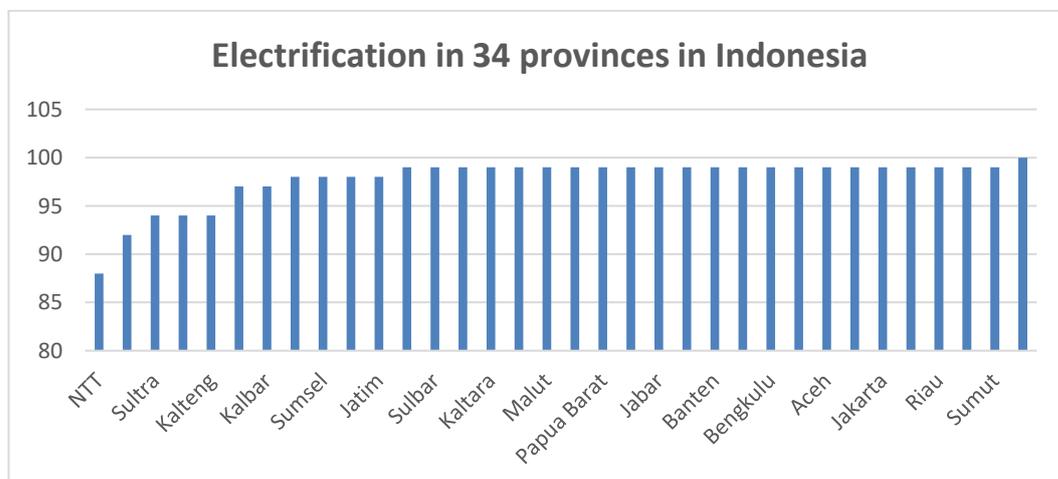


Figure 1 – Electrification in 34 provinces in Indonesia (Source : ESDM 7 January 2020)

Transformer works through electromagnetic induction. As its name implies, a transformer's magnetic core is indeed the core of transformer operation since it acts as a magnetic coupling between primary and secondary coils by providing a controlled path for the magnetic flux. In general, there are two types of magnetic core construction: Wound Core, in which the laminations are arranged vertically around the coils (wound), and Stacked Core, in which the laminations are arranged horizontally around the coils (stacked). Core stacking is done on a specialized table with the help of stacking pins, of which position corresponds to stacking holes punched into the laminations.

As of 2022, there are more than fifteen transformer manufacturing companies in Indonesia, serving the whole range and capacity of distribution and power transformer. To increase Indonesian industry capabilities and to create job opportunities, the Indonesian Government encouraged manufacturing companies to increase local content in their products by releasing its "Roadmap on Increasing Local Content Value". This policy, coupled with the need to employ lean and agile business principles prompted transformer manufacturers to outsource some of transformer's key components production to partner companies – namely tank, cooling devices, and magnetic cores, which in turn creates an opportunity for local companies to take up the challenge to manufacture them. One such company is PT Trafcomp Indonesiaperkasa.

State Electricity Company ("PLN") is the biggest user of distribution and power transformers in Indonesia. As such, most Indonesian transformer manufacturers are dependent on PLN's transformer needs and demands. Over the years, PLN's need to increase its electric power transmission and distribution efficiency has led to higher specifications. This requires better materials and couples with rising labor and production costs has put more pressure into transformer manufacturers. PT Trafcomp Indonesiaperkasa was established in 2009 as a supplier of raw materials and components for distribution and power transformers. It is the first independent and locally owned company in Indonesia which specializes in producing electrical steel (CRGO – Cold Rolled Grain Oriented) products. It mainly supplies magnetic cores to most of Indonesia's major transformer manufacturers. Since 2010, Trafcomp Indonesiaperkasa has been supporting Indonesian transformer companies with outsourcing of magnetic core components manufacturing services, and there is a shift in transformer manufacturing culture from 100% in house towards 100% assembly thus in 2021 PT Trafcomp Indonesiaperkasa started to supply completely built magnetic core to its customers. Built cores arrive at the customer's facility ready for windings and terminal installation and before leaving PT Trafcomp's facility, each and every one of them have had their dimensions checked, every accessory installed, and electrical properties tested to confirm with the customer's specifications.

PT Trafcomp Indonesiaperkasa currently employs a manual stacking process, CRGO laminations are brought and stacked onto the table manually by the operator. Therefore, bigger core size and higher production demands must be countered by increasing the quantity of the stacking table and the operators needed to serve them. In recent times, Indonesian transformer manufacturers are starting to recognize the advantages of procuring built cores to support their production process. Two major transformer manufacturers in Indonesia have already started to order and stated that they will order Built Cores instead of Cut Cores in the future. In anticipation to this, the management of PT Trafcomp Indonesiaperkasa has opted for an alternative solution by acquiring an automated stacking machine. This is thought to maximize revenue and cost efficiency. One non-monetary advantage of this solution is that having an automated stacking machine will increase customer's trust in PT Trafcomp Indonesiaperkasa's quality and production capacity.

In Indonesia there are only three companies that produce magnetic core for transformer company and PT Trafcomp Indonesiaperkasa is the one and only local company thus considering the niche market, private companies and tight competition this research will focus on the company itself in provide stacking core service and there will be no further comparative study and research is conducted with 2021-2022 data. Numerous research has been conducted to determine the worth of projects using the Capital Budgeting Technique and Monte Carlo Analysis, no further study combining with strategic analysis and non-monetary analysis. In addition, no research conducted for a local transformer core company.

The result will contribute to PT Trafcomp Indonesiaperkasa management in order to determine whether buying a machine is feasible by combining monetary and non-monetary analysis also enrich the practical contribution to the academics.

## **LITERATURE REVIEW**

The combination of mixed method for qualitative and quantitative use to make decision on whether the project of acquisition of automated stacking machine is feasible. This chapter will look at the theory of the framework.

### **SWOT Analysis**

According to Sarsby, (2016) SWOT is a four-box strategy analysis and strategy development framework. It stands for Strength, Weaknesses, Opportunities and Threats. SWOT analysis is a tool used by organizations for strategic planning and management. It works well for developing both organizational and competitive strategies. Organizations are made up of many sub-systems and exist as wholes that interact with their environments. According to this definition, an organization has two environments—one inside of it, the other outside. Analyzing these ecosystems for strategic management techniques is essential. SWOT Analysis is the phrase used to describe this process of analyzing the organization and its surroundings.

### **Porter's Five Forces**

According to Baxter, G. (2019), prior to a firm defining its business level strategy, it must have a comprehensive understanding of what forces influence profits in the industry in which it competes. If a firm understands these forces, then it can define and implement a business-level strategy that enables the firm to either take advantage of, or protect itself from, these forces. This

practice subsequently allows the firm to be consistently profitable. The Five Forces model is widely used to analyze the industry structure of a company as well as its corporate strategy, which focuses on buyers, suppliers, new entrants, substitution, and rivalry that have an impact on one another in an industry

### Capital Budgeting

According to (EduPristine, 2015), Capital budgeting is a company's formal process used for evaluating potential expenditures or investments that are significant in amount. It involves the decision to invest the current funds for addition, disposition, modification, or replacement of fixed assets. Capital Budgeting is a tool for maximizing a company's future profits since most companies can manage only a limited number of large projects at any one time. (Anthony, Hawkins, & Merchant, 2011) defines as an alternative of decisions making to those that involve relatively long-term differential investments of capital. According to (Gitman & Zutter, 2015), Capital Budgeting is the process of evaluating and selecting long-term investments that are consistent with the firm's goal of maximizing owner's health. From several literatures, there are many formal methods are used in Capital Budgeting, techniques or variables such as:

- Payback Period

Payback period in capital budgeting refers to the period of time required to recoup the funds expended in an investment, or to reach the break-even point. Payback period is the number of years over which the investment outlay will be recovered (paid back) from the cash inflows if the estimates turn out to be correct. If the payback period is equal to, or only slightly less than, the economic life of the project, then the proposal is clearly unacceptable. If the payback period is considerably less than the economic life, then the project begins to look attractive.

The formula is as follows:

$$PP = \text{Years full recovery} + \frac{\text{Unrecovered cost at beginning of last year}}{\text{Cash Flow in Following Year}}$$

- Return on Investment

Return on Investment is the ratio between the net profit and cost of investment resulting from an investment of some resources. A high ROI means the investment's gains compare favorably to its cost. As a performance measure, ROI is used to evaluate the efficiency of an investment or to compare the efficiencies of several different investments. Because of the return on investment nature of the proposed metric and because of its augmented inclusion of economic and other sustainability factors, it can be readily incorporated in typical process engineering activities and can be used by decision makers to make informed decisions regarding the viability of the projects and their impact on sustainability. (El- Halwagi, 2017). The formula is as follows:

$$ROI = \frac{\text{Accounting Profit} \times 100\%}{\text{Initial Investment}}$$

- Weighted Average Cost of Capital (WACC)

According to Anthony et. al (2011) in economic theory, the required rate of return should be equal to the company's cost of capital. This is the cost of debt capital plus the cost of equity capital, weighted by relative amount of each in the company's capital structure. According to an article (Hargrave, 2019), the weighted average cost of capital (WACC) is a method of calculating a firm's cost of capital in which each category of capital is proportionately weighted. All forms of funding, including conventional sources, a long-term debt portfolio including stocks, preferred stocks, bonds, and any other debt are included in WACC calculation. When the WACC is higher, there is often more risk involved in the project, and investors will typically want a bigger return to make up for the higher risk. The formula is:

### WACC Formula and Calculation

$$WACC = \left( \frac{E}{V} \times Re \right) + \left( \frac{D}{V} \times Rd \times (1 - Tc) \right)$$

where:

$E$  = Market value of the firm's equity

$D$  = Market value of the firm's debt

$V = E + D$

$Re$  = Cost of equity

$Rd$  = Cost of debt

$Tc$  = Corporate tax rate

- Net Present Value

According to Daryanto & Primadona (2018), Net Present Value has been computed by dividing the cash inflow for each year by the \$1 present value at the appropriate rate of return. To calculate a project's net present value, you must first determine the difference between its cash expenditures (project costs) and its cash inflows (cash flows). Although in real life, cash flow is hard to predict, the net present value is still the most frequently utilized method for economic decision-making (Sun & Queyranne, 2000). The formula is as follows:

$$NPV = \sum_{t=1}^n \frac{CF_t}{(1+r)^t} - CF_0$$

- Net Present Value (Index)

The profitability index is determined by dividing the original investment by the net present value (NPV) of the project's projected future cash flows. Positive profitability is shown by a PI above 1.0, while a PI below 1.0 implies that the project will lose money. The financial attractiveness of the proposed project rises as values on the profitability index do. The formula is as follows:

$$\text{Profitability index} = \frac{\text{PV of future cash flows}}{\text{Initial investment}} = 1 + \frac{\text{NPV}}{\text{Initial investment}}$$

- Internal Rate of Return

A discount rate known as the internal rate of return is frequently used to estimate how much of a return an investor may anticipate from a specific project. One of the simpler ways to get a quick indication of the return percentage for each alternative is to use the internal rate of return (IRR) (Daryanto, 2018). The more desirable the project is, the wider the gap between financing cost and IRR.

### Montecarlo Simulation

According to Harrison, R. L. (2010) Monte Carlo simulation uses random sampling and statistical modeling to estimate mathematical functions and mimic the operations of complex systems. Monte Carlo Simulation is a statistical method applied in financial modeling where the probability of different outcomes in a problem cannot be simply solved due to the interference of a random variable. The simulation relies on the repetition of random samples to achieve numerical results. It can be used to understand the effect of uncertainty and randomness in forecasting models.

### Sustainable Development Goals

The Sustainable Development Goals (SDGs) are a set of 17 nonbinding, or "aspirational," goals that have been set by the UN with the aim of achieving a more sustainable planet by 2030. According to Holling (2001), Sustainability is the capacity to create, test, and maintain adaptive capability. Development is the process of creating, testing, and maintaining opportunity. The phrase that combines the two, "sustainable development," thus refers to the goal of fostering adaptive capabilities and creating opportunities. According to Schramade (2017), sustainability is about creating and investing in a corporate capacity for systems change and holistic thinking, not just box-ticking.

## RESEARCH METHOD

This study combining a monetary and non-monetary analysis in the research approach. This research is carried out by four stages.

Stage 1 – Strategic Analysis by interview with the expert system from the company

A strategic analysis analyzes an organization's external and internal environment, evaluates current strategies, generates, and evaluates the most successful strategic alternatives. A company must have a clear understanding of what it is and what it represents to develop a business strategy. This phase of general data collecting aims to acquire both management perspectives and data collection. The author conducted appreciative inquiry and thorough discussion with the General Manager and Technical Consultant of PT Trafcomp Indonesiaperkasa to elaborate the reason behind the project, understanding the strategy, and getting data for financial assumptions.

Stage 2 – Capital Budgeting Analysis

Author calculated data from PT Trafcomp Indonesiaperkasa to calculate Payback Period, Discounted Payback Period, Return on Investment (ROI), Net Present Value (NPV), NPV Index, Internal Rate of Return (IRR).

Stage 3 – Sensitivity Analysis

Author uses Monte Carlo Simulation using volume and discount rate variables to analyze the probability of the project to be feasible.

Stage 4 – Non-Monetary Analysis

Author adds the non-monetary analysis for management consideration to take or leave the project by analyzing from Sustainable Development Goal perspectives.

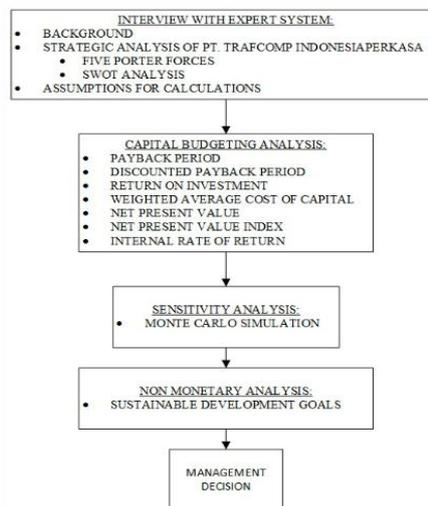


Figure 2 – Methodology (Source: Author, 2022)

## RESULT AND DISCUSSION

### Interview with the expert

Indonesian transformer manufacturing companies have always been dependent on orders from the State Electricity Company (PLN), therefore most of their production capacity is geared toward fulfilling PLN's order. However besides technical specifications, PLN also requires its transformer to meet a certain percentage of local content which has been revised and increased over time. The rising costs of manpower has always put a burden on every company. Coupled with the effects of pandemic which saw PLN canceling its tender in 2021 and 2022, the production downturn it caused have led to layoffs which left many companies understaffed. Unfortunately, transformer manufacturing, especially magnetic core building, is a specialized job which needs extensive training. Therefore, it is not so easy for the manufacturers to replenish its manpower level in a short time when production demands are not stable. One of the solutions to this problem is to buy a completely built core. PT Trafcomp Indonesiaperkasa has seen this opportunity from as far back as 2013. The reasoning was that by manufacturing completely built cores, PT Trafcomp Indonesiaperkasa would be able to obtain additional profit margin. However back then the demand was still too small so the additional costs over conventional cut core products were not seen as beneficial to the customers; so, the project was scrapped. In the pandemic years, this opportunity arose again; this time some of the customers have finally recognized the advantages of buying built cores over cut cores. One of the big advantages of PT Trafcomp Indonesiaperkasa compared to their competitor is that they are able not only to produce and test its built cores, but also to actually calculate the design of their cores. In relation to this, one of the future plans is to develop a so-called standard type magnetic core, in which its dimension and electrical specifications are tailored to be more flexible and can be used for a couple of different purposes so that the customer does not have to always use different custom-designed cores for different projects. This can serve as a backup plan if the projected production volume and ROI

is not met. With the increase in demand within the same timeframe shown in it is important to be able to manufacture as many built cores as possible in the shortest time available, without sacrificing accuracy and product quality.

The first possible answer is to construct and install additional manual stacking tables and hire additional operators to man them. Since PT Trafcomp Indonesiaperkasa have already worked with manual stacking tables before, the commonality with older tables makes this solution relatively simple. Additionally, manual stacking tables are low-tech equipment; therefore, they are cheaper to construct.

However, the manual process has its own disadvantages: The first is that CRGO laminations to be stacked must be brought to the table manually. Bigger cores need bigger and longer lamination sizes which, coupled with its low thickness presents a considerable challenge since it is heavier and more prone to deformation if handled incorrectly, causing the stacking process to be even slower. Next, building a transformer magnetic core must be done in a precise and accurate manner. An uneven stacking or bent material may cause the electrical properties of the completed core to deviate from its intended specification. This means that additional manpower to be hired should be either have had previous experience in stacking magnetic cores, or must be trained from zero, which means additional time will be needed. In relation to that, having more manpower means more spending to be made on the salary, which steadily increases by the year. Keeping more manpower also presents another challenge when the production volume is not steady, which is common for a new product. Lastly, more stacking tables means there is a bigger chance of many cores being finished at the same time; it means that installing new manual stacking tables must be coupled with improvement in the logistical system to enable extracting all finished cores.

The second solution is to buy an automatic stacking machine. Compared to human operators stacking a magnetic core manually on a newly built stacking table, acquiring an automatic stacking machine is much more expensive. However, it is not subject to annual salary rise, cannot fall ill, needs less people to operate nor it will hold a strike unless it is down; therefore, its main advantages are its production consistency and relative safety for its operator; buying an automatic stacking machine also means that there will be only one product to be finished at any given time, albeit at a much faster rate.

Table 2 - Advantages and Disadvantages of Manual Stacking Table and Automatic Stacking Machine

Manual Stacking Table	Automatic Stacking Machine
<b>Pros</b> <ol style="list-style-type: none"> <li>1 Simpler transition to new units</li> <li>2 Cheaper to construct</li> <li>3 Easier to install</li> <li>4 Spare part commonality with existing units</li> <li>5 Less moving part, less spare part quantity needed</li> <li>6 Less chance of table down time</li> </ol>	<b>Pros</b> <ol style="list-style-type: none"> <li>1 Higher production consistency</li> <li>2 Higher duty cycle compared to Manual Table</li> <li>3 Less additional manpower needed</li> <li>4 Less HR problems</li> <li>5 Less direct operator's involvement - less danger to operator</li> <li>6 Simpler training program</li> <li>7 Simpler operation procedures</li> <li>8 One product being finished at any given time but at a shorter interval</li> </ol>
<b>Cons</b> <ol style="list-style-type: none"> <li>1 Additional manpower recruitment</li> <li>2 Additional training for new operators</li> <li>3 Inconsistencies in production quality &amp; speed due to operators' direct involvement</li> <li>4 More HR problems</li> <li>5 More products being finished at the same time presents another logistical problem</li> </ol>	<b>Cons</b> <ol style="list-style-type: none"> <li>1 Higher cost of acquisition</li> <li>2 New system means new concept - old operators might need more time to adjust</li> <li>3 More complex operation means more spare part needed</li> <li>4 More chance of machine down time</li> <li>5 Installation and its preparation can not be done independently</li> </ol>

Source: PT Trafcomp Indonesiaperkasa, 2022

Table 3 – Cost Comparison of Adding Manual Stacking Table vs Buying Automatic Stacking Machine for eight years

Additional Stacking Table, Acquisition Cost With Operators						
Item	Qty	Cost				Remark(s)
		Per Unit		Total		
Additional Stacking Table, each	13	IDR	30,000,000.00	IDR	390,000,000.00	
New Operators, per month	52	IDR	4,200,000.00			2 operators per table/shift
New Operators, 1 year	12	IDR	218,400,000.00			
New Operators, 8 years	8	IDR	2,620,800,000.00	IDR	20,966,400,000.00	
				IDR	21,356,400,000.00	Total Cost, 8 years
Automatic Stacking Table, Acquisition Cost With Operators						
Item	Qty	Cost				Remark(s)
		Per Unit		Total		
Automatic Stacking Machine	1	USD	412,000.00	IDR	6,180,000,000.00	USD 1,- = IDR 15.000,-
Delivery & Installation Costs	1	IDR	1,320,000,000.00	IDR	1,320,000,000.00	
New Operators, per month	2	IDR	4,200,000.00			1 operator/shift
New Operators, 1 year	12	IDR	8,400,000.00			
New Operators, 8 years	8	IDR	100,800,000.00	IDR	806,400,000.00	
				IDR	8,306,400,000.00	Total Cost, 8 years

Source: PT Trafcomp Indonesiaperkasa, 2022

Table 4 – Comparison Between Manual Stacking Table and Automatic Stacking Machine

Comparison Manual Stacking vs Auto Stacking Machine			
Number of Stacking Table (unit)	7	Number of Auto Stacking Machine (unit)	1
Unit Production/ Day	7	Unit Production/ Day	30
Unit Production/ Month	175	Unit Production/ Month	750
Number of Operators per table (2 shifts)	4	Number of Operators (2 shifts)	2

Source: PT Trafcomp Indonesiaperkasa, 2022

Author use SWOT analysis and Porter’s Five Forces analysis as a tool to determine PT Trafcomp Indonesiaperkasa’s position in the market both from internal and external environments

Table 5 – SWOT Analysis

Strength	Weakness	Opportunity	Threat
Trafcomp is well known in the transformer manufacturing companies’ circle	Smaller capital compared to its multinational company competitors	To be the market leader in terms of completely built core	Not enough production capacity
Trafcomp is a small company therefore its operational costs are lower than its competitors		Quality control from the customer’s side would be stronger since they are able to visit Trafcomp anytime they need to	
		Almost unlimited flexibility with Trafcomp’s ability to design and test its own magnetic cores	

Source: PT Trafcomp Indonesiaperkasa, 2022

Table 6 – Porter’s Five Forces Analysis

Competition in the Industry	Potential of New Entrants into an Industry	Power of Suppliers	Power of Customers	Threat of Substitutes
Domestically, from a Japanese and an Indian company. Big, well-established companies, have been supplying to worldwide customers, but since they are abroad, quality control from customer’s side can be considered – and proved to be – weaker	Middle to low potential; depending on respective company policies on business development	In the past transformer companies seek for Japanese, European, or at least Korean Steel to build their magnetic cores; now they buy anything that fit their budget as long as the electrical properties are still within specification boundaries	Indonesian transformer market is not a hugely expanding one and depend heavily to PLN’s demand	Material-wise: New materials are already available, such as amorphous and nano-crystalline cores. But currently their practical applications are still very restricted
At the moment, Trafcomp has gained a head start and has been able not only to test, but also to design their built core while the other two companies have not		Legacy steel mills from Europe, Japan, and Korea are facing stiff competition from Chinese mills	Indonesian customers, i.e. transformer manufacturers, are very price sensitive therefore in starting a new production line from scratch, one must prepare to survive with little to no profit margin for the first few years	Design-wise: New magnetic core construction techniques such as 3D wound core has started to be accepted by private customers. However the PLN still haven’t approved of its applications in their power distribution network and since the

Competition in the Industry	Potential of New Entrants into an Industry	Power of Suppliers	Power of Customers	Threat of Substitutes
				current 3D core is only effective for small capacity transformers, it will not be able to wholly replace the conventional stacked core design
Trafcomp has been successfully supplying built core to its customers, while the other two companies are still struggling with their production quality			Many transformer manufacturers are still family-controlled therefore having a good relationship with the controlling family(ies) is a big plus point	
Internationally, from Chinese companies				

Source: PT Trafcomp Indonesiaperkasa, 2022

### Capital Budgeting Analysis

Table 7 – Forecasting Assumptions

Item	Description	Value
1	Price of the machine	Rp 7,500,000,000.00
2	Economic Value	8 years
3	Estimated Terminal Value	-
4	Source of fund for Initial Investment	100% debt
5	Collateral	Machine
6	Period of Installment	2 years
7	Corporate Tax	25%
8	Interest Rate	8%
9	Expected Commercial Operation Date	Jun-23
10	Target Selling Price per unit	5 Mio Year 1-3, 7 Mio Year 4-8
11	Electricity for Testing per unit	Rp 500,000.00
12	Electricity for operate machine per month	Rp 13,000,000.00
13	Numbers of operators needed per day (2 shift)	2
14	Operator Salary (day)	Rp 160,000.00
15	Maintenance Cost per year	Rp 50,000,000.00

Source: PT Trafcomp Indonesiaperkasa, 2022

In order to calculate the Net Present Value, the first step is to create Cash Flow Report. Table 8, Table 9 and Table 10 is the Income Statement Forecast, Balance Sheet Forecast and Cash Flow Forecast.

Table 8 – Income Statement Forecast

Income Statement (in million IDR)	1	2	3	4	5	6	7	8
Projected Sales Volume	1050	4500	5400	6300	7200	8100	8100	8100
Projected Price Per Unit	5	5	5	7	7	7	7	7
Revenue	5,250	22,500	27,000	44,100	50,400	56,700	56,700	56,700
Operating Expense								
Personnel Expense	48	99	102	105	108	111	115	118
Operations	603	2,458	2,910	3,363	3,815	4,267	4,270	4,272
Depreciation	469	938	938	938	938	938	938	938
Operating Income	4,130	19,005	23,050	39,695	45,539	51,384	51,378	51,372
Finance Costs	150	300	150					
Pretax Income	3,980	18,705	22,900	39,695	45,539	51,384	51,378	51,372
Income Tax	995	4,676	5,725	9,924	11,385	12,846	12,845	12,843
Net Income	2,985	14,029	17,175	29,771	34,155	38,538	38,534	38,529

Table 9 – Balance Sheet Forecast

Balance Sheet (in million IDR)	0	1	2	3	4	5	6	7	8
<b>Assets</b>									
Cash	-	704	9,045	24,533	52,392	86,434	124,859	164,330	203,797
Accounts Receivable	-	875	3,750	4,500	7,350	8,400	9,450	9,450	9,450
Equipment (net)	7,500	7,031	6,094	5,156	4,219	3,281	2,344	1,406	469
<b>Total Assets</b>	<b>7,500</b>	<b>8,610</b>	<b>18,889</b>	<b>34,189</b>	<b>63,960</b>	<b>98,115</b>	<b>136,653</b>	<b>175,186</b>	<b>213,715</b>
<b>Liabilities and Equity</b>									
Bank Loan	7,500	5,625	1,875	-	-	-	-	-	-
Retained Earnings	-	2,985	17,014	34,189	63,960	98,115	136,653	175,186	213,715
<b>Total Liabilities and Equity</b>	<b>7,500</b>	<b>8,610</b>	<b>18,889</b>	<b>34,189</b>	<b>63,960</b>	<b>98,115</b>	<b>136,653</b>	<b>175,186</b>	<b>213,715</b>

Table 10 – Cash Flow Forecast

Cash Flow Statement (in million IDR)	1	2	3	4	5	6	7	8
<b>CF from Operating Activities</b>								
Net Income	2,985	14,029	17,175	29,771	34,155	38,538	38,534	38,529
Depreciation	469	938	938	938	938	938	938	938
-/- Account Receivables	875	2,875	750	2,850	1,050	1,050	-	-
<b>CF from Operating Activities</b>	<b>2,579</b>	<b>12,092</b>	<b>17,363</b>	<b>27,859</b>	<b>34,042</b>	<b>38,425</b>	<b>39,471</b>	<b>39,467</b>
<b>CF from Investing Activities</b>								
Purchase of equipment	- 7,500	-	-	-	-	-	-	-
<b>CF from Investing Activities</b>	<b>- 7,500</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>CF from Financing Activities</b>								
Borrowing from Bank	7,500	-	-	-	-	-	-	-
Repayment of Loan	-	1,875	3,750	1,875	-	-	-	-
Dividends	-	-	-	-	-	-	-	-
<b>CF from Financing Activities</b>	<b>7,500</b>	<b>- 1,875</b>	<b>- 3,750</b>	<b>- 1,875</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Net Cash Flow</b>	<b>-</b>	<b>704</b>	<b>8,342</b>	<b>15,488</b>	<b>27,859</b>	<b>34,042</b>	<b>38,425</b>	<b>39,471</b>

With a different discount rate, the result of Net Present Value shown in Table 11 and Table 12, on which the discount rate increment reduce the Net Present Value result.

Table 11 – NPV Calculation with 8% Discount Rate

Year	Net Cash Flow (in million IDR)	Present Value 8% (in million IDR)	NPV (in million IDR)
0	- 7,500		124,811
1	704	652	
2	8,342	7,152	
3	15,488	12,295	
4	27,859	20,477	
5	34,042	23,168	
6	38,425	24,214	
7	39,471	23,031	
8	39,467	21,323	

Source: Author, 2022

Table 12 – NPV Calculation with 15% Discount Rate

Year	Net Cash Flow (in million IDR)	Present Value 8% (in million IDR)	NPV (in million IDR)
0	- 7,500		86,809
1	704	612	
2	8,342	6,307	
3	15,488	10,183	
4	27,859	15,928	
5	34,042	16,925	
6	38,425	16,612	
7	39,471	14,839	
8	39,467	12,902	

Using the assumptions, all elements in Capital Budgeting are being calculated. The summary of the calculation is shown in Table 13 and Table 14.

Table 13 – Summary of Capital Budgeting Analysis with 8% discount rate

Capital Budgeting Tools	Result
Payback Period	0.83 years
Discounted Payback Period	0.96 years
ROI Year 1	35%
ROI Year 2	74%
ROI Year 3	50%
ROI Year 4	47%
ROI Year 5	35%
ROI Year 6	28%
ROI Year 7	22%
ROI Year 8	18%
WACC	6%
NPV	124,811 (million IDR)
Profitability Index	16.64 X
IRR	105%

Source: Author, 2022

Table 14 – Summary of Capital Budgeting Analysis with 15% discount rate

Capital Budgeting Tools	Result
Payback Period	0.83 years
Discounted Payback Period	1.08 years
ROI Year 1	35%
ROI Year 2	74%
ROI Year 3	50%
ROI Year 4	47%
ROI Year 5	35%
ROI Year 6	28%
ROI Year 7	22%
ROI Year 8	18%
WACC	11%
NPV	86,809 (million IDR)
Profitability Index	11.57 X
IRR	105%

Source: Author, 2022

Based on table 13 and 14 with the different discount rate, although the Net Present Value is decrease but it shows that the project of acquiring automatic stacking core machines can be concluded feasible as this two calculation still provide a positive result.

### Sensitivity Analysis

After conducting a capital budgeting analysis, the next step is to define how sensitive the changes in quantity order will affect NPV Calculation, since it will depend on how many demands are ordered from the customer and discount rate.

Table 15 – Quantity Order Forecast (in unit)

Scenario	1	2	3	4	5	6	7	8
Worst Case	1,050	1,050	1,050	4,500	5,400	6,300	7,200	8,100
Most Likely Case	1,050	4,500	5,400	6,300	7,200	8,100	8,100	8,100
Best Case	4,500	4,950	5,940	6,930	7,920	8,910	9,000	9,000

Source: PT Trafcomp Indonesiaperkasa, 2022

Table 15 is the forecast from PT Trafcomp Indonesiaperkasa for the worst, most likely case and best case in terms of quantity order.

Monte Carlo Simulation is performed to show the sensitivity of quantity order and discount rate with NPV. Figure 2 shows that the NPV will be at IDR 119 billion with probability around 1.9%. Figure 3 shows the sensitivity to reach the IDR 125 billion as per calculation is at 84,3% with probability around 1.2%.

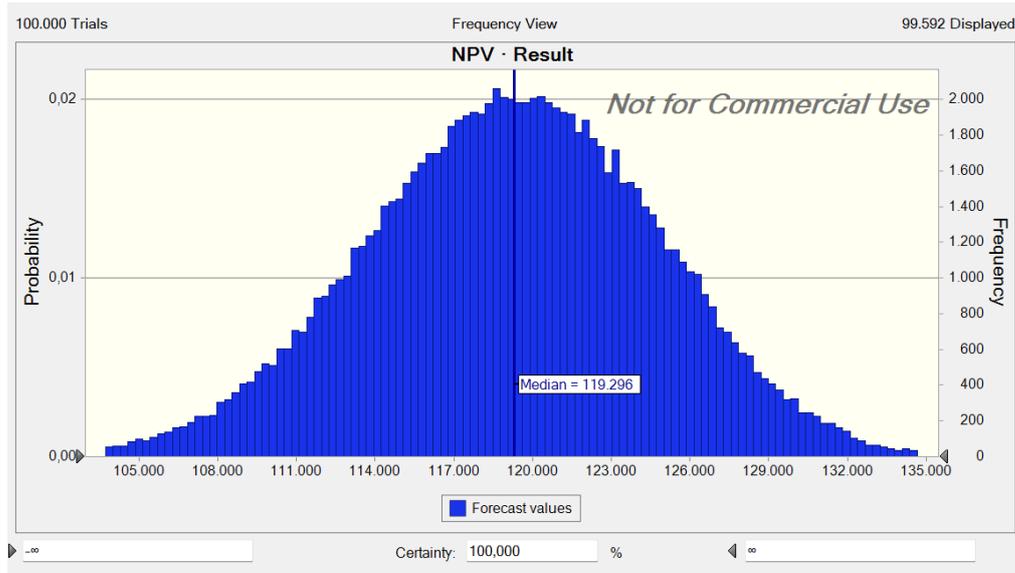


Figure 2 – Distribution Function of NPVs (Source: Author, 2022)

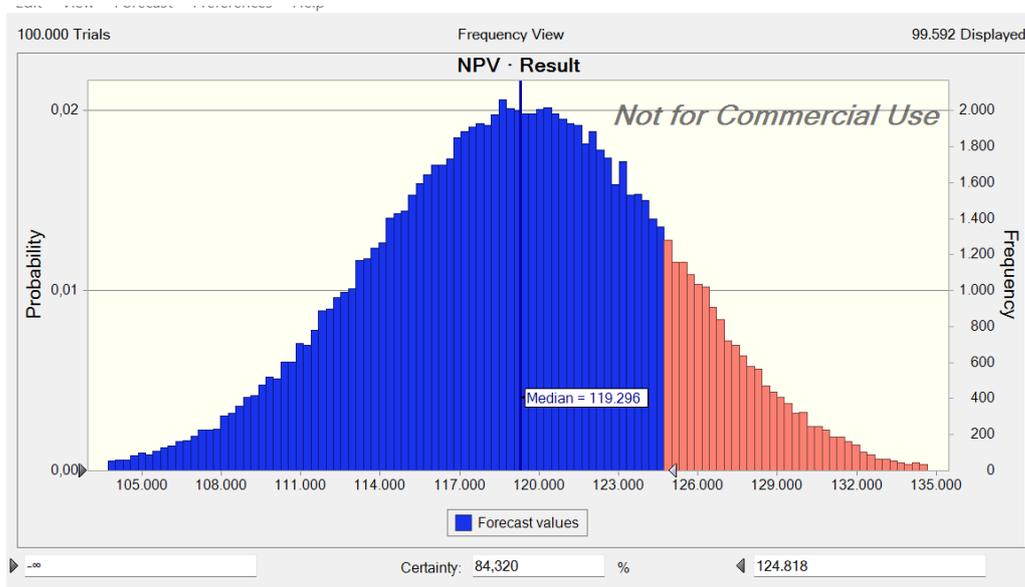


Figure 3 – Probability NPV near Forecast (Source: Author, 2022)

From the sensitivity analysis, it shows that the result for the requirement Capital Budgeting criteria is acceptable, even in the pessimistic scenario PT Trafcomp Indonesiaperkasa still has a good return.

### Non-monetary Analysis

There are SDGs that is relevant to be achieved when PT Trafcomp Indonesiaperkasa acquire an automatic stacking core machine, first is SDGs number five which is gender equality. According to Roberts, C., Parkes, H., Statham, R., & Rankin, L. (2019). An acceleration of automation could increase productivity and enable higher pay in currently low-paid roles dominated by women. Working in a factory, especially on the production floor, has long been viewed as not women friendly due to its physical nature and the inherent danger present in machineries. With automation however, the need for direct human intervention in the production process diminished, enabling women to take part in this production process if they wish to. Currently PT Trafcomp Indonesiaperkasa has one of woman employee that works as Production Planning and Inventory Control on which this job usually for man.

Second SDGs is number nine, with adopting a technology will bring a competitive advantage and increase the market share, which according to United Nations inclusive and sustainable industrialization, together with innovation and infrastructure, can unleash dynamic and competitive economic forces that generate employment and income. By increase the market share, PT Trafcomp Indonesiaperkasa as a local company will be sustain and will give a positive economy impact to community around.

## CONCLUSION

The first research goal was to determine the most effective equipment, manual or automated to anticipate the market growth. The result indicated that acquiring automated stacking machine is a suitable strategy to anticipate market growth. This is based on the interview that conducted by the expert system of PT Trafcomp Indonesiaperkasa and analysis for the competitive advantages of the company with the market demand condition by using SWOT Analysis and Porter's Five Forces.

The second objective of this study is to decide the feasibility of automated equipment acquisition project by the management of PT Trafcomp Indonesiaperkasa. The capital budgeting analysis indicating that automated equipment acquisition project is feasible for PT Trafcomp Indonesiaperkasa, which this project brings a positive NPV at IDR 125 billion and payback period less than one year.

The third research goal was to analyze the sensitivity toward market volume changes. The Monte Carlo Simulation shows the findings reveal that volume changes have impact for NPV result, which there is 84% probability to get the IDR 125 billion within 8 years.

The fourth research objective is to analyze the impact to non-monetary factors. The result reveals that H4 was supported, which buying machine will support SDGs Goal number five related to Gender Equality and SDGs Goal number nine related build resilient infrastructure, promote sustainable industrialization and foster innovation.

The study shows the result that if PT Trafcomp Indonesiaperkasa decides to acquire the automated stacking machine, it can give back a good result based on quantitative and qualitative analysis.

## Limitation

The first limitation is about the period of sales. The number of sales was collected based on actual sales from companies that begin in October 2021 for this service. The second limitation is no data from competitor companies in Indonesia considering it is a niche market. The limitations of a study can provide more opportunities for future studies to use in different industries. The third limitation is no option to rent the machine before acquiring a new machine.

## Future Research Recommendation

This study combines monetary, non-monetary and probabilistic analysis for Capital Investment decisions. Further studies are needed for research in other industries and non-niche markets, due to different industries may lead to different results and decision-making.

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