FEASIBILITY STUDY OF CNC MACHINE INVESTMENT TO OPTIMIZE MAIN WORKSHOP OPERATIONS AT PT BUKIT ASAM

FINAL PROJECT

In partial fulfilment of the requirements
for the master's degree
from Institut Teknologi Bandung

By
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(Master of Business Administration Program)

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ABSTRACT

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PT Bukit Asam Tbk (PTBA), a company in the coal mining sector, faces challenges in enhancing operational efficiency, particularly in the maintenance and repair of equipment at the Coal Handling Facility (CHF). The rising demand for components and spare parts highlights the limitations of conventional machines in terms of accuracy, efficiency, and operational costs. To address these challenges, PTBA considers investing in Computer Numerical Control (CNC) machines to improve productivity and reduce long-term expenses.

This study evaluates the feasibility of CNC machine investment through capital budgeting methods such as Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period (PBP), and Profitability Index (PI). Additionally, risk analysis involving sensitivity analysis, scenario analysis, and Monte Carlo simulation was conducted to assess the impact of uncertainty on the investment outcome. The results indicate that the investment is financially viable, with an NPV of IDR 5.26 billion, an IRR of 18%, and a payback period of 6 years and 4 months, with a 93.7% probability of achieving positive returns.

With proper implementation, including production process optimization, improved machine utilization, and workforce training, the investment in CNC machines is expected to enhance operational efficiency, reduce reliance on external vendors, and contribute to PTBA's long-term business sustainability.

Keywords: Investment Feasibility, CNC Machines, Operational Efficiency, Capital Budgeting, Risk Analysis.

ABSTRAK

STUDI KELAYAKAN INVESTASI MESIN CNC UNTUK MENGOPTIMALKAN OPERASIONAL BENGKEL UTAMA DI PT BUKIT ASAM

Oleh
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PT Bukit Asam Tbk (PTBA), perusahaan yang bergerak di bidang pertambangan batubara, menghadapi tantangan dalam meningkatkan efisiensi operasional, khususnya dalam pemeliharaan dan perbaikan peralatan di Coal Handling Facility (CHF). Meningkatnya permintaan komponen dan suku cadang menyoroti keterbatasan mesin konvensional dalam hal akurasi, efisiensi, dan biaya operasional. Untuk mengatasi tantangan ini, PTBA mempertimbangkan untuk berinvestasi pada mesin Computer Numerical Control (CNC) untuk meningkatkan produktivitas dan mengurangi biaya jangka panjang.

Studi ini mengevaluasi kelayakan investasi mesin CNC melalui metode penganggaran modal seperti Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period (PBP), dan Profitability Index (PI). Selain itu, analisis risiko yang melibatkan analisis sensitivitas, analisis skenario, dan simulasi Monte Carlo dilakukan untuk menilai dampak ketidakpastian terhadap hasil investasi. Hasilnya menunjukkan bahwa investasi ini layak secara finansial, dengan NPV sebesar Rp 5,26 miliar, IRR sebesar 18%, dan periode pengembalian modal selama 6 tahun 4 bulan, dengan probabilitas 93,7% untuk mencapai pengembalian positif.

Dengan implementasi yang tepat, termasuk optimalisasi proses produksi, peningkatan utilisasi mesin, dan pelatihan tenaga kerja, investasi mesin CNC ini diharapkan dapat meningkatkan efisiensi operasional, mengurangi ketergantungan terhadap vendor eksternal, dan berkontribusi terhadap keberlanjutan bisnis jangka panjang PTBA.

Kata kunci: Kelayakan Investasi, Mesin CNC, Efisiensi Operasional, Penganggaran Modal, Analisis Risiko

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FINAL PROJECT GUIDANCE

This final project is dedicated to parents, wife and my children who always support me.

may allah give them protection and blessings at every moment.

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Bandung, [March] [Rizki Satriawan]

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LIST OF ABBREVIATIONS AND SYMBOLS

ABREVIATIONS	Name	Page of initial usage
CNC	Computer Numerical Control	1
IRR	Internal Rate of Return	7
PBP	Pay Back Period	7
PI	Profitability Index	7
NPV	Net Present Value	7
CAPEX	Capital Expenditure	9
OPEX	Operating Expenditure	9
WACC	Weighted Average Cost of Capital	10
DCF	Discounted Cash Flow	12
BETA	Risk Factor	16
VRIO	Value, Rarity, Inimitability and Organization	17
SWOT	Strength, Weakness, Opportunity and Threat	17
PHEI	Penilaian Harga Efek Indonesia	33
ERP	Equity Risk Premium	33
SD	Standard Deviation	47

CHAPTER I – INTRODUCTION

I.1 BACKGROUND

Over the years, many mining companies in Indonesia have used conventional machines in their machining processes. These conventional machines, while they can serve the same purpose, often have limitations in terms of precision, time efficiency and the ability to operate automatically. In an increasingly competitive and technology-driven world, a company's operational sustainability depends on the ability to adopt more advanced technologies.

Along with the rapid growth of the industrial era, technological transformation in the mining industry also continues to grow along with the demands for increased efficiency, productivity, and competitiveness. One technology that has been widely adopted in the mining industry is CNC (Computer Numerical Control) machines, which are generally used for the manufacture and repair of heavy equipment components.

CNC technology has advantages in terms of the ability to produce parts with high precision, reduce human error, and can be operated automatically with computer programs. This can reduce operational costs, improve product quality, and minimize downtime of heavy equipment in the field. So that CNC machines are an alternative solution to improve efficiency and accuracy in the production process of mining machinery and equipment components.

However, the transformation from conventional machines to CNC machines requires significant investment, both in terms of capital, infrastructure, and human resource development. Therefore, before a mining company makes a decision to undertake this technological transformation, it is important to conduct an in-depth feasibility study. This feasibility study involves the analysis of costs and benefits, potential risks, organizational readiness, as well as the long-term impact on the company's productivity and profitability.

This study aims to evaluate the feasibility of technological transformation from conventional machines to CNC machines in mining companies, taking into account factors such as operational efficiency, economic impact, and technological and human resource readiness. The results of this study are expected to provide comprehensive recommendations for mining companies in making strategic decisions regarding the adoption of CNC technology.

In the middle of rapid technological development and increasing market demands, companies that are able to adapt to cutting-edge technology will have a significant competitive advantage. Thus, the transformation to CNC technology can be one of the key factors in improving the competitiveness of the mining industry in Indonesia.

I.2 COMPANY PROFILE

PT Bukit Asam Tbk (PTBA) is a company specialized in the coal mining industry and is part of the MIND ID Group. Since its establishment in 1981, PTBA has continued to develop into one of the major players in the coal mining sector in Indonesia. The company has a vision to become a world-class energy company that cares about the environment. In an effort to realize this vision, PTBA carries out its mission through the management of natural resources and energy with operational excellence, so as to provide maximum benefits for all stakeholders. In addition, PTBA is committed to conducting business with sustainability principles to support sustainable national development. The company also continues to increase its contribution in various initiatives aimed at improving the welfare of the community and preserving the environment around its operational areas.

Figure I-1 Holding structure of mining companies in Indonesia

(Source: Website of PT Bukit Asam Tbk)

By the end of 2022, the company manages a business network covering five main operating areas and three strategic ports. The five operational areas include Tanjung Enim, Ombilin, Peranap, Bantuas, and Bukit Kendi. Meanwhile, PTBA's three main ports are Teluk Bayur Port, Tarahan Port, and Kertapati Jetty.

PTBA has a Mining Business License (IUP) for coal production with a total area of 65,632 hectares. The company's coal resources reach 5.85 billion tons with reserves of 3.02 billion tons. In 2023, PTBA recorded coal production of 41.9 million tons, an increase of 13% compared to 2022 production of 37.1 million tons. This achievement also exceeded the initial 2023 target of 41 million tons. The organizational structure of PT Bukit Asam Tbk is as follows:

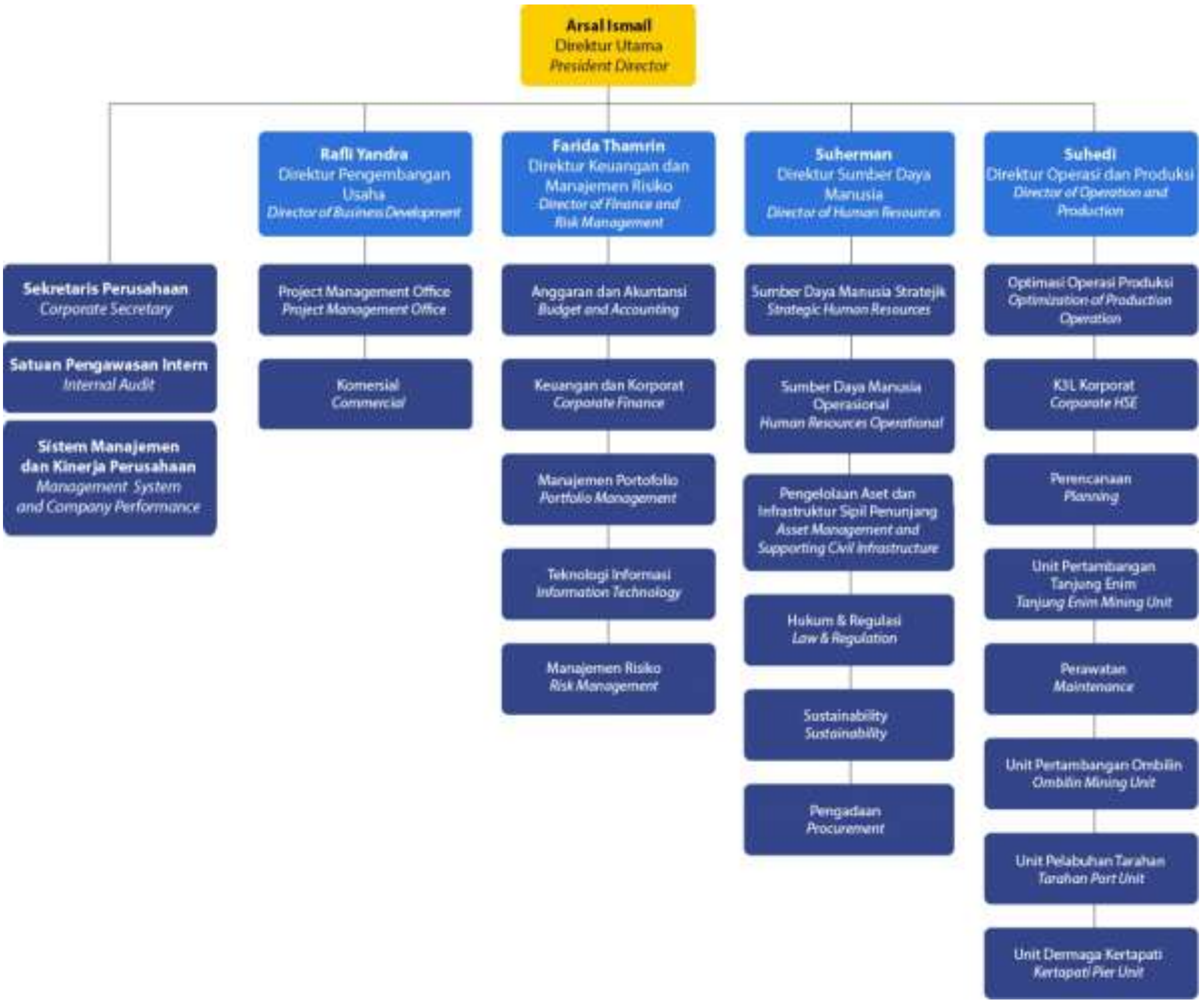

Figure I-2 Organizational structure of PT Bukit Asam Tbk
(Source: Website of PT Bukit Asam Tbk)

PT Bukit Asam Tbk (PTBA) not only focuses on profitability, but also has a high commitment to environmental sustainability and community welfare. PTBA actively participates in various Corporate Social Responsibility (CSR) programs covering education, health, infrastructure development, and economic empowerment of local communities around its operational areas. Through these initiatives, PTBA strives to provide a sustainable positive impact to the surrounding community and support social development.

As part of its commitment to sustainability, PTBA has launched various environmentally friendly initiatives. One of the company's main focuses is the use of clean technology in the coal production process as well as the development of renewable energy. PTBA participates in renewable energy projects such as the construction of solar power plants (PLTS) and more efficient mine waste management, which are the company's concrete steps in supporting the transition to green energy and environmental impact reduction.

In terms of financial performance, PTBA has consistently recorded strong growth. In 2023, the company managed to increase revenue significantly, driven by increased coal production and export expansion to international markets. PTBA capitalized on the momentum of high coal prices in the global market, which helped strengthen the company's financial position. In addition to meeting domestic needs, PTBA continued to expand its market to various Asian countries, including China, India, and Japan.

Nonetheless, PTBA faces challenges in maintaining the sustainability of its growth, especially amid fluctuations in global coal prices, increasingly stringent environmental regulations, and a shift in the global energy market towards renewable energy. However, with its energy diversification strategy and commitment to renewable energy development, PTBA remains optimistic that it can overcome these challenges and continue to lead in the energy industry in Indonesia. The company is determined to adapt and innovate, ensuring its important role in supporting national energy needs and environmental sustainability.

I.3 BUSINESS ISSUE

As stated in the 2025 RKAB PTBA targets to produce 50 million tonnes of coal, then increase to 60 million tonnes in 2026. In order to support the achievement of future production, PTBA started the construction of a new coal handling facility to increase coal transport capacity through the Tanjung Enim - Keramasan railway line. There are 3 new coal handling facilities built. First, two Train Loading Stations (TLS) with a capacity of 3,000 tonnes per hour each along with rail loops. Then two Conveyor System lines of 13 km and 17 km, each with a capacity of 3,000 tonnes per hour. In addition, three Dump Hoppers that can be used by dump trucks with a capacity of 60 tonnes and 100 tonnes.

Figure I-3 Coal Production of PT Bukit Asam Tbk

(Source: Website of PT Bukit Asam Tbk)

In addition to improving Coal handling facilities, PTBA also has the challenge of ensuring the reliability of all existing facilities. So PTBA requires the maintenance division to be able to ensure the reliability of all coal handling facilities. In this case, the maintenance unit must find various methods and equipment that can ensure the reliability of coal handling equipment.

Figure I-4 Total Closing work order of Main workshop

(Source : Internal data main workshop)

Figure I-5 Total Closing work order of machine shop

(Source : Internal data main workshop)

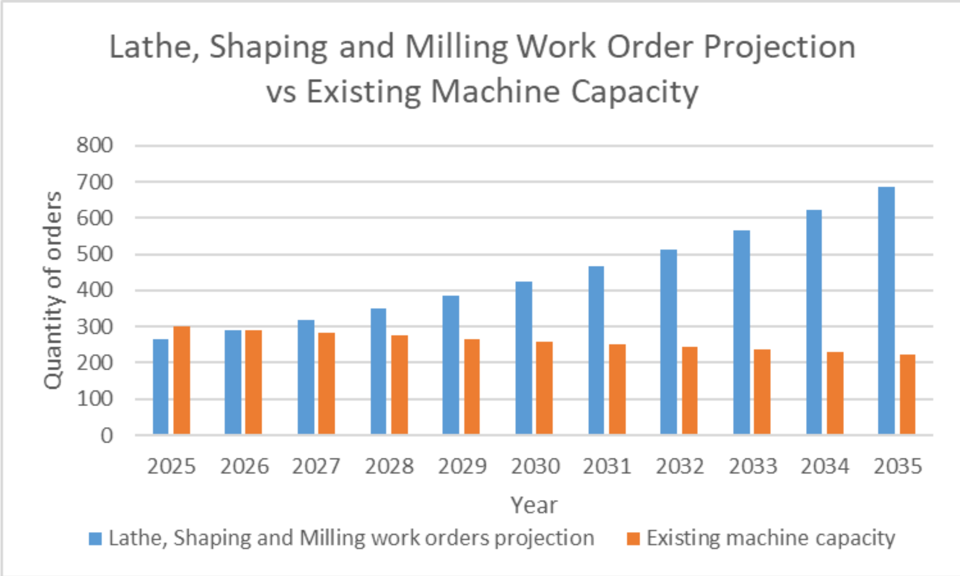

Figure I-6 Work order projection vs existing capacity

(Source : Internal data main workshop)

Along with the increasing need for machine maintenance and the company's higher production targets, the number of work requests from operational units has an increasing trend. However, the current machine capacity is no longer sufficient to accommodate the surge in demand. As a result, there is a backlog of work, increased waiting time for repairs, and potentially heavy equipment downtime that impacts the company's operational effectiveness.

Main workshop of the engineering and manufacturing unit as part of the maintenance division is responsible for repairing, maintaining, modifying, producing and managing components of coal handling facilities. With this increase in work orders, the main workshop of engineering and manufacturing is challenged to improve work efficiency without reducing quality. In response to this challenge, the main workshop of engineering and manufacturing has future plans to invest in several machineries such as CNC lathes, milling, laser cutting and welding machines. Replacing the previous conventional machines with the hope of increasing the efficiency and productivity of work in the workshop.

I.4 RESEARCH QUESTIONS AND OBJECTIVES

To evaluate the feasibility of implementing CNC lathes in the main workshop of PTBA's engineering and manufacturing unit, this research will focus on the financial aspects. To achieve the research objectives, several research questions are proposed as a basis for analysing the feasibility and impact of this implementation. The research questions to be answered in this study are as follows:

1. Is CNC lathe machine investment profitable based on the results of capital budgeting analysis?
2. What are the most sensitive variables affecting financial feasibility result?
3. What are the best and worst scenarios that most affect the financial feasibility of this project?
4. What is the probability of positive financial feasibility in this project using Monte Carlo simulation?

In line with the research questions posed, this study aims to answer various aspects related to the feasibility of implementing CNC technology in the main workshop of PT Bukit Asam. the objectives of this study are as follows:

1. Analyse the investment based on the calculation results of net present value (NPV), Internal rate of return (IRR), Payback Period (PBP), Profitability Index (PI) can be profitable or acceptable.
2. Evaluate what variables are sensitive to affecting NPV when changes are made to increase and decrease by 20%.
3. Analysing and calculating the best and worst scenarios of changes in variables that affect NPV.
4. Analysing and calculating the values that positively affect NPV using monte carlo simulation.

I.5 RESEARCH SCOPE AND LIMITATIONS

There are several scopes and limitations in writing this research, such as:

1. The primary data of this project is sourced from the internal data of operational and capital expenditures of the company's departments. in addition, some economic data is obtained from the financial information platform and the investment cost data of machine purchases comes from vendors. all of these data only focus on the projected investment of cnc lathe machines in the main workshop of the engineering and manufacturing work unit.
2. Some supporting data such as regional minimum wage data, the number of future equipment maintenance and repairs and some other estimation data are made based on the company's department policy by adjusting the current situation and conditions of the department.

3. The results of this study are only based on the analysis of the business situation and financial aspects projected for the next 10 years. starting from 2025 to 2035 adjusting the depreciation value of the machine.
4. This research is limited to the cnc lathe investment project of the engineering and manufacturing work unit of the maintenance division of PT Bukit Asam. where the financial aspects of this investment project are based on the calculation of NPV, IRR, PBP and PI while for analyzing the business situation using risk analysis, namely sensitivity, scenario and simulation analysis.

CHAPTER II - LITERATURE REVIEW

II.1 Theoretical Foundation

II.1.1 Definition and Basic Concepts of Investment

Investment can be defined as the investment of capital in the hope of earning profits in the future. Some definitions of investment according to experts include:

1. According to Bodie, Kane, and Marcus (2014), investment is the sacrifice of current consumption value to gain more value in the future.
2. Another view from Sharpe (2011) states that investment is the act of placing funds in assets with the aim of benefiting from capital appreciation or income streams.

In the context of CNC machine investment, investment is not only in the form of financial capital, but also includes the allocation of human resources and time in the procurement of technology to increase the productivity of workshop operations. In investment analysis, there are several methods that are commonly used to evaluate the feasibility of a project. The following are the methods used in this investment analysis.

II.1.2 Capital Budgeting Analysis

1. Capital Expenditure (CAPEX)

   According to Damodaran (2010) in Corporate Finance: Theory and Practice, CAPEX reflects strategic investments made by companies to ensure future growth. capital expenditure made by a company to acquire, improve or upgrade fixed assets (e.g. land, buildings, machinery and equipment). These expenditures are long-term investments.

   Characteristics:

   a. Non-routine, usually involving large amounts.
   b. Adds value to the asset or extends its useful life.
   c. Recorded on the balance sheet as an asset, and recognised as depreciation in the income statement over time.

2. Operating Expenditure (OPEX)

   According to Charles T. Horngren, et al. (2012) in the book Cost Accounting: A Managerial Emphasis, OPEX are expenses incurred to support the company's activities to keep it running normally without adding value to assets. OPEX usually includes all expenses directly related to business operations, such as salaries, utility costs, raw materials, and maintenance costs. Characteristics:

a. Routine and repetitive in nature.
b. Does not create new assets, but is necessary to maintain continuity of operations.
c. Recorded as an expense in the income statement.

3. Weighted Average Cost of Capital (WACC)

WACC is a financial metric that represents the average rate of return a company is expected to pay to all its security holders, including debt holders, equity investors, and preferred equity investors, weighted by their respective proportions in the company's capital structure. WACC is used by companies to evaluate the cost of financing and investment decisions.

The formula for calculating WACC is:

$$\boldsymbol{WACC = \left(\frac{E}{V}\right) \times R_e + \left(\frac{D}{V}\right) \times \mathrm{R}_d \times (1 - T)} \quad \text{.....................(2.1)}$$

$$\boldsymbol{R_e = R_f + \beta\left(R_m - R_f\right)} \quad \text{..................................(2.2)}$$

$$\mathbf{R}_d = \mathbf{r}_d \times (\mathbf{1} - \mathbf{T}) \quad \text{......................................(2.3)}$$

Where:

$\boldsymbol{E}$ = Market value of equity

$\boldsymbol{V}$ = Market value of debt

$\boldsymbol{V}$ = Total value of capital (equity + debt)

$\boldsymbol{R_e}$ = Cost of equity

$\mathbf{R}_d$ = Cost of debt

$\boldsymbol{T}$ = Corporate tax rate

$\boldsymbol{R_f}$ = Risk Free rate

$\boldsymbol{R_m}$ = Expected market return

$\boldsymbol{(R_m - R_f)}$= Equity risk premium

$\boldsymbol{\beta}$ = Beta Stock

$\mathbf{r}_d$ = Interest rate on loans or debt before tax

4. Depreciation

Depreciation is the systematic allocation of the cost of a fixed asset over its useful life. The purpose of depreciation is to reflect the use or depreciation of the economic value of the asset over time, either due to obsolescence, physical damage, or other factors that reduce its ability to generate future economic benefits. Depreciation is calculated by various methods, such as the straight-line method, where the depreciation expense is divided evenly each year, or the declining balance method, where the depreciation expense is greater at the beginning of the useful life. Depreciation is important to ensure accurate recording of asset costs in the income statement, reflect the book value of assets in the balance sheet, and help companies plan for future asset replacement.

5. Net Present Value (NPV)

Net Present Value (NPV) is a method used to calculate the difference between the present value of the cash inflows generated by an investment and the initial investment cost. NPV is the most comprehensive method in project evaluation as it takes into account the time value of money (Brealey, Myers & Allen, 2017). NPV takes into account the time value of money, using a discount rate that represents the cost of capital or expected rate of return.

The NPV formula is:

$$\boldsymbol{NPV} = \sum(\frac{\boldsymbol{Cash\ flow_t}}{\boldsymbol{(1+r)^t}} - \boldsymbol{I} \qquad (2.4)$$

Where Cash flow t is the cash inflow in period t, r is the discount rate, I is the initial investment, and t is the time period. If the NPV is positive, the project is considered viable because it provides a profit after taking into account the cost of capital. Conversely, if the NPV is negative, the project is considered unviable.

6. Internal Rate of Return (IRR)

Internal Rate of Return (IRR) is the discount rate at which the NPV of a project equals zero. In other words, IRR is the rate of return generated from an investment, where the present value of the cash inflows equals the initial investment cost. IRR is an important tool for comparing profitability between projects, although it has limitations if projects are mutually exclusive (Berk & DeMarzo, 2014).

The IRR formula is:

$$\mathbf{0} = \sum \left(\frac{CashFlow_t}{(1+IRR)^t} \right) - \boldsymbol{I} \quad (2.5)$$

If the IRR is higher than the cost of capital or the minimum expected rate of return, the project is considered viable. Conversely, if the IRR is lower, the project should be rejected. IRR is useful because it provides results in the form of a percentage, but in certain cases, such as irregular cash flows, it can result in more than one IRR value.

7. Payback Period (PP)

Payback Period (PP) is a simple method that measures the time required to recover the initial investment cost from the project's cash inflows (Atrill & McLaney, 2018).

The Payback Period formula is:

$$\boldsymbol{PP} = \frac{Initial\ Investment}{Average\ Annual\ Cash\ Flow} \quad (2.6)$$

This method does not take into account the time value of money, so it only gives an idea of how quickly the initial capital can be returned. PP is considered better the shorter the duration, but the main drawback is that this method does not take into account the profit generated after the payback period is reached.

8. Discounted Cash Flow

Discounted Cash Flow (DCF) is a method of valuing a company, project or investment by calculating the present value of the entity's expected future cash flows. This process is done by discounting the cash flows expected to be received in the future using an appropriate discount rate, which usually reflects the cost of capital or the rate of return desired by investors (Damodaran, 2012).

The Formula is :

$$\boldsymbol{DCF} = \sum_{t=1}^{n} (\frac{CF_t}{(1+r)^t} \quad (2.7)$$

Where :

$\boldsymbol{DCF}$ = Discounted cash flow

$\boldsymbol{CF_t}$ = Cash flow in year t

$\boldsymbol{r}$ = Discount rate (cost of capital)

$\boldsymbol{t}$ = Period of time (year to t)

II.1.3 Sensitivity Analysis

Sensitivity analysis is a method used to evaluate how changes in key assumptions or parameters in a model affect the outcome or decision taken, especially in the context of project or investment valuation. In this study, a tornado chart is used to identify which variables are most influential in this sensitivity analysis. it illustrates the maximum and minimum swing difference in forecasted values for each variable. this analysis only includes NPV as the variable tested.

II.1.4 Scenario Analysis

Scenario Analysis involves the creation and evaluation of several scenarios that describe different future conditions that may occur during the project life cycle. The main objective is to help organizations understand the range of possible futures and their impact on their strategy and operational decisions. In this analysis, the scenario is presented as a scenario that illustrates many possible of future conditions, allowing organizations to prepare for various challenges and opportunities.

II.1.5 SimulationAnalysis.

Simulation Analysis can be considered a development of Scenario Analysis as it provides a more comprehensive and probabilistic approach in dealing with uncertainty in capital budgeting. While Scenario Analysis relies on a few fixed scenarios to evaluate outcomes, Simulation Analysis provides a broader picture of possible outcomes by taking into account uncertainties in many variables and dependencies between them. There are typically multiple primary steps in the scenario simulation process. The first step is problem definition, which establishes the issue or circumstance that needs to be examined. The data collecting phase is then carried out in order to compile relevant data for the creation of an appropriate simulation model. A mathematical or computer model that replicates the actual system is then produced in the model development stage so that it may be utilized for additional study. Following model establishment, the simulation process is executed with different parameters to produce a range of potential outcomes. Lastly, the simulation's output is assessed in the outcomes analysis stage in order to make conclusion and offer suggestions that can help in decision-making.

II.2 Conceptual Framework

The conceptual framework in this research is a structure or map that illustrates the relationship between concepts relevant to the research topic. the first step in compiling this research is to determine the business issue that is the main objective in this research topic. after that, the author compiles a business situation analysis based on internal and external business data. the next step is to design financial projections based on income statement, balance sheet and operating cash flow. the next step is to determine financial feasibility which consists of two methods namely capital budgeting analysis and risk analysis. At the end of this analysis, the author provides conclusions and suggestions from the results of this study. the conceptual framework is shown below.

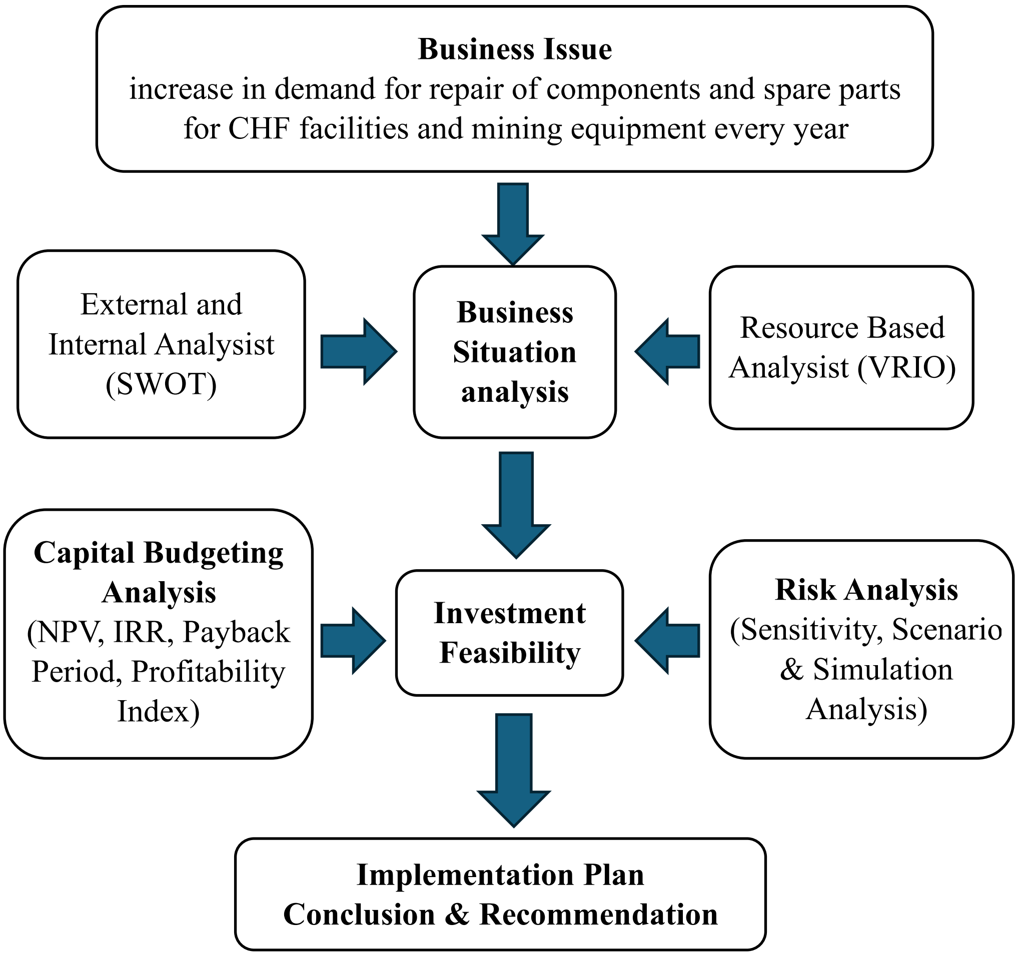

Figure II-1 Conceptual Framework

(Source : Author Analysis)

CHAPTER III - RESEARCH METODOLOGY

III.1 Research Design

Research design serves as the framework for planning and executing research. Research design determines the methodology to be used in the study and structures the steps required to achieve the research objectives. The research design also helps ensure that the research is conducted in a systematic and organized manner, so that the results obtained are reliable and valid. This research design project can be seen in the figure below:

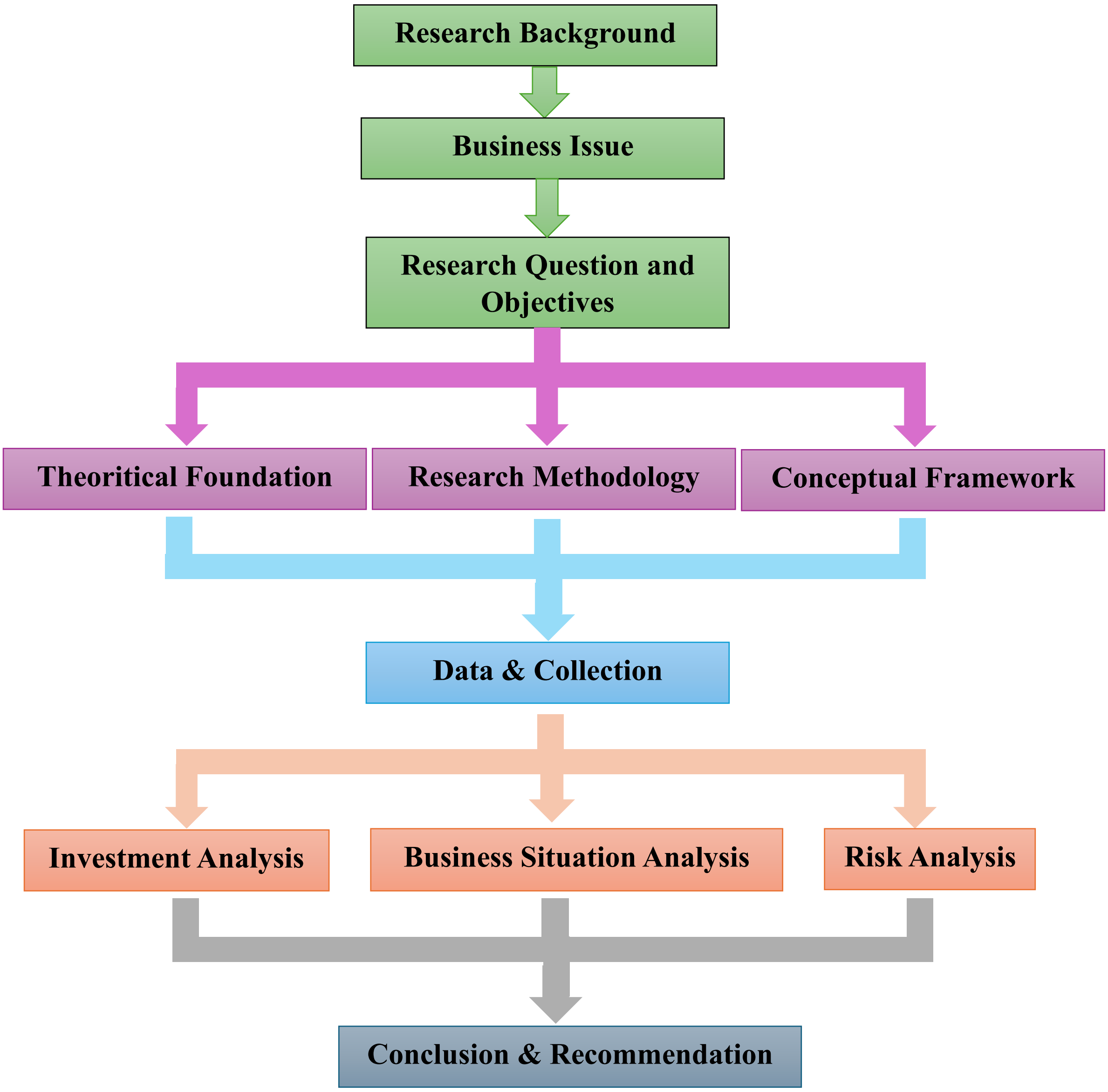

Figure III-1 Research Design

(Source : Author Analysis)

III.2 Data Collection Method

This research uses quantitative data with a combination of primary and secondary data. Primary data was obtained from direct interviews or internal data conducted by the author with main workshop engineer and machine planner. Then the secondary data was obtained from internal hystorical data of the main workshop and eksternal data from authorized distributor. All data in this study has been adjusted to the current condition of the company. Details regarding the data used can be seen in the following table:

Table III-1 Data Collection

CAPEX Data	
Data	Source
CNC Turning machine with installation and tax	Vendors/Authorized distributor
OPEX Data	
purchase price of repaired damaged spare parts	Authorized Distributor, Vendors and market
Energi consumption	Energy cost per kwh from PLN
Total work order per year	Main workshop planning and scheduling unit
Preventif maintenance data	Main workshop planning and engineering data
Wage rate	Main workshop contractor employee salary
Material Cost	internal data on material procurement
Depreciation rate	Internal data of company unit business
General and Finance Data	
Inflation rate	Central Bank of Indonesia
Risk Free rate	PHEI corporate bond yield of 5 year Dec 2024 (FR0101)
Beta	Calculated based on historical data of JKSE and PTBA shares for 5 years (January 2020 - December 2024)
Equity risk Premium	Damodaran
Cost of Equity	Calculated

WACC	Calculated
Ratio	Company data
Cash Flow	Company data
NPV	Calculated
IRR	Calculated
PBP	Calculated
PI	Calculated

(Source : Author Analysis)

III.3 Data Analysis Method

In this investment project the author uses several data analysis methods. to understand the current business situation the Resource-based view method with VRIO framework and Internal-Eksternal analysis method with SWOT is used. because this study is an investment analysis project, then to help in evaluating the feasibility of this investment where the method used is the capital budgeting method coupled with risk analysis.

III.3.1 Resource-Based View with VRIO Framework

Resource-Based View (RBV) is a strategic approach that focuses on a company's internal resources to create a competitive advantage. The Resource-Based View (RBV) theory was discovered and introduced by Birger Wernerfelt through his article entitled "A Resource-Based View of the Firm" published in 1984 in the Strategic Management Journal.

Using this analysis makes it easier for the author to understand the capabilities of the Engineering and manufacturing work units in planning CNC machine investment projects to increase time and cost efficiency in the main workshop. where so far the main workshop has been the main support in ensuring the availability of reliable components and spare parts in mining operations. which resources used are divided into tangible and intangible assets.

1. Tangible assets : include physical assets such as machinery, technology, equipment, land, buildings and human resources. These assets can be easily measured and controlled but have little long-term competitive advantage as every organization is able to replicate and own the same assets in the future.
2. Intangible assets : These assets do not have a physical form, are not easy to imitate and become the identity of the company such as brand reputation,

corporate culture, intellectual property and trademarks. These assets are built over a long period of time in an organization making them the most long-term competitive assets.

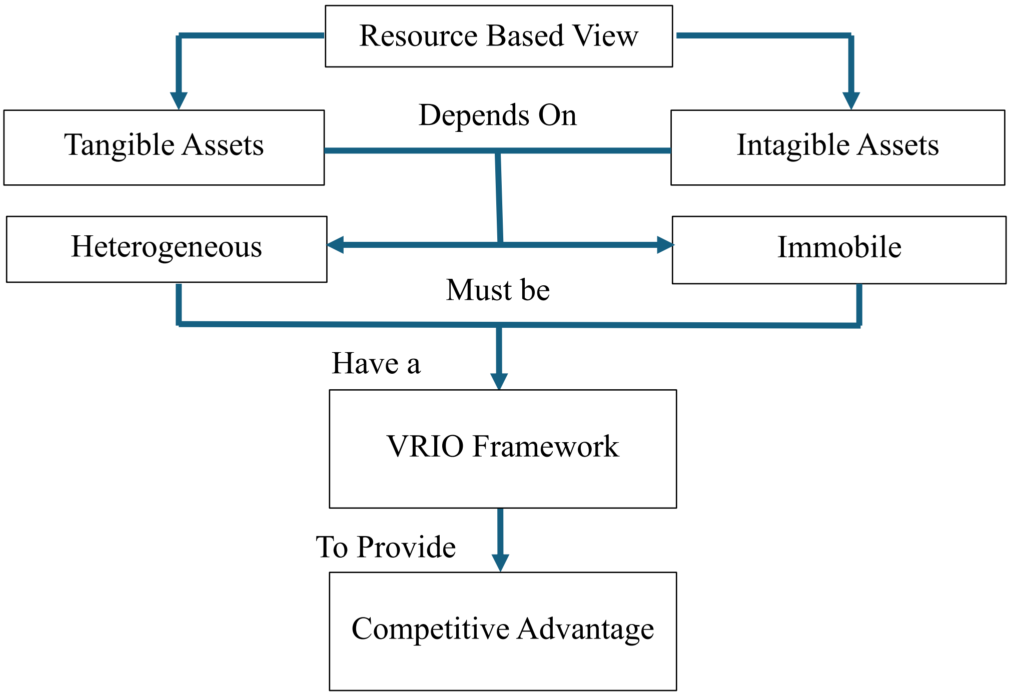

Figure III-2 Resource-based view with VRIO Framework

(Source : Author Analysis)

The VRIO framework was introduced by Jay Barney in his article titled "Firm Resources and Sustained Competitive Advantage" published in 1991. Jay Barney explained that in order for a firm's resources to generate sustainable competitive advantage, they must fulfill 4 criteria:

1. Value : resources provide economic value by helping the company take advantage of opportunities or overcome future threats. Valuable resources improve the efficiency or effectiveness of a company's operations.
2. Rarity : show the uniqueness of these resources owned by the company where other companies rarely have them, so that resources provide a competitive advantage.
3. Imitability : The resource must be difficult or expensive to replicate, either because of high cost, confidentiality of information, historical uniqueness, or complexity.

4. Organization : The company's organizational structure, internal processes, and strategy must support the optimization of resources by effective management and utilization of all lines within it.

Is a resource or capability ...					
Valuable?	Rare?	Costly to imitate?	Exploited by organisation?	Competitive implications	Economic performance
No	–	–	No	Competitive disadvantage	Below normal
Yes	No	–		Competitive parity	Normal
Yes	Yes	No		Temporary competitive advantage	Above normal
Yes	Yes	Yes	Yes	Sustained competitive advantage	Above normal

Figure III-3VRIO Framework

(Source : Barney (2002))

Fulfilling all four VRIO criteria in a company's resources can create a long-term sustainable competitive advantage. If only some of the criteria are fulfilled, the resulting advantage is only temporary.

III.3.2 SWOT Analysis

SWOT analysis provides information on the strengths, weaknesses, opportunities and threats of a situation, project or organization going forward. This analysis aids strategic decision-making by understanding the internal and external factors that affect performance. The following is a SWOT analysis of the engineering and manufacturing work unit:

Figure III-4 SWOT analysis

(Source : Author analysis)

Components:

1. Strengths: Internal factors that give the organization a competitive advantage, such as unique resources, good reputation, or advanced technology.

2. Weaknesses: Internal factors that may hinder the organization's performance, such as limited resources, lack of expertise, or inefficient processes.
3. Opportunities: External factors that can be leveraged to the organization's advantage, such as favorable market trends, positive regulatory changes, or technological developments.
4. Threats: External factors that may pose a risk to the organization, such as increased competition, changing consumer preferences, or economic instability.

III.3.3 Capital Budgeting Analysis

Capital budgeting analysis helps to determine the financial viability of investment projects. This analysis is done in the following step :

1. Evaluate the feasibility of the investment project by analyzing and calculating all necessary financial data. This process involves assessing key financial metrics to determine the viability and potential returns of the investment. A thorough evaluation of these data points provides insight into the financial sustainability and risk factors associated with the project.

   Based on the analysis and calculations, a capital budgeting analysis is conducted using several financial assessment methods. The Net Present Value (NPV) method measures the difference between the present value of cash inflows and outflows. The Internal Rate of Return (IRR) calculates the discount rate that makes the project's NPV equal to zero. The Payback Period determines the time required to recover the initial investment from the project's net cash flow. Lastly, the Profitability Index (PI) assesses the ratio between the present value of cash inflows and the initial investment costs, providing a measure of the project's overall profitability.
2. Measuring the level of risk in the feasibility of this investment project using sensitivity and scenario analysis by calculating how big the effect of changes in each variable of the investment project and simulation analysis by measuring the probability of a positive outcome of the investment project based on changes in each key variable such as costs, revenues and discount rates.

CHAPTER IV – RESULT AND DISCUSSION

This chapter will discuss the results of the analysis conducted on the CNC machine investment project in the engineering & manufacturing Work Unit. The main focus of this discussion is to evaluate the feasibility of the investment through a comprehensive business analysis approach, including external and internal analysis using the SWOT method, as well as internal analysis with the VRIO framework. Furthermore, capital budgeting calculations will be performed to assess the value of this investment by calculating Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period (PBP), and Discounted Cash Flow (DCF).

After the financial evaluation, a risk analysis will be conducted using sensitivity approaches, scenarios, and simulations to understand the potential impact of uncertain variables on the investment outcome. With this systematic approach, it is expected to provide a clear picture of the prospects and challenges of CNC machine investment in engineering and manufacture unit.

IV.1 Analysis

IV.1.1 Business Situation Analysis

1. External and Internal Analysis: SWOT Method

SWOT analysis will be used to evaluate the strengths, weaknesses, opportunities and threats associated with this investment project.

Table IV-1 SWOT analysis

Strategic Aspect	Condition	Key Findings	**Impact on Costs / Benefits**	**Implication for Capital Budgeting**
Strength	Modern technology	CNC provides precision and automation	Time and quality efficiency (production cost savings)	Adds to operating savings (increases NPV)
	Management support	Strong commitment to technology investment	Reduces implementation risk	Assumes full implementation without additional cost delays

Strategic Aspect	Condition	Key Findings	**Impact on Costs / Benefits**	**Implication for Capital Budgeting**
	Infrastructure available	Workshop facilities already support CNC installation	No additional CAPEX needed for building/infrastructure	Investment focused only on CNC machine price
	Higher capacity & quality	Faster and more accurate work output	Reduces reliance on external vendors	Outsourcing cost savings counted as net benefit
Weakness	High initial investment cost	CNC machine is expensive	Large CAPEX burden upfront	Counted in year 0 investment in NPV calculation
	Maintenance cost if unmanaged	CNC requires regular maintenance	Potential OPEX increase	Maintenance cost included in annual OPEX projection
	Limited operator experience	CNC operation needs trained personnel	Training costs potential	Considered minimal due to readiness
	Spare part dependency	Specific vendor-based spare parts	Risk of high repair cost	Accounted for in annual maintenance cost (5% of machine value)
Opportunity	Rising demand for precision	Internal demand for precise parts increasing	Internal workload increases cost efficiency	Revenue savings (boosts operating cash flow)

Strategic Aspect	Condition	Key Findings	**Impact on Costs / Benefits**	**Implication for Capital Budgeting**
	Internal market expansion	Potential to serve other units within PTBA	Broadens internal service scope	NPV based on single unit but has potential upside
	Product innovation potential	CNC enables custom design and flexibility	May reduce external component purchases	Non-financial benefit; supports investment rationale
	Training partnerships	Opportunity to partner with training centers	Reduces internal training burden	Not included in current costs (future saving potential)
Threat	Input material price fluctuation	Risk of rising input material costs	Potential OPEX increase	Handled via risk scenarios
	Machine breakdown risk	Risk of unplanned downtime	Repair cost or productivity loss	Simulated in Monte Carlo as risk variable
	Coal price volatility	PTBA revenue fluctuation risk	May affect investment continuity	Included in external risk scenarios
	Rapid tech advancement	Future technology may surpass CNC	Salvage value may decrease	Residual value included in NPV (year 10)

(Source : Author Analysis)

2. Internal Analysis : VRIO Method

This section presents a VRIO (Value, Rarity, Inimitability and Organization) analysis of the CNC machine investment in the engineering and manufacturing work unit. The purpose of this analysis is to assess the resources and capabilities of the work unit to support this investment project. The VRIO framework can be used to determine whether this investment will provide a sustainable competitive advantage.

Table IV-2 Tangible Resource

No.	Resource	Description
1.	Infrastructure facilities	The engineering and manufacturing unit is equipped with infrastructure facilities designed to support operational and maintenance efficiency.
2.	Tools and Equipment	The engineering and manufacturing unit is equipped with various tools and equipment that are essential to support facilities and equipment maintenance activities.
3.	Technology system	The Engineering and Manufacturing Unit utilizes integrated operational management software with appropriate procedures to support efficient coordination between areas.
4.	Finance	company innovation investment fund

(Source : Author Analysis)

Table IV-3 Intangible Resource

No.	Resource	Description
1.	Human Resource	has six integrated work sections with competent workers
2.	Customer Relationship	Internal customers with increasing demand for orders every year
3.	Reputation	Trusted partner for internal customers with a good reputation for environment, safety, delivering quality and efficient work. less than 3 major complaints per year.
4.	Experience	more than 50 years of experience with an average of five hundred repair and maintenance jobs completed each year.

(Source : Author Analysis)

Table IV-4 VRIO analysis of main workshop work unit

Resource/Capability	V	R	I	O	Competitive
Tools and Equipment	Yes	Yes	No	No	Temporary competitive advantage
Operational system technology	Yes	Yes	No	No	Temporary competitive advantage
Infrasctructure facilities	Yes	Yes	No	No	Temporary competitive advantage
Customer relationship & Network	Yes	Yes	Yes	Yes	Sustain competitive advantage
Competent and excellent service	Yes	Yes	Yes	Yes	Sustain competitive advantage
Innovation in product design & customization	Yes	Yes	Yes	Yes	Sustain competitive advantage
Company Innovation investment funds	Yes	Yes	Yes	Yes	Sustain competitive advantage
Experience	Yes	Yes	Yes	Yes	Sustain competitive advantage
Reputation	Yes	Yes	Yes	Yes	Sustain competitive advantage

Resource / Capability	**Competitive Type**	**Impact on Cost / Benefit Estimation**	**Implication for Capital Budgeting**
Tools and Equipment	Temporary Competitive Advantage	Limited efficiency and short-term precision improvements	Justifies short-term productivity gains (CAPEX only valid if upgraded)
Operational System Technology	Temporary Competitive Advantage	Streamlines process but still limited without CNC integration	Partial OPEX efficiency (full benefit realized only with CNC investment)
Infrastructure Facilities	Temporary Competitive Advantage	No additional infrastructure cost required	Reduces additional CAPEX (strengthens feasibility of investment)

Resource / Capability	Competitive Type	Impact on Cost / Benefit Estimation	Implication for Capital Budgeting
Customer Relationship & Network	Sustainable Competitive Advantage	Supports consistent internal demand and trust in output	Increases machine utilization (supports internal revenue projections)
Competent & Excellent Service	Sustainable Competitive Advantage	Ensures smooth operation with minimal training cost	Lowers initial learning curve cost; supports reliable cash flow
Innovation in Product Design	Sustainable Competitive Advantage	Ability to handle custom/internal components efficiently	Enhances internal value-added; supports long-term OPEX efficiency
Innovation Investment Funds	Sustainable Competitive Advantage	Availability of internal funding reduces financing cost	No external debt; discount rate based only on cost of equity
Experience	Sustainable Competitive Advantage	Reduces implementation risks and operational error	Supports optimistic scenario in NPV analysis
Reputation	Sustainable Competitive Advantage	Reinforces trust from internal clients; faster adoption	Reduces risk of underutilization (increases projected savings realization)

(Source : Author Analysis)

3. Business situation analysis result

Based on the results of the external and internal analysis using the SWOT method and a deeper internal resource evaluation using the VRIO framework, the business situation indicates a strong strategic foundation for investing in CNC machines at the Engineering and Manufacturing Unit of PT Bukit Asam. From the SWOT analysis, several key implications emerge:

1. Strengths such as modern technology adoption, management support, and available infrastructure reduce the complexity of implementation and minimize non-machine related investment costs. These strengths indicate potential cost efficiencies in

operations (such as reduced outsourcing and shorter lead time), which are expected to generate financial benefits when evaluated further in the capital budgeting section.

2. Weaknesses, including high initial investment, maintenance dependency, and limited operator experience, are acknowledged as cost drivers. These will later be included as initial capital expenditures (CAPEX) and operating expenses (OPEX) in the financial analysis. However, some weaknesses are mitigated by existing infrastructure and internal training readiness.
3. Opportunities such as increasing internal demand and the potential for service expansion to other units suggest the possibility of maximizing machine utilization. This supports the assumption that the CNC machine can deliver cost-saving benefits and increased efficiency in fulfilling internal work orders.
4. Threats such as input price volatility and technological shifts highlight potential risk areas. These will influence the risk assumptions in the financial model but do not invalidate the strategic relevance of the investment.

The VRIO analysis shows that PTBA possesses several resources and capabilities — such as competent human capital, strong internal customer relationships, and a history of reliable service — that fulfill all VRIO criteria (Valuable, Rare, Inimitable, Organized). These sustained competitive advantages indicate that the company is not only ready to adopt CNC technology but also has the internal ecosystem to fully leverage its benefits.

This strategic readiness implies that:

1. The expected benefits from CNC utilization (efficiency, precision, reduced external dependency) are realistic and justifiable,
2. And the expected costs (investment, maintenance, training) can be properly managed due to organizational support and existing systems.

These findings serve as the qualitative foundation for proceeding to the capital budgeting analysis, where the cost-benefit relationship will be quantified to assess the financial feasibility of the CNC machine investment.

IV.1.2 Capital Budgeting Analysis

1. Project Assumption

This investment feasibility study is conducted under the assumption that the existing conventional machines at the main workshop will be fully replaced by the proposed CNC lathe machine. The existing machines have been in operation for over 20 years and are experiencing increasing technical failures despite regular scheduled maintenance. These conditions indicate that the machines have reached their economic and operational limits, making them inefficient to sustain future production demands. Therefore, all projected financial calculations in this study are based on the scenario where the CNC machine fully takes over the workload previously handled by the conventional machines.

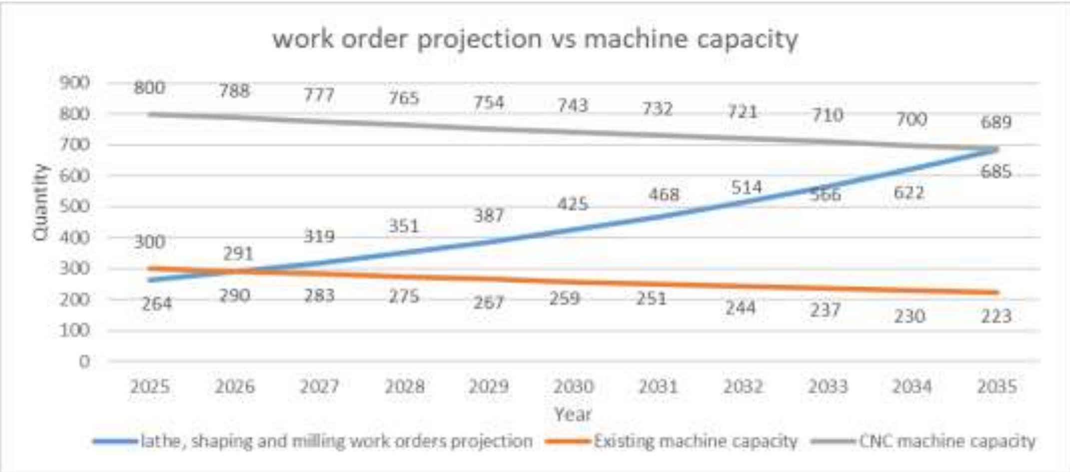

Figure IV-1 Work order projection vs machine capacity

(Source : Author analysis and Internal data of whorkshop)

a. Capital Expenditure (CAPEX).

The capital expenditure in this investment is a CNC lathe machine along with its delivery, installation and commissioning. the costs incurred are presented in the table below.

Table IV-5 Capex of purchasing cnc turning machine

Q'ty		No	Description	No	Description	Unit Price (Rp)	Amount (Rp)
1	SET		**Mazak Integrex i500 - 2500U**			Rp. 18.390.000.000	Rp. 16.390.000.000
		1	Max Swing Diameter : ø 700 mm	11	Tool Magazine : 36 Tools		
		2	Max Machining length : 2584 mm	12	Tool shank : HSK-A63		
		3	Max Machining diameter : ø 700 mm	13	Max tool diameter : ø 90 mm		
		4	Bar Work Capacity : ø 77 mm	14	Max tool length : 500 mm		
		5	X, Y, Z Axis travel : 845/430/2660 mm	15	Max tool weight : 12 kg		
		6	B Axis travel : -30° - 210°	16	Main spindle motor : 30/22 kW		
		7	Chuck Size : 10"	17	Milling spindle motor : 24/22 kW		
		8	Spindle speed : 4000 rpm	18	Machine height : 2950 mm		
		9	Spindle nose : A2-8	19	Floor space requirement : 6980x3400 mm		
		10	Spindle bore : ø 91 mm	20	Machine Weight : 23500 kg		
			OPTIONAL ACCESSORIES :				
		1	COMPLETE COOLANT SYSTEM	38	PREP. FOR CHIP CONVEYOR (SIDE/HINGE)		
		2	FULL COVERAGE CHIP AND COOLANT GUARD	39	SMOOTH STANDARD SOFTWARE FOR M/C		
		3	WORK LIGHT	40	MCAFEE EMBEDDED CONTROL		
		4	STANDARD TOOLING PACKAGE (HSK)	41	EIA/ISO PACKAGE		
		5	SAFETY SHIELD	42	SOLID MAZATROL		
		6	AI THERMAL SHIELD	43	3-D COORDINATE CONVERSION		
		7	ONE SET OF MANUALS (CD)	44	DIRECT ENTRY OF DRAWINGS DIMENSIONS		
		8	ONE SET OF ADJUSTING TOOLS	45	SMOOTH RESTART FUNCTION		
		9	FOUNDATION KIT(PLATES)	46	USB I/F (1-PORT)		
		10	MAZAK STD COLOR (F WHITE(FINE)/S BLACK)	47	LAN PORT		
		11	MAZATROL SMOOTHAI CNC	48	SD MEMORY I/F(1-PORT) + USB I/F(1-PORT)		
		12	19" COLOR LCD (TOUCH SCREEN)	49	ACCURACY INSPECTION		
		13	POWER TRANSFORMER FOR OTHER MARKETS	50	RELOCATION DETECTOR		
		14	MAIN SPINDLE MOTOR AC 30KW(40HP)	51	18"THRU-HOLE CHUCK BB218 DIA.185 (UPGRADE , SPEED WILL REDUCE)		
		15	SPINDLE SPEED 4000 RPM	52	ONE SET OF HARD JAWS FOR BB-218		
		16	MILLING SPINDLE SPEED 12000 RPM	53	1 SET OF SOFT JAWS(H110(4.3"))/BB-218		
		17	36 HSK-TOOL MAGAZINE	54	ONE SET OF SOFT JAWS FOR BB-218		
		18	NC TAILSTOCK	55	CHUCK AIR BLAST		
		19	TAILSTOCK BUILT-IN LIVE CENTER MT5	56	SMW SLU-X4 SINGL/AUTO W/SHOWER COOLANT		
		20	C-AXIS POSITIONING 0.0001DEG. CONTOURING	57	TOOL EYE (AUTOMATIC)		
		21	B-AXIS 0.0001 DEG/CNTRING (REQ. EIA/ISO)	58	MAZAK MONITORING SYSTEM B (RMP60)		
		22	SPINDLE BORE DIA.91MM(3.58")	59	MANUAL PULSE GENERATOR(WIRED/DETACHABLE)		
		23	AUTOMATIC CHUCK JAWS OPEN/CLOSE	60	GREASE CARTRIDGE (LHL X100-7)		
		24	CHUCK OPEN/CLOSE CONFIRMATION	61	1.5MPA THRU CLNT/FLOOD COOLANT SIMUL		
		25	ABSOLUTE POSITIONING SYS (LINEAR AXES)	62	SIGNAL TOWER (3 COLORS LIGHTS,SQUARE)		
		26	X,Y,Z PITCH ERROR COMPENSATION INPUT	63	CHIP CV SIDE DISPOSAL(HINGE,FILTER)2500U		
		27	COOLERS FOR BALL SCREW (X,Y,Z-AXIS)	64	CHIP BUCKET (FIXED TYPE)		
		28	ROLLER GUIDES	65	SMOOTH SYNCHRO. TAPPING(MILLING-SPINDLE)		
		29	HYDRAULIC PRESSURE INTERLOCK	66	F)TOOL RADIUS COMPENSATION / 5-AXIS		
		30	SWIVEL TYPE OPERATION CONTROL PANEL	67	INCH/METRIC CONVERSION		
		31	EIA/ISO LATHE & MILL SPDL IND. ROTATION	68	B)CYLINDRICAL & POLAR COORDINATE (EIA)		
		32	COOLANT THROUGH MILLING HEAD	69	MAXIMUM PROGRAM SIZE : 8MB		
		33	5KG THRU CLNT/FLOOD CLNT SIMUL-FLOWABLE	70	5-AXIS MACHINING PACKAGE FOR SMOOTHAI		
		34	AUTO POWER ON/OFF + WARM-UP	71	MTCONNECT ADAPTER		
		35	ATC AUTO RECOVERY	72	NAME PLATE RELOCATION DETECTOR (INDON)		
		36	OPERATOR DOOR INTERLOCK WITH LOCK-SWITCH	73	TOOLING SET FOR TRIAL PRODUCTS 1 PCS OF 1 DRAWING		
		37	NUMBER DISPLAY MAG. PANEL (N/A TOOL ID)	74	CAM PROGRAM		
					TOTAL (Rp):		Rp.16.390.000.000
					VAT (Rp)		Rp.1.802.900000
					GRAND TOTAL (Rp)		Rp.18.192.900.000

VALIDITY OF OUR OFFER: 30 Days
SELLING CONDITIONS: unless otherwise stated, our General Conditions of Sale are applicable
WARRANTY: our warranty is 12 months from installation date
INCLUDE installation & Operational training

(Source : Vendor quotation document)

b. Operating Expenses (OPEX).

Operating costs for this project include salaries for two employees, totaling Rp12,000,000 per month (Rp6,000,000 each), industrial electricity costs of Rp1,035 per kwh as well as machinery maintenance costs of 5% of the initial value of the machinery. This resulted in a large portion of the operational budget being allocated to staff costs, energy consumption and machine maintenance, which are critical to maintaining operational efficiency.

Table IV-6 Operating expenses

No.	Component	Details	Cost
1	Employee Salaries	2 employees, each earning Rp 6 million/month and fix bonus of 2 months salaries.	Rp 168,000,000/year
2	Electricity Costs	Industrial rate of Rp1,035/kWh, cnc machine using max 48 kw for 8 hour/working day with 22 working day per moth	Rp 49,680 /hour or 104,924.000 /year
3	Maintenance Cost	50 liters x 4 coolant = IDR 30 mio spindle lubricating oil 10 liters x 2 = IDR 5 mio engine lubricating oil 10 liters x2 = IDR 5 mio hydraulic lubricating oil 40 liters x1.5 = IDR 9 mio assumption of replacement cost of consumable spareand calibration parts per year = 5% of machine price.	Rp 958,600,000 /year

(Source : Author Analysis)

c. Inflation rate.

Based on central bank of indonesia web data for the last 5 years, it is found that the average inflation rate is around 2.76%. for more details, the movement of inflation in Indonesia is described in the graph below.

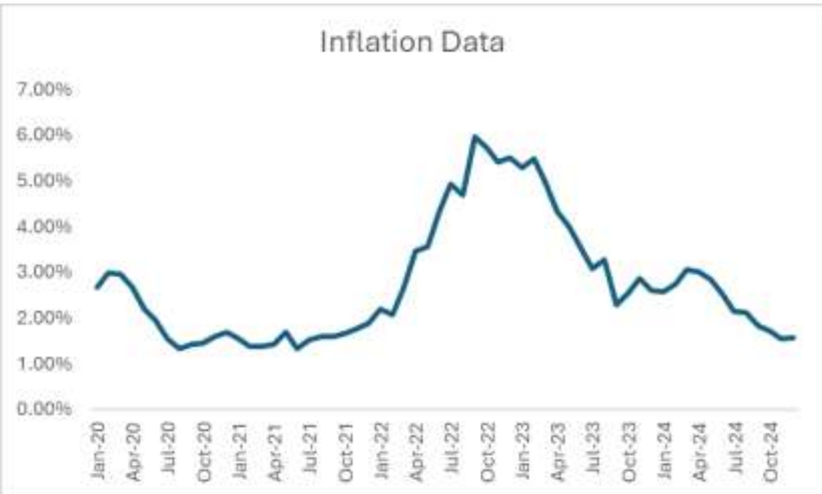

Figure IV-2 Indonesian inflation chart in the last 5 years

(Source : Bank Indonesia website)

d. Depreciation.

Using the straight-line method, depreciation is calculated based on the length of operation which is around 10 years with a depreciation rate of 10% per year or 0.83% per month. the table below explains the depreciation rate of cnc machines during 10 years of use.

Table IV-7 Depreciation

Year	In thousand Rp			
	Opening book of Value	**Depreciation expenses**	**Accumulated depreciation**	**Closing book of value**
0	18,192,000	-	-	18,192,000
1	18,192,000	1,819,200	1,819,200	16,372,800
2	16,372,800	1,819,200	3,638,400	14,553,600
3	14,553,600	1,819,200	5,457,600	12,734,400
4	12,734,400	1,819,200	7,276,800	10,915,200
5	10,915,200	1,819,200	9,096,000	9,096,000
6	9,096,000	1,819,200	10,915,200	7,276,800
7	7,276,800	1,819,200	12,734,400	5,457,600
8	5,457,600	1,819,200	14,553,600	3,638,400
9	3,638,400	1,819,200	16,372,800	1,819,200
10	1,819,200	1,819,200	18,192,000	-

(Source : Author calculation)

e. List of CNC machine work orders.

Some work orders that were previously done on conventional machines will later be done on cnc machines.

Table IV-8 List of work order in cnc turning machine

Work description	Material cost (Rp)	Order quantity	Product quantity	Labour cost (Rp)
Year of 2023				
repair/fabrication flange	250,408,075	7	12	142,065,000
repair/fabrication bushing	8,814,636,673	65	493	1,426,320,000
repair/fabrication shaft	3,245,699,403	84	487	1,930,005,000
repair/fabrication pin	691,391,508	51	255	517,230,000
repair/fabrication ring	1,090,851,380	33	117	917,280,000
total	14,092,987,040	240	1,364	4,932,900,000
Year of 2022				
Repair/fabrication flange	470,970,168	8	24	142,380,000
Repair/fabrication bushing	2,825,722,083	65	1,361	2,781,450,000
Repair/fabrication shaft	4,054,855,482	94	305	3,316,635,000
Repair/fabrication pin	4,102,625,194	49	895	1,075,410,000
Repair/fabrication ring	880,762,804	33	183	1,133,370,000
Total	12,334,935,731	249	2,768	8,449,245,000

Work description	Material cost (Rp)	Order quantity	Product quantity	Labour cost (Rp)
Year of 2021				
Repair/fabrication flange	1,901,246,101	21	43	519,435,000
Repair/fabrication bushing	12,292,045,945	50	712	404,105,000
Repair/fabrication shaft	2,504,075,582	95	297	712,490,000
Repair/fabrication pin	1,253,569,042	46	708	499,430,000
Repair/fabrication ring	3,089,179,150	29	74	635,945,000
Total	21,040,115,819	241	1,834	2,771,405,000
Year of 2020				
Repair/fabrication flange	84,295,913	19	50	92,295,000
Repair/fabrication bushing	1,193,020,058	40	288	254,480,000
Repair/fabrication shaft	1,846,454,123	62	79	326,580,000
Repair/fabrication pin	503,130,931	37	797	181,935,000
Repair/fabrication ring	1,392,468,482	28	67	307,155,000
Total	5,019,369,506	186	1,281	1,162,445,000
Total	52,487,408,096	916	7,247	17,315,995,000
Average	13,121,852,024	229	1,812	4,328,998,750

(Source : Internal main workshop data.)

Since production increases by 5-15% per year based on historical data of production volume for the last 4 years, it is assumed that the average increase in work orders is 10% per year.

f. Weighted average cost of capital (WACC)

In this cnc machine investment, the Weighted Average Cost of Capital (WACC) is calculated based solely on equity financing sourced entirely from the company's project funds, without undertaking debt or external financing. thus reflecting a fully equity-based capital structure, which affects the overall cost of capital and investment decisions.

To calculate the cost of equity value using the formula:

$$Cost\ of\ equity\ (Re) = rf + \beta(equity\ risk\ premium) \quad \text{................ (4.1)}$$

By comparing the historical data of JKSE and PTBA shares for 5 years (January 2020 - December 2024) obtained from PHEI source. Beta value is obtained based on the slope of the linear regression as follows.

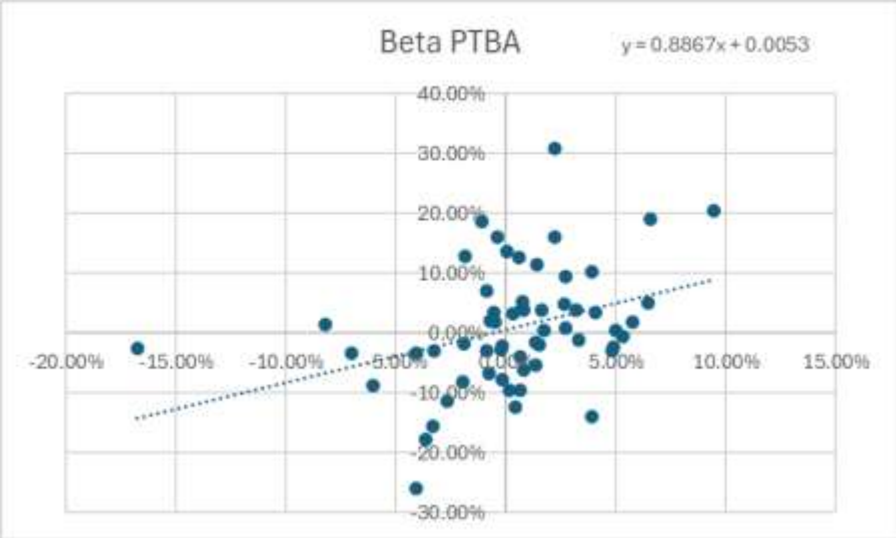

Figure IV-3 Beta Levered PTBA

(Source: Author calculation)

Table IV-9 Source parameters of WACC

Parameters	Values	Source
Risk Free rate (rf)	6,89%	PHEI corporate bond yield of 5 year Dec 2024 (FR0101)
Equity risk premium (erp)	6,44%	Country default spread Damodaran 4 july 2024
Beta (β)	0,88	Calculated based on historical data of JKSE and PTBA shares for 5 years (January 2020 - December 2024 with formula $\beta = \frac{Kov(PTBA,JKSE)}{Var(JKSE)}$

Source : Damodaran spread sheet and PHEI website

with 100% equity company to invest in this cnc machine, it was shown that:

Table IV-10 WACC calculation

Parameter	Weight
% Equity	100%
% Debt	0%
Cost of equity	12,56%
WACC	12,56%

Source : Author calculation

with a 100% equity financing structure, the calculated WACC is 12.56%. This implies that the CNC machine investment must achieve a return exceeding 12.56% to be considered financially viable and profitable for the company.

2. Financial Projection

   a. Income Projection

The potential revenue from this CNC machine investment is focused on the operational efficiency generated compared to the use of conventional machines. Revenue in this context is defined as the difference between the operating cost incurred using conventional machines and the projected operating cost after the implementation of CNC machines, reflecting the significant cost savings that can be achieved.

Revenue = cost of using conventional machines

Average of operating cost from 2020-2023 are Rp 4,328,998,750.

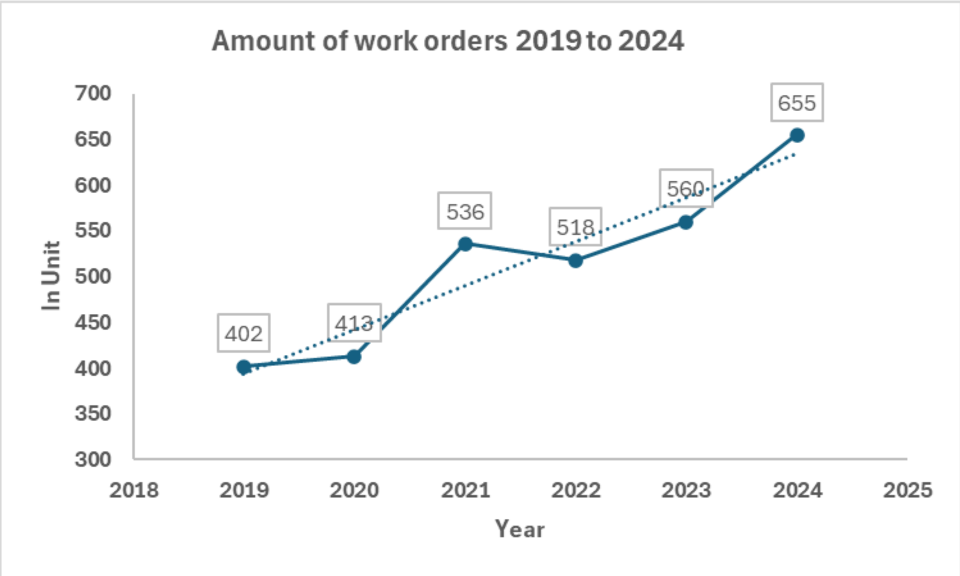

Figure IV-4 amount of Work orders in 5 years before

(Source: Author analysis)

Based on the graph of the number of work orders from 2019 to 2024, it can be seen that there is a general increasing trend even though there was a slight decrease in 2022. The number of work orders increased from 402 units in 2019 to 655 units in 2024.with an average of 10% per year. so the previous operating cost using conventional machines from 2026 to 2035 is considered to be 10% per year.

Table IV-11 Revenue calculation

Year	Operating cost using conventional In Rp	% increase of work order	Conventional cost projection In Rp
2026	4,328,998,750	-	4,328,998,750
2027	4,328,998,750	10%	4,761,898,625
2028	4,761,898,625	10%	5,238,088,488
2029	5,238,088,488	10%	5,761,897,336
2030	5,761,897,336	10%	6,338,087,070
2031	6,338,087,070	10%	6,971,895,777
2032	6,971,895,777	10%	7,669,085,355
2033	7,669,085,355	10%	8,435,993,890
2034	8,435,993,890	10%	9,279,593,279
2035	9,279,593,279	10%	10,207,552,607

(Source : Author calculation)

b. Total operating expenses and depreciation

Total operating expenses and depreciation for CNC turning machine are calculated in the table below with average annual inflation of 2.76%.

Table IV-12 Total operating expenses and depreciation

	In thousand Rp				
Year	2026	2027	2028	2029	2030
energy cost	104,924	107,820	110,796	113,854	116,996
salary cost	168,000	172,637	177,402	182,298	187,329
maintenance cost	958,600	985,057	1,012,245	1,040,183	1,068,892
depreciation	1,819,200	1,819,200	1,819,200	1,819,200	1,819,200
Total operating	3,050,724	3,084,714	3,119,642	3,155,534	3,192,417

	In thousand Rp				
Year	2031	2032	2033	2034	2035
energy cost	120,225	123,543	126,953	130,457	134,058
salary cost	192,500	197,813	203,272	208,882	214,648
maintenance cost	1,098,393	1,128,709	1,159,861	1,191,874	1,224,769
depreciation	1,819,200	1,819,200	1,819,200	1,819,200	1,819,200
Total operating	3,230,318	3,269,265	3,309,287	3,350,413	3,392,675

(Source : Author calculation)

Total operating expenses and depreciation for the CNC turning machine over the ten-year period from 2026 to 2035 amount to Rp 32,154,990,000. This figure is derived from the summation of annual operating costs, which include energy costs, salary expenses, maintenance costs, and depreciation. The calculation incorporates an average annual inflation rate of 2.76%, affecting all cost components except depreciation, which remains constant at Rp 1,819,200,000 per year. The projected cost trend indicates a steady increase in total operating expenses over the investment period, highlighting the financial commitment required for the long-term operation of the CNC machine.

c. Operating profit

Operating profit is calculated based on the formula :

$$Operating\ profit = Cost\ saving$$

$$Operating\ profit = \text{Cost operating before} - \text{Cost operating cnc machine}$$

$$Operating\ profit\ margin = \frac{Operating\ profit}{\text{Cost operating before}}$$

use the formula above to calculate operating profit in the table below :

Table IV-13 Total operating profit

Year	In Rp			Operating saving margin
	Operating cost using conventional machine	Operating expenses using CNC machine	Operating saving	
2026	4,328,998,750	3,050,724,000	1,278,274,750	29.53%
2027	4,761,898,625	3,084,714,062	1,677,184,563	35.22%
2028	5,238,088,488	3,119,642,251	2,118,446,237	40.44%
2029	5,761,897,336	3,155,534,457	2,606,362,879	45.23%
2030	6,338,087,070	3,192,417,288	3,145,669,782	49.63%
2031	6,971,895,777	3,230,318,085	3,741,577,692	53.67%
2032	7,669,085,355	3,269,264,944	4,399,820,411	57.37%
2033	8,435,993,890	3,309,286,736	5,126,707,154	60.77%
2034	9,279,593,279	3,350,413,130	5,929,180,149	63.89%
2035	10,207,552,607	3,392,674,613	6,814,877,994	66.76%

(Source : Author calculation)

The analysis of operating profit demonstrates a significant cost-saving potential achieved through the implementation of the CNC turning machine over the ten-year period from 2026 to 2035. The operating profit, calculated as the difference between the conventional machine's operating costs and the CNC machine's operating expenses, exhibits a consistent upward trend throughout the investment period. In 2026, the initial year of implementation, the cost savings amount to Rp 1,278,274,750, representing an operating profit margin of 29.53%. As the years progress, the cost savings increase substantially, reaching Rp 6,814,877,993.90 in 2035, with an operating profit margin of 66.76%.

This progressive improvement in cost savings and profit margin highlights the efficiency and economic advantage of transitioning from conventional machining to CNC technology. The increasing margin percentage indicates that the CNC machine not only reduces operational costs but also enhances profitability as production scales up. Additionally, the trend suggests that the machine's efficiency in cost reduction becomes more pronounced over time, likely due to factors such as improved process stability, reduced waste, and lower maintenance expenses compared to conventional methods.

d. Net Profit

"Net profit, also known as net income or net earnings, represents the amount remaining after all expenses, including taxes and interest, have been deducted from total revenue"(Gitman and Zutter,2015). net profit is calculated based on the formula

$$Net\ Profit\ = Operating\ profit - Tax \quad (4.2)$$

while net profit margin is calculated using the formula:

$$Net\ Operating\ profit = \frac{Net\ profit}{Revenue} \quad (4.3)$$

Based on the calculation using the methodology above, the net profit is shown in the table below:

Table IV-14 Total net profit (saving)

Year	In Rp			net profit margin
	Operating profit (saving)	Tax	Net profit (saving)	
2026	1,278,274,750	281,220,445	997,054,305	23.03%
2027	1,677,184,563	368,980,603	1,308,203,959	27.47%
2028	2,118,446,236.	466,058,172	1,652,388,064	31.55%
2029	2,606,362,879	573,399,833	2,032,963,045	35.28%
2030	3,145,669,781	692,047,352	2,453,622,429	38.71%
2031	3,741,577,691	823,147,092	2,918,430,599	41.86%
2032	4,399,820,410	967,960,490	3,431,859,920	44.75%
2033	5,126,707,154	1,127,875,573	3,998,831,580	47.40%
2034	5,929,180,149	1,304,419,632	4,624,760,516	49.84%
2035	6,814,877,993	1,499,273,158	5,315,604,835	52.08%

(Source : Author calculation)

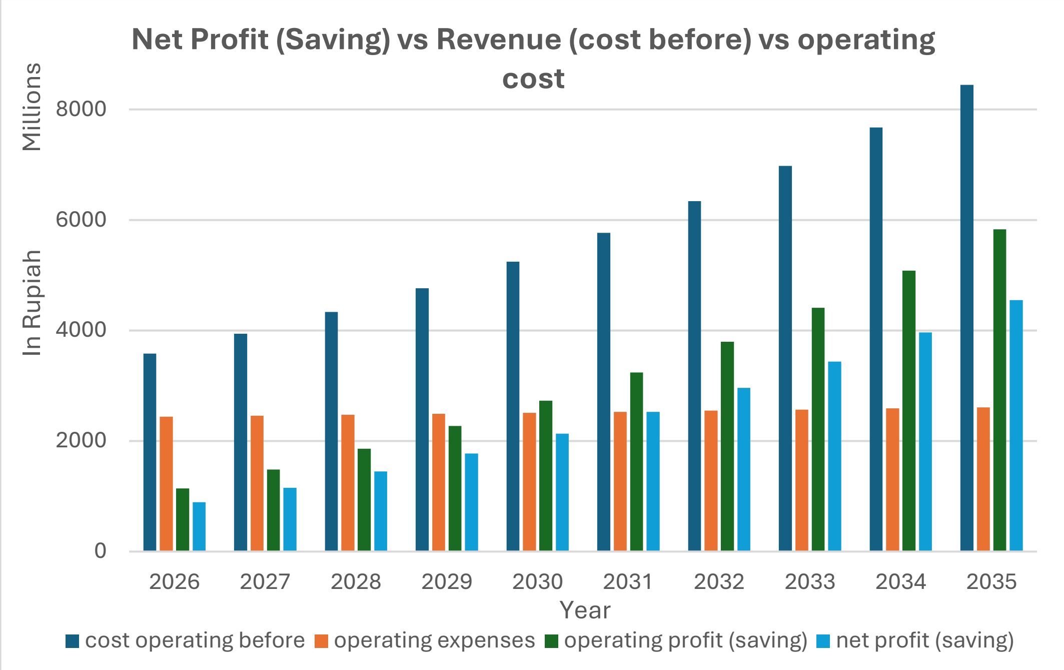

Figure IV-5 Revenue vs profit

(Source: Author calculation)

The net profit analysis illustrates the financial impact of CNC machine implementation by showing the progression of cost savings after accounting for tax deductions over a ten-year period. The net profit, derived from the operating profit minus tax, exhibits a steady increase from Rp 997,054,305 in 2026 to Rp 5,315,604,835.25 in 2035. Correspondingly, the net profit margin follows an upward trend, beginning at 23.03% in 2026 and reaching 52.08% by 2035. This positive trajectory highlights the increasing profitability of the investment as operational cost savings grow over time.

The continuous rise in net profit indicates that despite tax obligations, the financial benefits of CNC technology remain significant and expand progressively. This trend suggests that the CNC machine's efficiency contributes to sustainable long-term savings, reinforcing its role in enhancing overall financial performance. Additionally, the net profit margin's consistent increase implies that a larger proportion of cost savings translates into retained earnings, further validating the investment's feasibility and long-term profitability.

3. Financial Analysis

a. Cash Flow

Table IV-15 Cash flow from net saving

Year	In Rp				
	Net Profit	**Depreciation**	**operating cash flow**	**net fixed asset investment**	**Free cash flow**
2025	-	-	-	18,192,000,000	(18,192,000,000)
2026	997,054,305	1,819,200,000	2,816,254,305	-	2,816,254,305
2027	1,308,203,959	1,819,200,000	3,127,403,959	-	3,127,403,959
2028	1,652,388,064	1,819,200,000	3,471,588,064	-	3,471,588,064
2029	2,032,963,046	1,819,200,000	3,852,163,046	-	3,852,163,046
2030	2,453,622,430	1,819,200,000	4,272,822,430	-	4,272,822,430
2031	2,918,430,600	1,819,200,000	4,737,630,600	-	4,737,630,600
2032	3,431,859,920	1,819,200,000	5,251,059,920	-	5,251,059,920
2033	3,998,831,580	1,819,200,000	5,818,031,580	-	5,818,031,580
2034	4,624,760,516	1,819,200,000	6,443,960,516	-	6,443,960,516
2035	5,315,604,835	1,819,200,000	7,134,804,835	-	7,134,804,835

(Source : Author calculation)

The cash flow analysis based on net savings highlights the financial viability of the CNC machine investment by evaluating the annual operating cash flow and free cash flow over the ten-year period from 2026 to 2035. The operating cash flow is derived from the sum of net profit and depreciation, with depreciation acting as a non-cash expense that enhances cash flow availability.

In the first year (2026), the investment in net fixed assets amounts to Rp 18,192,000,000, resulting in a negative free cash flow (FCF) of Rp (15,375,745,695). This negative FCF is expected, as it reflects the substantial initial capital expenditure required for acquiring the CNC machine. However, from 2027 onward, the free cash flow turns positive, beginning at Rp 3,127,403,959 and steadily increasing each year, reaching Rp 7,134,804,835 by 2035. This continuous growth in FCF signifies that the investment is progressively generating surplus cash, which can be utilized for reinvestment, debt servicing, or shareholder returns. The increasing trend in operating cash flow, from Rp 2,816,254,305 in 2026 to Rp 7,134,804,835 in 2035, underscores the efficiency of CNC technology in reducing operating expenses and enhancing overall financial performance. The absence of additional net fixed asset investments beyond the initial year further strengthens the investment's attractiveness, as all future cash flows contribute directly to the company's financial reserves.

b. Capital Budgeting analysis

Capital budgeting analysis plays a crucial role in assessing the feasibility and profitability of long-term investments. In this study, the investment decision for the CNC machine is evaluated using key financial metrics, including Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period (PP), and Profitability Index (PI). These parameters provide a comprehensive assessment of the project's financial performance and its potential to generate value over time.

To determine the feasibility of the CNC machine investment, the projected cash flows over the investment period are discounted using the Weighted Average Cost of Capital (WACC). The present value of these cash flows is calculated to assess the Net Present Value (NPV) and other capital budgeting indicators. Table IV-21 presents the detailed computation of the present value of cash flows over the 10-year period.

Table IV-16 Present value cash flow

Year to	In Rp		r = WACC = 12,56% In Rp	
	Cash Flow	Accumulated Cash Flow	PV of Cash Flow	Accumulated PV of Cash Flow
0	(18,192,000,000)	(18,192,000,000)	(18,192,000,000)	(18,192,000,000)
1	2,816,254,305	(15,375,745,695)	2,502,001,355	(15,689,998,645)
2	3,127,403,959	(12,248,341,736)	2,468,401,563	(13,221,597,082)
3	3,471,588,064	(8,776,753,671)	2,434,310,281	(10,787,286,801)
4	3,852,163,046	(4,924,590,626)	2,399,762,834	(8,387,523,967)
5	4,272,822,430	(651,768,196)	2,364,800,032	(6,022,723,935)
6	4,737,630,600	4,085,862,404	2,329,467,676	(3,693,256,258)
7	5,251,059,920	9,336,922,324	2,293,814,972	(1,399,441,286)
8	5,818,031,580	15,154,953,904	2,257,893,217	858,451,930
9	6,443,960,516	21,598,914,421	2,221,754,717	3,080,206,647
10	7,134,804,835	28,733,719,256	2,185,451,906	5,265,658,554

(Source : Author calculation)

Based on the results of the present value cash flow calculation table, the NPV, IRR, PBP, PI values are as follows:

Table IV-17 Capital budgeting analysis

Parameters	Criteria	Value	Decision
Net Present Value (NPV)	> 0	Rp 5,265,658,554.00	Acceptable
Internal Rate of Return (IRR)	> WACC (12.56%)	18%	Acceptable
Pay back period (PBP)	< 10 years	6 year and 4 months	Acceptable
Profitability Index (PI)	> 1	1.29	Acceptable

(Source : Author analysis)

The Net Present Value (NPV) of the project is Rp 5,265,658,554.00, which is positive, indicating that the investment is financially viable and expected to generate value for the company. A positive NPV suggests that the projected cash flows, discounted at the Weighted Average Cost of Capital (WACC) of 12.56%, exceed the initial investment, supporting the decision to proceed with the project.

The Internal Rate of Return (IRR) for this investment is 18%, which is significantly higher than the WACC. This reinforces the attractiveness of the project, as an IRR greater than the WACC implies that the expected returns will surpass the company's cost of capital, ensuring a favorable return on investment. Additionally, the Payback Period (PP) is calculated at 6 years and 4 months, well within the acceptable threshold of 10 years. This relatively short payback period indicates that the investment will start generating positive returns in a reasonable timeframe, further strengthening its feasibility.

Lastly, the Profitability Index (PI) is 1.29, meaning that for every rupiah invested, the project is expected to generate Rp 1.29 in value. Since a PI greater than 1 indicates profitability, this metric confirms that the CNC machine investment is expected to yield positive economic returns and enhance the company’s financial performance.

4. Buy or lease

In the CNC machine purchase option, the company had to spend an initial investment of Rp 18.2 billion. Although the initial cost is high, the machine becomes a company asset that can be used in the long run. In addition, the company should also consider the maintenance cost, which is estimated to be around 5% of the purchase price per year. On the other hand, the CNC machine rental option offers higher flexibility with a monthly fee of Rp 583 million. With the lease system, the company does not need to spend a large initial investment, but only pays a fixed cost of Rp 7 billion per year. The table below shows the buy vs lease comparison.

Table IV-18 buy vs lease comparison

Finance		
Parameter	Buy (Purchase)	Lease (Rental)
Initial Investment	≈Rp18,200,000,000 (including tax)	Rp 0
Monthly Cost	Rp0	≈ Rp 583,000,000
Annual Cost	-	≈Rp 7,000,000,000
Depreciation	10 % of initial investment / year	-
Maintenance Costs	5 % of initial investment / year	included in contract
Insurance Premium	2% of initial investment/ year	Include in contract
Down Payment	-	30%
Tax	22%	-
Salvage Value	Rp 1,953,351,126.22	-
Cost of equity	12.56% per years	12.56% per years

(Source : Author Analysis)

Table IV-19 Lease alternative

Year	**In Rp**			
	Lease Payment	**Option to Purchase**	**Tax Shield**	**Total Cash Outflows**
0	-	-	-	-
1	7,000,000,000.00	-	1,540,000,000.00	5,460,000,000.00
2	7,000,000,000.00	-	1,540,000,000.00	5,460,000,000.00
3	7,000,000,000.00	-	1,540,000,000.00	5,460,000,000.00
4	7,000,000,000.00	-	1,540,000,000.00	5,460,000,000.00
5	7,000,000,000.00	-	1,540,000,000.00	5,460,000,000.00
6	7,000,000,000.00	-	1,540,000,000.00	5,460,000,000.00
7	7,000,000,000.00	-	1,540,000,000.00	5,460,000,000.00
8	7,000,000,000.00	-	1,540,000,000.00	5,460,000,000.00
9	7,000,000,000.00	-	1,540,000,000.00	5,460,000,000.00
10	7,000,000,000.00	-	1,540,000,000.00	5,460,000,000.00

(Source : Author calculation)

Table IV-20 Buy alternative

Year	In Rp		
	Beginning Balance	Depreciation	Ending Balance
1	18,192,000,000.00	3,638,400,000.00	14,553,600,000.00
2	14,553,600,000.00	2,910,720,000.00	11,642,880,000.00
3	11,642,880,000.00	2,328,576,000.00	9,314,304,000.00
4	9,314,304,000.00	1,862,860,800.00	7,451,443,200.00
5	7,451,443,200.00	1,490,288,640.00	5,961,154,560.00
6	5,961,154,560.00	1,192,230,912.00	4,768,923,648.00
7	4,768,923,648.00	953,784,729.60	3,815,138,918.40
8	3,815,138,918.40	763,027,783.68	3,052,111,134.72
9	3,052,111,134.72	610,422,226.94	2,441,688,907.78
10	2,441,688,907.78	488,337,781.56	1,953,351,126.22

Year	In Rp			
	Maintenance & Insurance Cost	Depreciation Expense	Total	Tax shields
1	1,273,440,000	3,638,400,000	4,911,840,000.00	1,080,604,800.00
2	1,273,440,000	2,910,720,000	4,184,160,000.00	920,515,200.00
3	1,273,440,000	2,328,576,000	3,602,016,000.00	792,443,520.00
4	1,273,440,000	1,862,860,800	3,136,300,800.00	689,986,176.00
5	1,273,440,000	1,490,288,640	2,763,728,640.00	608,020,300.80
6	1,273,440,000	1,192,230,912	2,465,670,912.00	542,447,600.64
7	1,273,440,000	953,784,730	2,227,224,729.60	489,989,440.51
8	1,273,440,000	763,027,784	2,036,467,783.68	448,022,912.41
9	1,273,440,000	610,422,227	1,883,862,226.94	414,449,689.93
10	1,273,440,000	488,337,782	1,761,777,781.56	387,591,111.94

Year	In Rp				
	Down Payment	Remaining Payment	Maintenance & Insurance Cost	Tax shields	Total Cash Outflows
0	5,457,600,000	-	-	-	5,457,600,000
1		12,734,400,000	1,273,440,000	1,080,604,800	12,927,235,200
2			1,273,440,000	920,515,200	352,924,800
3			1,273,440,000	792,443,520	480,996,480
4			1,273,440,000	689,986,176	583,453,824
5			1,273,440,000	608,020,300	665,419,699
6			1,273,440,000	542,447,600	730,992,399
7			1,273,440,000	489,989,440	783,450,559
8			1,273,440,000	448,022,912	825,417,088
9			1,273,440,000	414,449,689	858,990,310
10			1,273,440,000	387,591,111	885,848,888

(Source : Author Calculation)

Table IV-21 PV Buy vs Lease in 10 years

	In Rp			
Year	Lease Cash Ouflows	PV of Lease Cash Outflows	Buy Cash Ouflows	PV of Buy Cash Outflows
0	-	-	5,457,600,000	5,457,600,000
1	5,460,000,000	4,850,746,269	12,927,235,200	11,484,750,533
2	5,460,000,000	4,309,476,074	352,924,800	278,556,956
3	5,460,000,000	3,828,603,477	480,996,480	337,279,267
4	5,460,000,000	3,401,389,017	583,453,824	363,471,324
5	5,460,000,000	3,021,845,253	665,419,699	368,277,538
6	5,460,000,000	2,684,652,854	730,992,399	359,425,061
7	5,460,000,000	2,385,086,047	783,450,559	342,233,882
8	5,460,000,000	2,118,946,381	825,417,088	320,332,335
9	5,460,000,000	1,882,503,892	858,990,310	296,163,480
10	5,460,000,000	1,672,444,823	885,848,888	271,343,111
PV Lease Alternative		**38,773,148,782**	**PV Buy Alternative**	**19,879,433,488**

(Source : Author calculation)

Figure IV-6 PV of cash outflows lease vs buy in 10 years

(Source : author analysis)

Table IV-22 Buy vs Lease other factor

Factor	Buy	Lease
Ownership	Yes	No
Flexibility	Hard to upgrade	Easy to upgrade
Financial Impact	Report as a capital expenditure (CapEx)	Report as an operational expenditure (OpEx)
Impact on Cash Flow	High initial investment but lower long-term costs	Predictable monthly expenses but higher total cost over time
Long-Term Cost Efficiency	Lower over time if the machine is used for more than 5 years	More expensive if leased long-term (beyond 5 years)

(Source : Author Analysis)

IV.1.3 Risk Analysis

1. Sensitivity Analysis

Sensitivity analysis is conducted to evaluate the impact of changes in key variables on the Net Present Value (NPV) of the project. Using this approach, it is possible to identify which factors have the greatest influence on investment returns and how much fluctuation is likely to occur under different scenarios. Table IV-23 presents the results of the sensitivity analysis by looking at changes in input values against the NPV output, while the Tornado Chart illustrates the level of sensitivity of each variable visually.

Table IV-23 Sensitivity analysis

Variable	In Million Rp							Percentage
	Input value			Output Value (NPV)			Swing	
	Low	Base	High	Low	Base	High		
Previous operating cost	3,463	4,329	5,195	(156)	5,266	10,687	10,843	43.62%
WACC (%)	15.07%	12.56%	10.05%	2,683	5,266	8,347	5,665	22.79%
Work order (%)	8.00%	10%	12.00%	3,239	5,266	7,495	4,255	17.12%
Maintenance cost	1,150	959	767	4,353	5,266	6,178	1,825	7.34%
Income Tax (%)	18%	22%	26%	4,509	5,266	6,022	1,513	6.09%
Salary Cost	202	168	134	5,106	5,266	5,426	320	1.29%
Inflation rate (%)	3.31%	2.76%	2.21%	5,146	5,266	5,382	237	0.95%
Energy cost	126	105	84	5,166	5,266	5,365	200	0.80%
							Total	100%

(Source : Author analysis)

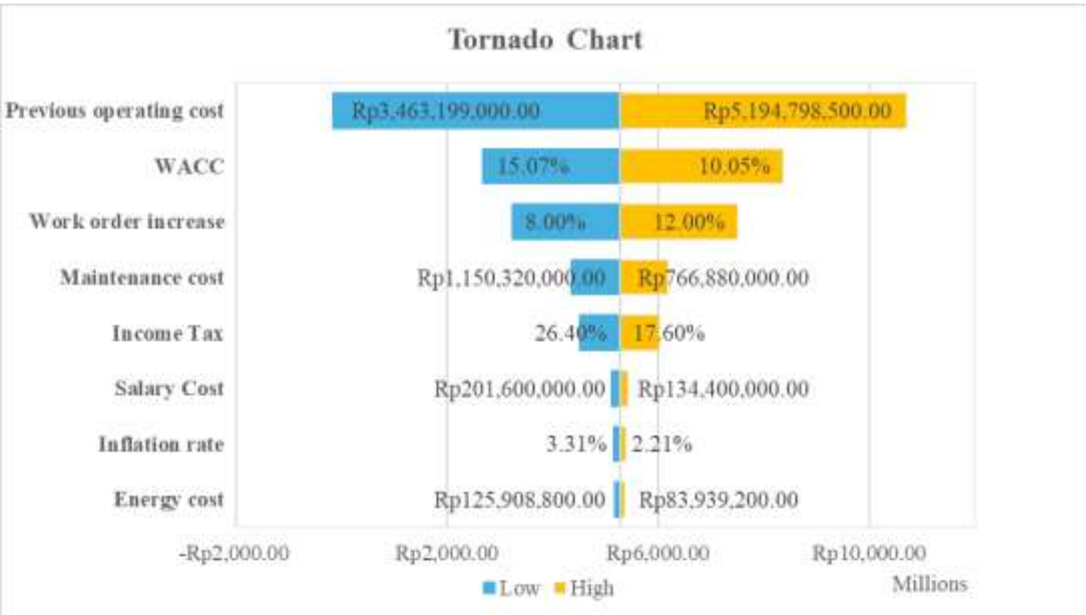

Figure IV-7 Tornado Chart

(Source: Author calculation)

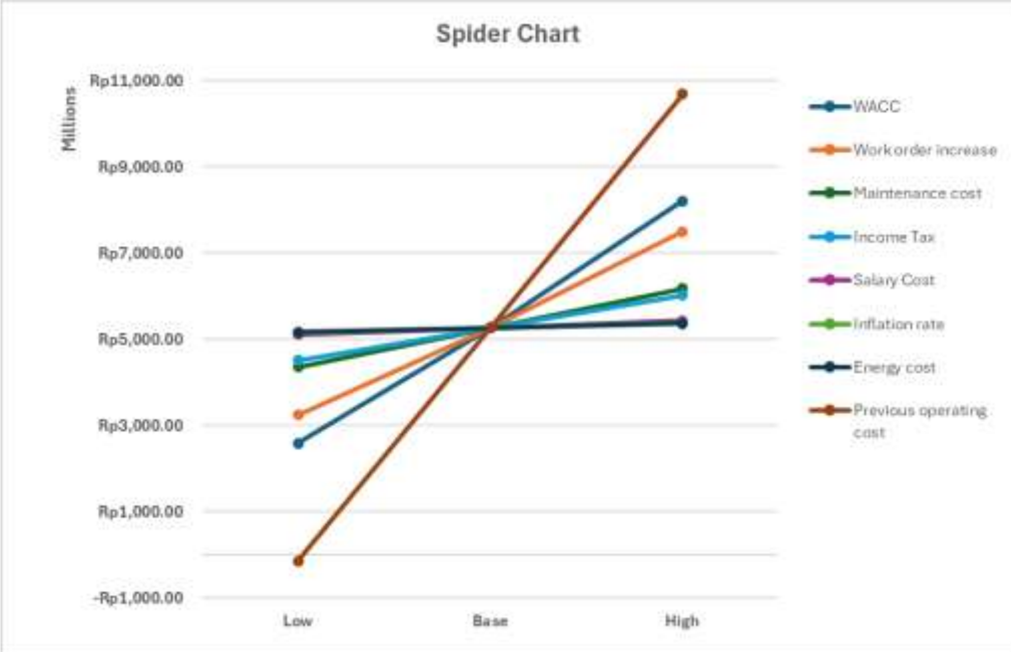

Figure IV-8 Sensitivity chart

(Source: Author calculation)

Based on the sensitivity analysis results presented in Table IV-23 and supported by the tornado chart visualization, it can be concluded that the variable with the greatest impact on the NPV is previous operating costs, with a sensitivity level of 43.62%. This indicates that changes in pre-investment operating costs have a highly significant effect on the project's profitability. Additionally, WACC (22.79%) and work order increase (17.12%) also play a crucial role in determining the NPV, meaning that fluctuations in these factors require special attention in financial planning and risk mitigation strategies.

Furthermore, variables such as maintenance costs, income tax, and salary costs have a lower impact on NPV changes, though they should still be considered in operational budget management. Meanwhile, inflation rate and energy costs have the least impact on NPV fluctuations, indicating that these macroeconomic factors do not significantly affect the investment feasibility.

This analysis provides valuable insights for investment decision-making. Management should prioritize controlling pre-investment operating costs, managing the WACC level, and optimizing the number and efficiency of work orders to enhance overall project value. Additionally, understanding these sensitive variables enables the company to design more effective risk mitigation strategies, ensuring long-term investment sustainability.

2. Simulation Analysis

Monte Carlo simulation is a powerful technique used to evaluate the uncertainty and risk associated with financial projections. By running multiple iterations based on probabilistic variations in key input parameters, it provides a comprehensive understanding of potential outcomes.

Table IV-24 Parameter of NPV in monte carlo simulation

Probability > 0	93.70%
Probability < 0	6.30%
Max (In million Rp)	Rp19,998.85
Min (In million Rp)	-Rp 5,053.06
Average (In million Rp)	Rp 5,398.66
Standar Deviation (SD) (In million (Rp)	3838
Median (In million (Rp)	5224
Kurtosis	0.06
Skewness	0.22
Prob NPV > Average	48%

(Source: Author calculation)

Figure IV-9 Probability NPV distribution in histogram

(Source: Author calculation)

The simulation results indicate that the probability of obtaining a positive NPV is 93.70%, suggesting a strong likelihood that the investment will be financially viable. Conversely, there is a 6.30% probability of a negative NPV, representing a relatively low risk of financial loss.

The NPV outcomes range from a minimum of -Rp 5,053.06 million to a maximum of Rp 19,998.85 million, with an average NPV of Rp 5,398.66 million and a median of Rp 5,224 million. The standard deviation of Rp 3,838 million indicates moderate dispersion in potential outcomes, emphasizing the importance of risk mitigation strategies.

The histogram of the Monte Carlo simulation results further supports these findings by showing the frequency distribution of NPV values. The distribution appears approximately normal, with most outcomes clustering around the mean. The highest concentration of results falls between Rp 1,447 million and Rp 7,247 million, suggesting that these values represent the most probable financial outcomes for the project.

Additionally, the skewness of 0.22 and kurtosis of 0.06 indicate a near-normal distribution with a slight positive bias, meaning that while negative outcomes are possible, they are relatively rare compared to positive results. Moreover, the probability of achieving an NPV greater than the average is 48%, reinforcing the expectation of a balanced distribution of possible returns.

IV.2 Business Solution

The investment in CNC machines at PT Bukit Asam's Main Workshop is a strategic move aimed at improving production efficiency, reducing operational costs, and accelerating the internal parts manufacturing process. With the use of CNC technology, the company can optimize production speed and accuracy compared to conventional machines, while reducing dependence on external suppliers. However, for this investment to truly add value to the company, a well-thought-out implementation strategy is required. With the proper strategy, PT Bukit Asam can ensure that the CNC machine operates optimally and has a positive impact in the long run.

1. The company needs to ensure that this investment is made with an optimal funding structure. if the company wants to make a direct machine purchase with full equity it is more profitable than renting, especially in the next 5 years.
2. In the previous NPV calculation analysis, all the work that will be done by the cnc machine is the work of conventional machines. even though there are still many expensive spare parts that are precision done by external vendors due to the inability of conventional machines. by using CNC machines, companies can produce these

parts themselves at a much lower cost than vendour costs. thus increasing higher efficiency than previous calculations.

3. This investment must be accompanied by a production optimization strategy to achieve efficiency. Automation of the manufacturing process with CNC allows PT Bukit Asam to increase precision, reduce processing time, and minimize product reject rates. To avoid technical problems that can disrupt production, the company needs to implement a preventive maintenance schedule.
4. Investment in CNC machines also requires an effective HR management strategy so that the workforce has skills that match operational needs. Therefore, PT Bukit Asam should conduct training and certification for CNC operators, covering technical skills such as G-Code programming, basic maintenance, as well as troubleshooting. This training can be conducted internally or through cooperation with professional training institutions to ensure higher competency standards.
5. Based on the results of the sensitivity analysis, it is found that previous operating cost is the highest variable that affects the NPV value. The operating costs before reflecting the production costs with conventional machines are quite high. If this value fluctuates, the impact on cost efficiency after investment becomes significant.

IV.3 Implementation Plan and Justification

To ensure the successful implementation of CNC machine investment at main workshop, a structured plan with clear stages is required. The following implementation plan is organized into several phases:

Table IV-25 Implementation planning

Project	:	Investment project of CNC lathe in main workshop			2025												2026					
Phase	ID	Activity	Related parties	Days	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	indicator
1		Planning and Analysis		90																		
	1	setting investment goals and objectives	ws planning section	10																		Investment approval from management
	2	review of work demand requirements and machine specifications	ws engineering section	15																		Machine specifications and selected vendor
	3	Develop investment estimates and financial analysis	finance & investment div.	30																		Finalization of budget and funding strategy
	4	Identify vendors or suppliers	procurement division	15																		
	5	internal management approval and develop funding strategy.	top management	20																		
2		Procurement and Installation		225																		
	1	Contract negotiation with vendors	vendor	30																		Machines properly installed
	2	facility readiness for machine installation	procurement team	30																		No technical problems in installation
	3	Delivery and installation of CNC machines	Project team	150																		Machine successfully passed the initial test phase
	4	Initial test run and calibration of the machine	ws engineering section	15																		
3		Operational Training and Integration		45																		
	1	CNC operator training for basic operation and maintenance.	ws planning section	10																		All operators have completed training and are certified
	2	Integrate the CNC machine into the main production process.	machining section	10																		CNC machines are operating at optimum capacity
	3	Production trials	QC section	15																		Trial production shows results that comply with quality standards
	4	implementation of monitoring system and maintenance schedule.	Project team	10																		
	5	Finalize and operation	vendor																			
4		Evaluation and Optimization		150																		
	1	Monitoring production performance and efficiency of CNC machines	ws planning section	90																		Increased production efficiency and reduced operational costs
	2	Identify technical or operational constraints	QC section	30																		No major obstacles in CNC machine operation
	3	Evaluate the impact of investment on cost efficiency and productivity.		30																		achievement of ROI targets within the planned timeframe

(Source: Author analysis)

CHAPTER V CONCLUSION AND RECOMMENDATIONS

V.1 CONCLUSION

1. Based on capital budgeting calculations, the CNC lathe machine investment has a Net Present Value (NPV) of IDR 5.26 billion, an Internal Rate of Return (IRR) of 18%, a Payback Period (PP) of 6 years and 4 months, and a Profitability Index (PI) of 1.29. These results indicate that the investment is financially feasible and will generate returns above the company's cost of capital.
2. The sensitivity analysis identifies previous operating costs, with a sensitivity level of 43.62% as the most sensitive variables affecting NPV. Additionally, WACC (22.79%) and work order increase (17.12%) also play a crucial role in determining the NPV Changes in these variables significantly impact the investment's financial viability.
3. The best-case scenario with a 20% increase of each variable assumes lower operating costs and a higher increase in efficiency, resulting in a higher NPV and shorter payback period. The worst-case scenario with a 20% decrease of the variables assumes an increase in costs and a decrease in efficiency, leading to a decrease in NPV and a longer payback period. Nonetheless, both scenarios show that the investment remains feasible with various variables generating positive NPV values except for cost operating profit which has the potential to generate negative NPV in the worst case scenario.
4. The Monte Carlo simulation shows a 93.7% probability that the project will result in a positive NPV, further confirming the robustness and financial reliability of the investment.

V.2 RECOMMENDATIONS

Based on the research results, here are some recommendations that can be applied by PT Bukit Asam in implementing CNC machine investment :

1. Funding Source Optimization: To ensure that this investment provides maximum benefits, PTBA can consider funding options with low capital costs, such as utilizing tax incentives, low-interest loans, or leasing with competitive schemes. If using its own capital, the company should ensure that the return on investment (ROI) is higher than the cost of equity.
2. Production and Maintenance Strategy: PTBA should develop a more automated production system, including the integration of CAD/CAM software to make the CNC programming process more efficient. In addition, it is necessary to implement IoT-based preventive and predictive maintenance strategies to reduce the risk of downtime and reduce sudden repair costs.
3. Human Resources Development: PTBA needs to organize CNC operator training and certification to ensure the workforce has sufficient competence in operating and maintaining the machine. In addition to technical training, there needs to be a mentoring program between senior and junior technicians to accelerate the knowledge transfer process.
4. Production Diversification and Machine Utilization Optimization: To improve the efficiency of CNC machine utilization, PTBA can expand the scope of production by making components that were previously produced by external vendors. Thus, the company can reduce external costs and increase machine utilization.

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APPENDICES

HISTORICAL MARKET STOCK PRICE DATA
(5 years)

		PTBA	Monthly Retun	
	JKSE	**STOCK**	**JKSE**	**STOCK**
12/1/2024	7,079.90	2,750		
11/1/2024	7,114.27	2,700	-0.48%	1.85%
10/1/2024	7,574.02	2,960	-6.07%	-8.78%
9/1/2024	7,527.93	3,080	0.61%	-3.90%
8/1/2024	7,670.73	2,730	-1.86%	12.82%
7/1/2024	7,255.76	2,680	5.72%	1.87%
6/1/2024	7,063.58	2,450	2.72%	9.39%
5/1/2024	6,970.74	2,490	1.33%	-1.61%
4/1/2024	7,234.20	3,030	-3.64%	-17.82%
3/1/2024	7,288.81	2,970	-0.75%	2.02%
2/1/2024	7,316.11	2,560	-0.37%	16.02%
1/1/2024	7,207.94	2,610	1.50%	-1.92%
12/1/2023	7,272.80	2,440	-0.89%	6.97%
11/1/2023	7,080.74	2,420	2.71%	0.83%
10/1/2023	6,752.21	2,480	4.87%	-2.42%
9/1/2023	6,939.89	2,800	-2.70%	-11.43%
8/1/2023	6,953.26	2,860	-0.19%	-2.10%
7/1/2023	6,931.36	2,770	0.32%	3.25%
6/1/2023	6,661.88	2,680	4.05%	3.36%
5/1/2023	6,633.26	3,060	0.43%	-12.42%
4/1/2023	6,915.72	4,140	-4.08%	-26.09%
3/1/2023	6,805.28	3,990	1.62%	3.76%
2/1/2023	6,843.24	3,860	-0.55%	3.37%
1/1/2023	6,839.34	3,400	0.06%	13.53%
12/1/2022	6,850.62	3,690	-0.16%	-7.86%
11/1/2022	7,081.31	3,800	-3.26%	-2.89%
10/1/2022	7,098.89	3,910	-0.25%	-2.81%
9/1/2022	7,040.80	4,170	0.83%	-6.24%
8/1/2022	7,178.59	4,250	-1.92%	-1.88%
7/1/2022	6,951.12	4,300	3.27%	-1.16%
6/1/2022	6,911.58	3,820	0.57%	12.57%
5/1/2022	7,148.97	4,530	-3.32%	-15.67%
4/1/2022	7,228.91	3,820	-1.11%	18.59%
3/1/2022	7,071.44	3,290	2.23%	16.11%
2/1/2022	6,888.17	3,140	2.66%	4.78%
1/1/2022	6,631.15	2,850	3.88%	10.18%
12/1/2021	6,581.48	2,710	0.75%	5.17%
11/1/2021	6,533.93	2,600	0.73%	4.23%
10/1/2021	6,591.35	2,680	-0.87%	-2.99%
9/1/2021	6,286.94	2,760	4.84%	-2.90%
8/1/2021	6,150.30	2,110	2.22%	30.81%
7/1/2021	6,070.04	2,230	1.32%	-5.38%
6/1/2021	5,985.49	2,000	1.41%	11.50%
5/1/2021	5,947.46	2,210	0.64%	-9.50%
4/1/2021	5,995.62	2,370	-0.80%	-6.75%
3/1/2021	5,985.52	2,620	0.17%	-9.54%
2/1/2021	6,241.80	2,710	-4.11%	-3.32%
1/1/2021	5,862.35	2,580	6.47%	5.04%
12/1/2020	5,979.07	2,810	-1.95%	-8.19%
11/1/2020	5,612.42	2,360	6.53%	19.07%
10/1/2020	5,128.23	1,960	9.44%	20.41%
9/1/2020	4,870.04	1,970	5.30%	-0.51%
8/1/2020	5,238.49	2,040	-7.03%	-3.43%
7/1/2020	5,149.63	2,030	1.73%	0.49%
6/1/2020	4,905.39	2,020	4.98%	0.50%
5/1/2020	4,753.61	1,945	3.19%	3.86%
4/1/2020	4,716.40	1,875	0.79%	3.73%
3/1/2020	4,538.93	2,180	3.91%	-13.99%
2/1/2020	5,452.70	2,240	-16.76%	-2.68%
1/1/2020	5,940.05	2,210	-8.20%	1.36%
	Average		0.38%	0.87%
	Average years		4.57%	10.42%
	all years		19.19%	24.43%
	years		3.84%	4.89%

Cash flow

	In million Rp										
Year	2025	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Net Profit (Saving)		997	1,308	1,652	2,033	2,454	2,918	3,432	3,999	4,625	5,316
Depreciation		1,819.2	1,819.2	1,819.2	1,819.2	1,819.2	1,819.2	1,819.2	1,819.2	1,819.2	1,819.2
Total Cash Flow from Operating Activities		2,816	3,127	3,472	3,852	4,273	4,738	5,251	5,818	6,444	7,135
(Increase)/Decrease in Asset	(18,192)	-	-	-	-	-	-	-	-	-	-
Total Cash Flow from Investing Activities	**(18,192)**										
Net Cash Flow	(18,192)	2,816	3,127	3,472	3,852	4,273	4,738	5,251	5,818	6,444	7,135
Beginning Cash		(18,192)	(15,376)	(12,248)	(8,777)	(4,925)	-652	4,086	9,337	15,155	21,599
Ending Cash	(18,192)	(15,376)	(12,248)	(8,777)	(4,925)	(652)	4,086	9,337	15,155	21,599	28,734

WACC

WACC CALCULATION				
WACC Calculation		Weight	Cost	Weighted Cost
Cost of Debt (After Tax)	Calculated	0.00%	0.00%	0.00%
Cost of Equity	Calculated	100.00%	12.56%	12.56%
WACC		**100.00%**		**12.56%**

COST OF EQUITY CALCULATION		
Capital Asset Pricing Model		
Cost of Equity Calculation		
Project Debt to Equity Ratio	Calculated	1.86
Cost of Equity	Data	12.56%
Beta Levered	Data	0.88
risk free rate	PHEI corporate bond yield of 5 year Dec 2024 (FR0101)	6.89%
euity risk premium	damodaran	6.44%

Capital Budgeting Analysis

Free Cash Flow (In Rp)			Discounted (r=WACC)		
Year	Cash Flow	Accumulated Cash Flow	80%	Base	120%
0	(18,192,000,000)	(18,192,000,000)	1.0000	1.0000	1.0000
1	2,816,252,725	(15,375,747,275)	1.1005	1.1256	1.1507
2	3,127,403,959	(12,248,343,316)	1.2111	1.2670	1.3242
3	3,471,588,065	(8,776,755,252)	1.3327	1.4261	1.5237
4	3,852,163,046	(4,924,592,206)	1.4667	1.6052	1.7534
5	4,272,822,430	(651,769,775)	1.6140	1.8068	2.0177
6	4,737,630,600	4,085,860,824	1.7762	2.0338	2.3218
7	5,251,059,920	9,336,920,745	1.9547	2.2892	2.6717
8	5,818,031,580	15,154,952,325	2.1511	2.5768	3.0744
9	6,443,960,516	21,598,912,841	2.3672	2.9004	3.5377
10	7,134,804,835	28,733,717,676	2.6051	3.2647	4.0710

PV of cashflow			Accumulated PV		
80%	Base	120%	80%	Base	120%
(18,192,000,000)	(18,192,000,000)	(18,192,000,000)	(18,192,000,000)	(18,192,000,000)	(18,192,000,000)
2,559,113,046	2,502,001,355	2,447,383,138	(15,632,886,954)	(15,689,998,645)	(15,744,616,862)
2,582,377,168	2,468,401,563	2,361,808,378	(13,050,509,786)	(13,221,597,082)	(13,382,808,484)
2,604,844,030	2,434,310,281	2,278,343,502	(10,445,665,756)	(10,787,286,801)	(11,104,464,982)
2,626,491,769	2,399,762,834	2,196,979,554	(7,819,173,987)	(8,387,523,967)	(8,907,485,428)
2,647,305,574	2,364,800,032	2,117,710,246	(5,171,868,413)	(6,022,723,935)	(6,789,775,182)
2,667,277,923	2,329,467,676	2,040,531,140	(2,504,590,490)	(3,693,256,258)	(4,749,244,042)
2,686,407,524	2,293,814,972	1,965,437,982	181,817,033	(1,399,441,286)	(2,783,806,060)
2,704,698,381	2,257,893,217	1,892,425,464	2,886,515,415	858,451,930	(891,380,596)
2,722,158,968	2,221,754,717	1,821,486,338	5,608,674,383	3,080,206,647	930,105,742
2,738,801,497	2,185,451,906	1,752,610,802	8,347,475,880	5,265,658,554	2,682,716,544

Risk Analysis

Input Variable	Input Value			NPV Output Value				% swing ^2
	Low	Base	High	Low	Base	High	Swing	
WACC	15.07%	12.56%	10.05%	2,682,716,544	5,265,658,554	8,347,475,880	5,664,759,335	40.42%
Work order increase	8.00%	10%	12.00%	3,238,958,513	5,265,658,554	7,494,091,565	4,255,133,052	30.36%
Maintenance cost	1,150,320,000	958,600,000	766,880,000	4,353,395,508	5,265,658,554	6,177,921,600	1,824,526,092	13.02%
Income Tax	26.40%	22%	17.60%	4,509,186,921	5,265,658,554	6,022,130,186	1,512,943,265	10.80%
Salary Cost	201,600,000	168,000,000	134,400,000	5,105,779,363	5,265,658,554	5,425,537,744	319,758,380	2.28%
Inflation rate	3.31%	2.76%	2.21%	5,145,778,378	5,265,658,554	5,382,446,670	236,668,293	1.69%
Energy cost	125,908,800	104,924,000	83,939,200	5,165,806,386	5,265,658,554	5,365,510,721	199,704,335	1.43%

Equity Risk Premium (Damodaran Spread sheet)

Row Labels	Average of Adj. Default Spread	Average of Country Risk Premium	Average of Equity Risk Premium	Average of Corporate Tax Rate
⊞ Africa	6.05%	7.86%	11.97%	26.82%
⊟ Asia	3.64%	4.73%	8.84%	24.51%
Bangladesh	4.24%	5.50%	9.61%	30.00%
Cambodia	5.18%	6.72%	10.83%	20.00%
China	0.66%	0.86%	4.97%	25.00%
Fiji	4.24%	5.50%	9.61%	20.00%
Hong Kong	0.56%	0.73%	4.84%	16.50%
India	2.07%	2.68%	6.79%	30.00%
Indonesia	1.79%	2.33%	6.44%	22.00%
Japan	0.66%	0.86%	4.97%	30.62%
Korea	0.46%	0.60%	4.71%	25.00%
Macao	0.56%	0.73%	4.84%	26.86%
Malaysia	1.13%	1.46%	5.57%	24.00%
Maldives	7.06%	9.16%	13.27%	26.86%
Mongolia	6.12%	7.94%	12.05%	25.00%
Pakistan	9.41%	12.22%	16.33%	29.00%
Papua New Guinea	5.18%	6.72%	10.83%	30.00%
Philippines	1.79%	2.33%	6.44%	25.00%
Singapore	0.00%	0.00%	4.11%	17.00%
Solomon Islands	7.06%	9.16%	13.27%	30.00%
Sri Lanka	11.29%	14.66%	18.77%	24.00%
Taiwan	0.56%	0.73%	4.84%	20.00%
Thailand	1.50%	1.95%	6.06%	20.00%
Vietnam	2.83%	3.67%	7.78%	20.00%
Laos	9.41%	12.22%	16.33%	26.86%
⊞ Australia & New Zealand	1.41%	1.83%	5.94%	29.25%
⊞ Caribbean	3.58%	4.65%	8.76%	17.76%
⊞ Central and South America	5.43%	7.05%	11.16%	28.37%
⊞ Eastern Europe & Russia	3.69%	4.80%	8.93%	16.11%
⊞ Middle East	3.27%	4.24%	8.35%	13.46%
⊞ North America	0.00%	0.00%	4.11%	25.75%
⊞ Western Europe	0.88%	1.14%	5.25%	19.52%
Grand Total	**3.74%**	**4.86%**	**8.97%**	**21.74%**

CNC Machine

DATE : 06 Oct 2023
PAYMENT TERMS : 30% DP; 70% Cash Before Delivery
DELIVERY TERMS : FRANCO GUDANG PT. BA TANJUNG ENIM
DELIVERY TIME : 11-12 months (To be confrm prior order)
VALIDITY : 30 days

* Picture only for reference

Q'ty		Description	Unit Price (Rp)	Amount (Rp)
1	SET	**Mazak Integrex i500 - 2500U**	Rp. 16.390.000.000	Rp. 16.390.000.000

1 Max Swing Diameter : ø 700 mm
2 Max Machining length : 2594 mm
3 Max Machining diameter : ø 700 mm
4 Bar Work Capacity : ø 77 mm
5 X, Y, Z Axis travel : 845/430/2660 mm
6 B Axis travel : -30° - 210°
7 Chuck Size : 10"
8 Spindle speed : 4000 rpm
9 Spindle nose : A2-8
10 Spindle bore : ø 91 mm
11 Tool Magazine : 36 Tools
12 Tool shank : HSK-A63
13 Max tool diameter : ø 90 mm
14 Max tool length : 500 mm
15 Max tool weight : 12 kg
16 Main spindle motor : 30/22 kW
17 Milling spindle motor : 24/22 kW
18 Machine height : 2950 mm
19 Floor space requirement : 6980x3400 mm
20 Machine Weight : 23500 kg

OPTIONAL ACCESSORIES :

1 COMPLETE COOLANT SYSTEM
2 FULL COVERAGE CHIP AND COOLANT GUARD
3 WORK LIGHT
4 STANDARD TOOLING PACKAGE (HSK)
5 SAFETY SHIELD
6 AI THERMAL SHIELD
7 ONE SET OF MANUALS (CD)
8 ONE SET OF ADJUSTING TOOLS
9 FOUNDATION KIT(PLATES)
10 MAZAK STD COLOR (F WHITE(FINE)/S BLACK)
11 MAZATROL SMOOTHAI CNC
12 19" COLOR LCD (TOUCH SCREEN)
13 POWER TRANSFORMER FOR OTHER MARKETS
14 MAIN SPINDLE MOTOR AC 30KW(40HP)
15 SPINDLE SPEED 4000 RPM
16 MILLING SPINDLE SPEED 12000 RPM
17 36 HSK-TOOL MAGAZINE
18 NC TAILSTOCK
19 TAILSTOCK BUILT-IN LIVE CENTER MT5
20 C-AXIS POSITIONING 0.0001DEG. CONTOURING
21 B-AXIS 0.0001 DEG/CNTRING (REQ. EIA/ISO)
22 SPINDLE BORE DIA.91MM(3.58")
23 AUTOMATIC CHUCK JAWS OPEN/CLOSE
24 CHUCK OPEN/CLOSE CONFIRMATION
25 ABSOLUTE POSITIONING SYS (LINEAR AXES)
26 X,Y,Z PITCH ERROR COMPENSATION INPUT
27 COOLERS FOR BALL SCREW (X,Y,Z-AXIS)
28 ROLLER GUIDES
29 HYDRAULIC PRESSURE INTERLOCK
30 SWIVEL TYPE OPERATION CONTROL PANEL
31 EIA/ISO LATHE & MILL SPDL IND. ROTATION
32 COOLANT THROUGH MILLING HEAD
33 5KG THRU CLNT/FLOOD CLNT SIMUL-FLOWABLE
34 AUTO POWER ON/OFF + WARM-UP
35 ATC AUTO RECOVERY
36 OPERATOR DOOR INTERLOCK WITH LOCK-SWITCH
37 NUMBER DISPLAY MAG. PANEL (N/A TOOL ID)
38 PREP. FOR CHIP CONVEYOR (SIDE/HINGE)
39 SMOOTH STANDARD SOFTWARE FOR M/C
40 MCAFEE EMBEDDED CONTROL
41 EIA/ISO PACKAGE
42 SOLID MAZATROL
43 3-D COORDINATE CONVERSION
44 DIRECT ENTRY OF DRAWINGS DIMENSIONS
45 SMOOTH RESTART FUNCTION
46 USB I/F (1-PORT)
47 LAN PORT
48 SD MEMORY I/F(1-PORT) + USB I/F(1-PORT)
49 ACCURACY INSPECTION
50 RELOCATION DETECTOR
51 18"THRU-HOLE CHUCK BB218 DIA.185 (UPGRADE , SPEED WILL REDUCE)
52 ONE SET OF HARD JAWS FOR BB-218
53 1 SET OF SOFT JAWS(H110(4.3"))/BB-218
54 ONE SET OF SOFT JAWS FOR BB-218
55 CHUCK AIR BLAST
56 SMW SLU-X4 SINGL/AUTO W/SHOWER COOLANT
57 TOOL EYE (AUTOMATIC)
58 MAZAK MONITORING SYSTEM B (RMP60)
59 MANUAL PULSE GENERATOR(WIRED/DETACHABLE)
60 GREASE CARTRIDGE (LHL X100-7)
61 1.5MPA THRU CLNT/FLOOD COOLANT SIMUL
62 SIGNAL TOWER (3 COLORS LIGHTS,SQUARE)
63 CHIP CV SIDE DISPOSAL(HINGE,FILTER)2500U
64 CHIP BUCKET (FIXED TYPE)
65 SMOOTH SYNCHRO. TAPPING(MILLING-SPINDLE)
66 F)TOOL RADIUS COMPENSATION / 5-AXIS
67 INCH/METRIC CONVERSION
68 B)CYLINDRICAL & POLAR COORDINATE (EIA)
69 MAXIMUM PROGRAM SIZE : 8MB
70 5-AXIS MACHINING PACKAGE FOR SMOOTHAI
71 MTCONNECT ADAPTER
72 NAME PLATE RELOCATION DETECTOR (INDON)
73 TOOLING SET FOR TRIAL PRODUCTS 1 PCS OF 1 DRAWING
74 CAM PROGRAM

Existing Machine Condition