International Journal Of Humanities Education And Social Sciences ***(IJHESS)*** *E-ISSN:* **2808-1765**
Volume 3, Number 5, April 2024, *Page. 2722 – 2731*
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Automating Ammunition Packaging Line To Improve Small Caliber Ammunition (MU-5TJ) Production Process AT PT. Pindad

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Abstract

Technology development in the defense industry is directed at building the ability to produce Alpalhankam that meets the operational requirements standardized by the Ministry of Defense, namely high quality, weather resistance, accuracy, combat power, high speed and difficult to detect. PT Pindad as a State-Owned Enterprise engaged in the Defense Industry is capable of making quality munitions, but the packaging line for small caliber munitions is still done manually. Therefore, it is necessary to automate the munition packaging line. In this research, the author conducted research using quantitative research methods through the Feasibility Study approach. The results and objectives of this study accelerate the packaging process on the small caliber munitions production line which was originally partly done semi-manually to use full machine automation and be able to support production so as to accelerate the fulfillment of small caliber munitions demand. The steps that are considered necessary are by investing in machines to increase the ability to package small caliber munitions and minimize the occurrence of errors in the munition packaging process.

Keywords: Defense Industry, Automation, Machinery Investment, Small Caliber Ammunition, Ammunition Packaging Line.

INTRODUCTION

The dynamic development of the environment and strategic context constantly brings about changes to the spectrum of complex threats and implications for the defense of the Unitary State of the Republic of Indonesia. The complexity of threats is categorized into patterns and types of multidimensional threats, including military threats, non-military threats, and hybrid threats that can be categorized as real and unreal threats. Therefore, the future defense of the country requires the integration of military defense and non-military defense through efforts to build a strong and respected national defense capability with high resilience. National defense is organized within a universal defense system to achieve national goals. Universal defense, in essence, is a defense that involves all citizens according to their roles and functions. The involvement of every citizen in national defense, as mandated by the 1945 Constitution of the Republic of Indonesia, is implemented in the form of a state defense program based on love for the homeland. The state defense program is aimed at reaching 100 million militant citizens over the next 10 years and will continue to be developed in line with national defense needs.

As time goes by, PT Pindad, as a Defense Industry engaged in the production of Special Vehicles, Ammunition, and Weapons, plays a role in supporting the Indonesian National Army in maintaining the nation's integrity. In this regard, the Ministry of Defense provides an opportunity for PT Pindad to produce ammunition used by the Indonesian National Army to safeguard the nation's integrity.

PT Pindad has received a potential order from the Ministry of Defense based on the Ministry of Defense's strategic plan for 2020-2024, totaling 3 billion rounds of 5.56 mm x 45 mm Sharp Ammunition (MU-5TJ). A total of 3 billion rounds have been ordered. In order to expedite the fulfillment of the Ministry of Defense's request, PT Pindad needs to increase the

capacity of each process in the Small Caliber Ammunition production line. It is known that the production capacity for the assembly line is 980 ppm, the packaging line is 700 ppm, and 280 ppm is done manually. To streamline the packaging process, the Ammunition Division needs to prepare the production line with additional machines and/or other support. Based on the risk assessment conducted, PT Pindad must ensure that the planned investment machines arrive on time, operate at maximum capacity, and achieve production targets. To maximize the benefits of the investment received by the company, all parties involved in marketing must maintain intensive relationships with the Ministry of Defense, TNI (Indonesian National Army), POLRI (Indonesian National Police), and maximize the potential for export markets through exhibitions and strategic collaborations.

RESEARCH METHODS

In this research, the author conducted a study using quantitative research methods through a Feasibility Study approach by collecting data, analyzing, and interpreting numerical data into words so that readers can understand what the author intends in this writing. The author collected research data by conducting direct interviews during field studies, using books, presentations, and various references that can be used according to the research topic the author wants to investigate.

RESULT AND DISCUSSION

Results

PT Pindad (Persero) has received the potential order from the Ministry of Defense based on the Ministry of Defense's strategic plan for 2020-2024, which amounts to 3 billion rounds of 5.56 mm x 45 mm Sharp Ammunition (MU-5TJ). This order of 3 billion rounds of small caliber ammunition (MKK) for the years 2020-2024 will utilize Domestic Loans (PDN) for 2.5 billion rounds of MKK and Foreign Loans (PLN) for 500 million rounds of MKK, totaling IDR 14.88 trillion. To expedite the fulfillment of the Ministry of Defense's request, PT Pindad needs to enhance the capacity of each process in the MKK production line. It is known that the production capacity for the assembly line is 980 ppm or 415 million rounds per year, and the packaging line is 700 ppm or 297 million rounds per year when using machines, and 280 ppm or 118 million rounds per year when done manually. To optimize the packaging time, the Munitions Division needs to prepare the production line with the addition of machines and/or other support equipment.

The total investment to be made amounts to IDR 92.8 billion, with the breakdown as follows:

NO	DESCRIPTIONS	VALUES(RP)
1	Production Machines	35,397,611,200
2	Supporting Facilities	57,441,765,352
TOTAL INVESTMENT		**92,839,376,552**

Figure 1. Total Invesment from potential order
Source: PT Pindad Company Plan for year 2020 until 2024

PT Pindad, as one of the state-owned enterprises operating in the Defense and Security Industry, has the potential to receive orders from the Ministry of Defense based on the Ministry of Defense's strategic plan for 2020-2024, which is the 5.56 mm x 45 mm Sharp Ammunition

(MU-5TJ). This project can be considered highly important in driving PT Pindad to become one of the Top 100 global defense companies, in line with PT Pindad's vision to achieve the TOP 100 Global by the year 2024.

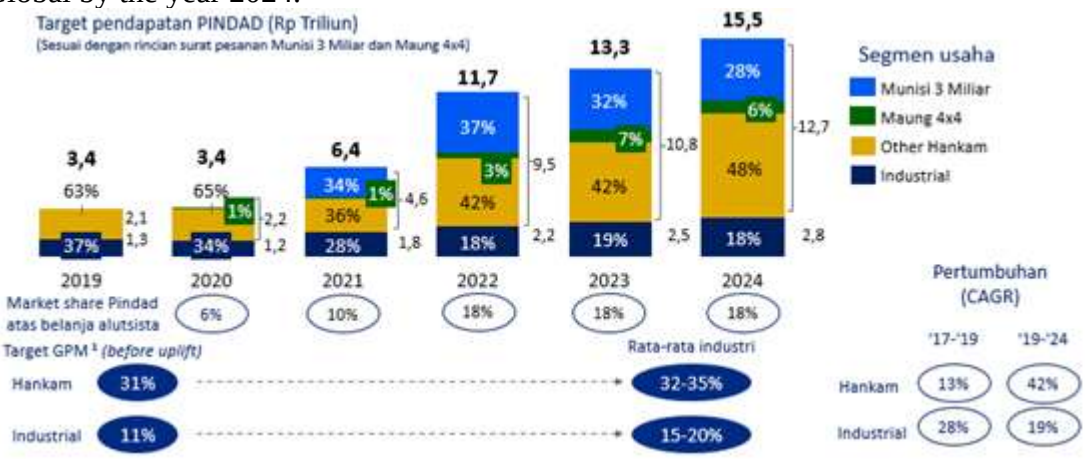

Figure 2. The target of PT Pindad in the Long Term Company Plan
Source: PT Pindad Company Plan for year 2020 until 2024

In order to expedite the fulfillment of the Ministry of Defense's request, PT Pindad needs to prepare its production line with the addition of machines and/or other supporting equipment. The current production capacity is extremely challenging to accelerate the Ministry of Defense's needs, so PT Pindad needs to expedite investment in the form of adding packaging machines to operate in 2023 to accelerate the packaging process using machines. The addition of packaging machines in the assembly and packaging line will result in an improvement in the packaging process. It is known that the production capacity for the packaging line is 700 ppm or 297 million pieces/year when using machines and 280 ppm or 118 million pieces/year when done manually. To streamline the packaging time, the Munitions Division needs to prepare the production line by adding machines to the packaging line to accelerate the production process. The required packaging machine is one (1) to meet the 980 ppm or equivalent capacity of 415 million pieces/year. The required packaging machine is the Clipping and Packing Machine (Clipping, Packing Box, Packing Bandoleer) with an effective capacity of 280 ppm.

- **Condition of Production Capacity**

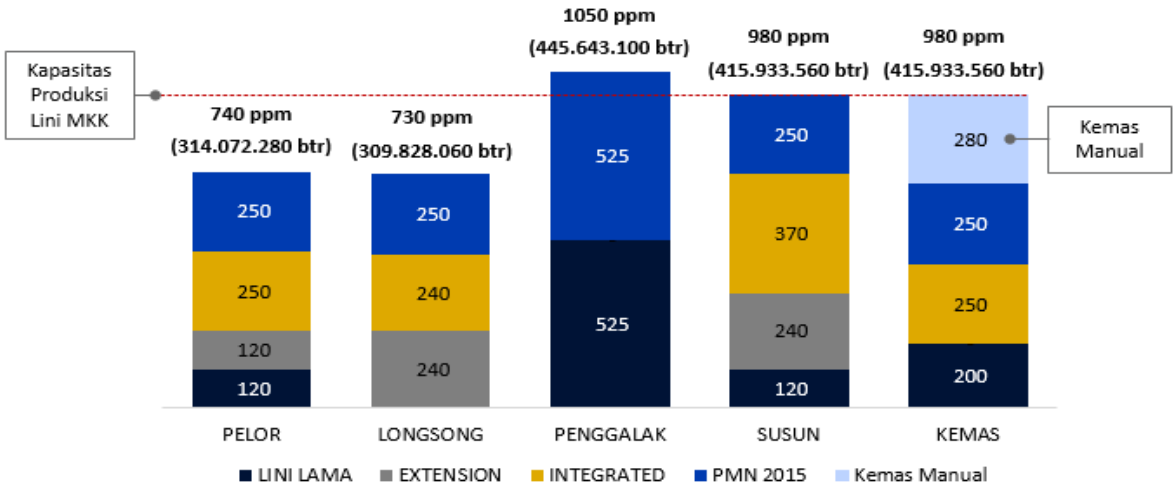

Figure 3. Production Capacity After the 2015 PMN Machines Operate
Source: PT Pindad Company Plan for year 2020 until 2024

Production capacity after the 2015 State Capital Investment program machines are operational, resulting in production capacity for the stacking line to 980 ppm or 415 million grains/year and the packaging line to 700 ppm or 297 million grains/year. The gap between stacking and packaging capacity of 280 ppm or 118 million grains/year is done by manual packaging process.

- **Sales Histories**

The sales of small caliber munitions (MKK) from 2015 - 2019 had an average of 129 million rounds/year. Based on the graph below, sales in 2017 decreased but in 2018 sales increased again.

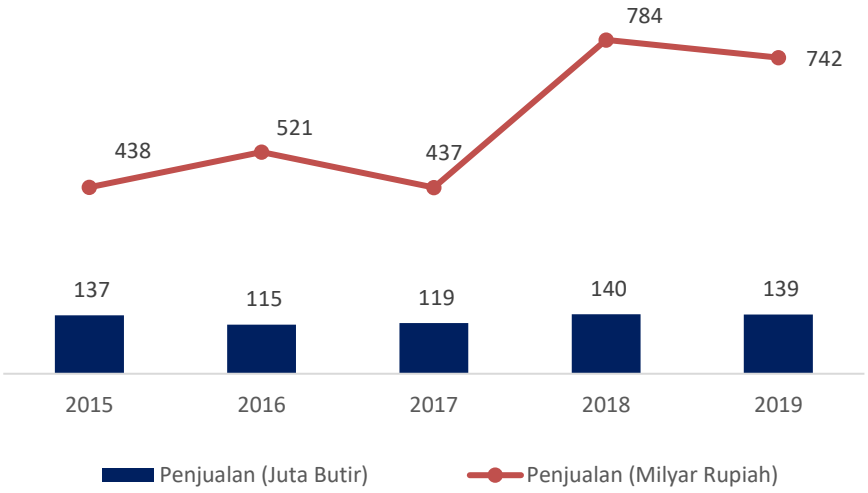

Figure 4. Sales Data of Small Caliber Munitions in 2015 – 2019
Source: processed by researcher

- **Market Prospect**

Market conditions, especially for the Alpalhankam industry, are still very attractive where until 2024 it is projected that the TNI Alpalhankam budget expenditure will reach IDR 48-86 Trillion and the projected defense budget until 2024 will also increase (CAGR 2020-2024 reaches 30%).

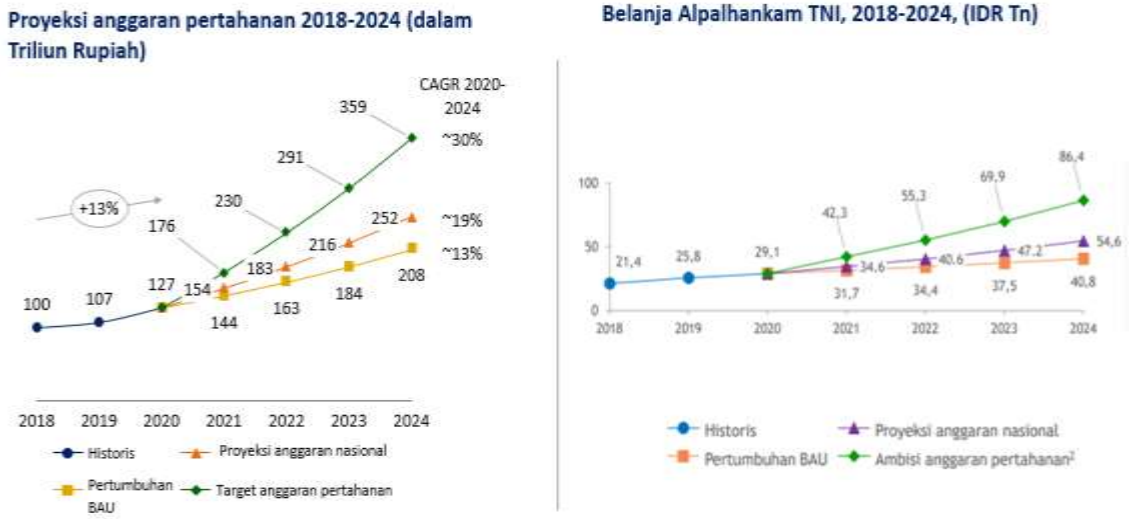

Figure 5. Projected Defense Budget and military equipment expenditure 2018-2024
Source: processed by researcher, Statista, APBN TNI/POLRI 2017-2022, RPJMN 2020-2024, Project Team Analysis

The Ministry of Defense issued 4 Strategic Plan (20 years) requests for the TNI's basic provisions and routine needs (HIRBAK and OPSLAT) for the next 5 years (2020 - 2024) amounting to 3 billion MKK rounds. Based on the sales trend in Figure 2.2, the TNI's needs are quite large and of course after 2024 the TNI will have a very large supply of munitions when viewed from the TNI's consumption trend so far. The projected consumption for 5 years is only 1,875 million MKK grains including basic supplies of 1,230 million grains, and operations & hirbak of 645 million grains, so there is a potential inventory of 1,125 million MKK grains. This value is the amount of TNI domestic consumption for 10 to 18 years, if this value is met it will affect future orders after 2024. So it is necessary to analyze domestic consumption in a steady state, export targets, and demand scenarios in stable conditions after 2024.

Figure 6. Projected Defense Budget and military equipment expenditure 2018-2024
Source: processed by researcher - Annual Munitions Consumption (million rounds, year)

Based on the annual consumption of munitions, the projected demand for MKK after 2024 for the domestic market consists of a low scenario of 129 million grains obtained from historical data on average sales in 2015-2019, a basic scenario of 300 million grains in accordance with the maximum production capability in 2021, while the high scenario is estimated to increase by 67% from the basic scenario of 500 million grains (equal to the world average). Based on PT Pindad's experience so far, which is still difficult to compete in the export market, the scenario for the export market is significant, including for the basic scenario of 1% (101 million grains) and for the high scenario of 2.5% (252 million grains). Potential target countries for export include countries in Asia (Philippines, Brunei Darussalam, Vietnam, Thailand, Malaysia, Japan, and Myanmar), the UK, the Netherlands, Italy, and Africa. So that after 2024, it becomes a very important task for PT Pindad to increase its sales in accordance with the investment scenario that will be carried out. With a large domestic demand and an equally large export demand, the solution that PT Pindad can do is to increase the packaging capacity to 400 million grains/year to speed up the packaging process on the Small Caliber Munition production line, which was originally partly done manually to use machines.

- **Invested Production Facilities**

The Clipping and Packing Machine (Clipping, Packing Box, Packing Bandoleer) works automatically and is fully designed for the process of clipping and packing small caliber munitions. Ten (10) munitions are arranged on one (1) munition clip then 2 munition clips are put into a box after which the box is weighed if the results are within specifications then the box is marked with a Lot number. Then the boxes are put into cloth bags (the number of sub bags in 1 cloth bag is 7 sub bags). The machine is designed for 5.56 mm caliber munitions.

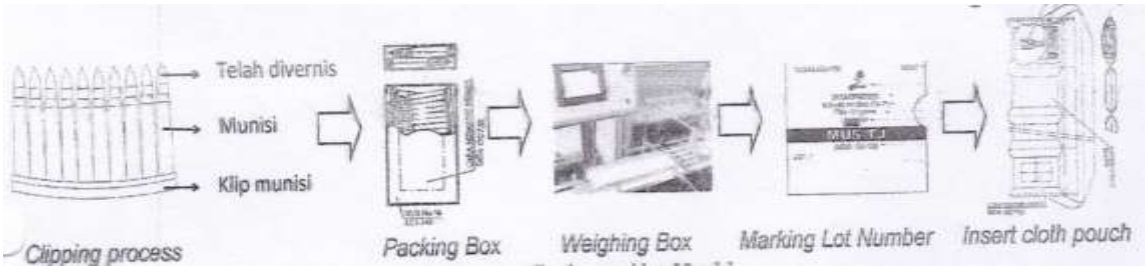

Figure 6. Clip and Packing Munitions Process
Source: PT Pindad

- **Investment Value Estimation**

In an effort to fulfill a large order from the Ministry of Defense, PT Pindad (Persero) must pay attention to the need for a more efficient and productive packaging machine. In this context, a high-capacity packing machine was required to meet the ambitious production target of 980 ppm, equivalent to 415 million small caliber (MKK) munitions per year. The desired machine for this task was a Clipping and Packing Machine, capable of effectively producing 280 ppm. It is important to recognize that this investment in a packing machine has significant value. However, this machine is not only considered as a cost but as a tool that will assist PT Pindad (Persero) in accelerating and improving the efficiency of their production process. This Clipping and Packing Machine is the latest technology specifically designed to tackle packaging tasks that require high speed and precision. With higher production capacity, PT Pindad (Persero) will be able to fulfill orders in larger quantities and faster, which is in line with their targets in the Ministry of Defense's strategic plan. In addition, by using this machine, PT Pindad (Persero) will reduce reliance on manual processes that are often time-consuming and not as efficient as machines. It will also help reduce the risk of human error in the packaging process, which can affect product quality.

As part of the effort to increase production capacity, this investment is a very important step to ensure PT Pindad (Persero) remains competitive in the arms and ammunition market. Thus, while the investment value is high, the long-term benefits in increasing production and efficiency are substantial and will support PT Pindad (Persero) in meeting the increasing demand from the Ministry of Defense. The investment in the Clipping and Packing Machine is a strategic move that will bring great benefits to PT Pindad (Persero). In the manufacturing world, production efficiency is key to meeting increasing demand, especially in the context of an order for 3 billion rounds of 5.56mm x 45mm Sharp (MU-5TJ) caliber munitions from the Ministry of Defense. By having high-quality and efficient packaging machines, PT Pindad (Persero) can significantly speed up the production process. Greater production capacity will enable the company to produce more munitions in less time, better meet order deadlines and improve the quality of the products produced. In addition, the use of modern packaging machines will also help reduce long-term production costs. These machines can operate consistently without fatigue, reduce the need for manual labor, and avoid potential errors that may occur during the manual packaging process. In this case, the Clipping and Packing Machine is not only an investment in production, but also an investment in the company's growth and competitiveness. By increasing production capacity and efficiency, PT Pindad (Persero) can more effectively compete in the competitive arms and ammunition market, both nationally and internationally.

Furthermore, the use of this advanced technology will also enhance PT Pindad's (Persero) reputation as a high-quality and reliable ammunition manufacturer. This will assist the company in winning more contracts with the government and business partners, which in turn will help business growth and contribution to the national economy. In conclusion, the Clipping and Packing Machine is an important investment to advance PT Pindad (Persero) in facing challenges

and opportunities in the defense market. By increasing production capacity, efficiency and reputation, PT Pindad (Persero) will become a stronger and more sustainable player in the industry, making it a valuable asset to the country's defense and the national economy as a whole.

Discussion

Sales Projection

This statement outlines the importance of understanding the allocation of investment in a project. The investments discussed in this context do not cover the entire Small Caliber Munitions (MKK) production line, but rather focus on improvements and upgrades to the packaging line. The direct impact of this investment on the project as a whole is expressed as 20.06% of the total Cost of Goods Manufactured (COGS) component. This 20.06% figure is based on a percentage analysis that describes the ratio of costs associated with the packaging line, both direct and indirect costs, to the overall COGS. In other words, this investment affects approximately 20.06% of the total costs incurred in MKK's production process.

However, it is important to understand that this investment, despite focusing only on the packaging line, has a significant impact on the overall project. This is because packaging is a critical stage in the production chain that affects the quality of the final product, speed of delivery, and overall operational efficiency. The direct costs involved in the packaging process include material costs, machine costs, and direct labor costs. On the other hand, indirect costs include various things such as overhead costs, supply costs, maintenance, supervision, control, tools and equipment, spare parts, and depreciation. All these components must be carefully accounted for in the investment analysis to ensure their long-term viability and benefits. In the context of assessing investment feasibility, the assumption that total sales will reflect the effect of the investment on the COGS value of 20.06% is a reasonable approach. This provides a clear view of how the investment in the packaging line will contribute to improved efficiency and quality in MKK's overall production. In conclusion, this comprehensive analysis is important to make the right decision in allocating resources and ensuring that this investment will have a significant positive impact on PT Pindad's operations and finances.

In investing resources in the packaging line, PT Pindad should consider important factors that will influence the outcome of this investment. One of the key factors is improving the quality of the final product. By using more sophisticated and efficient packaging machines, the company can avoid problems that often arise in the manual packaging process, such as product damage and defects. The result is a final product that is more consistent in quality, which will enhance the company's reputation in the eyes of customers and end consumers. In addition, this investment will enable PT Pindad to meet the increasing demand from the Ministry of Defense better and faster. With greater production capacity and improved efficiency, the company will be able to respond to orders more quickly, which will increase customer satisfaction. This is very important in maintaining a good relationship with business partners, especially the government. From an economic perspective, this investment in a packaging line also has the potential to reduce long-term production costs. Packaging machines tend to require less labor compared to manual processes, which translates to reduced labor costs. In addition, higher efficiency in the packaging process can reduce material losses and minimize wastage, which will have a positive impact on the company's finances.

When all these factors are properly considered, investing in a packaging line is a sensible strategic move to improve PT Pindad's competitiveness and profitability in the long run. While the initial investment may be large, the long-term benefits in terms of product quality, operational efficiency, and customer and government relations are significant. As such, this move is not just about spending, but also about investing in the growth and future of the company. This will ensure that PT Pindad remains a major player in the arms and ammunition industry, and can continue to contribute to the country's security and overall national economic growth.

- **Cost of Goods Manufactured**

Production cost analysis is an important step in assessing the feasibility of an investment in a packaging line. In this context, the Cost of Goods Produced (COGS) of each product produced in the packaging line is the main focus to measure the effectiveness of the investment. This production cost breakdown includes three main aspects: machinery cost, raw material cost, and wage cost. Machine cost is one of the most crucial cost components in packaging line production. In the calculation, it is assumed that the new machine to be adopted has an acquisition cost of IDR 3.126 billion per year with an average depreciation value per year. Then, the cost of this machine is converted into the cost per munition grain, resulting in Rp 20.18 per grain.

Then, the cost of raw materials is the next factor that affects COGS. This cost is assumed by referring to the cost of raw materials that already exist in the existing COGS. The use of this assumption takes into account the current price and availability of raw materials used in the packaging process. In addition, wage costs need to be carefully accounted for. In the calculation, the initial wage cost assumption is Rp 265.55 per munition. However, in making investment decisions, it is important to consider the inflation factor. Therefore, it is assumed that this wage cost will increase by 3% annually, which is in line with expected inflation. These three cost components will provide a complete picture of the COGS per product in the packaging line. This is key information that will help PT Pindad calculate the profitability of the investment project in the packaging line.

Keep in mind that the use of assumptions is a critical step in this analysis. These assumptions reflect the current situation and conditions, but keep in mind that the business environment may change over time. Therefore, companies should always monitor market developments, inflation, and operating costs to ensure that these assumptions remain relevant. In addition, this production cost analysis also needs to be viewed in the context of the long-term benefits of this investment. While the initial cost of the investment may be large, the improved efficiency in the packaging line can help offset those costs over a period of time. It can also provide non-financial benefits, such as improving the company's reputation and ability to win more contracts in the future. However, this investment should also be seen as part of the company's long-term strategy. How will this investment support the company's growth in the long term and how will it affect the company's competitiveness in an increasingly tight market. In the context of assumed changes in wage costs over time, companies also need to consider compensation and human resource management strategies. With inflation looming, companies should assess the impact on overall operating costs and look for ways to mitigate potentially significant cost increases.

In addition, environmental aspects also need to be considered. How will the use of new machinery affect the environmental impact. Whether there are sustainability initiatives that can be implemented in the production process to reduce the carbon footprint. Given the global demand for sustainable business practices, these considerations are also important. By doing so, PT Pindad (can make informed and sustainable investment decisions, which will support the company's long-term growth and success in the face of challenges and opportunities in the competitive arms and ammunition market.

- **Cost of Goods Sold**

Cost of Goods Sold is obtained from Cost of Goods Manufactured plus indirect costs, namely indirect labor, maintenance, FTG, spare parts, and depreciation. For indirect labor, maintenance, FTG and spare parts, we use the cost assumptions contained in the existing COGS, while for depreciation we use the depreciation value of the invested machinery and supporting facilities. The cost of direct labor wages is Rp 156.96 per munition, maintenance costs Rp 9.91 per munition, FTG costs Rp 19.38 per munition, spare parts costs Rp 11.17 per munition, and these costs are assumed to increase (inflation) 3% each year.

CONCLUSION

PT Pindad (Persero) as one of the state-owned companies engaged in the defense and security industry received a potential order from the Ministry of Defense based on the Ministry of Defense's 2020-2024 strategic plan of 3 billion rounds of 5.56 mm x 45 mm Sharp (MU-5TJ) caliber munitions. The order of 3 billion small caliber munitions (MKK) for 2020-2024 will use Domestic Loans (PDN) for 2.5 billion MKK items and Foreign Loans (PLN) for 500 million MKK items. In order to accelerate the fulfillment of the Ministry of Defense's demand, PT Pindad needs to increase the production capacity of each process in the MKK production line. The production capacity for the stacking line is 980 ppm and the packaging line is 700 ppm which is done using machines and 280 ppm or 118 million grains/year is done manually.

To be able to streamline packaging time, the Munitions Division needs to prepare a production line with the addition of a packaging line of 280 ppm (effective capacity), bringing the total packaging capacity to 980 ppm or 415 million grains/year. Capacity fulfillment was chosen after considering the MKK demand scenario after 2024. Where it is projected at 401 million grains/year. With domestic demand of 300 million grains/year and export demand of 101 million grains/year. Based on the risk assessment, at the initial stage PT Pindad must ensure the timely arrival of the investment plan machine can operate optimally and the production target can be achieved, to maximize the investment benefits that can be received by the company, all parties related to marketing must conduct intensive relationships with the Ministry of Defense, TNI, POLRI, and maximize the potential of the export market through exhibitions and strategic cooperation

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