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# REDUCE TRANSPORTATION COSTS USING THE MILK-RUN SYSTEM AND DYNAMO STAGES IN THE VEHICLE MANUFACTURING INDUSTRY

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*Research paper*

***Abstract:*** *The vehicle manufacturing industry is one of the automotive industries in Indonesia that produces four-wheeled vehicles with the main product being cars. The vehicle manufacturing industry has several sub-companies including Vehicle Manufacturers (VM) and Vehicle Sales (VS). The VM industry is experiencing problems with rising transportation operating costs. The same thing is also experienced by the corporate company such as VS. In 2020, transportation operational costs incurred by the company exceed the target, which can cause losses for the company. The purpose of this study is to find the cause of the problem and improve the transportation operational costs that continue to increase so that the company gets a reduction in transportation costs. The implementation of the improvement concept is carried out using the Dynamo++ stages starting from pre-study until the implementation of improvements. Through improvements to the milk-run system, it was found that vehicle manufacturers and vehicle sales benefited from a reduction in transportation costs of 77,861 USD or a decrease of 79.3%.*

***Keywords***: *Covid-19, Dynamo++, Milk-run, Transportation Cost, Vehicle Industry*

## 1. Introduction

The design of the safeguarding framework, realizing different supply chain capabilities is very helpful in identifying a good and efficient logistics system (Muhammad et al., 2022). The development of industry in the world is increasing rapidly so increasing competitiveness is a priority for all industrial sectors in the world market (Baalsrud Hauge et al., 2021). This is important because the industrial sector is a driver of economic development (Pattanaik, 2021). The existence of the

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industrial sector can make a significant contribution and escalation of employment, and foreign exchange, and can make a major contribution to world economic development (Bocewicz et al., 2019).

In 2020, it was a very difficult year for the after-sales business of four-wheeled vehicles with the Vehicle Manufacturing (VM) brand due to the Covid-19 pandemic situation. Starting in May 2020 the company experienced a decline in sales. Based on the medium-term plan from the Vehicle Manufacturing Corporation (VMC), this condition will continue in FY21, but in FY22-FY25 a significant increase in sales is expected. Based on initial observations, VM sales during 2020 showed that the decline in sales directly affected the decrease in purchases to suppliers, which caused the company to receive many complaints and requests from suppliers, including increasing transportation costs or implementing minimum order quantities, reducing loading and unloading queue times for spare parts center and delivery request 1 time/month. Opportunities for rising transportation costs from suppliers, the company has set transportation for the export of service parts as the company's target. In the future, the company plans to estimate sales versus operating profit, which can be seen in Figure 1.

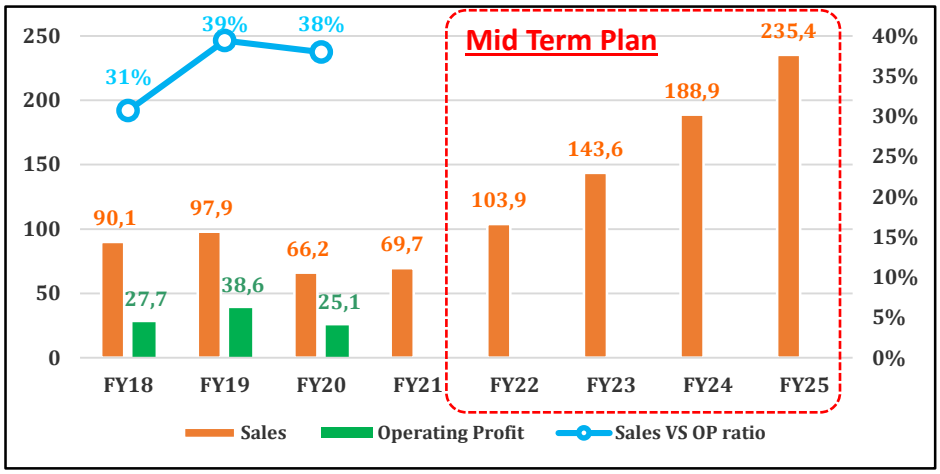


*Figure 1. Comparison of Sales and Operating Profit*

Figure 1 shows that FY20 experienced a decline in profits due to the covid-19 pandemic and government regulations regarding mobility restrictions so that transportation costs increased 5 to 10 times. Indirectly, this condition causes losses to the company such as the high operating costs of the company.

Industrial growth in this globalization era requires companies to implement various kinds of improvements to save operational costs and must be able to improve performance and competitiveness to excel in competition in the global market (Klenk & Galka, 2019; Suratno & Ichtiarto, 2021). This will certainly trigger competition among industry players and have an impact on the supplier industry. In line with that, it is necessary to increase the efficiency and effectiveness of each industry player (Kluska & Pawlewski, 2018; Yuik & Puvanasvaran, 2020). Various kinds of improvement strategies, use of resources, and all existing facilities must be used effectively and efficiently and must be implemented sustainably. Through these improvements, industrial players can carry out their production activities with

increased productivity and efficient costs from time to time (Mirzaei et al., 2021). The use of the Supply Chain Operation References (SCOR) method shows that Asset, Agility, and Cost are variables that must be improved in the logistics process to improve transportation schedules (Shobur et al., 2021).

One of the industrial sectors that continues to grow and provides the largest contribution to the world economy is the VM industry (Mácsay & Bányai, 2017; Bajic et al., 2020). The VM industry is one of the automotive industries in Indonesia that produces four-wheeled vehicles with the main product being cars. The VM industry has several sub-companies including vehicle manufacturers and vehicle sales. The VM industry is experiencing problems with rising transportation operating costs. The same thing is also experienced by corporate chains such as Vehicle Sales (VS). In 2020, transportation operational costs incurred by the company exceeded the target, causing losses for the company. Factors that play a role in maintaining company productivity so that an industrial company can continue to compete in the market are minimizing operating costs.

Based on the problems shown in Figure 1, several other studies have also made improvements to the milk-run system (Urru et al., 2018). Based on research (Ranjbaran et al., 2020; Adriano et al., 2020) Milk-run can increase company productivity by reducing costs. According to Tellini et al. (2019) and Biswas & Das (2020), the milk-run system can overcome loading and unloading times, so that an effective and efficient operational time is obtained. Milk-run is also able to improve transportation efficiency (Mei et al., 2017; Mao et al., 2020). Research by Purba et al. (2019) applies the milk-run system to the supply chain. The difference is that this study uses a dynamo++ level approach in carrying out the repair stages, this is done so that corrective actions are more focused and conceptualized from the start of Pre-study-Measurement-Analysis-Implementation.

The new approach in this research is the transportation system using the milk-run method with a corrective action flow using the dynamo++ stages. The difference with other studies related to articles related to transportation operations is that in applying the milk-run method by calculating the actual delivery time and distance from the transportation capital alone (Bocewicz et al., 2019; Klenk & Galka, 2019), it does not calculate the reduction in transportation costs obtained after applying the milk-run method combined with the Dynamo++ stages.

The originality of this study provides added value related to the application of the milk-run system in reducing transportation costs in four-wheeled automotive companies and will analyze cost efficiency in the vehicle sales chain. The purpose of this study is to find out the causes and at the same time improve the transportation operational costs which have been increasing so far so that the company gets a reduction in transportation costs.

## 2. Research Method

This research is included in the type of applied research and the research focus is cost efficiency in the VM industry. Problem improvement analysis was carried out through Focus Group Discussions (FGD) with experts (Setiawan et al., 2021; Kurnia et al., 2021). In this section, we will describe the research steps with a milk-run system using the Dynamo++ stages which include pre-study, measurement, analysis, and implementation (Herlambang et al., 2021; Hendra et al., 2021) in the electronics

manufacturing industry. Through this stage, it is hoped that the research will be systematic, orderly, and easy to understand in terms of the process and the results of its improvement. The research method used in this research is the milk-run method combined with the Dynamo++ stages of improvement, this combination of methods is a new thing in its application to the car industry. The combination of these methods is expected to make it easier for other researchers to improve transportation costs to reduce logistics costs in the supply chain management of the automotive industry. The research steps can be seen in Figure 2.

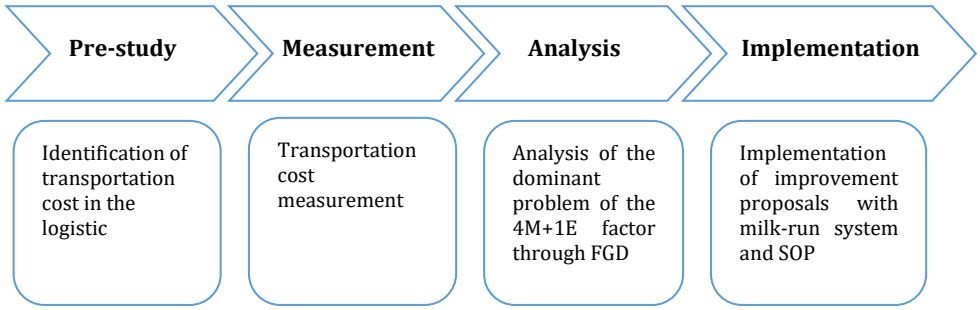


*Figure 2. Research Framework*

## 3. Result and Discussion

### 3.1. Data Analysis

In this section, the data analysis used uses the Dynamo++ stage. At the end of the chapter, there is a discussion on the comparison of the results with previous studies. Data analysis in this study is as follows:

*3.1.1 Pre-study*

This section identifies the pre-repair process flow, where VM and VS receive parts from multiple suppliers who ship them directly to the company. The description of the process flow can be seen in Figure 3.

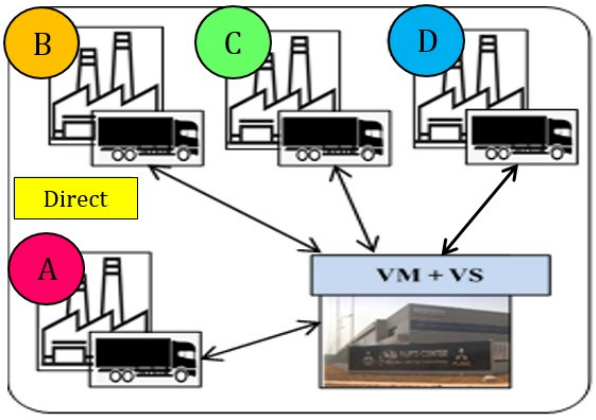


*Figure 3. Direct Transportation by Suppliers*

Meanwhile, the type of transportation that is currently being carried out is divided into several parts, including logistics partners, companies, rental companies, and others which can be seen in Figure 4.

Figure 4 shows that VM and VS mostly use truck logistics partners in making deliveries from suppliers or to distributors. The process of loading trucks from various suppliers is 65%, and there are major problems or an increase in transportation costs that is not proportional to the speed of receiving goods.

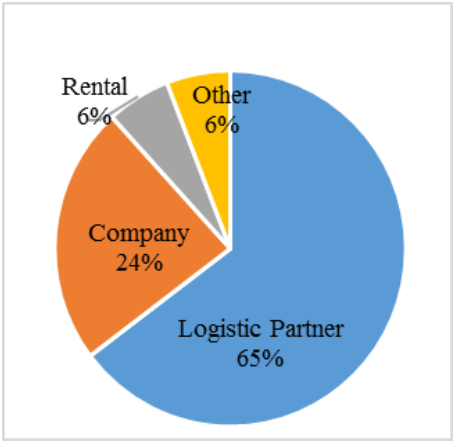


*Figure 4. Transportation Type*

Figure 5 shows that the most Pareto loss of waiting time is 73%. This problem occurs because a lot of time is wasted entering the VM and VS areas. Loss of time is caused by a lot of trucks queuing outside the factory because the factory is full of parking and loading capacity. so all suppliers complain and increase their transportation costs. This results in very high transport costs for VM and VS. The dominant problem from the Pareto diagram can be seen in Figure 5.

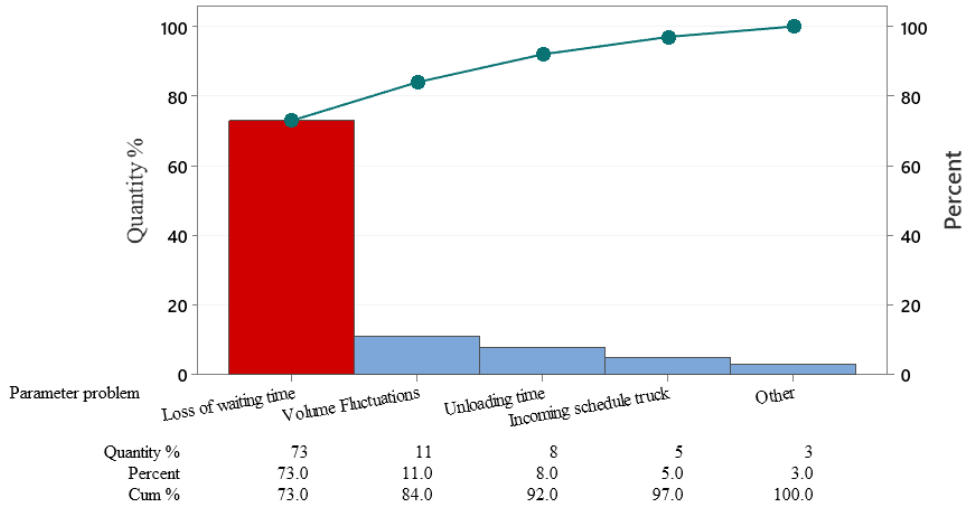


*Figure 5. Pareto Diagram of Increasing Transportation Cost*

*3.1.2. Measurement*

VM and VS have spare parts suppliers from several suppliers who are still in the same area. This has the aim that the delivery of spare parts does not take too long to arrive at the location. The location of suppliers and the number of suppliers in the vehicle industry production chain can be seen in Figure 6.

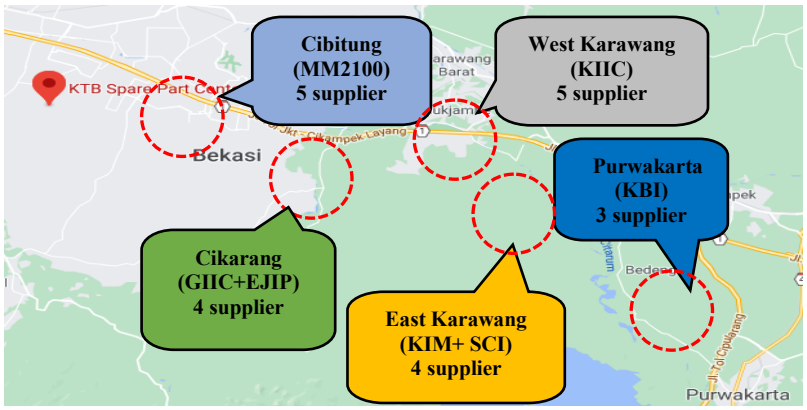


*Figure 6. Suppliers Location*

Based on highly fluctuating After-Sales orders, the company manages milk-run flexibility by changing milk run route cycles daily. Based on the milk-run cycle ratio shows that from July 2019 to June 2020, the costs incurred by VM and VS are different each month. The average reached 8000 USD and the total results for 1 year from the two companies can be seen in Table 1.

*Table 1. Total Transportation Cost Before Improvement*

| Item | Amount (USD) |
|---|---|
| VM cost | 98,137 |
| VS cost | 106,965 |
| Total | 205,102 |

Table 1 shows that the amount of expenditure for VS is greater because of the large number of transportation activities that enter the company.

*3.1.3. Analysis*

This section analyzes the causes of the problem in the loss of waiting time. The factors causing the problem are known based on 5M through Fishbone Diagram which aims to find the main cause of the disappearance of the waiting time problem. Analysis of the causes of the problem was carried out with experts through FGDs (Kurnia et al., 2022). The fishbone diagram of the FGD results can be seen in Figure 7.

*3.1.4. Implementation*

VM After Sales (AS) has to manage milk-run operations that are not just for VMs and VSs. Therefore there will be a new operation in the AS VM which requires an additional 1 manpower to control the milk-run system. Milk-run operations must operate at least 1 cycle/day to cover truck investment costs. The cost of using milk-run can be seen in Table 2.

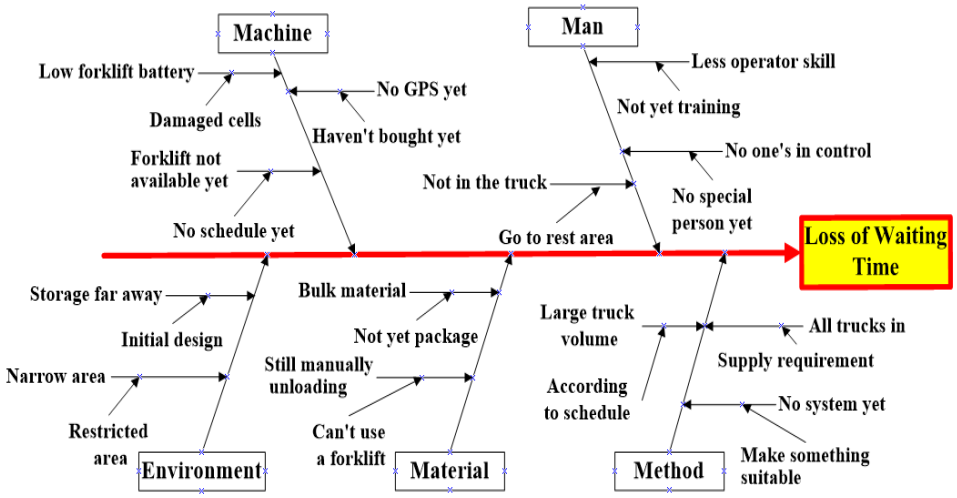


*Figure 7. Fishbone Diagram of Increased Transportation Cost*

*Table 2. Cost of Using Milk-run*

| Item | Amount (USD) |
|---|---|
| Milk-run cost (186 days) | 24,000 |
| Man Power cost | 10,828 |
| Base Pallet | 7,586 |
| Total | 42,414 |

Table 2 shows the investment costs in implementing the milk run system. Investments are earmarked for the cost of procuring a special workforce in controlling this system and the cost of making standard pallets in the operation of loading and unloading materials from trucks. This section describes the post-repair process flow, where VM and VS receive parts from multiple suppliers who ship them in parallel to the company. That means the milk truck will pick up parts from suppliers A, B, C, and D and then return to VM and VS. The description of the flow of the new transportation process can be seen in Figure 8.

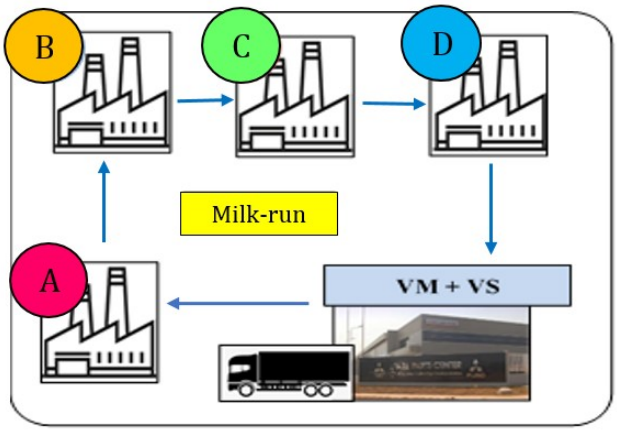


*Figure 8. Milk-run Transportation by Suppliers*

Transportation costs after using the milk-run system between VM and VS have decreased. Milk run is a shared project between VM and VS, therefore VM should negotiate with VS about compensation amount as a basis for increasing outsourcing costs. The results of the negotiation of the amount of compensation issued can be seen in Table 3.

*Table 3. Total Transportation Cost After Improvement*

| Company | Before Improvement (Direct Delivery) | After Improvement (Use Milk-run System) | Cost Down |
|---|---|---|---|
| VM | 98,137 | 20,276 | 77,861 |
| VS | 106,965 | 22,137 | 84,828 |
| Grand Total | | | 162,689 |

Table 3 shows that the VM experienced a decrease in costs or profits after using a milk-run system of 77,861 USD. If the system is consistent up to FY25, it will benefit the company. The following predictions of cost usage until FY25 can be seen in Figure 9.

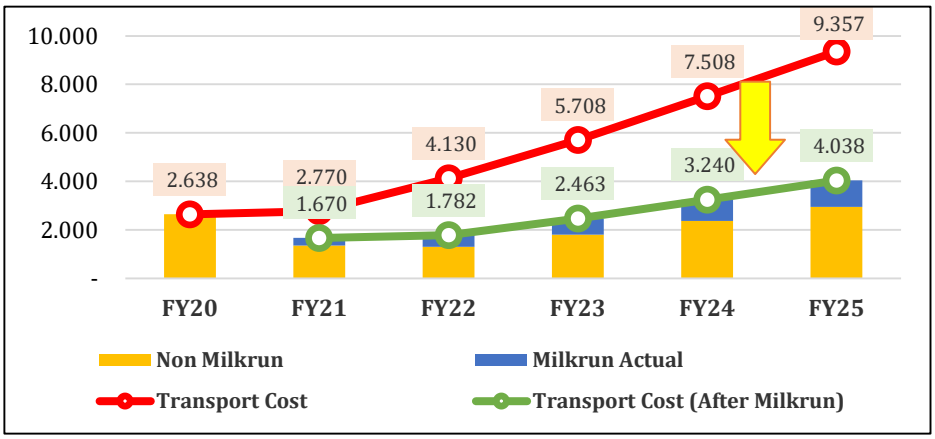


*Figure 9. Milk-run Cost Reductions (Million IDR)*

Figure 9 shows that if the company consistently implements the milk-run system, it is predicted that in FY25, it will get a cost savings of 43% or only incur transportation costs of 4,038 USD.

### 3.2. Discussion

The findings of this study are very good and not too difficult to implemented. The implementation of improvements by applying the milk-run system is very effective in the vehicle industry. The results showed a decrease in transportation costs after the milk run application. This is in line with Purba et al. (2019) research that an effective transportation system can reduce transportation operational costs. Even the results of his research suggest focusing more on $CO_2$ efficiency. The system built in this research has added 1 new worker as a system control operator. This research is in

line with Klenk & Galka (2019) that the model built provides optimization on the scheduling of transportation activities so that costs can be reduced.

This research contributes directly to the reduction of transportation costs by optimizing the efficient and effective scheduling of the milk-run method. The benefit obtained after using the milk-run system but not is the reduction in the cost of purchasing spare parts which means that the price of Mitsubishi parts is more competitive than other brands. This can support the government to reduce CO2 emissions in the logistics chain.

### 3.3 Research Implications

This research is limited to transportation carried out by VM logistics that implements a milk-run system. This research implication to provides benefits for companies related to the reduction of transportation costs. For similar companies, this research can provide input for manufacturing practitioners in saving transportation costs for competing in the global market. The milk-run system can also reduce labor impact on labor cost savings.

This study also uses a gradual combination of the Dynamo++ approach which will assist other studies in determining the decision of the main causal factors in the problem of transportation costs. While the milk-run system is very helpful for other researchers in reducing transportation costs by arranging transportation scheduling so that it is efficient and effective in carrying out supply chain management logistics work.

## 4. Conclusion

In this study, the biggest cause of the problem was found, namely too long delivery times from several VM suppliers. Loss of time is due to the number of trucks queuing outside the factory because the factory is full of parking lots and loading capacity so all suppliers complain and increase transportation costs. Implemented a milk-run system, which means deliveries can be controlled in truck mode. This system works to pick up and deliver to customers which are controlled by the workforce. As a result, transportation operational costs can be reduced by 77,861 USD or a decrease of 79.3%. Therefore, the VM greatly benefits from implementing this milk-run system. Based on the problem of lost waiting time, and the amount of wasted time and processes in the logistics system in the VM company, it is recommended for further research to use the Lean manufacturing method, so that this waste can be reduced gradually and efficiently.

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