Enrichment: Journal of Management, 12 (5) (2022)

Published by: Instiute of Computer Science (IOCS)

Enrichment: Journal of Management

Journal homepage: www.enrichment.iocspublisher.org

Optimization of Transportation Costs With The Implementation of The Milk-Run Method

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ARTICLE INFO

Article history:

Received Nov 9, 2022
Revised Nov 20, 2022
Accepted Nov 28, 2022

Keywords:

Transportation System
Milk-Run Method
Cost Optimization

ABSTRACT

The rapid development of technology and information affects the development of international logistics. These developments have an impact on efficiency and effectiveness in logistics processes which include integration of information, transportation, inventory, warehousing and distribution so that in the global logistics business, service providers compete to reduce logistics costs and maximize logistics services. The purpose of this research is to obtain the most appropriate and optimal pick-up and delivery transportation system that can minimize transportation costs. The population in this study is data from PT. Nippon Express Indonesia, and the sample of this study is data from November 2021. Analysis of determining distribution routes using the Milk-Run method. By using the Milk-Run method, the number of truck fleets can be reduced from 4 trucks to only 1 truck. The original mileage of 133.1 kilometers can be reduced to 74.8 kilometers, which means distance the could shortened/more economical as big as 44.1 % or around 58.3 kilometers. The reduction in trucks resulted in lower transportation costs. The original cost was Rp. 8,670,000 down to Rp. 6,300,000. Thus, there is a savings in distribution channel costs of Rp.2,370,000 or approximately 27.03%.

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INTRODUCTION

The development of technology and information is increasingly fast influence development of international logistics. Where is the development it affects efficiency and effectiveness in logistics processes that include information integration, transportation, inventory, warehousing and distribution so that in the global logistics business para provider services compete to suppress cost logistics and maximize services service logistics.

Transportation Problem is part of "operations research" which talk about minimizing transportation costs from a place to another place. Case transportation arise when someone trying to determine the way of delivery (distribution) something type goods (items) from a number of source (offer location) to a number of destination (request location). Every company definitely

want the cost minimum for the transportation process, so that a solution strategy is needed problem who can provide solutions which optimal. With strategy and planning which well then charge for process transportation can be saved. Planning related transportation expenses with amount and when will expenditure is made. With existence transportation expenditure planning so will get an increase profit because it is able to minimize cost transportation and market demand can also fulfilled well

PT.NEI which is located in the central Cikarang GIIC area is a company with more than 17 years of experience engaged in transportation services or delivery of goods from one place to another using ground transportation mode, sea, and air. Several large companies in Indonesia have worked same use the services of PT. NEI in shipping services. For this reason, in order to optimize transportation costs, it is necessary to update the distribution system so that the delivery operational process can be effective and efficient efficient.

PT. NEI is collaborating with PT. YIM, where PT. NEI as a transporter service will provide good service to PT. YIM as its customer. In this collaboration project, PT. YIM also involves its suppliers as a starting point for picking up goods to be sent to cities for delivery. There are at least 4 suppliers that are used as pickup points for goods, and of course the operational costs are also quite large. Whereas in the cooperation agreement, every shipment whose pickup point is 1/2/3/4 place, the payment is the same referring to (Trip Basis), so pickup of more than one place is a form of PT.NEI's service to PT. YIM.

Land delivery process at PT. NEI often has problems, based on the above background, the authors identify the following problems:

1. Can the implementation of the *Milk-Run Transportation system* optimize operational costs Transportation?
2. How much is the decrease in mileage after the application of the method *Milk Run* ?

The purpose of this study is to optimize shipping costs by changing the transportation system.

Operations activities are activities to create goods and services offered by companies to consumers, here are some definitions of Operations Management according to experts: According to Heizer and Rander (2011), operations management is a series of activities that produce value in the form of goods and services by converting inputs into outputs. Stevenson and Chuong (2014), explain that operations management is the management of the operations department that is responsible for producing goods or services. Meanwhile, according to Russell and Taylor (2011), operations management is often defined as the process of transforming inputs (such as materials, machinery, labor, management, and capital into outputs (goods and service)..

The transportation model is one form of model that can be used to solve linear programming problems, which are generally related to the optimal distribution arrangement of a product of the same type (homogeneous), from several locations or sources of origin to several locations or certain destinations. In general, transportation modeling is intended to find the cheapest way (cost), to distribute or deliver products from several sources to several destinations. The point of origin or source can be a factory, warehouse, agent, or other where the intended destination is the point that receives products or items the.

According to Copa (2010, p87-88) the characteristics of the use of transportation methods:

a. There are a number of specific sources and destinations. b.Quantity commodity/goods distributed from each source and requested by each destination of a certain magnitude. c. Commodities sent/transported from a source to a destination are in accordance with the request and or source capacity. d. The type of commodity/goods distributed is the same. e. The cost of transporting a commodity from a source to a destination is of a certain magnitude.

Matters that are influential and related to the transportation method include the area of origin and the area of destination, the supply capacity of the area of origin and the amount of demand for the area of destination, as well as the cost of transportation from the area of origin to the destination. A transportation model is said to be balanced (balanced program) if the total amount between

supply and demand is the same. In simple terms, Heizer and Render in Hariyono (2012:11) identify that to use the transportation model the following things must be known :
1.The point of origin or sources of origin and the capacity or supply at each period.
2.Destinations and requests for each period.
3.Shipping costs (for problems with minimization goal cost), or allocation advantage (for profit maximization) per unit unit from each point of origin to point of destination is known.

Logistics process output includes competitive advantage for organization, results from marketing orientation and operational efficiency and effectiveness, utilization of time and space, and efficient transfer to customers. Another output occurs when logistics services are mixed in such a way that they become an organizational asset. 12 main logistics activities, namely:
a) Customer Service
b) Demand Forecasting
c) Inventory Management
d) Logistics Communications
e) Material Handling
f) Order Processing
g) Packaging Style
h) Component support and service
i) Location selection and warehouse
j) Procurement/Purchasing
k) reverse Logistics
l) Transportation
m) warehouse and Storage

RESEARCH METHOD

The research method is defined as a scientific way to obtain data with certain purposes and uses. The research method used in this study is a quantitative research method. Quantitative research methods can be interpreted as research methods based on the philosophy of positivism, used to examine certain populations or samples. Collecting data using research instruments, data analysis is quantitative/statistical, with the aim of testing the established hypothesis (Sugiyono, 2014).

The object of research is a scientific goal to obtain data with a certain purpose and use about something objective, valid and reliable about a thing (certain variables)."

This research was taken at PT. NEI in the GIIC Cikarang Industrial Estate and PT. YIM as well as their suppliers in Cikarang. The stages in this research activity start from the observation stage to the writing stage. The entire time of this research was carried out in the period November 2021 - May 2022.

The population is a generalization area consisting of objects/subjects that have certain quantities and characteristics determined by researchers to be studied and then drawn conclusions (Sugiyono 2017, p.61). In this study, the population is the Transportation Operational Data of PT. Nippon Express Indonesia.

The sample is part of the number of characteristics possessed by the population (Sugiyono, 2017, p.62) "The sample in this study is additional cost data with a period of 1 month.

The operational definition of a variable is a term for a research variable that must have empirical references (can be measured, calculated or collected through reasoning), and is stated in criteria/operations that can be critically tested. The operational understanding is then described into indicators that are used for each variable. Explanation of Operational Variables Research that shows what problems are shown by each variable.

Data analysis method

The method of data analysis in this study was carried out with the following steps:

1. Collecting Transportation master schedule data
2. Setting the transport rule scheme .
3. Take into account the cost requirements used to meet operational needs.

The technique used in analyzing the data that has been obtained is quantitative analysis which is used to obtain an overview of the Milk-Run method at PT. Nippon Express Indonesia.

Milk-Run System

Definition *Milk-run* is one of the advanced delivery concepts that can be improve the transportation management system. With the *Milk-run system,* shipments can occur several times for transportation or unloading of goods at different locations in the same schedule

The advantage of this shipping method is the fact that efficiency will occur in the way of transportation and the cost of receiving products from suppliers will be reduced because it will not face many suppliers who come and also does not require a large area of land. If the Economic Order Quantities (EOQ) required for several different products by the receiving location is smaller than the truckload size, Milk-run allows for a combination of several products until a way is found to match the truckload size. If there are multiple receiving locations that require a small amount of product, they can be served by just one truck.

RESULTS AND DISCUSSIONS

Transportation System long

Table 1. Vehicle Type and Capacity

Supplier	Transportation Type	Capacity
A	**Container 20 Feet**	**19.5 tons**
B	**CDE**	**4 tons**
C	**CDE**	**4 tons**
D	**CDE**	**4 tons**

The maximum capacity of goods is 18 tons for each shipment, so for the old system of transportation routes, each CDE truck carries 3.5 tons of goods to each supplier and then the goods are combined into a container truck.

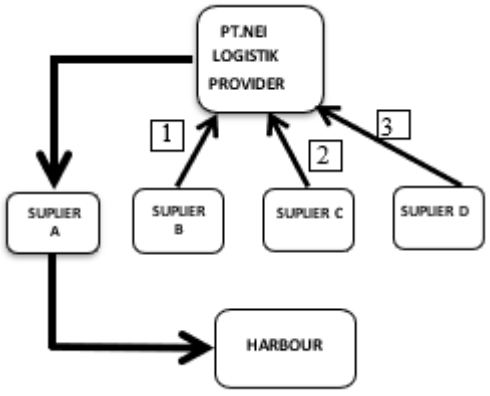


Figure 1. Initial Transport Scheme

Information :

1. In the picture of the transportation rule above, there are 3 additional trucks of cars
2. An additional truck transports supplier B, C, D goods to be brought to the pull
3. Items that have been brought to the pull and then loaded back into the car container
4. The container car departs from pull to supplier A to load goods the rest.
5. After the container is full, continue shipping to the port of tanjung priuk.

Additional Fee Data

The additional cost in the YIMM project is based on the additional truck for multi-site pickup. This additional cost is not included in the billing for shipping services because it is a form of service to the customer (PT.YIM). The table above is a data pickup of goods and services cost addition, if each shipment has more than one pickup point. One point pick-up per delivery, then there is no additional cost. Every take item 2 point place, so additional needed truck as much 1 units, taking 3 point the place 2 units are needed, and 4 pick-up points require 3 additional trucks.

Time Effectiveness

The customer gives a maximum of H + 3 from the PO down the goods have been picked up. For the old transportation system process lasts 2 days.

a. The first day, the pickup from the BCD supplier used a 4 ton truck and then it was taken to the warehouse to be transferred to a container truck.
b. The second day the Container Truck departs for pickup of goods to supplier A
c. After the pickup process is complete, the truck immediately sends it to the port Tj.Priuk.

In terms of time effectiveness, the old transportation system is still safe, because from the maximum time limit (H+3) given by the customer, the pickup process from the old transportation only takes 2 days.

Analysis of the Application of the Milk-Run Method

a. System Data Processing Transportation

The Transportation Rule Scheme prior to the study contained additional trucks to *support* shipping. The following changes to the Transportation Rule using the *Milk-Run method* . Where this method eliminates small trucks and is taken directly by container truck to each supplier.

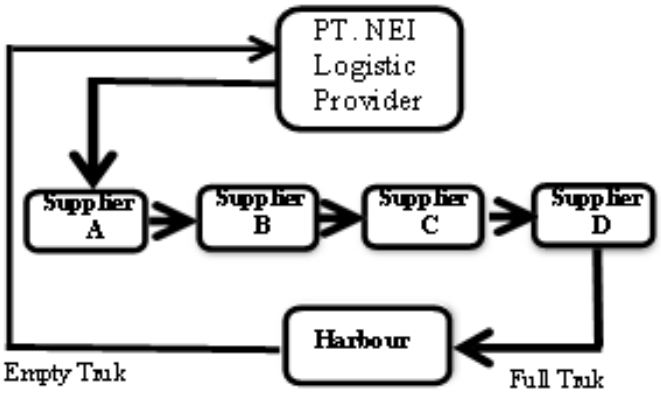


Figure 2. Milk-Run Transport Scheme

Description :

a. In the application of the Milk-Run method, it eliminates additional (small) trucks from each supplier which in the old system did direct delivery.
b. Container trucks with a capacity of 20 feet pick up goods to each supplier point.

c. Data Processing Fee Addition

Application of the *Milk-Run* method , there is a change where the additional (small) trucks that usually take to the BCD supplier are removed. Thus, Container Trucks take goods directly to each supplier by Thus , there will be additional costs in Container Truck fees to vendors (PT. KML).

For every additional 1 supplier point, the container truck gets an additional 150,000 fee, 2 300,000 points and 3 450,000 points. The determination of this fee is carried out through direct negotiations with the vendor (PT. KML). The same additional fee even though the distance of the supplier is different is a form of service from the vendor to PT. Nipoon Express Indonesia.

The additional cost of a container truck is lower than that of a 4 ton truck of 3 units. This is the basis

for the author to make changes to the transportation system. The existence of a third party (vendor) is very beneficial for the company. Because by using the vendor PT. Nippon Express Indonesia, there is no need to incur other costs such as driver salaries, *maintenance* (repairs) and also maintenance of the truck fleet.

Comparison Discussion Transport Scheme

The old transportation system uses 4 units of a truck fleet, where the pickup of goods at the 4 suppliers uses Conainer Trucks at the supplier A and Suppliers B,C,D using trucks 4 Tons.

Milk-Run Transportation system , the collection and delivery of goods only uses 1 container truck. One container truck takes the goods to the ABCD supplier and makes delivery to the port of Tj. Priuk. By eliminating the additional 4 tonne truck, it is hoped that it will optimize operational costs without compromising the service and time effectiveness of the pick-up process delivery.

Table 2. Scheme Distance

Total Distance before(km)	Total Distance after (km)	Difference Distance (km)	Percentage
133,1	74,8	58,3	43,8

Scheme The initial transportation using 4 trucks was changed to only 1 truck using the Milk-Run method. Table shows the difference in mileage from the old transportation system and the *Milk-Run system* with the calculation of : .

Difference distance travel = *Distance Route start-Route Distance Suggestion*

= *133.1 - 74.8*

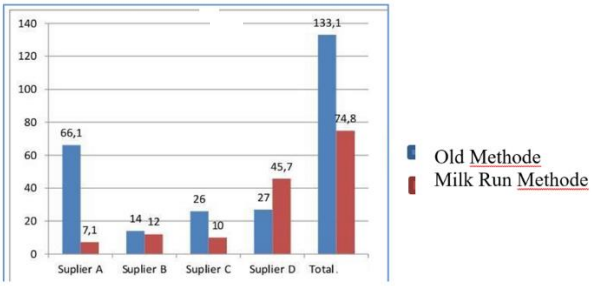
= *58.3 km*

Savings percentage :

(133.1- 74.8)/ 133, 1 x 100% = *43..8%*

Savings after applying the *Milk-Run method* , get a distance of 58.3 km or 43.8%.

The significant difference in terms of distance is shown in diagram. The old transportation system has a mileage of 133.1 km using a total of 4 trucks.



Distance Comparison Diagram

Figure 3. Disctance Comparison Diagram

After implementing the *Milk-Run method on the* YIM project , the company only uses 1 unit of 20" Container Truck to serve 4 *Suppliers* in Project YIM, with a total distance of 74.8 km. A 20" Container Truck carries 3500 kg in each Supplier and a total of 4 suppliers so 3500 x 4 = 14000 kg.

Transportation Cost Comparison Discussion

Changes in the transportation system have an impact on operational costs, which is the main objective of the proposed changes. Judging from the data analysis system The transportation costs before the application of the Milk-Run method obtained the total transportation costs on the initial route of Rp. 8,670,000 per month or Rp. 104,040,000 per year and transportation costs after the application of the Milk-Run method obtained a total transportation cost on the new route of Rp. 6,300,000 per month or Rp. 75.600.000 per year. Cost difference and savings by calculation :

Cost Difference
= *Initial system cost- Milk-Run system cost*

= Rp.8,670,000 - _ _ Rp. 6,300,000

= Rp. 2.370,000 per month

Saving percentage

The old and proposed transportation (*Milk-Run*) has decreased operational costs in this case, the changes are as expected. Transportation cost comparison data with the old system and the *Milk-Run system* = 43..8%. Transportation cost savings are Rp. 2.370,000 per month or Rp.28,440,000 per year with a percentage of 27.3%.

The change from the old Transportation System to the *Milk-Run Transportation system* resulted in a decrease in additional operational costs. It can be seen in diagram 4.5 that the difference is quite significant from operational costs.

Savings in transportation costs after the application of the Milk-Run method, for subsequent shipments the company can use the distribution scheme of Milk-Run, namely the pickup scheme with a 20" container truck from A to D, then delivery to the Tj. Priuk Port with a total transportation cost of Rp. Rp. 6,300,000 per month or Rp. 75,600,000 per year.

CONCLUSION

Milk-Run Transportation System can optimize operational costs with the following results: First, transportation operational cost savings of Rp. 2.370,000 per month or Rp. 28,440.00 per year with transportation cost savings of 27.3 %. Calculation of transportation costs on the initial route of Rp. 8,670,000 per month or Rp. 104,040,000 per year and after applying the *Milk-Run method, the* total transportation cost for the new system from Supplier A to the Tj.Priuk port is Rp. 6,300,000 per month or Rp. 75,600,000. Second, the Milk-Run method system reduces the Truck fleet (CDE) and picks up and delivers goods from suppliers to the Tj.Priuk port using 20" Container Trucks. The route includes from Supplier A to D with a total distance of 74.8 Km. Where the new scheme is obtained after the application of the *Milk-Run method and the minimum* distance for taking and delivering goods is obtained. The new route after the application of the *Milk-Run method on the* YIM project from Supplier A-D to delivery to the Tj.Priuk port *Start* from PT. Nippon Express to Supplier A with a distance of 7.1 km, taking goods from Supplier A to B with a distance of 12 km, pick up Supplier B to C with a distance of 10 km, pick up CD Supplier goods with a distance of 2.7 km, delivery of goods from Supplier D to the port of Tj. Priuk with a distance of 43 km.

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