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Proposed Improvement of Pertalite Fuel Outbound Logistics Performance to Achieve Pertamina Patra Niaga MS2 Compliance (A Case Study of Bandung City)

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ABSTRACT: PT. Pertamina Patra Niaga was founded in 2004, is a sub-holding of PT. Pertamina which handles Pertamina's downstream oil and gas processes, especially fuel trading and handling, as well as fleet and depot management. This study took Fuel Terminal Bandung Group - Ujung Berung as a research location which encounter issue related to the not achieved of the MS2 Compliance target in delivery time delay related to the external logistics performance. This research focuses on the delivery of Pertalite fuel in the city of Bandung in the third quarter of 2022.
This study aims to identify the factor that affect the value of MS2 Compliance in Fuel Terminal Bandung Group-Ujung Berung and initiate the improvement initiatives to improve outbound logistic performance for Fuel Terminal Bandung Group - Ujung Berung. The conceptual framework used in this research describes the supply chain design and focuses on outbound logistics in terms of moving the final product to the retailers to achieve responsive supply chain strategy is improving the outbound logistic performance. The equipment that used to carry the delivery are tank trucks. The method used in this study uses a quantitative approach with heuristic methods using a sweep algorithm. Quantitative data were obtained from company data, observations at the company and interviews with departments that related to the company's logistics. Secondary data analysis using literature and company data.
The analysis was carried out by finding the root of the problem with a fishbone diagram and analysing quantitative data with a sweep algorithm. The analysis is carried out by taking days that have low MS2 Compliance in Quarter III 2022 in one week, where one day has three delivery batch. From the results of the analysis, it was found that there were four main causes, namely method, environment, human, and equipment factors. Then examine by the sweep algorithm analysis which results in more effective route selection and maximizing the use of tank trucks by calculating the travel time for each shipment by considering the allowance time for each shipment.

KEYWORDS: Distribution, Heuristic Method, Outbound Logistic, Sweep Algorithm, Vehicle Routing Problem.

INTRODUCTION

This research focus on delivery process of Pertalite in PT. Pertamina Patra Niaga that at the Fuel Terminal Bandung Group – Ujung Berung. This focus based on the author's limitations in terms of permission to retrieve data from where the author conducts research. Which impacting the data that can be access and the availability of data for this research only Pertalite fuel distribution in Bandung City. This research took Fuel Terminal Bandung Group - Ujung Berung as a research location which encounter issue related to the not achieved of the MS2 Compliance target in delivery time delay related to the external logistics performance. The MS2 define as Stock Management SPBU, an application where demand or order requests and fuel stock reports are submitted via SMS. MS2 Compliance represent customer satisfaction with Pertamina's commitment in terms compatibility of the delivery times. This research focus on Pertalite product because demand for Pertalite products shows significant numbers and is expected to increase every year Pertalite consumption reaches almost 80 percent among other types of fuel [1]. Therefore, this research will focus on the Pertalite product to increase the service level through improving outbound logistic performance which improving the responsiveness fuel delivery process area of Pertalite in Bandung City, leading to increase the value of MS2 Compliance value through more responsive delivery process of Fuel Terminal Bandung Group Ujung Berung to fulfill the highly demand of Pertalite in Bandung City. The objective of this paper are to identify the factor that affect the value of MS2 Compliance in Fuel Terminal Bandung Group-Ujung Berung and to initiate the improvement initiatives to improve outbound logistic performance for Fuel Terminal Bandung Group-Ujung Berung. The main result of this research discovered there are 4 causes from the business issue regarding MS2

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compliance that are method, environment, equipment and manpower. The main focus of this research is to focus on the method and environment factors. For the method the author made efforts to solved the root cause with heuristic method namely sweep algorithm in vehicle routing problem. While the equipment root cause link with the method causes to maximize the tank truck utilization to minimize the effect of root cause from equipment factor. The manpower not discussed further because it is not related with a field of study.

REVIEW OF LITERATURE

Supply Chain Design Strategy

The purpose of supply chain strategy is to balance the company's competitive advantage, namely between responsiveness and efficiency [2]. From study the two case studies that already explain above concluded that primary tools to guide in the supply chain design process are enterprise databases, mathematical programming models, simulations, and geographical information systems. Due to current business conditions, the goal of supply chain to support the market strategy, and its design of supply chain must align accordingly [3]. The design based on the target of the supply chain design strategy itself which reflect the design contents such supplier requirements and inventory targets that shown on the figure below [3]. The author use the framework as same context for the comparison of efficient and responsive supply chains [2].

Table 1. Comparison of Efficient and Responsive Supply Chains

	Efficient Supply Chains	Responsive Supply Chains
Primary Goal	Supply demand at the lowest cost	Respond quickly to demand
Product design strategy	Maximize performance while maintaining product costs down.	Construct modularity to postpone product diversification
Pricing strategy	Reduced margins because customers are primarily motivated by price	Higher margins since customers are not primarily motivated by price
Manufacturing strategy	Lowered costs due to high utilization	Retain its capacity flexible to protect against demand/supply volatility
Inventory strategy	Reduce inventory to save money	Manage buffer stock to address demand/supply volatility
Lead-time strategy	Reduce expenses, but not at the expense of others.	Even if the costs are high, minimize expenditures drastically
Supplier strategy	Deciding based on quality and cost	Decide depending on responsiveness, adaptability, reliability, and quality

(**Source:** Chopra & Meindl, 2016)

It can be seen on the table 1 there are comparison of efficient and responsive supply chain. The efficient supply chain primary goal is to give efforts to fulfill consumer demand at the lowest price by minimizing total costs and reducing costs (material cost, production cost, and inventory cost) along the supply chain [2]. The responsive supply chains primary goal is the ability of supply chain in responding the rapid change in market demand [2]. To achieve this responsive supply chain require a reliable distributor, reliable supplier that underlying speed and flexibility [2]. Responsive supply chain is a supply chain's ability to do the following [2]:

1. Be able to respond to wide ranges of quantities demanded

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2. Fulfill short lead times
3. Deal with a large variety of products
4. Initiate highly innovative products
5. Fulfill a high service level

The efficient supply chains effective when products operate with low profit margins, low product variation, and have a predictable demand forecast [4]. While the responsive supply chains can be effective applicable when products have significant profit margins, a wide variety of products, and fluctuating demand, requiring swift adaptability to continually shifting consumer preferences [4]. It can be concluded that supply chain design become the critical success factor for the whole business process.

Vehicle Routing Problem

In line with the logistic driver's the supply chain decision making framework the vehicle routing problem (VRP) as one of the tools to support from transportation decision [2]. One of the most extensively researched subjects in the field of operations research is the "Vehicle Routing Problem" (VRP) [5]. The aim of VRP is to account for the complexities of real-world situations, such as time-dependent trip times (which reflect traffic congestion), time slots for pickup and delivery, and input information (such as demand information) that changes dynamically over time [5]. The VRP has four main goals [2], which are as follows:

1. Reducing distance-related and vehicle-related fixed expenses connected with transportation.
2. Reducing the number of vehicles required to transport products.
3. Reducing costs brought on by agents' unsatisfactory service.

Another reference said that the objective is to find and identify a group of delivery routes that satisfy certain conditions, limitation, constraints and have a minimum transportation cost [6]. Many detailed methods, including guided local search and exact algorithms based on linear programming, have recently been utilized to address the VRP [6].

Some research has been done by researchers in the past discussing vehicle routing problem is that optimizing VRP using nearest neighbor method and saving matrix in PT XYZ [7]. In the article, PT XYZ is a pharmaceutical company that provides distribution and logistics services in the health sector. The issue was difficulties when dealing with distribution process, specifically the frequent delay in delivering products to their customer due to the inaccuracy of route configuration and cause increase in transportation cost. The goal research is to determine distribution route and proper vehicle capacity at PT XYZ and to calculate the total cost of transportation by using nearest neighbor method and saving matrix [7]. The result was by using nearest neighbor method it resulting six routes and using saving matrix, the company could save up to 27% and 38% respectively for each method [7].

Heuristic Method

An effective problem-solving strategy defined as a finite sequence of instructions is called an algorithm [5]. Another way to look at it is that an algorithm is the combination of data structures and the algorithmic expression of a specific job [5]. Heuristic algorithms are standards or computer processes designed to realize any purpose or select the most useful among several alternative actions to reach the goal [5]. These algorithms have the ability to converge, but they can only guarantee a solution that is very close to the final one [5]. These algorithms are referred to as improvable algorithms when they reach the best solution in the space of solutions [5].

In addition, heuristic methods have drawn a lot of attention from researchers working to solve complex VRPs such as neural networks, genetic algorithms, and evolutionary tactics are some of the heuristic techniques that have lately been put to use [6]. Adding from newest research due of the size of real-world problems, heuristics and metaheuristics are frequently better suited for practical applications (e.g., a company may need to supply thousands of customers from dozens of depots with numerous vehicles and subject to a variety of constraints) [6]. The angle (angular position) can be calculated by the formula below:

Angular ($^{\delta}$i)= ATAN $\frac{(y1-y)}{(x1-x)}$ [4].

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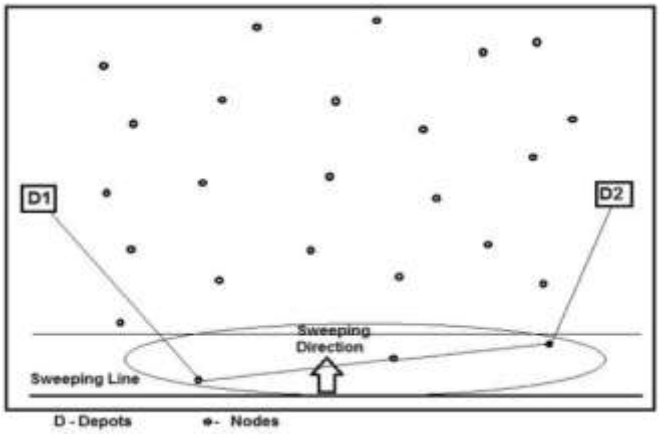

Figure 1. Illustration of Linear Sweep Algorithm
(**Source:** Kumar & Jayachitra, 2016)

The algorithm for sweep has been updated to become a linear algorithm [5]. According to Figure 1, the nodes are split up between two depots at either end rather than a single central store. As a result, the originally mentioned sweep method cannot be used and must be modified. The x and y coordinates of the nodes, which are arranged in a graph, are assigned.

METHODOLOGY

In conducting this research the author uses the combination of data obtained by primary data and secondary data. This research collects data and analyses data using quantitative methods. Quantitative methods are defined a research method based on concrete data, research data in the form of numbers that measured using statistics as a calculation test tool, related to the problem being studied to produce a conclusion or in other words scientific method whose data is in the form of numbers or numbers that can be processed and analysed using mathematical calculations or statistics (Sekaran & Bougie, 2017). Quantitative methods research that demands the use of numbers, starting from data collection, interpretation of the data, and the appearance of the results. The author collects quantitative data from recapitulation of MS2 Compliance on Quarter III 2022, total tank trucks, total customers, demand of each customers, type of tank truck capacity, coordinates via google maps, demand, mileage between customers, travel time via google maps and number of retailers as a customer served by Fuel Terminal Ujung Berung per region, and demand for each retailers on quarter III which are collected in PT Pertamina Patra Niaga specifically in Fuel Terminal Bandung Group Ujung Berung. The sample is MS2 recapitulation in QIII 2022 (July, August, September) which days in one week is taken where the dates used are the dates that represent the business issue which the MS2 value is low. The dates are:

1) Monday, August 29th 2022
2) Tuesday, July 5th 2022
3) Wednesday, September 1st 2022
4) Thursday, September 7th 2022
5) Friday, August 12th 2022
6) Saturday, July 2nd 2022
7) Sunday, July 3rd 2022

The purpose of take this sample is to analyse the pattern of customer's demand in one week and find the possible and effective routes on each day by considering the allowance time. From all data that are already gathered processed with quantitative methodology specifically in heuristic model that is sweep algorithm to determine the vehicle routing problem that resulting increase in MS2 Compliance value. This research use the sample of the date that showing low of MS2 Compliance which consist of one full week to see the Pertalite distribution pattern in the city of Bandung every day of the week. For this research, the author develop the conceptual framework (in figure 2) as shown below refer to journal [8]:

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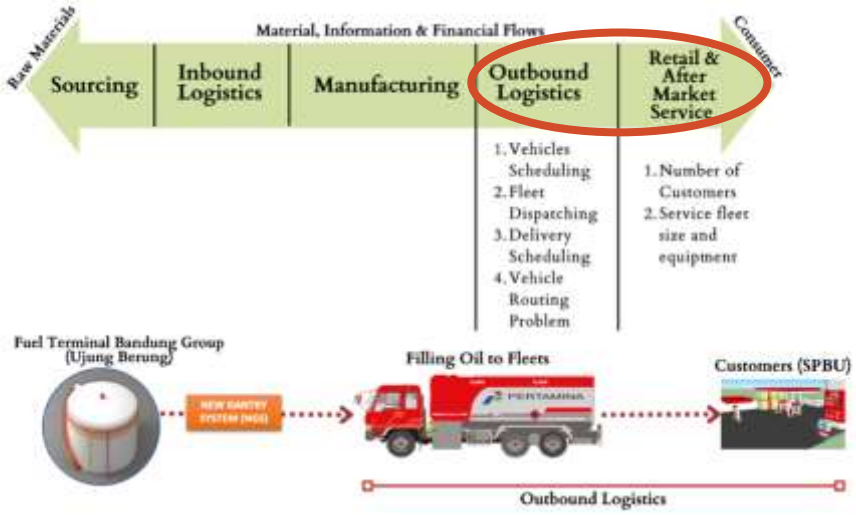

Figure 2. Conceptual Framework to be used in this research

Heuristic Method (Sweep Algorithm)

This research use heuristic model namely sweep algorithm to help solving the vehicle routing problem through identifying, calculating, analysing a set of vehicle routes that ensure each customer is served in high service level with available capacity, without exceeding the delivery time that already determined or fixed.

1. Information on the columns in the sweep algorithm table:
    - Location is the gas station location.
    - Shift (Plan) is a shift that should be scheduled.
    - Shift (Actual) is the shift that actually happened on that day.
    - Status is a description of whether the shipment was sent according to the scheduled shift or "late" more than the scheduled shift.
    - Pertalite demand is the demand for each gas station.
    - X is the X coordinate of each gas station.
    - Y is the X coordinate of each gas station.
    - Angular position is the angular position resulting from the calculation of the sweep algorithm.
    - Distance (Km) is the distance from the fuel terminal to each gas station.
    - Distance between locations (Km) is the distance between delivery gas stations.
    - Total distance departure (Km) is the total distance from the delivery to the fuel terminal to each gas station in one delivery batch.
    - Total distance return (Km) is the total distance from the gas station return to the fuel terminal in one delivery batch.
    - Total distance (Km)is the sum of the total distance departure and total distance return to find out the total distance travelled in one trip on one delivery batch.
    - Tank truck velocity (Km/Hours) is the assumed speed of the tank truck.
    - Tank truck capacity is the capacity of a tank truck, which is a maximum of 24.000 L
    - Travel Time (Hours) is the division of the total distance travelled in one trip divided by the tank truck velocity.
    - Filling time (Hours) is allowance time for Pertalite loading in Fuel Terminal which will be sent to the gas stations.
    - Unloading time (Hours) is the allowance time for unloading Pertalite at gas stations.
    - Set up time (Hours) is allowance time to prepare for Pertalite transfer at gas stations.
    - Percentage % Traffic probability (Hours) is the allowance time to estimate the level of congestion in each shift. Where each allowance is multiplied by time travel. Each shift have different percentage % of allowance.
    - Total allowance time (Hours) is the sum of allowance time for filling time, unloading time and set up time.

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- Total travel time (Hours) is the total travel time, namely travel time plus allowance time. (hours)
- Description is the possibility of a tank truck that has been used for one trip can be used for the next trip.

2. The angular position was calculated based on coordinate x and coordinate y which collected using google maps. The process was input the address of the each gas station and search the coordinate x and coordinate y. After search the coordinate, then entered into the formula Angular ($^{\delta}$i)= ATAN $\frac{(y1-y)}{(x1-x)}$ [2]. The result form angular, sort for the highest value to lowest value.
3. Grouping angular angles based on Pertalite demand on each shift into tank truck capacity which the maximum capacity is 24000KL (24KL).
4. Total Distance (Departure dan Return)

Each distance is searched via Google Maps by entering the Fuel Terminal address at the gas station (as a customer) of the destination or being searched for.

- Total Distance Departure:
  Added the distance from the Fuel Terminal to gas stations 1,2,3 along with the distance between gas stations.
  The example:
  - Starting point - From Fuel Terminal to Gas Station A (Terminal Sadang Serang) = 12.5 Km
  - From Gas Station A (Jl. Terminal Sadang Serang) to Gas Station B (Cinambo) = 10.7 Km
  - From Gas Station B (Cinambo) to Gas Station C Juanda Cobong) = 4.2 Km

  So the total distance departure = 27.4 Km
- Total Distance Return:
  Find the distance from the last visited gas station to the Fuel Terminal
  The example:
  - From Gas Station C (Juanda Cobong) back again to Fuel Terminal = 15.2

  So the total distance return = 15.2 Km
  The total distance can be calculated = Total Distance Departure + Total Distance Return
  In the example case = 27.4 Km + 15.2 Km = 42.6

5. Travel Time Without Allowance

The travel time can be calculated = $\frac{\text{Total Distance (Km)}}{\text{The Average Velocity of Tank Truck } (\frac{\text{Km}}{\text{Hour}})}$

With assumption the average velocity of tank truck is 40 Km/Hour the reason are:

- The size of tank truck have size:
  - Length = 5.430 mm
  - Width = 2.500 mm
  - Height = 2.850 mm
- The tank truck manuver different with normal vehicle so need time to operate the tank truck.
- The road condition in Bandung city is narrow, contoured up and down, and some road there are potholes so it need adjusting for big vehicle as tank truck.

The example:

From above case, total distance is 42.6 so the total time travel without allowance is $\frac{42.6 \text{ Km}}{40 \text{ Km/Hour}}$= 1.07 Hour.

1. Allowance time

The allowance time consist of unloading time (Hours), set up time (Hours), %traffic probability (%) and filling time. this allowance time has been discussed according to company policy.

- Unloading Time (Hours) = time to move (transfer) Pertalite to the tank at the gas station.
- Set Up Time (Hours) = time to prepare the vehicle to enter the gas station and clear the area.
- Percentage (%) Traffic Probability Hours = time allowance for possible congestion in each delivery shift. Multiplied by the total travel time without allowance.

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- Shift 1 (12pm-6am) = 10%
- Shift 2 (6am – 12am) = 40%
- Shift 3 (12am – 10pm) = 20%
- Filling Time in Fuel Terminal consist of:
  - Administration
  - Waiting time into Filling Shed
  - Pre & Post Loading
  - Quality control

From all section of filling time in Fuel Terminal the total filling time is 40 Minutes.

The total allowance time calculated by adding filling time, unloading time (Hour), set up time (Hour), %traffic probability.

The example:

- Shift 1:
  - Filling Time = 40 minutes = 0.67 hour
  - Unloading Time (Hour) = 30 minutes = 0.5 hour
  - Set Up Time (Hour) = 15 minutes = 0.40 hour
  - % Traffic Probability = 10% x total travel time for each batch
- Shift 2:
  - Filling Time = 40 minutes = 0.67 hour
  - Unloading Time (Hour) = 30 minutes = 0.5 hour
  - Set Up Time (Hour) = 15 minutes = 0.40 hour
  - % Traffic Probability = 40% x total travel time for each batch
- Shift 3:
  - Filling Time = 40 minutes = 0.67 hour
  - Unloading Time (Hour) = 30 minutes = 0.5 hour
  - Set Up Time (Hour) = 15 minutes = 0.40 hour
  - % Traffic Probability = 55% x total travel time for each batch

2. Total Travel Time With Allowance

Time Travel Without Allowance + Allowance time

Example:

- From above case, Time Travel Without Allowance = total distance is $\frac{42.6\ \text{Km}}{40\ \text{Km/Hour}}$= 1.07 Hour.
- The allowance time for shift 1 = unloading time (0.5 Hour) + set up time (0.4 Hour) for each gas station + % traffic probability = 2.8 Hour

The Total Travel Time With Allowance for one batch delivery is 3.87 Hour

Each batch delivery calculated as above explanation, then categorized the Total Travel Time With Allowance which is less than 2 hours. To maximize the utilization on tank truck capacity in Fuel Terminal.

- Shift 1 (12pm-6am) = ≥ 2.5 → 6 Hours
- Shift 2 (6am – 12am) = ≥ 2.5 → 6 Hours
- Shift 3 (12am – 10pm) = ≥ 4 →10 Hours

RESULT AND DISCUSSION

Analysis of Root Causes

According to the analysis of root cause using Ishikawa fishbone diagram that has been done in IV.1, the factor that affect the value of MS2 Compliance in Fuel Terminal Bandung Group-Ujung Berung are divided into 4 major causes namely Method, Environment, Equipment, and Manpower.

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1) The major cause **method** have two causes that is ineffective selection of routes and hours of fuel delivery this happen due there has not any effective tool for vehicle routing. Other causes is difficulties in scheduling this happen due if there are outstanding demand from unpredicted demand so there is unplanned scheduling and routing.
2) The major cause **environment** have two causes that is unpredictable daily demand from consumer this happen due to retailers experienced unexpected their customer panic buying that affect unexpected increasing in daily demand during the day. Other causes is unpredictable traffic situation this happen due uncontrollable factor such as demonstration suddenly happen in Bandung City and flood in shipping routes.
3) The major cause **equipment** have one cause that is any presumptions where lack of fleets capacity because there are tank trucks that are maintenance and there are tank trucks that already over the lifespan >10 years.
4) The major cause **manpower** have two cause that is indiscipline tank truck drivers and lack of tank trucks drivers but this major cause manpower cannot be discussed further because it is not included in the field of study.

Analysis of Heuristic Method (Sweep Algorithm)

Table 2. The result of Analysis of Sweep Algorithm

No	Sample	Day	Shift	Total Location	Total Demand	Total Delivery/Day	Maximizing of Tank Trucks Utilization	Total Tank Trucks After Maximization	Average Total Travel Time
1	**29th August 2022**	**Monday**	1	**33**	312000	13	0	13	4,29
2			2	28	296000	13	1	12	3,3
3			3	23	224000	9	5	4	3,65
	Total Demand and Total Delivery				**832000**	35	*become*	29	
4	**5th July 2022**	**Tuesday**	1	**41**	408000	17	0	17	3,84
5			2	37	384000	16	2	14	3,05
6			3	23	192000	8	4	4	4,08
	Total Demand and Total Delivery				**984000**	41	*become*	35	
7	**1st September 2022**	**Wednesday**	1	**40**	368000	16	0	16	3,99
8			2	28	296000	13	1	12	3,3
9			3	28	256000	11	5	6	3,99
	Total Demand and Total Delivery				**920000**	40	*become*	34	
10	**7th September 2022**	**Thursday**	1	**40**	368000	16	0	16	3,99
11			2	28	280000	12	0	12	3,71
12			3	24	224000	10	5	5	3,88
	Total Demand and Total Delivery				**872000**	38	*become*	33	
13	**12 August 2022**	**Friday**	1	**40**	408000	17	0	17	3,93
			2	28	264000	11	0	11	3,96
14			3	28	256000	11	5	6	3,99
	Total Demand and Total Delivery				**928000**	39	*become*	34	
16	**2nd July 2022**	**Saturday**	1	**44**	488000	21	3	19	3,38
17			2	35	368000	16	1	15	3,45
18			3	20	200000	9	3	6	2
	Total Demand and Total Delivery				**1056000**	46	*become*	40	
19	**3rd July 2022**	**Sunday**	1	**53**	504000	21	0	21	3,94
20			2	40	360000	15	0	15	4,23
21			3	10	80000	4	2	2	3,84
	Total Demand and Total Delivery				**944000**	40	*become*	38	3,69

It can be seen from the table 2, the sample was taken in Quarter III, namely July, August and September 2022, which is one full week from Monday to Sunday to see the delivery pattern. According to the analysis of sweep algorithm to answer the improvement initiatives to improve outbound logistic performance for Fuel Terminal Bandung Group – Ujung Berung define in each major cause derivative of analysis of root causes. To solved the **method** major root cause that is the implementation of new vehicle routing and shipping scheduling using heuristic method analysis using sweep algorithm to minimize or avoid the delivery delay. The result of heuristic method analysis is discovered that the total average of customer's location that have to delivered in shift is 32 locations with the average demand each delivery shift is 311238 L. Regarding the overall optimization of the use of tank trucks for each day,

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shift 3 is where it is most maximized because it lasts from 12 a.m. to 22 a.m., a period of time that is 10 hours longer than shifts 1 and 2. Additionally, the maximum tank truck use for delivery in shifts 1, 2, and 3 will vary depending on the proportion of traffic probability for each shift, which has variances. Additionally, shift 3 also experiences the lowest demand, whereas shift 1 experiences the greatest volume of shipments as a result of the urge for orders from a high number of clients. So that the average delivery batch in each day is 40 delivery batch. The delivery batch after maximization of tank truck utilization the average delivery batch in each day become 35 delivery batch, which will reduce the use of tank trucks. With the average travel time each day is 3.69 hours. Currently Fuel Terminal have 53 tank trucks for Pertalite products for the Bandung City for a day. Whereas, this should be sufficient to accommodate tank truck deliveries for Pertalite (from the results of mapping the distribution and capacity of tankers based on travel time using a sweep algorithm). Theoretically, it should not be late, but there are a number of factors that can decrease the effectiveness of scheduling as well as late routing. Because the sweep algorithm approach examines the largest angular angle, it can therefore minimize the tank trucks requirements or maximize tank trucks utility with more effective routing and route selection. Additionally, it can offer a summary and support for a more effective and reliable logistic network configuration with the sweep algorithm method. So that delays in delivery can be minimized.

To solved the **environment** major root cause adding the allowance time to the time calculation, so the total time required for delivery is included the allowance time (unpredictable traffic). The allowance time consist of unloading time (Hours), set up time (Hours), %traffic probability (%) and filling time. this allowance time has been discussed according to company policy. The allowance of unloading time (Hours), set up time (Hours) and filling time have the same percentage of all delivery shift in each day. On the other hand, the allowance time of %traffic probability has different percentage because each shift has a different time which are:

- Shift 1 (12pm-6am) = 10%
- Shift 2 (6am – 12am) = 40%
- Shift 3 (12am – 10pm) = 20%

The differences of percentage of allowance time in traffic probability affecting the result to the travel time, delivery shift 2 and delivery shift 3 tend to have higher travel time rather than delivery shift 1. Therefore it also affect the maximization of tank truck utilizations in each delivery shift 2 and delivery shift 3.

To solved the **equipment** major root cause solved by maximizing the tank trucks utilization by calculating the total time travel, and maximizing the delivery using the same tank truck which has been used for the previous delivery on the same batch. The average delivery batch in each day is 40 delivery batch. The delivery batch after maximization of tank truck utilization the average delivery batch in each day become 35 delivery batch, which will reduce the use of tank trucks. Therefore, the lack of fleet capacity can be avoided due to the maximization of tank truck utilization. For **manpower** major root cause cannot be discussed further because it is not included in the field of study.

CONCLUSIONS

PT. Pertamina Patra Niaga is a sub-holding company of PT. Pertamina that handles downstream process of PT. Pertamina. The downstream process is including the distribution process of fuels which distributed to industries and gas stations throughout Indonesia. To support the business process, PT. Pertamina Patra Niaga accommodate Fuel Terminal that support the distribution process so that can reach all parts of the area covered by each Fuel Terminal. This research mainly focus only in Fuel Terminal Bandung Group Ujung Berung which cover the region near Bandung City, especially Bandung City. Along with the focus is the Pertalite fuel product, because Pertalite fuel product still have a high demand among other products. Due to the high demand of the Pertalite fuel product, Fuel Terminal Bandung Group Ujung Berung faced several issue directing the distribution process specifically in delay delivery time which a part of outbound logistic performance. This issue are reflected on the MS2 Compliance a part of key performance in PT. Pertamina Patra Niaga. Fuel Terminal Bandung Group Ujung Berung used Tank Trucks to distribute the Pertalite fuel product. Then it becomes crucial to improve the distribution process of Pertalite fuel product in Bandung City.

To solved this issue is analysing the delivery pattern of Pertalite fuel product in Bandung City that covered by Fuel Terminal Bandung Group Ujung Berung with heuristic method (sweep algorithm) as a part of vehicle routing problem. The sample is Quarter III 2022 namely July, August, and September 2022, and choose the day that showing decreasing number of MS2 Compliance with one week full to see the pattern in one week. The analysis result of this method is the capacity of Tank Trucks adequate along with

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the customer's demand but it need better routing and delivery scheduling with heuristic tools that can maximize the tank truck utilizations. Therefore already done too the calculation the total of travel time in order to achieve better routing and delivery scheduling, and maximize the tank truck utilizations.

RECOMMENDATION

As for suggestions that can be conveyed by researchers that might be useful for the goal of the company. Fuel Terminal Bandung Group Ujung Berung can improve the outbound logistic performance with maximizing the implementation of heuristic method using sweep algorithm in order to achieve better delivery scheduling and delivery routing. Fuel Terminal Bandung Group Ujung Berung can also evaluate the standard operating procedures regarding the manpower root causes specifically the driver's tank trucks to minimize or avoid the delivery delay and maximize the tank truck utilization, so the tank truck capacity which already available in the Fuel Terminal Bandung Group Ujung Berung get to the degree of maximum use.

REFERENCES

1. Annur, C. M. (2022, October 17). *Energy*. Retrieved from Databoks: https://databoks.katadata.co.id/datapublish/2022/10/17/pertalite-bbm-paling-banyak-dikonsumsi-masyarakat-pada-2021
2. Chopra, S., & Meindl, P. (2016). *Supply Chain Management.* New Jersey: Pearson.
3. Caceres-Cruz, J., Arias, P., Guimarans, D., Riera, D., & Juan, A. A. (2014). Rich vehicle routing problem: Survey. ACM Computing Surveys, 47(2), 1-28.
4. Youn, S., Roh, J. J., & Yang, M. M. (2012). Extending the efficient and responsive supply chains framework to the green context. *Benchmarking An International Journal*.
5. Jayachitra, R., & Kumar, V. S. (2016). Linear Sweep Algorithm for Vehicle Routing Problem with Simultaneous Pickup and Delivery between Two Depots with Several Nodes. *Global Journal of Pure and Applied Mathematics*.
6. Omar, K., & Liong, C. (2008). Vehicle routing problem: Models and solutions. Journal of Quality Measurement and Analysis.
7. Ramaekers, K., Nieuwenhuyse, I. V., & Braekers, K. (2015). The Vehicle Routing Problem: State of the Art Classification and Review. *Computers & Industrial Engineering*.
8. Cattani, K. D., & Mabert, V. A. (2009). Supply Chain Design: Past, Present, and Future. *Production and Inventory Management Journal*.
9. Hutasoit, C. S., Susanty, S., & Imran, A (2014). Penentuan Rute Distribusi Es Balok Menggunakan Algoritma Nearest Neighbour dan Local Search (Studi Kasus di PT. X). Reka Integra, 2(2).

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