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Vehicle Routing Problem as a Solution for Determining Goods Delivery Routes PT. Kreasi Beton Nusa Persada

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ABSTRAK

Distribusi VRP mengalami kesulitan mengatasi masalah dalam mencari saluran dengan depot yang minimal ke lokasi yang mempunyai perbedaan tempat dengan total permintaan yang berbeda. Tujuan penelitian ini adalah menganalisis permasalahan jalur transportasi dalam pendistribusian produk yang diperoleh dari lokasi awal pendistribusian kepada pengguna. Jenis penelitian ini yaitu penelitian kualitatif. Penelitian ini dilakukan pada PT. Kreasi Beton Nusa Persada. Metode Nearest Neighbor dilakukan untuk menentukan distribusi rute. Metode Local Search dilakukan untuk mengevaluasi serta memperbaiki distribusi rute yang dilakukan di awal dengan metode Nearest Neighbors. Proses analisis data terdiri dari beberapa tahapan dengan metode metode Nearest Neighbor dan metode LocalSearch. Hasil penelitian yaitu Model Vehicle Routing Problem (VRP) diterapkan dalam penentuan rute pengiriman ready mix di PT. Kreasi Beton Nusapersada dengan menggunakan metode tetangga terdekat dan lokal. Model Vehicle Routing Problem (VRP) dengan menggunakan metode tetangga terdekat dan lokal dapat digunakan diterapkan dalam penentuan rute pengiriman ready mix ke perusahaan terbatas. Kreasi Beton Nusapersada. Hal ini membuat jarak dan waktu lebih efektif, serta biaya lebih efisien. Rute baru dihasilkan Ini adalah solusi perbaikan rute yang mungkin mulai diterapkan oleh PT. Penerapan model Nusapersada Concrete Creations ini menghasilkan rute baru yang memperkecil jarak lebih dekat, penyelesaian waktu lebih cepat, dan penghematan biaya bahan bakar kendaraan truk dibandingkan dengan rute awal. Hal ini membuat jarak dan waktu lebih efektif, serta biaya lebih efisien.

ABSTRACT

VRP distributions have had difficulty overcoming the problem of finding channels with minimal depots to locations that have different places with different total demand. The purpose of this study is to analyze the problem of transportation routes in the distribution of products obtained from the initial location of distribution to users. This type of research is qualitative research. This research was conducted at PT. Nusa Persada Concrete Creations. The Nearest Neighbor method is used to determine the distribution of routes. The Local Search method is carried out to evaluate and improve the distribution of routes carried out at the beginning with the Nearest Neighbors method. The data analysis process consists of several stages with the Nearest Neighbor method and the LocalSearch method. The results of the study, namely the Model Vehicle Routing Problem (VRP) applied in determining ready mix delivery routes at PT. Nusapersada Concrete Creation using nearest and local neighbor methods. Vehicle Routing Problem (VRP) models using nearest and local neighbor methods can be used applied in determining ready mix delivery routes to limited companies. Nusapersada Concrete Creations. This makes distance and time more effective, as well as more cost efficient. New routes generated This is a route improvement solution that PT. The application of the Nusapersada Concrete Creations model results in a new route that reduces the distance closer, faster completion time, and fuel cost savings for truck vehicles compared to the initial route. This makes distance and time more effective, as well as more cost efficient.

1. INTRODUCTION

PT. Concrete creations Nusapersada is a company manufacturing that produces product concrete good in form Ready use nor precast. PT This do delivery ready mix in accordance request customer made characteristic no fixed. Routes and loads cost material burn vehicle in the delivery process not optimal so need exists solution for repair distance, time, and burden cost material burn vehicle. Distribution of products to customers requires proper planning and needs to consider the routes used (Liu & Zhang, 2023; Wu et al., 2023). Previous findings also reveal that distribution requires proper planning to obtain transportation costs efficiently and that the company succeeds in setting the right price and time for delivering goods to compete with similar companies (Arvianto et al., 2014; Vacic & Sobh, 2014). However,

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the problem often encountered today is that the route problem becomes a distribution problem in finding Suite channels with a minimum rate with a determined capacity from the starting point to widely used areas. Something channel in Vehicle Routing Problem (VRP) is suite where you can brought in something transportation transport in finish various delivery something goods (J. Lin et al., 2016; Oktavia et al., 2019). Determination location and allocation impact facilities no only on profitability something company but also on ability fast in serve customer (Battarra et al., 2022; Salmani & Partovi, 2021). Generally problem determination route location is minimize cost whole with build series route delivery that fulfills a number of limitation (Panjaitan et al., 2019; Saputra & Pujotomo, 2019). Classification Vehicles Routing Problem depend to objective delimiter used. The purpose of the Vehicle Routing Problem is minimize costs, time and distance, whereas use barrier that is distance and time. How to overcome VRP problem is with know a number of route on each service to a starting vehicle and ended in accordance depot until fulfil desire user (Kumari et al., 2023; Yu et al., 2023). Entire problem performance can finished as well as financing transportation on generally minimized with good (Panjaitan et al., 2019; Widyastiti & Kamila, 2020). VRP classifications include periodic vehicle routing problem, vehicle routing problem with time window vehicle routing problem split delivery, vehicle routing problem with multiple trips, vehicle routing problem pick-up and delivery, vehicle routing problem multiple depots, vehicle routing problem multiple products, stochastic vehicle routing problem, and dynamic vehicle routing problem. Other reseach found that Periodic Vehicles Routing The problem is distribution products to consumers capable executed hum various time and distribution boundaries without pass time working (Al Theeb et al., 2023; Jia & Chen, 2023; Shi et al., 2023). Then Vehicle Routing Problem with Time Window, that is consumer have time limits work start from shop opened in each gift service until time work shop consumer. Vehicles Routing Problem Split Delivery, that service given to consumer exceed one similarities and differences vehicle, occurs matter this because if consumer request capacity transport vehicle exceed limitation. Then Vehicles Routing Problem with Multiple Trips that is use vehicle for distribution can used in serve a number of route during still no past working hours (Arvianto et al., 2014; Vacic & Sobh, 2014).

Vehicles Routing Pick-up problem and Delivery ie exists distribution product shipped especially first and continue with goods taken consumer. Vehicle Routing Multiple Problems Depots that is on case this done if object own more from one depot on point early. Vehicles Routing Simultaneous Problems Pick-up and Delivery activity distribution goods being carried with together with stages taking goods on site consumer. Vehicles Routing Multiple Problems Products, that is characteristics this Vehicle Routing Problem done if customer order more from one type product (Song et al., 2023; Wang et al., 2023). Then, Stochastic Vehicle Routing Problems that is the type of VRP that has parameter properties of the form free or not of course especially based on total demand consumer or hours of delivery service (Dastpak et al., 2023; Marinaki et al., 2023; Zhang et al., 2023). As well as Dynamics Vehicles Routing Problem is that aim in give anticipation if exists user new on the specified path, where user the must entered in the added route when send initial made. Distribution VRP own difficulty overcome problem in find channel with minimum depot to location that has difference place with a different total demand. Use nearest neighbor (NN) in problem traveling sales problem, and effectiveness as well as route which determined through something city to city other is one possible solution used. Use nearet neighbors with method heurisic applied as base determination specified route for overcome problem, method heuristic can maximizing time and load (Martono & Warnars, 2020; Putra, 2019). Use algorithm in obtain more routes short called as local search algorithm. Local Search is which method Enough Good in effort counting solution quality for solution problem Vehicle Routing Problem in enough time short. In the Local Search exists term (1- 0) Intra-Route Insertion, the stages move user to other consumers accordingly order inside similar and purposeful routes in minimize time and distance distribution (Panjaitan et al., 2019; Widyastiti & Kamila, 2020). Process exchange the keep going done until obtained best colution with do comparison results measurement. In other words, the exchange process will stop if obtained distance and time more fast compared to distance and time before done exchange First Best Solution. Function local search in give repair results via initial solution with give performance which appropriate as designer various different types of operators over 2- opt intra-route ie stages local search in do transfer One route arc to another arc against equality something route (F. Arnold et al., 2019; Florian Arnold & Sörensen, 2019). This paper presents a general Electric Vehicle Routing Problem (EVRP) that finds the optimal routing strategy with minimal travel time cost and energy cost as well as number of EVs dispatched (Fan et al., 2023; J. Lin et al., 2016). Based on results data processing with use algorithm Clarke and Wright savings were obtained three route where every route only use one tool transport. With the total distance traveled as far as 180.7 km. The route is the result of the model for solving the vehicle routing problem that is formed there are 3 routes with total distance transport on third route the of 115.63 km. Based on the total distance and utility volume of requests transported obtained that route results of the model for solving the vehicle routing problem. Application of the VRP model with use method nearest neighbor and local search this aim for

minimize distance, time, and burden cost material burn vehicle on PT. Kreasi Beton Nusa Persada. Based on this, the aim of this research is to analyze transportation route problems in distributing products obtained from the initial location for distribution to users.

2. METHOD

This type of research is quantitative research. This quantitative research starts from the process of collecting data to interpreting it using numbers.Use quantitative data types covers data results measurement distance travel delivery, time in process distribution goods to customer, speed vehicles, capacity data cargo. Study This carried out at PT. Kreasi Beton Nusa Persada , located on Island karimun kav.392 KIM II Mabar street, Distric Deli Serdang, North Sumatra. Nearest Neighbor Method done For determine route distribution , whereas method Local Search is performed For evaluate as well as repair route distribution done at the beginning by method Nearest Neighbors (Juliandri et al., 2018; Oktavia et al., 2019). The process of data analysis consists from a number of stages with method method Nearest Neighbor and methods LocalSearch. Deep data analysis process determine route distribution with method Nearest Neighbor consists from a number of must step implemented, among others served in the following Table 1.

Table 1. Deep Data Analysis Determine Route Distribution with Nearest Neighbor Method

Step	Description
Step 1	Perform data input requests for each customer (Di), Distance between depot with customer, And distance customer by customer, planning horizon (H), time loading (LT) and time unloading (UT). Proceed to step two.
Step 2	Do initialization beginning, route (r = 1), and tour (t = 1). Next to step three.
Step 3	Specify a location beginning of depot. Next to rare four.
Step 4	Define which customer has the shortest distance from the last location. Proceed to step five
Step 5	Calculating travel time for shipments between locations (WT). Travel time is the distance between the store and warehouse (Km) divided by the average speed (Km/Hour), then multiplied by 60. Continue to step six.
Step 6	Calculate Time Unloading (UT), or product drop time for each store or customer. Proceed to step seven.
Step 7	Calculating administration time (Wadm). Proceed to step eight
Step 8	Calculate completion time (CT), by doing calculation following : CTi = CTi-1 + WT + UT + LT + WADM . 1. When time solution (CTi) ≤ O'clock Work Which there is , so carry on to step ten . 2. When time completion (CTi) ≤ Working Hours so return to the distribution depot product done .
Step 9	1. When all over customer Which owned Already served , so distribution done . 2. When Still there is customers who Not yet finished served and capacity vehicle > 0, continued to step ten 3. If capacity vehicle < 0, continue to step eleven .
Step 10	The final customer point becomes the starting point for distribution, as well as look for distance Which most near.
Step 11	Return to depot beginning with count traveling time moment journey distribution. Next to step four.
Step 12	If the completion time (CTi) ≤ Working hours then proceed to step four . If the completion time (CTi) ≥ working hours, then return to the initial depot, the distribution is complete
Step 13	Do process until all served customers. Entire data input using tables

The process of data analysis with method Local Search is performed For evaluate And repair route distribution the beginning has determined by method Nearest Neighbor, there are a number of necessary steps carried out, among other things served in Table 2.

Table 2. Data Analysis with Method Local Search

Step	Description
Step 1	Tour and route data input is performed resulting from the Nearest Neighbor method, Distance Matrix, Loading Time, and Unloading Time, requests for each customer (Di), Vehicle

Step	Description
	Capacity (Q), proceed to step two.
Step 2	Starting from tour 1, it means i = 1 . proceed to step three.
Step 3	Carry out the Insertion Intra-route process (1-0), by sequentially exchanging services at each user point on a similar route for each vehicle fleet, continuing to step four when all routes have been completed .
Step 4	If route new own total distance Which more smaller than the previous one, then route selection is carried out to replace the previous route, this is done until the exchange is complete and continues with the second step. If all channel finished And done the exchange next in the fifth step .
Step 5	Procedure complete. After the analysis process with these two methods, the most effective distribution route determination solution with the shortest distance, and the shortest completion time is chosen.

Flow chart Application of the VRP model with use method nearest neighbour and local search from studies case delivery ready mix PT. Kreasi Beton Nusa Persada can seen in Figure 1.

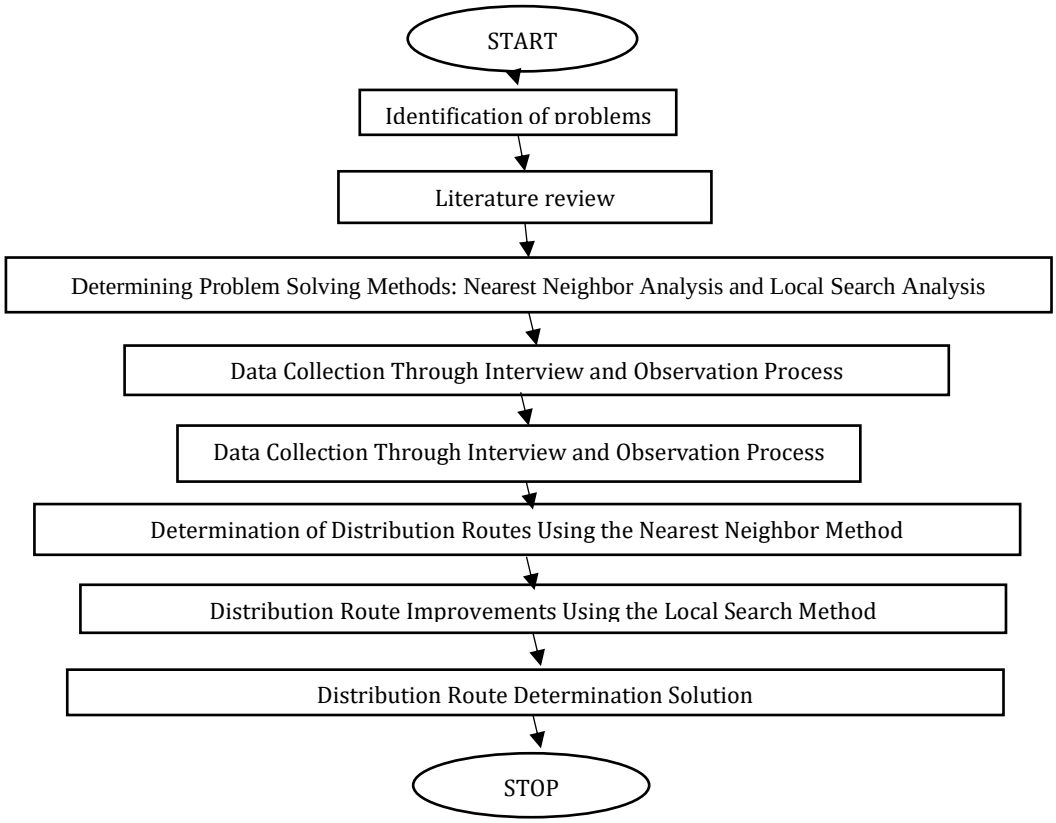

Figure. 1 VRP Model Implementation Flowchart

3. RESULT AND DISCUSSION

Result

PT. Creation Concrete Nusapersada own 20 customer Which spread in some area in Medan. The operational process carried out by PT. Kreasi Beton Nusa Persada use truck ready mix . Number of vehicles owned is 16 trucks that loaded 7 until 8 cubic And 2 that truck loaded 12 cubes used for process distribution ready mix to consumer. Based on results observation the average speed used by each truck is 90 km/h. Capacity maximum from truck number 1 until the 16th truck contains 7 to 8 cubic meters ready mix meanwhile capacity maximum the 17th and 18th trucks loaded 12 cubic meters ready mix. Material type fuel used by the fleet is solar type. If vehicle has go through distance 2.5 km so counted that vehicle need as much as 1 liter, and apply multiple in accordance the distance has been determined . Results recapitulation analysis performed on the route early PT. Kreasi Beton Nusa Persada presented in Table 3.

Table 3. Recapitulation Analysis Calculation Route Beginning

Vehicle Code	Route Delivery	Mileage (km)	Completion Time (Minute)
TM 107	0-A1-0-A1-0- A2- 0	120	138.67
	0-A9- 0	34	1139.88
	0-A13-0-A5- 0	18.9	1433.29
	0-A3- 0	64	1712.49
TM 50	0-A3-0-A1- 0	100	234.67
	0-A10- 0	18.4	1159.48
TM 102	0-A2-0-A4-0- A5- 0	55.9	332.57
	0-A12-0-A11- 0	26	1203.21
	0-A6- 0	10.4	1460.76
	0-A15-0-A17- 0	80	1803.96
TM 114	0-A6-0-A1-0- A1- 0	82.4	452.03
	0-A11- 0	14.8	1235.08
	0-A6- 0	10.4	1488.22
	0-A3- 0	64	1864.22
TM 122	0-A7- 0	38	492.03
	0-A12- 0	34	1275.34
	0-A14- 0	52	1537.56
	0-A18-0A3- 0	90	1953.56
TM 104	0-A4-0-A2- 0	54.8	571.10
	0-A9- 0	34	1315.61
TM 112	0-A4-0-A5-0- A1- 0	43.9	645,74
	0-A12- 0	11.2	1337.74
	0-A15- 0	44	1584.49
TM 119	0-A1-0-A3- 0	100	749.08
	0-A5- 0	1.1	1349.04
	0-A6-0-A1- 0	50.8	822.54
TM 110	0-A9- 0	34	1389.30
	0-A3- 0	64	2013.82
TM 103	0-A4-0-A1- 0	42.8	895.08
TM 117	0-A2- 0	48	947.61
	0-A3- 0	36	2058.36
TM 086	0-A8- 0	34	984.94
	0-A16- 0	56	1636.49
TM 106	0-A5-0-A1- 0	46.4	1042.28
	0-A3- 0	64	2118.62
TM 049	0-A1-0-A6- 0	50.8	1099.61
	0-A6- 0	10.4	1652.22
	0-A3- 0	64	2178.89
TM 113	0-A5-0-A3- 0	65.1	2257.49
TM 124	0-A3- 0	64	2317.76
AMOUNT TOTAL		**1932.5**	**51884.84**

Based on results analysis route beginning Which always in use PT. Creation Concrete Nusapersada is known that amount total distance travel the entire fleet in 1 month period amounting to 1932.5 km with Completion Time or time completion 51884.84 minutes . Determination route done in every month / tour with using 16 vehicles truck loaded with 7 cubic meters just. After done analysis route early, then furthermore done Determination route distribution with method nearest neighbour For determine location goals that have distance closest to those presented in Table 4.

Table 4. Recapitulation Analysis Calculation Route Nearest Neighbor

Code Vehicle	Delivery Route	Mileage _ (km)	Completion Time (Minute)
TM 107	0-A1- 0	36	46
	0-A1- 0	36	534.68
	0-A5- 0	1.1	1000.29
	0-A6- 0	10.4	1251.62

Code Vehicle	Delivery Route	Mileage _ (km)	Completion Time (Minute)
	0-A5- 0	1.1	1392.37
	0-A3- 0	64	1455.57
TM 50	0-A3- 0	64	103.33
	0-A1- 0	36	880.96
	0-A9- 0	34	1072.04
TM 102	0-A2- 0	48	155.87
	0-A4- 0	6.8	758.28
	0-A5- 0	1.1	944.33
	0-A11- 0	14.8	1165.64
	0-A6- 0	10.4	1279.09
	0-A3- 0	64	1828.91
	0-A6- 0	10.4	177.47
TM 114	0-A1- 0	36	580.68
	0-A3- 0	64	1518.77
TM 066	0-A19-A7- 0	40.4	233.90
	0-A2-A3- 0	61.1	731.75
	0-A9- 0	34	988.99
	0-A11- A10- 0	24.5	1146.97
	0-A6-A15- 0	47.2	1327.05
	0-A18- A20- 0	54	1883.24
TM 104	0-A4- 0	6.8	260.43
	0-A1- 0	36	626.68
TM 112	0-A4- 0	6.8	286.97
TM 119	0-A1- 0	36	332.97
TM 044	0-A4-A6- 0	12.4	360.15
	0-A5-A19- 0	15.35	790.43
	0-A12- 0	11.2	1031.77
	0-A13- A16- 0	58.9	1224.15
	0-A5- 0	1.1	1901.57
TM 117	0-A2- 0	48	412.68
	0-A17- 0	36	1990.64
TM 086	0-A8- 0	34	450.02
TM 049	0-A1- 0	36	488.68
	0-A3- 0	64	1768.64
TM 110	0-A1- 0	36	672.68
	0-A9- 0	34	1112.30
	0-A3- 0	64	1705.44
TM 106	0-A1- 0	36	836.43
	0-A3- 0	64	1579.04
TM 103	0-A1- 0	36	925.50
TM 122	0-A14- 0	52	1376.39
	0-A3- 0	64	1642.24
TM 113	0-A17- 0	36	1946.11
Amount Total		**1623.85**	**46179.73**

Based on table recapitulation results analysis determination route with method nearest neighbour obtained route latest with amount total distance which taken by all over truck in period 1 month is 1623.85 km and time solution (Completion Time) for 46179.73 minutes. Next, determine route latest done with do exchange location objective with method local search. This method applied with use route that has generated method nearest neighbor. Exchange process done in one route that has more from one location service, before finally return to depot early. Calculation results comparison before and after done exchange presented in Table 5.

Table 5. Recapitulation Comparison Route Exchange *LocalSearch*

Vehicle Code	Exchange Route	Before		S after	
		Distance Go (Km)	Completion Time (minute)	Mileage _ (Km)	Completion Time (minute)
TM 006	0- A19- A7- 0	40.4	80.77		
	0-A7- A9- 0			40.4	80.77
	0-A2- A3- 0	61.1	190.75		
	0- A11- A10- 0	24.5	245.83		
	0- A10- A11- 0			24.5	245.83
	0- A6- A15- 0	47.2	333.13		
	0- A15- A6- 0			47.2	333.13
	0- A18- A20- 0	54	438.13		
	0- A20- A18- 0			54	438.13
TM 044	0-A4- A6- 0	12.4	475.65		
	0-A6- A4- 0			12.4	475.65
	0- A5- A19- 0	15.35	512.37		
	0- A19- A5- 0			15.35	512.37
	0- A13- A16- 0	58.9	619.97		
	0- A16- A13- 0			58.9	619.97

Location of the dead done exchange will form route new with different order, then done calculation distance and time settlement. Calculation the show that route after done exchange produce mark which the same with route before done exchange, so method local search returns determination same route with what is generated through method nearest neighbor. The vehicle used by PT. Kreasi Beton Nusa Persada in the distribution process ready mix is use truck, where type material fuel used is diesel type . Every truck use up material burn 1 liter diesel fuel for go through distance of 2.5 km, with price Rp. 5.150,- per liter. Calculation cost material burn vehicle done on the route initial used , and on the route generated by the method nearest neighbor and local search. total cost material burn vehicle the truck used by PT. Nusapersada Concrete Works with use route beginning based on results calculation of the distribution process ready mix for 1 month covered a total distance of 1932.5 km with cost material burn is Rp. 3.980.950,- . which route generated from process analysis determination route with method nearest neighbor and local search returns distance travel in period of 1 month namely 1623.85 km with a total cost of Rp. 3.345.131,- .

Discussion

Problem Routing Vehicle (VRP) is element important from Lots system logistics involved routing and scheduling vehicle. Previous research findings also state that the Vehicle Routing Problem is very important (Kumari et al., 2023; Zhang et al., 2023). Problem this is problem optimization difficult combinatorial with objective for find series optimal routes used by the vehicle fleet for serve request bunch customer. For complete the model then done with develop combination heuristics and methods exact for complete the model (Beheshtiniya & Aarabi, 2017; Juliandri et al., 2018). Process analysis determination route new done reluctantly implement method nearest neighbor and local search with objective for repair determination route distribution so that effective and efficient. Measurement distance done for know distance between the depot and every consumer (Kristina et al., 2020; Saputra & Pujotomo, 2019; Saraswati et al., 2017). In the process analysis with method nearest neighbor, calculation period request delivery is highly considered. Analysis determination route with method nearest neighbor produce 1 tour in One request, and total 17 tour for period of 1 month distribution process and every request done per 4 hours for delivery ready mix. Vehicle truck number 1 until truck to 17 own different routes in accordance request consumers who where route truck the can seen on Table 2. Routes that have formed from the analysis process nearest neighbor then analysis process is carried out advanced with method local search, with objective for do correction and evaluation through the exchange process location existing goals in the route same distribution before finally return to the initial depot. Exchange process this done for obtain solution best related determination route distribution. There is a number of route own a number of location objective distribution, next exchange process is carried out so that form order route new or different (Pillac et al., 2013; Saraswati et al., 2017).

Furthermore route new ones have formed calculation process is carried out distance travel along with with time settlement distribution. Analysis results show that total distance settlement from route local search is the same with mark Which showed by route results analysis nearest neighbor, the total distance traveled by all vehicle truck in 1 month period is 1623.85 km with time completion (Completion Time) for 46179.73 minutes. total cost material burn vehicle truck Which used in 1 month is Rp. 3.345.131,-. Analysis results with method local search returns the same value with method nearest neighbor, means that route that has been determined by the method nearest neighbour is route optimal distribution (best solution). Based on results analysis comparison Which done to route early used by PT. Kreasi Beton Nusa Persada, with route new product is produced through analysis method nearest neighbor and local search create a distribution process ready mix looks go through effective distance and time, as well costs more efficient compared to with route initial used. The new route is generated This is solution repair route possible start implemented by PT. Kreasi Beton Nusa Persada. Application route new the minimize distance as big as 308.6 km more close, time solution of 5.705.11 minutes more fast, and savings cost material burn vehicle truck amounting to Rp. 635.819, compared with route initial done in period of 1 month distribution ready mix . This paper presents a general Electric Vehicle Routing Problem (EVRP) that finds the optimal routing strategy with minimal travel time cost and energy cost as well as number of EVs dispatched. Based on the results of data processing using the Clarke and Wright savings algorithm, three routes were obtained where each route only used one means of transport (Putri, 2017; Sugiono, 2022). With a total distance covered of 180.7 km and the routes resulting from the model for solving the vehicle routing problem formed were 3 routes with a total transportation distance on the three routes of 115.63 km. Based on the total distance and utility volume of requests transported, it was found that the route was the result of the model for solving the vehicle routing problem (C. Lin et al., 2014; Xiao et al., 2012). In addition, based on the calculations made, two routes were obtained according to the cluster which took a total time of 5 hours 55 minutes according to the time window policy applied by Solopos daily (Ferdiansyah et al., 2021; Soenandi et al., 2014). This indicates that the sequential insertion method is more effective in determining distribution routes in Victoria RO (Saputra & Pujotomo, 2019; Widyastiti & Kamila, 2019). This indicates a significant reduction in the distance traveled in waste transportation in Bogor City when compared to the currently implemented transport routes by the Bogor City Environmental Service (Florian Arnold & Sörensen, 2019; Lu et al., 2020). Other research also states that the use of sequential insertion algorithms in solving the Vehicle Routing Problem in this study takes into account vehicle capacity constraints and also time windows and the rules used in the sequential insertion algorithm can be declared feasible to be applied to real conditions and as a proposal for improving the company's distribution routes (Dhoruri & Sari, 2016; Shahab & Irawan, 2016). The multi-depot VRPTW model for determining the route for transporting medical waste provides an alternative solution to the problem for cases of reverse transportation (Sitek et al., 2021; Utama et al., 2020). The results of this study are in the form of a new distribution of four tours using two vehicles, where one vehicle can serve 2 tours alternately called VRP multiple trip. The savings made in this new distribution pattern are Rp. 465.182 for one-time fulfillment of demand. The use of a savings matrix in determining optimal routes can provide company cost savings (Fatma et al., 2022; J. Lin et al., 2016). Vehicles Routing Pick-up and Delivery y ie existing distribution product sent specifically initially and proceed with items taken consumer. Then, in case of emergency, Vehicle Routing Multiple Problems Depots This is done if the object owns more than one depot on the early point. Vehicles Routing Concurrent Issues Pick-up and delivery, i.e. activity distribution of products carried out in conjunction with phases of transporting items to the customer on-site. Vehicles Routing several Problems Products, which are features of this Vehicle Routing Problem done when a consumer orders several products of the same type. Then there are Stochastic Vehicle Routing Problems, which are VRPs that have parameter qualities of the kind free or not, depending on total customer demand or delivery service hours.

4. CONCLUSION

Model *Vehicle Routing Problem* (VRP) with use method *nearest neighbor* and *local* can applied in determination route delivery *ready mix* at the Nusapersada Concrete Creations. This make more distance and time effective, as well more costs efficient. The new route is generated this is solution repair route possible start implemented by PT. Kreasi Beton Nusa Persada. Application of this model produce route new ones that minimize distance more near, time solution more fast, and savings cost material burn vehicle truck compared to with route early. This make more distance and time effective, as well more costs efficient. The new route is generated this is solution repair route possible start implemented by PT. Kreasi Beton Nusa Persada.

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Accept love to Al-Washliyah Nusantara Muslim University and North Sumatra State Islamic University so study This can accomplished with good.

6. REFERENCES

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