CHAPTER I

INTRODUCTION

1.1   Background

Heterogeneous Fixed Fleet Vehicle Routing Problem (HFFVRP) is a variant of Vehicle Routing Problem (VRP) that occasionally exists in the company for distribution activity. HFFVRP is the extension of VRP with addition terms of the heterogeneity of vehicle used with fixed fleet. Feiyue *et. al.* (2007) explain the words of heterogeneous terms respect to different in capacity, fixed cost, and variable cost of the vehicle in the distribution activity while fixed fleet represents the number of available vehicle used in a fleet is limited. The problem is related with designing a set of vehicle route to distribute the goods in order to satisfy the customer needs and also to minimize the sum of the total relevant cost (fixed cost and variable cost). The route that designed must ensuring that each customer visited exactly only one times by one vehicle with the route start and ending at a depot, the accumulated cargo cannot exceed the capacity of each vehicle and also use no more vehicles than those available.

The research of HFFVRP firstly suggested by Tailard (1999) with the name of Vehicle Routing Problem with Heterogeneous Fixed Fleet. The first published research about HFFVRP done by Tarantilis *et. al.* (2003) that used a method called List Based Threshold Accepting (LBTA). Until now, the HFFVRP research mostly focused on the method used. Only one researcher Tuntuncu (2010) that extended the

HFFVRP to becomes Heterogeneous Fixed Fleet Vehicle Routing Problem with Backhauls. The other different also mostly about the asymmetric and symmetric distance that used, urban transport or Euclidean calculation, and the involvement of fixed cost (used or not used). Different with the mostly research about VRP that use homogeneous vehicle and unlimited number of vehicle, HFFVRP has more level of difficulties. Several researchers stated some difficulties to solve the HFFVRP for exact solution. Gencer *et. al.* (2006) stated that HFFVRP becomes one of the most difficult and complicated in the VRP. Brandao (2011) mentioned that HFFVRP is categorized as nondeterministic polynomial time combinatorial problem, it means this problem requires long computational in order to find the optimal (exact) solution. The problem is also becomes harder if the problem has the ratio of customer's total demand and the total capacity of the vehicle is close to one and the demand in various number, means even to find a feasible solution can be very difficult.

The problem that faced by a company where the research conducted is current vehicle routes created has not considering to minimize the total relevant cost and distance yet. The current vehicle routes created based on the estimation of the drivers to divides the distribution area into two west and east. In the real condition, implementing of vehicle routes always related with the cost that yielded from the summation of vehicle fixed cost and variable cost (from the multiplication of distance traveled and fuel price), so that, for the company considering the cost to creates a set of vehicle route is important to save the money spent in distribution activity. With minimized the total cost, it will impact the distance traveled by vehicle getting shorter.

This research will design a set of vehicle routes that considering minimizing the total relevant cost in the newspaper distribution which has specific name HFFVRP. To design a new set of vehicle routes, this research will use Holmes and Parker algorithm.

1.2 Problem Formulation

Based on the background, the problem that can be defined in routing of vehicles of Heterogeneous Fixed Fleet for a company as follows:

a. How is the design of vehicle routes that minimizes the total relevant cost by using Holmes and Parker algorithm?

b. How long the distance of the new vehicle routes created from Holmes and Parker algorithm?

1.3 Research Scope

The research scope contains of two things which are problem limitation and assumption. There problem limitations can be described as follow:

a. The Objects of the research are in the PT. Aksara Solopos and Koperasi Solopos.

b. The regions that will be used are only East Solo and West Solo.

c. The distance is measured in real urban transport.

d. The distance is between two nodes are in asymmetric condition.

There are also several assumptions used in this research so that appropriate with the mathematical model proposed, which are:

a.   The customers demand is deterministic.

b.   The speed fluctuation and obstacles such traffic light, railway crossing, and parking area that can influence of variable cost spent (fuel used) are assumed to be ignored because difficult to measured.

1.4   Research Objective

The objectives of the research are

a.   To determine the vehicle routes for the company so that the total relevant cost is minimized.

b.   To determine the minimum distance traveled of the vehicles.

1.5   Research Benefit

The benefits of the research are:

a.   Enrich the knowledge of Vehicle Routing Problem, especially for Heterogeneous Fixed Fleet Vehicle Routing Problem and its problem solver method.

b.   For the company can improve the current set of vehicle route into the better one.

1.6   Thesis Structure

To becomes an organized writing of research, here below the arrangement of writing systematic:

CHAPTER II   LITERATURE REVIEW

Literature review is the backbone to determine the current study from the previous related ones. It contains information about the result of related previous studies and supporting literatures underlying the research.

CHAPTER III   RESEARCH METHODOLOGY

Research methodology contains flow chart, model that used, the requirement to build the model, the method to analysis the model, and how the data is taken from the source and the tools to get the data.

CHAPTER IV   DATA COLLECTING AND PROCESSING

In this sub chapter contains of the recapitulation the data collected, model building, data processing and analysis. This sub chapter becomes the basic for result discussion in sub chapter V.

CHAPTER V   **DISCUSSION**

Results and analysis contains the results after the data are processed and analyzed.

CHAPTER VI   **CONCLUSION AND SUGGESTION**

Conclusion and suggestion are the end of the research, consists of the conclusion of the reserach and suggestion for the next reserach.

REFERENCE

APPENDIX

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