

ABSTRACT

CV. XYZ is a producer of processed soybean tofu products located in Depok City, West Java and has been established since 1978. The company has consumers spread across the city of Depok and South Jakarta. CV. XYZ delivers consumer demands every day using a transportation fleet owned directly by CV. XYZ. There are three types of transportation fleets owned by CV. XYZ, each of which has different characteristics. CV.XYZ's heterogeneous fleet is due to the multiple needs of operational vehicles and narrow road access to the location of some customers. Each customer has their own time window for receiving goods. If the vehicle arrives outside the predetermined time window, the goods cannot be received, and the product is returned to the factory. In the delivery planning, the travel route and arrival order are determined by the fleet driver based on knowledge, experience, and personal instinct. CV. XYZ experiences delays in its delivery process caused by route determination that is not carried out regularly, which causes variations in travel time and random arrival hours.

The problem of CV. XYZ can be solved using the Vehicle Routing Problem (VRP) approach. Because the fleet owned by CV. XYZ has various characteristics of capacity and travel speed, and each product delivery destination has a limited range of arrival times, the characteristics of Heterogeneous Fleet and Time Windows must be taken into account in the system modelling process using the Vehicle Routing Problem approach. A mathematical model was built to model the objectives and constraints. The mathematical model is built in linear and mixed integer variables (Mixed Integer Linear Programming). The solution of the mathematical model was carried out using Branch & Bound and Cutting Plane algorithms, through the Python programming language with the help of Gurobi solver software. The result is an optimal route design that can ensure the arrival of all products on time with the lowest transportation costs.

Based on the evaluation and analysis of the solution results, the proposed distribution design consisting of scheduling, vehicle assignments, and travel routes successfully meets the predetermined design targets. The design target is determined based on the results of the identification of gaps in the business

process of CV. XYZ. The proposed distribution design has achieved an on-time delivery rate of 100%. From the evaluation results of the proposed design, it can also be inferred that there is a reduction in transportation costs by 11.13%.

The proposed distribution design produced in this study can provide benefits to CV. XYZ by improving the performance and reliability of the CV logistics system. XYZ logistics system to deliver products to customers in a timely manner. The vehicle assignment pattern in the proposed distribution design can also reduce operational costs, increasing the profit that can be generated by CV. XYZ.

Keywords—***Late Arrivals, Delay, Vehicle Routing Problem, Time Windows, Heterogeneous Fleet.***