

ABSTRAK

Penelitian ini dilakukan untuk memperbaiki rute distribusi multi-produk air minum dalam kemasan (AMDK) pada PT Segar Murni Utama yang masih menghadapi inefisiensi akibat penentuan rute yang hanya berdasarkan kebiasaan tanpa perencanaan berbasis data. Perusahaan menggunakan armada heterogen berupa Tossa, L300, dan Panther Box dengan keterbatasan kapasitas yang sering tidak termanfaatkan secara optimal. Permasalahan ini dimodelkan menggunakan pendekatan *heterogeneous fleet vehicle routing problem* (HFVRP) dengan metode *mixed integer linear programming* (MILP). Data penelitian yang digunakan meliputi permintaan agen, kapasitas kendaraan, jarak antar lokasi yang diperoleh dari *Google Maps*, serta biaya bahan bakar kendaraan. Model matematis diselesaikan dengan bantuan *software Lingo 18.0*. Hasil rute dengan penerapan metode *mixed integer linear programming* mampu mengurangi total jarak tempuh distribusi hingga 90,36 km serta menurunkan total biaya distribusi sebesar Rp 33.685,33. Jika dilihat dari persentasenya, hasil pengurangan jarak tempuh mencapai 19% dari kondisi awal, sedangkan total biaya distribusi mencapai 16%. Hasil penelitian menunjukkan bahwa rute hasil perbaikan mampu mengurangi total jarak tempuh dibandingkan kondisi *existing*, sehingga menghasilkan efisiensi biaya operasional distribusi. Dengan demikian, penerapan metode *mixed integer linear programming* (MILP) pada permasalahan *heterogeneous fleet vehicle routing problem* (HFVRP) terbukti efektif dalam meningkatkan efisiensi distribusi dan pemanfaatan kapasitas kendaraan di PT Segar Murni Utama.

Kata Kunci: Distribusi, *heterogeneous fleet vehicle routing problem* (HFVRP), *mixed integer linear programming* (MILP), *Vehicle Routing Problem*, Meminimalkan biaya distribusi.

ABSTRACT

This research was conducted to improve the multi-product distribution route of bottled drinking water (AMDK) at PT Segar Murni Utama, which still faces inefficiencies due to route determination based solely on habits without data-driven planning. The company uses a heterogeneous fleet of Tossa, L300, and Panther Box trucks with limited capacity that is often underutilized. This problem is modeled using the heterogeneous fleet vehicle routing problem (HFVRP) approach with the mixed integer linear programming (MILP) method. The research data used include agent requests, vehicle capacity, distance between locations obtained from Google Maps, and vehicle fuel costs. The mathematical model is solved with the help of Lingo 18.0 software. The resulting route with the application of the mixed integer linear programming method is able to reduce the total distribution distance by up to 90.36 km and reduce the total distribution cost by Rp 33,685.33. When viewed from the percentage, the reduction in distance reached 19% from the initial condition, while the total distribution cost reached 16%. The results of the study indicate that the improved route can reduce the total distance traveled compared to the existing condition, resulting in efficient distribution operational costs. Thus, the application of the mixed integer linear programming (MILP) method to the heterogeneous fleet vehicle routing problem (HFVRP) has proven effective in improving distribution efficiency and vehicle capacity utilization at PT Segar Murni Utama.

Keywords: *Distribution, heterogeneous fleet vehicle routing problem (HFVRP), mixed integer linear programming (MILP), Vehicle Routing Problem, Minimizing distribution costs*