

## Perancangan rute distribusi air minum dalam kemasan dengan capacitated vehicle routing problem = Designing packaged drinking water distribution routes with capacitated vehicle routing problem

Ghea Almira Mafaza, author

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### Abstrak

Perusahaan distributor Air Minum Dalam Kemasan (AMDK) yang berlokasi di Semarang memiliki dua kendaraan untuk melakukan distribusi ke 16 lokasi distribusi di dalam Semarang dengan berbagai macam ukuran AMDK. Permasalahan yang dihadapi yaitu perusahaan melakukan distribusi tanpa memperhitungkan jarak tempuh, kuantitas permintaan yang berbeda-beda di setiap lokasi, keterbatasan jumlah dan kapasitas kendaraan, serta lokasi pelanggan yang tersebar di Semarang. Penelitian perlu dilakukan dengan menggunakan *Capacitated Vehicle Routing Problem (CVRP)* untuk mendapatkan rute distribusi yang optimal serta mendapatkan jarak dan waktu tempuh distribusi optimal bagi perusahaan. Penelitian ini menggunakan pendekatan *Mixed Integer Linear Programming (MILP)* dengan metode branch and bound. Model matematika dibuat dan diterjemahkan ke dalam bahasa pemrograman LINGO untuk dijalankan dan menghasilkan rute optimal. Hasil pada penelitian ini yaitu didapatkan dua rute optimal untuk setiap kendaraan 1 dan 2 melakukan distribusi AMDK ke 16 lokasi. Jumlah muatan juga didapatkan untuk masing-masing rute dengan tidak melebihi kapasitas kendaraan. Total jarak yang ditempuh berkurang sebesar 28% dan dapat menghemat total waktu tempuh sebesar 11%. Analisis sensitivitas dilakukan dengan mengubah parameter permintaan dan hasilnya yaitu terjadi penambahan rute menjadi 3 rute ketika kondisi kenaikan permintaan sebesar 5%, 10%, dan 15% serta terdapat pengaruh perubahan pada rute, jarak, dan waktu tempuh ketika kondisi penurunan permintaan 15% serta kondisi kenaikan permintaan 5%, 10%, dan 15%.

.....Packaged Drinking Water distributor company located in Semarang has two vehicles for distribution to 16 distribution locations in Semarang with various sizes of packaged drinking water. The problem faced is that the company distributes without taking into account the distance traveled, the quantity of demand that varies in each location, the limited number and capacity of vehicles, and customer locations spread across Semarang. Research needs to be done using the *Capacitated Vehicle Routing Problem (CVRP)* to get the optimal distribution route and the optimal distribution distance and travel time for the company. This study uses the *Mixed Integer Linear Programming (MILP)* approach with the branch and bound method. Mathematical models are created and translated into the LINGO programming language to run and generate optimal routes. The results of this study are that there are two optimal routes for each vehicle 1 and 2 to distribute packaged water to 16 locations. The load amount is also obtained for each route without exceeding the vehicle capacity. The total distance traveled is reduced by 28% and can save the total travel time by 11%. Sensitivity analysis was carried out by changing the demand parameters. The result was additional routes into three when the demand increased conditions of 5%, 10%, and 15%. There was an effect of changes in routes, distances, and travel time when conditions decreased by 15% and conditions increased in demand by 5%, 10%, and 15%.