OPTIMALISASI RUTE DAN BIAYA DISTRIBUSI MENGGUNAKAN METODE *SAVING MATRIX* DAN METODE *TRAVELING SALESMAN PROBLEM* (TSP) PADA DEPOT AIR MINUM SPLAZZ

Faizal Zulkarnain[1)], Suseno[2)]
Program Studi Teknik Industri, Fakultas Sains dan Teknologi, Universitas Teknologi Yoyakarta
Jl. Glagahsari No.63, Warungboto, Kec. Umbulharjo, Kota Yogyakarta, Daerah Istimewa Yogyakarta 55164
Email: [1)] faizaldzul11@gmail.com, [2)] suseno@uty.ac.id

ABSTRAK

Depot air minum splazz merupakan depot air minum isi ulang dan penyuplai air minum di daerah Yogyakarta yang memiliki rute pendistribusian / pengataran air minum ke konsumen pada beberapa lokasi berbeda .Pendistribusian yang dilakukan belum memperhitungkan rute yang optimal sehingga biaya yang dikeluarkan dalam pendistribusinya belum optimal .Oleh karena itu , dilakukan penelitian pada depot air minum splazz guna mengoptimalkan rute dan biaya pada pendistribusian air minum kepada konsumen dengan menggunakan metode *saving matrix* dan metode *branch and bound*. Rute awal pendistribusian / pengataran air minum yang dilakukan pada depot bersasarkan hari dari data yang ambil menunjukan total jarak 66.6 Km kepada 35 titik pengataran. Setelah dilakukan pengolahan data dengan dua metode yang berbeda didapatkan penghematan rute 16 – 18 % jarak pengantaran dengan penghematan jarak menjadi total 54.9 Km untuk metode *saving matrix* dan 55.8 Km untuk metode *branch and bound*. Alokasi kendaraan yang digunakan yaitu menggunakan jenis motor yang dimodifikasi dengan kapasitas angkut 5 galon. Kemudian dihitung besarnya penghematan biaya dalam hal ini bahan bakar setelah dilakukan penghematan jarak rute distribusi / pengataran diperoleh penghematan biaya bahan bakar sebesar 16 – 17 %.

Kata Kunci: *Saving Matrix*, *Branch and Bound*, Penghematan Rute, Penghematan Biaya

OPTIMIZING DISTRIBUTION ROUTES AND COSTS USING THE SAVING MATRIX METHOD AND THE TRAVELING SALESMAN PROBLEM (TSP) METHOD AT THE SPLAZZ DRINKING WATER DEPOT

ABSTRACT

Splazz drinking water depot is a supplier of refilled drinking water in the Yogyakarta area, with a distribution and delivery route to various locations for consumers. The distribution that was carried out was not considered the most efficient route, resulting in higher than optimal distribution costs. As a result, a study was carried out at the Splazz drinking water depot to improve the route and distribution costs of delivering drinking water to consumers using both the saving matrix method and the branch and bound method. The original data from the depot shows that the initial route for distributing drinking water covered a 66.6 km total distance and reached 35 delivery points. After analyzing the data using two distinct approaches, a reduction in delivery distance of 16 - 18% was achieved, resulting in a total distance saved of 54.9 km for the saving matrix technique and 55.8 km for the branch and bound method. The vehicles employed for this task are customized motorcycles with a capacity of 5 gallons. Subsequently, upon calculating the cost savings related to fuel after optimizing the distribution route, a 16 - 17% fuel cost reduction is reached.

Keywords*: Saving Matrix, Branch and Bound, Route Savings, Cost Savings*

DAFTAR PUSTAKA

Alderio, R., & Puspa Sari, R. (2023). Perbandingan Pendekatan Breadth First Search, Depth First Search dan Best First Search Pada Pencarian Rute Menggunakan Metode Branch and Bound. *Jurnal Serambi Engineering*, *8*(3), 6707–6714. https://doi.org/10.32672/jse.v8i3.6525

Anggraeni, M. S., Tazkiya, O. N., Mawandi, E., & Amarilies, H. S. (2023). *Optimization of Fuel Distribution Routes for Green Logistics in Multi Compartment Vehicle Routing Problem (MCVRP) using Branch and Bound Algorithm (Case Study: Boyolali Fuel Terminal)*. 1132–1144. https://doi.org/10.46254/an13.20230333

Ardiansyah, M. V., Darajatun, R. A., & Rinaldi, D. N. (2021). Optimalisasi Pendistribusian Dengan Metode Travelling Salesman Problem Untuk Menentukan Rute Terpendek Di Pt Xyz. *Tekmapro : Journal of Industrial Engineering and Management*, *16*(2), 84–95. https://doi.org/10.33005/tekmapro.v16i2.264

Azzahra, V. L., & Fauzi, M. (2023). Penentuan Rute Terpendek Pengangkutan Sampah Anorganik Menggunakan Algoritma Clarke and Wright Saving. *MOTIVECTION : Journal of Mechanical, Electrical and Industrial Engineering*, *5*(2), 195–204.

Bhuranda, L. K., Rizwanullah, M., Sharma, A. K., Gautam, K., & Chawla, Y. (2023). Stochastic optimization of multi-capacitated vehicle routing problem with pickup and delivery using saving matrix algorithm. *Journal of Information and Optimization Sciences*, *44*(3), 541–552. https://doi.org/10.47974/jios-1413

Damayanti, T. R., Kusumaningrum, A. L., Susanty, Y. D., & Islam, S. S. (2020). Route optimization using saving matrix method – a case study at public logistics company in indonesia. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, *August*.

Ernawati, Nurul, H.. (2023). Borneo International Conference Of Management , Accounting , And Economy (BICMAE) 1 Determining Optimal Palm Oil Transport Routes Using The Saving Matrix Method (Study On Palm Oil Plantations In Sekilan Village , Borneo International Conference Of Mana. *Borneo International Conference Of Management, Accounting, And Economy (BICMAE)*, 882–897.

Juliani, & Heliawati Hamrul. (2023). Optimasi Distribusi Buku menggunakan Algoritma Branch and Bound untuk Efisiensi Rute Terpendek. *Journal of Computer and Information System (J-CIS)*, *5*(2), 13–25. https://doi.org/10.31605/jcis.v5i2.2550

Kushariyadi, Sono, Adi, T. W., Eka Aristantia, S., & Aviciena Taufiqurrahman, M. (2024). Analisis Rute Distribusi BBM di Pertashop Menggunakan Metode Saving Matrik. *Jurnal Sistim Informasi Dan Teknologi*, *5*, 51–56. https://doi.org/10.60083/jsisfotek.v5i4.332

Method, M., Pt, A. T., & Niaga, E. (2023). *Journal of Industrial Engineering To Minimize Total Distribution Costs With The Saving*. *8*(2), 70–77.

Mussafi, N. S. M. (2023). Distribution Route Optimization of Zakat Al-Fitr Based on the Branch-and-Bound Algorithm. *JTAM (Jurnal Teori Dan Aplikasi Matematika)*, *7*(1), 113. https://doi.org/10.31764/jtam.v7i1.10375

Noviwiyocha, R., Rahim, A., & Hidayati, J. (2023). JSTI Jurnal Sistem Teknik Industri

Application of Saving Matrix Approach for Minimize Distribution Cost and Route Optimization: A Literature Review. *Jurnal Sistem Teknik Industri (JSTI)*, *25*(2), 206–217.

Nurhayati, N. (2021). Penerapan Metode Branch and Bound Dalam Menentukan Rute Optimal Pendistribusian Air Minum Isi Ulang. *CSRID (Computer Science Research and …*, *13*(3), 1–5. http://csrid.potensi-utama.ac.id/ojs/index.php/CSRID/article/view/587%0Ahttp://csrid.potensi-utama.ac.id/ojs/index.php/CSRID/article/viewFile/587/272

Oetomo, D. S., Ramdhani, R. F., & Abdi, A. P. (2022). Penentuan Rute Pengiriman Produk Dengan Meminimalkan Biaya Transportasi Menggunakan Metode Saving Matrik Dan Nearest Neighbour Di Pt. Aisyah Berkah Utama. *Jurnal Sains Dan Teknologi: Jurnal Keilmuan Dan Aplikasi Teknologi Industri*, *22*(1), 130. https://doi.org/10.36275/stsp.v22i1.477

Rohmad K, Y. A. N. (2022). *Optimasi Distribusi Alat Kesehatan Steril Dan Non Steril Menggunakan Metode Saving Matriks And Algoritma Clarke Studi Kasus Pt Multitama Sarana Indonesia (Msi)*. *20*(1), 105–123.

Sari, T. W., Aditya, T. M., & Fauzi, M. (2020). Penentuan Rute Optimal Distribusi Paving Block dengan Metode Branch and Bound. *Jurnal Teknik Industri: Jurnal Hasil Penelitian Dan Karya Ilmiah Dalam Bidang Teknik Industri*, *6*(2), 66. https://doi.org/10.24014/jti.v6i2.9473

Syafiin, I. A. S., Fatimah, S. N., & Fauzi, M. (2021). Travelling Salesman Problem Analysis with Complete Enumeration Method, Branch & Bound and Greedy Heuristic. *Eduvest - Journal of Universal Studies*, *1*(8), 752–756. https://doi.org/10.59188/eduvest.v1i8.144

Tyas, R. A., Dzulqarnain, S., & Aini, Q. (2020). Optimasi Jalur Distribusi Pada Kopkar Pt. Ykk Ap Indonesia Dengan Metode Saving Matrix. *Sistemasi*, *9*(2), 215. https://doi.org/10.32520/stmsi.v9i2.689

Wulandari, R. T., & Azis, A. M. (2022). The Saving Matrix Method for Improving Distribution Efficiency. *Jurnal Manajemen Indonesia*, *22*(2), 217. https://doi.org/10.25124/jmi.v22i2.4239

Zupemungkas, H. O. (2021). Optimalisasi Rute Distribusi Menggunakan Metode Traveling Salesman Problem (Tsp) Untuk Meminimasi Biaya Distribusi. *Eqien: Jurnal Ekonomi Dan Bisnis*, *8*(2), 163–178. https://doi.org/10.34308/eqien.v8i2.246