

Optimasi biaya transportasi dan emisi gas rumah kaca Distribusi Logistik BBM di Wilayah Distribusi Niaga III = Transportation cost and green house gas emissions optimization of Petroleum Products Logistic Distribution in the Commercial Distribution Region III

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Abstrak

Transportasi merupakan salah satu bagian penting dari sistem logistik, tetapi sektor transportasi juga merupakan salah satu konsumen bahan bakar terbesar dan penyumbang sebagian besar polutan di dunia. Berdasarkan studi ketiga dari IMO pertumbuhan emisi Gas Rumah Kaca (GRK) berpotensi meningkat secara signifikan di tahun 2050 yang utamanya dikarenakan pertumbuhan perdagangan maritim dunia. Lebih dari 80% kegiatan pendistribusian produk Bahan Bakar Minyak (BBM) dalam rantai bisnis PT. Pertamina (Persero) didukung melalui transportasi maritim, khususnya kawasan Indonesia bagian timur yang terdiri dari banyak kepulauan. Pengendalian emisi GRK dalam tranportasi maritim dapat dilakukan salah satunya melalui pengelolaan rute distribusi logistik.

Dalam penelitian ini dilakukan optimasi biaya transportasi dan emisi GRK pada sistem depot majemuk dengan armada transportasi kapal yang heterogen untuk diaplikasikan pada kasus distribusi logistik produk Premium, Kerosene dan Solar di Wilayah Distribusi Niaga III dimana sumber pasokan berasal dari kilang Pertamina yang berlokasi di Balikpapan dan Kasim (RU V dan VII). Komputasi penyelesaian model optimasi menggunakan piranti lunak AIMMS versi 4.74 dengan solver CPLEX versi 12.9 untuk mendapatkan rute distribusi logistik terbaik dengan meminimalkan biaya transportasi dan emisi GRK yang dihasilkan oleh infrastruktur transportasi.

Hasil optimasi skenario Z1, Z2 dan MOO untuk biaya transportasi secara berurutan diperoleh sebesar 0,05, 0,078 dan 0,062 USD/kL-km dan intensitas emisi CO₂ sebesar 9,16, 4,48 dan 4,62 gr-CO₂/kL-km. Hasil dari optimasi multi tujuan dapat memberikan rute distribusi logistik yang optimal dengan memminimumkan biaya transportasi dan emisi CO₂ secara bersamaan.

<hr><i>Transportation is an important part of the logistics system, but the transportation sector is also one of the largest fuel consumers and contributors to the majority of pollutants in the world. Based on the third study of IMO, Green House Gas (GHG) emission growth has the potential to increase significantly in 2050 mainly due to the growth of world maritime trade. More than 80% of the distribution activities of fuel products in the business chain of PT. Pertamina (Persero) is supported through maritime transportation, especially the Eastern Indonesia Region which consists of many islands. One of the ways to control GHG emissions in maritime transportation is by managing logistics distribution routes.

This research carried out an optimization of transportation costs and GHG emissions on a multi-depot system with a heterogeneous ship transportation fleet to be applied to the logistics distribution of Gasoline, Kerosene and Diesel products in the Commercial Distribution Region III where the source of supply comes from the Pertamina Refinery located in Balikpapan and Sorong (RU V and VII). The computational model solution used in this study uses AIMMS version 4.74 software with the CPLEX solver version 12.9 to get the best logistics distribution route by minimizing transportation costs and GHG emissions generated by transportation infrastructure. Z1, Z2 and MOO scenario optimization results for transportation costs are

respectively obtained by 0.05, 0.078 and 0.062 USD/kL-km and CO₂ emission intensities of 9.16, 4.48 and 4.62 gr-CO₂/kL-km.

The results of multi-purpose optimization can provide optimal logistics distribution routes by minimizing transportation costs and CO₂ emissions simultaneously.</i>