Life Cycle Assessment (LCA) Produksi Bahan Bakar Nabati (BBN) Berbasis Jarak Pagar = Life Cycle Assessment (LCA) Analysis of Production Jatropha-based Biofuels (BBN)

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Abstrak

Bahan bakar nabati menjadi salah satu alternatif menggantikan bahan bakar fosil. Salah satu bahan dasar yang digunakan dalam penyediaan bahan bakar nabati adalah pohon jarak. Pohon jarak diuntungkan karena jarak bukan sumber non-pangan. Sintesis minyak nabati dapat menghasilkan biofuel, seperti biogasoline, bioavtur, bioLPG, dan renewable diesel yang ramah lingkungan. Penelitian ini dilakukan untuk menganalisis tahapan daur hidup produksi BBN dengan metode yang digunakan adalah Life Cycle Assessment (LCA), dengan lingkup cradle-to-gate yang meliputi tahap pembukaan lahan, perkebunan, ekstraksi minyak, sintesis BBN, dan transportasi distribusi, untuk mengetahui emisi yang dihasilkan dari semua proses tersebut seperti Analisis ditinjau dari aspek emisi, yaitu CO2, CH4, N2O, CO, NOx, SOx, dan NMVOCs. Dari keseluruhan proses produksi BBN berbasis jarak, pada tahapan sintesis menghasilkan menghasilkan CO2 terbesar, yaitu senilai 2052% per 1 Ton produk BBN. Hal ini dikarenakan pada sintesis BBN dipengaruhi oleh besarnya utilitas seperti kompresor, pompa, dan heat exchanger. Berdasarkan simulasi unisim, laju alir bahan baku minyak nabati pada proses sintesis BBN berpengaruh terhadap presentase produk terhadap bahan baku minyak jarak, semakin kecil laju alir bahan baku maka yield produk BBN akan semakin tinggi. Didapatkan hasil bahwa yield produk BBN sebesar 79% pada laju alir sebesar 100kg/h, sedangkan pada laju alir 1000kg/h yield produk BBN sebesar 38%. Laju alir berpengaruh sebesar 13% produk samping CO2 terhadap produk BBN. Sehingga, perubahan laju alir bisa dikatakan berpengaruh kecil terhadap emisi CO2 yang dihasilkan.

.....Biofuels are one of the alternatives to replace fossil fuels. One of the basic materials used in the provision of biofuel is the jatropha tree. The jatropha tree benefits because it is not a non-food source. Synthesis of vegetable oils can produce biofuels, such as biogasoline, bioavtur, bioLPG, and environmentally friendly renewable diesel. This research was conducted to analyze the life cycle stages of biofuel production with the method used is the Life Cycle Assessment (LCA), with a cradle-to-gate scope which includes the stages of land clearing, plantations, oil extraction, biofuel synthesis, and distribution transportation, to determine emissions. the results of all these processes such as analysis in terms of emissions aspects, namely CO2, CH4, N2O, CO, NOx, SOx, and NMVOCs. From the whole process of distance based biofuel production, the synthesis stage produces the largest CO2, which is worth 2052% per 1 ton of biofuel product. This is because the synthesis of biofuels is influenced by the amount of utility such as compressors, pumps, and heat exchangers. Based on the unisim simulation, the flow rate of vegetable oil raw materials in the biofuel synthesis process affects the product percentage of castor oil raw materials, the smaller the flow rate of raw materials, the higher the yield of biofuel products. The results showed that the biofuel product yield was 79% at a flow rate of 100kg / h, while at a flow rate of 1000kg / h the yield of biofuel products was 38%. The flow rate affected by 13% of CO2 byproducts on biofuel products. Thus, changes in flow rate can be said to have little effect on the resulting CO2 emissions.