

Net energy and techno-economic assessment of biodiesel production from waste cooking oil using a semi-industrial plant: a Malaysia perspective

ABSTRACT

To promote the growth of the biodiesel industry, many countries have started allocating initial inducements to start-up companies to set up the infrastructure for its production facilities. Thus, comprehensive economic assessments are vital to keeping businesses on the right track in the long run. In this present study, net energy ratio (NER) and macroeconomic assessment are investigated using actual data obtained from biodiesel production from waste cooking oil (WCO) by using a semi-industrial plant. The fuel quality produced has complied with the European Biodiesel Standard (EN 14214) and the net energy ratio (NER) calculated was positive, which, in other words, epitomized a competent-designed production practice. Concerning mass balance, 74.3% of biodiesel, 24.0% of by-product glycerol and 8.9% soap were measured. By applying these as baseline values for scale-up production of 3.68 kt per annum, projected values of total production costs, selling price of B10 fuel, net present value (NPV) and internal rate of return (IRR) were USD 1.78 million, USD 0.47/kg, USD 1.43 million and 60%, respectively. In summary, these projected values are suggestively lucrative, offering strong business growth for 10 years and capable of withstanding the variations of plant capacity and raw material price.

Keyword: Net energy; Pilot plant scale; Biodiesel; Waste cooking oil; Economic assessment