

Life Cycle Analysis of Biodiesel Fuel Production

-Case study of used cooking oil as raw material in Japan-

Ampaipetin Singhabhandhu*, Tetsuo Tezuka

Department of Socio-environmental Energy Science, Graduate School of Energy Science,

Kyoto University, Yoshida-honmachi, Sakyo-ku, Kyoto 606-8501, Japan

Tel/Fax: +81-75-753-3346, E-mail: ampaipetin@g05.mbox.media.kyoto-u.ac.jp

Introduction

Due to the rapid increase of fossil fuel prices, the depleting of energy and the awareness of the GHG effects, all nations have faced certain economic difficulties and environmental challenges. As a result, the countries have put their efforts on the development of renewable energy (solar energy, biomass energy, wind energy, etc.) as an alternative future fuel. Utilization of biomass to produce biodiesel is another alternative to alleviate the energy need problem for the transportation sector and the agriculture sector. Since diesel fuels play key role not only for the transportation of products from both the industrial and the agricultural sector, but are also an energy source for the operation of the equipments used in agricultural sector, for example diesel tractors, water pumps, etc. The advantages of using biodiesel as substitute energy are: (i) less air pollution emissions; (ii) no increase of the CO₂ content in the air; (iii) efficient resource and/or waste utilization; (iv) decrease of the volume of imported fossil fuel; (v) this type of fuel is biodegradable, non-toxic, and essentially free of sulfur and aromatics; (vi) utilization of residual in agriculture (an issue that used to be ignored in the past) which would enhance the proceeds from agricultural activities as well.

Presently, there are many methods to produce the biodiesel for instance: Dilution, Micro-emulsification, Pyrolysis and Transesterification. However, it's accepted worldwide that the transesterification method is more practical for industrial production. The raw material used for biodiesel production by transesterification method can be categorized into two main types. One is the use of vegetable oils, for example: rapeseed oil, *Jatropha Curcas Linn* oil, palm oil, soybean oil, sunflower oil, coconut oil, etc. Besides being the raw material for biodiesel production, those vegetable oils can be utilized for other purposes. Most of them can be utilized to produce cooking oil or for food purposes such as rapeseed oil, palm oil, soybean oil, sunflower oil, coconut oil, except *Jatropha Curcas Linn* oil, which have some special characteristic that are unsuitable for edible vegetable oil. Another raw material used for biodiesel production is the used cooking oil, which is collected from the households or restaurants.

Objective

The purpose of this study is to evaluate the raw material with regard to the environmental friendliness for the biodiesel production by transesterification method which using used cooking oil as a raw material in Japan

Methodology & Result

Life Cycle Analysis (LCA) has been used as the methodology for assessment in this study. As a result of this study it should be possible to clarify whether or not the utilization of the recycled raw material such as used cooking oil is environment friendly for biodiesel production.