The influence of blending process on the quality of rapeseed oil-used cooking oil biodiesels

Jabbar Gardy*, Ali Hassanpour, Xiaojun Lai, Mohammad Rehan
Institute of Particle Science & Engineering (IPSE), School of Process, Environmental & Materials Engineering (SPEME), University of Leeds
Presenter details: Jabbar Gardy, The University of Leeds/SPEME-IPSE, pmjlia@leeds.ac.uk
Correspondence contact: Ali Hassanpour, The University of Leeds/SPEME-IPSE, a.hassanpour@leeds.ac.uk

Abstract:
Use of Biodiesel as an alternative source of fuel has been increasing over the last ten years, reflecting a rapid rise in demand due to global industrialisation, coupled with recognition by countries with no oilfields of the need for a strategic and alternative source of energy [1, 2]. Unlike petrodiesel, biodiesel satisfies the 1990 amendment to the Clean Air Act, on account of the almost zero emission of sulfur oxides [3]. However, some of its physicochemical properties including cold flow properties have proved a major drawback to its usage. Furthermore, the cost of biodiesel – it is roughly 1.5 times more expensive than its fossil-based counterpart and this has been the major drawback in making commercial progress and gaining universal acceptance. An approach to lower the cost of production is maximising use of cheap feedstock such as used cooking oil for biodiesel. Used cooking oil can be "pre-blended" with other feedstock prior to the process of transesterification or alternatively the biodiesel produced from different feedstocks could be "post-blended". These processes can affect the product yield as well as the properties of final biodiesel product. Despite a considerable research work over the past years in this area, the yield of biodiesel as well as final product properties have yet to be fully analysed with respect to the process of blending.
This study examines the effect of pre-blending used cooking oil with rapeseed oil and post-blending of rapeseed biodiesel with used cooking oil biodiesel on the key properties of final product such as thermal stability, could flow properties, kinematic viscosity and flash point. Furthermore, the prepared individual biodiesels from rapeseed oil and used cooking oil, as well as those from pre-blending and post-blending processes, were analysed in accordance to EN14214 standard methods to determine the characteristic fuel properties such as FAME content, kinematic viscosity, density, flash point, cold flow properties, acid number, thermal stability and heating value. It was concluded that post-blends had a more positive impact on the key properties of biodiesels than pre-blending strategies of biodiesels. This effect was mainly dependent on the proportion of blending in weight percentages.

Keywords: Used cooking oil, rapeseed oil, transesterification, pre-blending and post-blending biodiesel, and optimisation.

References:

1. Diya'uddeen, B.H., et al., *Performance evaluation of biodiesel from used domestic waste oils: A review.* Process Safety and Environmental Protection, 2012. **90**(3): p. 164-179.
2. Santacesaria, E., et al., *Main technologies in biodiesel production: State of the art and future challenges.* Catalysis Today, 2012. **195**(1): p. 2-13.
3. Veríssimo, M.I.S. and M.T.S.R. Gomes, *Assessment on the use of biodiesel in cold weather: Pour point determination using a piezoelectric quartz crystal.* Fuel, 2011. **90**(6): p. 2315-2320.