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The Optimum Biodiesel Blend in Low Sulfur Diesel and Its Physico-Chemical Properties and Economic Aspect

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Abstract : In Thailand, biodiesel has been utilized as an attractive substitute of petroleum diesel and the government imposes a mandatory biodiesel blending requirement in transport sector to improve energy security, support agricultural sector and reduce emissions. Though biodiesel blend has many advantages over diesel fuel such as improved lubricity, low sulfur content and higher flash point, there are still some technical problems such as oxidative stability, poor cold- flow properties and impurity. Such problems were related to the fatty acid composition in feedstock. Moreover, Thailand has announced the use of low sulfur diesel as a base diesel and will be continually upgrading to EURO 5 in 2023. With ultra low sulfur content, it may affect the diesel fuel properties especially lubricity as well. Therefore, in this study, the physical and chemical properties of palm oil-based biodiesel in low sulfur diesel blends from different producers will be investigated by standard methods per ASTM and EN. Also, its economic benefits based on diesel price structure in Thailand will be highlighted. The appropriate biodiesel blend ratio can affect the physico-chemical properties and reasonable price in the country. Properties of biodiesel, including specific gravity, kinematic viscosity, FAME composition, flash point, sulfur, water, oxidation stability and lubricity were measured by standard methods of ASTM and EN. The results show that the FAME composition of biodiesel has the fatty acid of C12:0 to C20:1, mostly in C16:0, C18:0, C18:1, and C18:2, which were main characteristic compositions of palm biodiesel. The physical and chemical properties of biodiesel blended diesel was found to be increases with an increasing amount of biodiesel such as specific gravity, flash point and kinematic viscosity while sulfur value was decreased. Moreover, in this study, the various properties of each biodiesel blends were plotted to determine the appropriate proportional range of biodiesel-blended diesel with an optimum fuel price.It can be seen that the amount of B100 can be filled from 1% up to 7% in which the quality was in accordance with Notification of the department of Energy business.The understanding of relation between physico-chemical properties of palm oil-based biodiesel and pricing is beneficial to guide the better development of desired feedstock in Thailand and to implement biodiesel blends with comparative price and diesel engine performance.

Keywords : fatty acid methyl ester, biodiesel, fuel price structure, palm oil in Thailand
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