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Green Diesel: A Dominant Prerequisite of Future

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During the past century, the levels of carbon dioxide (CO_2) and other greenhouse gases (GHG) has tragically increased due to the burning of fossil fuels. The limited sources of fuel energy and deleterious effect of fossil fuel on the environment have guided us to produce a surrogate fuel; like biofuels. A biofuel is a fuel which can produce energy from living organisms. Green diesel can be used as an alternative clean, energy resource, which is biodegradable, renewable and nontoxic. The biomass can be converted to suitable energy containing substances in different ways via thermal conversion, chemical conversion, and biochemical conversion. Biomass energy technologies use waste or plant matter to produce energy with a lower level of greenhouse gas emissions than fossil fuel sources[1]. The second-generation biodiesel technology predominantly uses animal and vegetable oil and fat as feedstock and produces non-fatty acid methyl ester biodiesel by catalytic hydrogenation. Green diesel, also known as renewable diesel, is a diesel substitute of renewable origin[2]. Green diesel is produced from the same feedstock as biodiesel, but by following direct hydrodeoxygenation (HDO) of the triglyceride and fatty acid molecules, and thus for its production; the complete knowledge of HDO reactions is indispensable[3]. The hydrogenation of vegetable oils can be carried out by using the oils as feedstock to a refinery distillate hydrotreater. It has been suggested as a promising petroleum based diesel alternative. Hydrodeoxygenation is a method that uses elevated temperatures and pressure in the presence of a catalyst to break down larger molecules, such as those found in vegetable oils, in shorter hydrocarbon chains used in diesel engines[4]. The product of vegetable oil hydrogenation is a liquid hydrocarbon mixture similar to diesel fuel components, and is zero aromatic and sulfur free[5]. Green diesel molecules do not contain oxygen, which makes this biofuel very stable over time. The cetain number of green diesel ranges between 80 and 99, which is much higher compared to diesel standards, rendering it a competitive diesel substitute. Its net heating value is between 42 and 44 MJ/kg, which is almost similar to that of conventional diesel[6]. Green diesel has a flash point of 68–120 °C, thus it is invulnerable for handling and storage[2]. In cold climates Green diesel has an exceptional lead over bio-diesel that it doesn't freeze until much lower temperatures (-40°C). Green diesel is biodegradable as compared to

petro-diesel because it contains largely n-alkanes. It can play a prime role in decrease the emissions of numerous air pollutants; these are particulate matter (PM), carbon monoxide (CO), hydrocarbons (HC), sulfur oxides (SO_x), nitrogen oxides (NO_x), and air toxics. It does not produce the black smoke because it contains no particulates. GHG emissions from green diesel were more than 80% lower than petroleum diesel and about 40% less than biodiesel[7]. Another advantage of the green diesel production, which differentiate it with biodiesel is that propane is produced as by product instead of glycerin[8]. It can be used in today's tanks, pipelines, trucks, pumps and automobiles without changes, which will save significant expense as demand for renewable grows. The economics of biodiesel vs. renewable diesel are largely identical to the point of production as both processes can utilize the same feedstock. Biodiesel is better than diesel fuel in terms of sulfur content, flashpoint, aromatic content, biodegradability and low emission of greenhouse-gases effect. Altogether, depletion of energy sources and environmental concern frame the inflation in significance of Green diesel.

References:

1. Sheehan, J., Camobreco, V., Duffield, J., Shapouri, H., Graboski, M. and Tyson, K., An overview of biodiesel and petroleum diesel life cycles. National Renewable Energy Lab., Golden, CO (US).
2. Bezergianni, S. and Dimitriadis, A., Comparison between different types of renewable diesel. Renewable and Sustainable Energy Reviews, 2013, 21, 110-116.
3. European Biodiesel Board. Available at: www.ebbeu. org/stats.php (Accessed July 1, 2012).
4. Knothe, G., Biodiesel and renewable diesel: A comparison. Progress in Energy and Combustion Science, 2010, 36, 364-373.
5. Šimáček, P., Kubička, D., Šebor, G. and Pospíšil, M., Fuel properties of hydroprocessed rapeseed oil. Fuel, 2010, 89, 611-615.
6. Kalnes, T.N., Koers, K.P., Marker, T. and Shonnard, D.R., A technoeconomic and environmental life cycle comparison of green diesel to biodiesel and syndiesel. Environmental Progress & Sustainable Energy, 2009, 28, 111-120.
7. Kalnes, T., Marker, T. and Shonnard, D.R., Green diesel: A second generation biofuel. International Journal of Chemical Reactor Engineering, 2007, 5.
8. Vonortas, A. and Papayannakos, N., Comparative analysis of biodiesel versus green diesel. Wiley Interdisciplinary Reviews: Energy and Environment, 2014, 3, 3-23.