Purification of Biodiesel with Magnesium Silicate Adsorbent Treatment

Brian S. Cooke

Adsorbent purification of mono-alkyl esters (biodiesel) with synthetic magnesium silicate (MAGNESOL®, Dallas Group of America, Inc.) was compared to the method of washing with water followed by drying (water wash method). Mono-alkyl esters derived from crude soybean, yellow grease and rapeseed feedstocks were utilized in the comparison. Methyl esters were produced in separate batches from crude soybean oil and yellow grease feedstocks in the pilot plant reactor at the Biomass Energy CONversion Facility (BECON) in Nevada, IA by Iowa State University. The methyl esters were separated from the glycerin and the excess methanol was flash evaporated. A portion of the yellow grease and the soybean methyl esters were then water washed and dried and another portion was treated and filtered with synthetic magnesium silicate.
Methyl esters derived from rapeseed oil were provided by University of Idaho. The esters had been separated from the glycerin and the excess ethanol was removed. A portion of the rapeseed ethyl esters was water washed and dried and another portion was treated and filtered with synthetic magnesium silicate. The water washing and adsorbent treatments were performed in the laboratory.

Soybean Methyl Esters: The resulting biodiesel from both sections was able to meet the specifications that were tested. However, the adsorbent treated biodiesel contained a lower soap and sodium content than the water washed and dried sample. The oxidative stability of the washed and dried methyl ester was only 0.2 hours compared to 3.7 hours for the treated biodiesel.

Yellow Grease Methyl Esters: The adsorbent treated sample passed all of the specifications that were tested, while the water washed sample did. Once again the magnesium silicate treated biodiesel showed a significant improvement in oxidative stability (4.3 hours) when compared to the water washed and dried sample (0.2 hours).

Rapeseed Ethyl Esters: The magnesium silicate treated biodiesel showed a significant increase in oxidative stability (2.25 hours) when compared to the water washed and dried sample (0.49 hours).