

# NATURAL OILS – THE NEXT GENERATION OF DIESEL ENGINE LUBRICANTS?

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This presentation focuses on the next generation of diesel engine lubricants. It reviews current lubricant technology, including both petroleum and renewable lubricants. Current technology suggests that diesel engines will require aftertreatment systems to meet the stringent 2007 emission regulations. To meet current regulations, API C-4 was developed to handle anticipated severe oil conditions, such as increased soot, acids, and higher temperatures resulting from the use of cooled exhaust gas recirculation.

The next generation of diesel engine lubricants faces an even more severe challenge. Changes in lubricant additive packages will be the biggest challenge faced by lubricant manufacturers in the last two decades. Poisoning or plugging of emission control system components by ash, sulfur, and other metals may require elimination or significant reduction of currently preferred additives, such as zinc dithiophosphate. Similar problems exist for passenger car motor oils. Most of the effective antiwear and EP lubricating additives contain either sulfur, phosphorus, chlorine, or combinations.

The question is whether natural renewable oils can be utilized to make the quantum leap transition to the next generation of diesel engine and passenger car engines. The weaknesses of vegetable oils are well known and include poor thermal and oxidative stability and undesirable low-temperature properties. Significant progress is being made in each of these areas. Chemical and genetic modification can be used to change the chemical structure of these oils and thereby improve their oxidative stability. Alkylation and other syntheses are used to modify the low-temperature properties and also to improve thermal and oxidative stability. However, this costly processing makes the oils more similar in price to synthetic esters and hydrocarbons.

One issue is whether there are enough vegetable oils to go around. Competition exists from the demand for food products, hydraulic fluids, and biodiesel fuels. Another issue is whether variations in composition of the oils can be controlled and acceptable specifications developed. Although a number of companies are manufacturing and supplying environmentally friendly lubricants, most of the applications are niche markets or hydraulic oils. This still leaves their unproven performance as engine oils as an issue. This presentation discusses these issues and the technical hurdles yet to be tackled. A research plan to accelerate the use of these natural oils is reviewed.