Investigation into the use of BioDiesel fuels for use in aviation applications.

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Over the last one hundred years, our world has become increasingly dependent on transportation. The power for this transportation primarily requires energy released from the burning of fossil fuels. Recently however, it has been recognised that there are a number of problems associated with sustaining activities, which rely on transportation. The most obvious is the fact that reserves of fossil fuels are finite and are rapidly declining. Unsurprisingly, researchers are now developing alternative fuels to ultimately take the place of fossil fuels. Even so, science is raising concerns over emissions of carbon dioxide acting in a feedback loop with water vapour in the atmosphere(1), suggesting that it is almost certainly responsible for the recent measured increases in average global temperatures. Therefore, they say, not only should researchers develop alternative fuels, but also it should do so in such a way as to minimise emissions of greenhouse gases like carbon dioxide.

Alkyl Esters, more commonly known as BioDiesel, offer a solution to curb these emissions. To a first approximation, BioDiesel is carbon neutral, but in reality, measurements show reductions in carbon dioxide emissions of only 80% over fossil fuels(2). Further to this, BioDiesel promises to reduce emissions of particulate matter, which some consider to be carcinogenic, by up to 70%.

The internal combustion engines laboratory within the School of Mechanical and Manufacturing Engineering at the University of New South Wales is establishing a small scale BioDiesel manufacturing and testing facility initially focussing on the use of BioDiesel as an aviation fuel. With the rise in use of diesel-powered aircraft, BioDiesel could be utilised as a replacement fuel for diesel powered fleets. In addition, gas turbine powered jets have run with a blend of BioDiesel and Jet A up to 30% (3). To implement BioDiesel as an alternative aviation fuel, our research is focusing on low temperature gelability, emissions and ignition delay times. This analysis will involve a comparison of the combustion properties of different feedstocks, including waste vegetable oil, raw crop (e.g. rapeseed or soy bean), peanut and coconut oil. As part of the gelability analysis, the use of fuel additives and fuel line heating is being investigated.

This work will be extended to testing these fuels as pilot fuels for the ignition of natural gas (dual fuelling mode) in compression ignition engines for automotive applications.

(1) Flannery, T., 2005, '*The weather makers*', The Text Publishing Company.
(2) National BioDiesel board, http://www.biodiesel.org/pdf_files/fuelfactsheets/Enviro_Benefits.PDF.
(3) CFM International, http://www.cfm56.com/index.php?level2=blog_viewpost&t=395