11TH INTERNATIONAL CONFERENCE ON STABILITIY,
HANDLING AND USE OF LIQUID FUELS
October 18-22, 2009
Prague, Czech Republic

ENHANCED THERMAL STABILITY & STORAGE OF HIGH VISCOSITY FUELS AND OILS USING PHYRE'S OIL DE-OXYGENATION SYSTEM (PODS)

Steven Walker, Wesley Jung, Stuart Robertson, and Santosh Limaye

Phyre Technologies, Inc., 1950 Cordell Court, Suite 104, El Cajon, CA 92020 USA

The lubricating oils used in aircrafts have three important functions: to act as a lubricant between moving parts, to provide heat transfer from hot machinery, and to act as a hydraulic control medium. Oxidation of lubricating oil can change its physical and chemical properties, so that it is unable to perform one or more of these functions. This oxidation tends to occur much more rapidly at elevated temperatures which limits the maximum operating temperature of modern lubricating oils to about 200°C (~400°F).

Traditional efforts at reducing thermal oxidation have been centered on making adjustments to the oil's chemical make-up and the use of additives or removal of undesirable species. Generally, synthetic base ester oils exhibit quite good thermal stability characteristics, and these are used extensively in military applications. Undesirable sulfur, nitrogen, oxygen and aromatic components can be removed from the base oil by solvent refining or hydrocracking. Removal of these compounds increases the ability of the oil to resist oxidation. However, some of these solutions such as oxygen tend to remix with the oil during the storage and use.

Phyre Technologies Inc. has developed a proprietary jet fuel deoxygenation system based upon the use of gas-liquid contractor. The complete system is known as PADS, for Phyre Advanced Deoxygenation System. While there are some significant differences between oil and jet fuels that will affect the process of deoxygenation (such as much higher liquid viscosity and different vaporization characteristics), the underlying mechanisms of fuel and lubrication oil deoxygenation are similar enough that a modified version of the PADS system will also very effectively deoxygenate oil. The modified PADS systems is called PODS, for Phyre Oil Deoxygenation System, to differentiate it from our jet fuel system.

This effort, funded by US-DOD/AFRL's SBIR (Small Business Innovation Research Program), has clearly demonstrated the feasibility of deoxygenating the high viscosity fluids. The results of these studies will be presented and the potential benefits and payoffs will be discussed in this presentation.