

Thermal Properties of Oils Measured With A Field Portable Meter

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Statement of Work

Decagon Devices, Inc. is currently working in conjunction with the U.S. Government and the National Center for Manufacturing Sciences (NCMS) in an effort to find a solution for measuring the thermal properties of engine oil.

The primary function of engine oil is the transfer and storage of the thermal energy. Changes in thermal energy transfer and storage characteristics with use are significant in themselves, in terms of oil performance. However, they can also be correlated with other important properties, such as viscosity, fuel content, water content, impurities, etc. Measurement of thermal properties (conductivity and specific heat) may, therefore, provide a fast and accurate assessment of oil condition (need for change) in a vehicle. Such measurements are available in a laboratory setting, however, obtaining sufficient sample, transport of samples to the laboratory, analysis and cost of maintaining the laboratory itself, as well as returning the results to the relevant authority is expensive and inefficient.

Decagon Devices, Inc's solution proposal entails using a dual-probe line heat source method that will provide quick and accurate measurements

of thermal properties of fluids, even under field conditions. The basis for the instrument is Decagon's existing KD2-Pro thermal properties analyzer. New probes will be constructed to either measure thermal properties of a few drops of oil from a dipstick, or to be inserted into the dipstick hole to make the measurements. A field measurement provides an on-the-spot assessment of fundamental physical properties of the oil, which can be used to assess oil quality. These measurements can be integrated with measurements from other hand-held instrumentation to provide a more complete picture of oil quality in the field.

Decagon Devices, Inc will be delivering thermal properties measurements for a wide range of oil samples, both new and used, and contaminated with added water, antifreeze, and/or fuel. Thermal properties of the test samples will be measured over a range of temperature from -20 °C to 100 °C. These tests will determine the range of thermal properties and the KD2-Pro's effectiveness in detecting contamination or degradation. New probes for the KD2-Pro will be developed which are suitable for oil thermal properties assessment under field conditions. Three production-ready prototypes of the KD2-Pro and probe will be delivered along with the analysis of the data.