Operation and Uncertainty Analysis of a

 Multi-Viscosity Oil Calibration Facility

**T. Kegel, T. Cousins, J. Reiner**

*Colorado Engineering Experiment Station, Inc. (CEESI)*

*54043 WCR 37, Nunn, Colorado, USA*

*E-mail: tkegel@ceesi.com*

In September 2015 CEESI began operation of a new accredited multi-viscosity oil calibration facility. Traceability is achieved based on two provers: a bi-directional pipe prover and a small volume prover. Daily calibrations can be made in comparison with a set of master meters or directly against one of the provers.

The basic capabilities are:

* Line size: 1-12 inch
* Flowrate range: 2.0 - 3000 m3/hr.
* Viscosity range: 2 – 200 cSt
* Uncertainty range: 0.025% - 0.050% (95% level of confidence)

The paper briefly describes the flow facility measurement methods and equipment and instrumentation. It then shows the development of the uncertainties associated with each method and the requirements for all the instrumentation to achieve the accredited total uncertainty. Once the uncertainty is determined it is necessary to check all of the components that make up the uncertainty in practical terms. The paper then goes on to describe the methods used to obtain the base uncertainty of the provers, and more particularly the master meters. The master meters require a good calibration from the provers, but also good understanding of the viscosity for Reynolds number correction. Ensuring the quality of the temperature control, pressure and temperature measurement is also essential to the uncertainty.

Finally the paper discusses the extra practical methods used to ensure the operation of the facility to retain the accredited uncertainty for measurement of mass (momentum) based meters such as differential pressure devices.