Calibration Models and Uncertainty Analysis of the
Euroloop Liquid Hydrocarbon Flow Facility

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Since the end of 2015 the EuroLoop Liquid Hydrocarbon Flow Facility is operated under accreditation [1]. With an increasing amount of operational experiences [2] it is time to re-evaluate the initial uncertainty analysis. The objective of the analysis is to find the lowest uncertainty that is reasonably achievable for the test facility. 

The primary references of the calibration facility are a 24” and a 48” piston prover, which were calibrated dimensionally. Subsequently, the provers are used to calibrate the master meters in the system. In addition the provers can be used to calibrate a meter under test (MuT). The master meters are also used to calibrate the MuT, which can be a volume flow meter, a mass flow meter or a differential pressure device. The adjacent figure gives a schematic overview of the traceability.

The prover is divided in sections with calibrated diameters and with known distances between the detector switches. As the prover is bi-directional, calibrations were performed moving the piston from north to south and from south to north. In stead of a single start and stop trigger per section, each section has three switches j=1..3 located at the 2 o’clock, 4 o’clock and 8 o’clock positions (when looking north) at begin and end. A calibration of a meter under test (MuT) using the piston prover gives in three calibration results obtained from the 2 o’clock, 4 o’clock and 8 o’clock positions. The overall result is the average of the three results. This data processing method allows to lower the uncertainty of the final calibration result.

The paper will describe the calibration models of the afore mentioned calibration processes and the associated uncertainties. The uncertainties will be compared with the current CMC’s of the accreditation.

References

1. RvA (2015): Scope of accreditation for EuroLoop, <https://www.rva.nl/system/scopes/file_ens/000/000/593/original/K161-sce.pdf?1449474279>
2. Jos van der Grinten, Bart van der Stap and Dick van Driel (2015): Operational experiences with the EuroLoop Hydrocarbon Liquid flow facility, 33rd International North Sea Flow Measurement Workshop, Tønsberg, Norway, 20 - 23 October 2015.