Establishment of Hydrocarbon Flow Traceability for a Large Ball Prover by Using Flowmeters installed in Parallel

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A large ball prover for hydrocarbon flow measurement has been calibrated over the actual operating flow rate range by using a standard flowmeter and a positive displacement flowmeter installed in parallel. The operating flow range of the ball prover is from 100 m3/h to 1800 m3/h, and its volume is 10 m3. The standard flowmeter, of which maximum flow rate is 300 m3/h, was calibrated at NMIJ in order to be traceable to national standard. The calibrated flow rates for the ball prover were expanded from 300 m3/h to 1800 m3/h by the standard flowmeter and the PD meter installed in parallel. As a results, the calibration factors for the ball prover were obtained at all operating flow range. The deviation of the calibration factors against flow rates was less than 0.05 %, indicating good linearity of the prover. The detailed uncertainty analysis was carried out, resulting the uncertainty of the calibration factors of the ball prover were evaluated to be less than 0.09 %. Furthermore the three flowmeters calibrated at NMIJ were mounted in parallel and calibrated by the ball prover simultaneously in order to confirm the calibration results.