

EDF R&D Industrial flow metering test facility : main past achievements and innovative plans for the future

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Since 1997, EDF Research and Development Division has been carrying out flow metering studies on the EVEREST experimental loop at Lab Chatou (France). This test facility was initially designed to perform calibration tests on innovative industrial flow meters. Tested devices are generally mounted on stainless steel pipes and can be invasive as well as non-invasive according to the sensor technology. EVEREST provides a steady water stream from $4 \cdot 10^4$ up to $1 \cdot 10^6$ Reynolds number. Depending on the geometrical configuration, flow range generally goes from $30 \text{ m}^3 \cdot \text{h}^{-1}$ up to $1100 \text{ m}^3 \cdot \text{h}^{-1}$.

However, in order to meet Nuclear Power Plant (NPP) thermal hydraulic measurements requirements, EVEREST has evolved into a unique experimental tool which is able to test sensors not only with high accuracy requirements (reference volume flow uncertainty goes from 0.36% up to 0.49%) but also under a quasi-real industrial environment. EVEREST has indeed a multi-purpose test area which allows to re-create numerous NPP industrial pipeworks or to install a reduced scale mock-up of typical NPP components (such as a 1/4 scale semi steam generator for reactor coolant system (RCS) elbow taps flow measurements sensitivity studies). This flexibility allows EDF R&D to investigate the real installation conditions impacts on industrial flowmeters accuracy: orifice plate installation with no required upstream and/or downstream straight lengths of piping, ultrasonic flow metering systems under an asymmetric flow profile.

Recently, EVEREST has been increasingly used for flow metering uncertainty optimisation investigations. This work has been carrying out by mixing experimental data and CFD results. This tendency led EDF R&D to the idea of re-designing the current loop in order to meet this exciting challenge. Consequently, in a near future, EVEREST will be able to provide not only a flow metering reference but also a flow profile reference for industrial configurations. Velocimetry data will allow EDF R&D not only to perform more accurate experimental tests but also to assess the actual accuracy of industrial flow metering devices under asymmetrical but well-characterised velocity fields.
