A Novel Motor-driven Flow Diverter

with an Enclosed Structure

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Flow diverters are essential components of a liquid flow calibration facility using the flying start and stop method. The uncertainty related to the flow diverter can significantly impact the overall flow rig uncertainty to achieve better calibration and measurement capability. The movement repeatability of the actuation mechanism and the time symmetry of transfer actions are key factors for improving flow diverters. For a traditional flow diverter, it typically has an open structure and this may present problems for volatile oil or hot water flows.

In order to reduce the uncertainty and improve the calibration with oil flows or hot water flows, an electric motor driven flow diverter with an enclosed structure was developed. The structure, performance parameters and characteristics of the novel flow diverter will be described in the paper. The details of the enclosed mechanical structure for fluid diversion and the measures taken to control vaporization of volatile oils or hot water will be presented. The principle of the integrated electric control subsystem together with the strategy of turn speed control will also be presented. In particular, the selection of the positions for start and end timing triggers will be analysed. Experimental data together with detailed analyses on a prototype flow diverter using water flows will be introduced. According to the test data, the standard uncertainty of the flow diverter is better than 0.005% using the method of transfer time difference.