

TWENTY-FIVE YEARS OF FLOW LAB COMPARISONS USING TANDEMS METER TRANSFER STANDARDS: LESSONS LEARNED AND LESSONS NOT LEARNED

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At the first FLOMEKO in 1978, in Groningen, the Netherlands, the author with his NBS co-authors and his UK counterparts presented results from the first known international flow standards comparison using a tandem flow meter transfer standard. This comparison included a testing procedure designed to produce two, statistically independent flow meter calibration results that are "typical" of the lab's normal calibration capability. As such, these results comply with the requirements for the Youden graphical analysis of variance to make conclusions regarding the comparability of the flow standards in the participating labs conducting these tests.

National flow lab metrologists in these years compared their standards on ad-hoc bases to assess values of different techniques and to evaluate improvements to existing methods. Results were generally kept among participants. In the ensuing 25 years, flow lab comparison testing techniques have evolved, appropriately in some sectors with significant lessons learned, but in other sectors, there are still lessons to be learned.

Through these years, local, national commerce and trade was satisfactorily conducted when the pertinent measurements -vendors specs and buyers requirements- were validated and made credible through some sort of traceability to the domestic National Metrology Institute (NMI). More recently, local, national commerce and trade have expanded to global and international and satisfactory exchanges now need measurement acceptability across national boundaries. To achieve this, the International Committee on Weights and Measures (CIPM) has, in 1999, signed into existence a Mutual Recognition Arrangement (MRA), see www.bipm.org. The central objective of this MRA is to eliminate measurement based barriers to international trade. To do this, Key Comparison (KC) tests are being planned to quantify how the flow standards in the NMIs are equivalent to each other. This equivalence is intended to be the key link enabling industries to trade satisfactorily across national borders. Where this equivalence clearly (i.e., with small uncertainties) quantifies respective NMI-to-NMI differences, vendor specs and buyer requirements will be clearly understood and useful for international commerce. Where this equivalence is quantified with unfortunately excessive uncertainty levels, trading industries in respective countries will have to suffer through such limitations. Therefore, the KCs designed to quantify NMI equivalencies will need to have highest reasonable levels of metrological quality and therefore they will need to use all of the lessons learned in the past 25 years of conducting flow lab comparisons.

This paper will describe the evolution of flow lab testing over the years since FLOMEKO 1978. Hopefully, over the next 25 years and more, satisfactory flow comparisons are done among the world's NMIs and so that the results enable efficient, effective, and satisfactory international commerce and trade in fluid quantity and flow measurement products.