

A new method to measure small volumes for tritium handling facilities using p-V measurements

Z. Köllő^{a*}, C. G. Alecu^b and H. Moosmann^b

^a *Institute of Nuclear Research of the Hungarian Academy of Sciences, Hertelendi Laboratory of Environmental Studies, P.O. Box 51, H-4001, Debrecen, Hungary*

^b *Karlsruhe Institute of Technology, Tritium Laboratory, P.O. Box 3640, D-76021, Karlsruhe, Germany*

In a tritium handling facility it is important to know the volume of the parts of the system for accurate accountancy (pVT-c measurements). The usual method to measure volumes in a system is to have a reference chamber with well known volume, and determine the unknown volumes using gas expansions and Boyle's law. For a precise measurement the reference chamber has to have a similar size as the measured ones; otherwise the pressure changes will be too low or too high to measure accurately. The reference volume is sometimes hard to determine accurately, especially when it has to be small (because of small volumes in the system to measure).

In this work a novel method is used to determine volumes: The volume of the reference chamber is changeable by placing different sized solid cylinders into it. The volume to determine can be calculated from the measured pressures of expansions, made with at least two different inner cylinders, and the volume differences. This way we don't have to know the exact volume of the reference chamber, only the volume of the cylinders. The latter can be determined very accurately by means of height and diameter measurements.

Here the design of the device constructed at the Tritium Laboratory Karlsruhe is presented, together with a detailed error calculation. Also the first measurement results with the system are discussed in detail.