

NASA TECH BRIEF

Lewis Research Center



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USE OF SMALL TURBINE-TYPE FLOWMETERS TO MEASURE FLOW IN LARGE PIPES

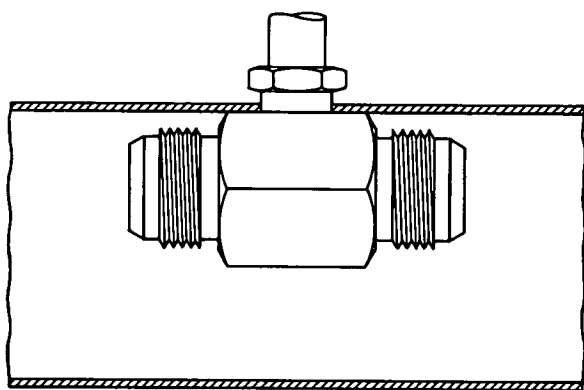


Figure 1. - 2.54-cm Turbine Meter in 7.62-cm Pipe.

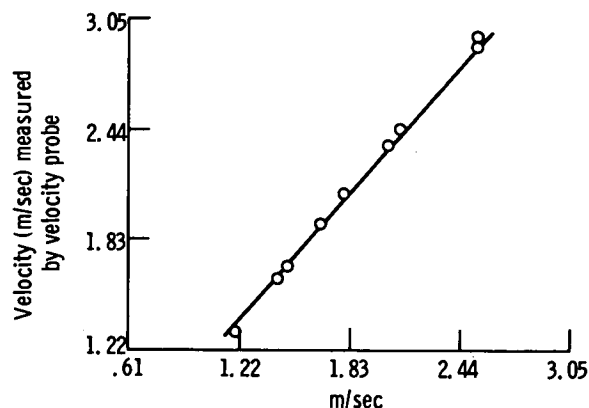


Figure 2. - Velocity (m/sec) measured by calibration facility.

Small turbine-type flowmeters have been used in large pipes as velocity detection devices to determine total mass flow in the pipes. The method allows the use of small, inexpensive, and easily calibrated flowmeters to determine mass flow in large pipes in lieu of larger, more expensive flowmeters.

Feasibility experiments were conducted with liquid hydrogen, but the results are applicable to all liquids. A calibrated one-inch diameter turbine-type flowmeter was placed in a three-inch diameter pipe. The flowmeter was placed in the position shown in Figure 1 primarily for convenience. Consideration, however, was given to the velocity profile in the pipe, and the meter was positioned to measure an average velocity. Velocities measured by the flowmeter were consistently slightly higher than the actual average velocities in the pipe, however, as shown in Figure 2. This higher result is attributed to (1) distortion of the velocity profile by the meter, and (2) systematic shift of the average-velocity radius with bulk velocity. The first effect would diminish as pipe size increased. The second effect can be accounted for by assigning a flow coefficient for the installation. A calibration of each installation is therefore necessary.

The experiments conducted show the method to be feasible and, with further attention to design detail and the possible use of multiple detectors, the method should be practical and inexpensive for measuring flow rates in large pipes where the size and cost of metering devices becomes prohibitive.

NOTE:

No further documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
 Lewis Research Center
 21000 Brookpark Road
 Cleveland, Ohio 44135
 Reference: B72-10631

PATENT STATUS:

NASA has decided not to apply for a patent.

Source: H.L. Minkin and H.F. Hobart
 Lewis Research Center
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Category 06