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**EMISSION MEASUREMENT CENTER  
GUIDELINE DOCUMENT**

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**COEFFICIENTS OF TYPE-S PITOT TUBES AT LOW FLOW RATES**

**SUMMARY**

A  $C_p$  value of 0.84 can be assigned to properly constructed Type-S pitot tubes throughout the velocity range normally encountered in stack testing, including velocities that correspond to the lower limit of a manometer's readability.

**DISCUSSION**

According to Ower and Pankhurst<sup>1</sup>, errors for velocity measurement with a standard pitot tube are less than 0.5 percent for flow rates between 3 and 200 ft/sec.

In a study investigating the use of Type-S pitot tubes for the measurement of low flow rates, Vollaro<sup>2</sup> calibrated twelve Type-S pitot tubes against a standard pitot at velocities ranging from 6.7 ft/sec, which is typically very close to the lower limit of the readability of a Method 5 manometer, to 17 ft/sec. Each of the pitot tubes had been previously calibrated at higher velocities, ranging from 25 to 58 ft/sec, providing "reference"  $C_p$ 's for each pitot tube. In general, the  $C_p$ 's varied little from the "reference"  $C_p$ 's. The average difference was 2.1 percent with an average deviation of 1.3 percent.

**REFERENCES**

1. Ower, E. and R.C. Pankhurst. The Measurement of Air Flow. London, Pergamon Press, 1966. p. 35.
2. Vollaro, R.F. The Use of Type-S Pitot Tubes for the Measurement of Low Velocities. Emission Measurement Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC.

