SEATTLE CHEMICAL INDUSTRIES
ENGINEERING DEVELOPMENT LABORATORY
SEATTLE, WASHINGTON 98195

TO: Team D
FROM: Engineering Management
SUBJECT: Gas Flow Measurement

One of our plants has asked us to evaluate the accuracy of a Pitot meter for measuring gas flow rates. We have installed a test system for this purpose.

The plant plans to use the Pitot tube to measure the maximum velocity (at the pipe center), then apply a correction factor to obtain the average velocity and volumetric flowrate. Figure 10-7 on page 10-9 of Perry's (7^{th} Edition) gives typical correction factors.

Please determine correction factors for our Pitot tube at the maximum and minimum Reynolds numbers allowed by our equipment, and at three other Re values equally spaced between these limits. Report the mean correction factor and its uncertainty at each condition. Use the installed Venturi meter as the standard for comparison, assuming that its accuracy is typical of such meters.

You may wish to use the electronic differential pressure sensor to measure the Pitot tube pressure difference. The sensor provides a linear voltage output varying from 2 to 10 volts as the pressure difference varies from 0 to 0.25 inches of water. The sensor's voltage output can be read on a computer display. The value is "filtered" (by averaging a specified number of sequential measurements) to reduce the impact of "noise", i.e., rapid pressure fluctuations caused by fan blade rotation and turbulence.

The other option is to use the manometer system (with the micrometers for measurement of small pressure differences). In either case, describe and justify your procedures.

Use the installed orifice meter as a cross-check on the Venturi meter's accuracy. If there are significant differences, report on the cause.

If your velocity correction factors differ significantly from those given in Perry's, we would like to know why.