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TECHNICAL NOTES

USING THE CORRECTION FACTOR CURVE FOR IMPROVED FLOW MEASUREMENT ACCURACY

The predictable Kinematic Performance of a Turbine Flowmeter allows it to be used over a wider range of applications than would normally be possible by consideration of linear flow range, linearity and linear viscosity limits alone.

It is necessary that the flowmeter's performance be documented over the entire range of flow rate and viscosities of interest and that a Correction Factor Curve be generated. In addition, it is necessary that the fluid's viscosity be a know function of temperature. In this manner, the fluid's viscosity can be inferred from a temperature measurement.

The effects of low flow rate and high viscosity normally cause the flowmeter's linearity to deviate beyond the specified limits of the tolerance, thereby decreasing the accuracy of measurement. The amount of this dependency may be conveniently represented on a CORRECTION FACTOS VS GPM/CSTK graph. This graph may then be used to extract a greater accuracy in a flow measurement.

The Correction Factor Curve approach allows the user to calculate the true flow from the measured flow by applying a correction factor to eliminate the non-ideal behavior introduced by low flow rates and high viscosity.

Given the apparent flow rate, the flowing temperature, the Correction Factor Curve for the particular flowmeter being used, and finally a curve of the Viscosity in Centistokes (as a function of temperature for the fluid being measured), the Correction Factor for the flowmeter under the flowing conditions may be determined according to the procedure below.

<u>The procedure for graphical determination of the correction factor is as follows:</u>

1. Read the apparent flow rate from the flow rate indicator.
2. Read the temperature from the temperature indicator.
3. Look up the fluid viscosity in centistokes from the fluid viscosity curve for the fluid being used.
4. Divide the apparent flow rate by the flowing viscosity using a calculator.
5. On the Correction Factor Curve, find the value obtained in Step 4 on the horizontal axis. Go vertically up to the intersection of the Correction Factor Curve. Read horizontally to obtain the Correction Factor under the flowing conditions.
6. Solve the following equations to obtain the true flow rate and flow total.

   Equation 1: True Flow Rate = Apparent Flow Rate X Correction Factor

   Equation 2: True Total = Apparent Total Flow X Correction Factor

NOTES:

A. When using this procedure to adjust the total flow, it is important that the factor be determined whenever the flow rate or viscosity changes significantly enough to cause the correction factor to change by more than the desired accuracy percentage. For example, if the effect of viscosity doubling causes the correction factor to change by more than 0.5% at the constant flow rate being measured, this would typically require calculating a different Correction Factor if the Fluid Temperature changes by 40°F. Since this is a function of the flowmeter size, fluid type, and flow rate, the user should examine his application to determine under what conditions a new correction factor should be determined.

B. Where the flow totalizer is being used as an accumulator (that is not being reset between readings) the correction factor should be applied to the difference between the most recent and last reading.

C. Fully automatic viscosity compensators are available from Hoffer for applications where flow totalizers are left unattended with varying flow rates and viscosities that cause changes in the Correction Factor beyond those desired for the application.