Technical Bulletin,
Meter Factor Linearization

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NOTE: User Manual Reference - This Technical Bulletin complements the information contained in Volume 2 and Volume 3, applicable to Firmware Revision 22.74+/26.74+.

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Scope

Firmware Revisions 22.70+ and 26.70+ of OMNI 6000/OMNI 3000 Flow Computers have the feature of Meter Factor Linearization. This feature applies to Turbine/Positive Displacement Liquid Flow Metering Systems (with Meter Factor Linearization).

Abstract

Meter Factor Linearization Function

Flowmeter performance varies depending upon flow rate and fluid viscosity. The flow computer can compensate for this variation in performance by applying a meter factor which is determined by interpolation of a ‘base meter factor curve’. The user develops this base meter factor curve by proving the flowmeter at various flow rates and determining the meter factors for those flow rates.

A base meter factor curve must be developed for each product or fluid viscosity (Figure 1). The curve can consist of from one (1) to twelve (12) meter factor, versus flow rate points. The baseline meter factor curve is usually developed when the flow metering system is initially commissioned. The curve should be redeveloped whenever significant maintenance is performed on the flowmeter.

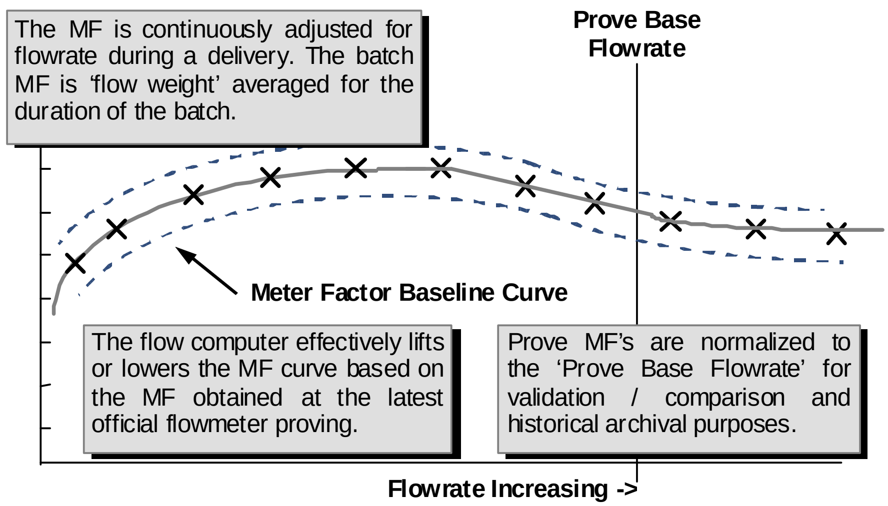

Figure 1. Meter Factor Baseline Curve

Meter Factor Validation and Control Chart Functions

The second purpose of the baseline meter factor curve is to act as a reference against which any meter factors developed during subsequent provings of the flowmeter can be compared. As an aid to this comparison the user specifies the base proving flow rate. This value is the flow rate which is considered to be the normal for the flowmeter concerned. For comparison purposes, each subsequent meter factor is normalized to this base proving flow rate and must pass two tests before it can be automatically implemented after a proving. The first test (test1) checks that the newly calculated meter factor is within some maximum deviation percentage from the baseline meter factor curve.

The second test (test 2) verifies that the meter factor, when normalized to the base proving flow rate, is within some maximum deviation percentage from the historical average of the last ‘n’ meter factors. Only normalized and implemented meter factors are included in the historical average. The number ‘n’ can be one (1) through ten (10).

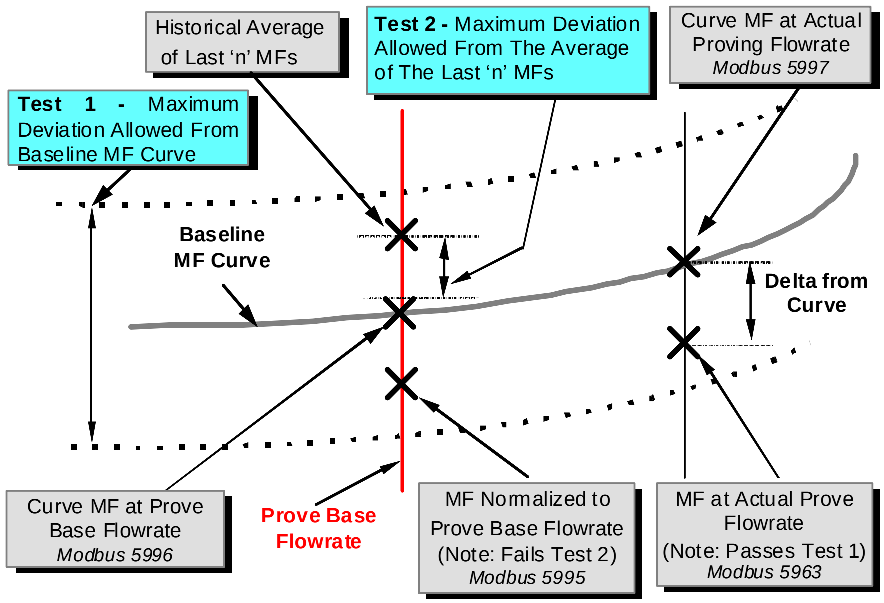

Figure 2. The Function of the Meter Factor Base Curve

NOTE: The meter factor shown in Figure 2 example would not have been acceptable or implemented by the flow computer because it failed 'Test 2', i.e. when it was compared to the historical average of the last 'n' meter factors implemented, it was outside of the acceptable limits.

Meter Factor Implementation

Meter Factors can be implemented; (a) automatically as a result of a successful proving, or (b) manually from the flow computers key-pad, or (c) manually via a Modbus write. In all three cases, the meter factor implemented must be the meter factor normalized to the 'prove base flow rate'.

a) The following has to occur for a meter factor to be automatically implemented:

- The flow computer must be configured to have 'Auto Implement MF' selected in the configuration.
- All prove runs must repeat within preset limits.
- The resultant meter factor normalized to the prove base flow rate must pass 'Test 1' and 'Test 2'

b) At the flow computer key-pad, press 'Prog' 'Meter' 'n' 'Factor', enter the value of the meter factor 'normalized' to the prove base flow rate, press 'Enter'.

c) Write the value of the meter factor 'normalized' to the prove base flow rate, to Modbus point 5n21 (substitute 'n' with the meter run number within the flow computer). Point 5n21 is a long integer type with an inferred decimal. The number of inferred decimal places is set by the flow computers configuration settings in the 'Decimal Resolution' tab of the 'General Setup' entries.

Description of Relevant Modbus Database Points

The following is a list of relevant Modbus database points:

- Meter run variables (substitute 'n' with the meter run number within the flow computer, 1-4)

  5n13 = The MF being applied this calculation cycle.

  5n21 = The implemented MF that was normalized to the prove base. Flow rate at the time of the prove or data entry.

  5n22 = The MF from the baseline curve for the current flow rate.

  5n23 = The current MF delta from the baseline curve MF.

  5n24 = The baseline curve MF at the prove base flow rate.

- Prove result variables

  5963 = The MF calculated for the actual prove flow rate.

5995 = The actual MF (5963) normalized to the prove base flow rate.
5996 = The MF from the curve at the prove base flow rate.
5997 = The MF from the curve at the actual prove flow rate.

DOCUMENT REVISION HISTORY

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REVISION	DATE	PURPOSE / CHANGE REQUEST
A	15-May-2003	Maintained on the Web - Initial release
B	09-April-2009	DCR 090108