Meter IT Automated Meter Systems (AMS) Libraries

ABB controllers are able to perform multi-tube flow compensation calculations. Meter IT AMS libraries includes Gas Flow Calculations such as AGA 3 gas orifice (1985,92), AGA 7 gas turbines and others. Liquid Flow calculations available include API Liquid Orifice and API Liquid Turbines for various densities. Other calculations available include SuperCompressibility calculations and energy volume.

Gas Flow Calculations

AGA 3 Gas Orifice (1985 & 1992)

This function computes the temperature, pressure and composition compensation factors for gas orifice meters to state gas volumes at base conditions according to the AGA 3 standard. Both the individual factors and the composite C' factors are reported. The function monitors for temperature, pressure, flow, and composition changes and computes only those equations necessary.

The function code can accept supercompressibility values from any of the methods described below. Additional outputs indicate changes in F, T, P, Z, specific gravity or orifice size and indicate any computational errors. (This functionality is the basis for all of the following calculations).

AGA 7 Gas Turbine

This function computes the temperature and pressure compensation factors for gas turbines and gas displacement meters to state gas volumes at base conditions according to the AGA 7 standard.

Gas Annubar

This function computes the temperature, pressure and composition compensation factors for gas annubars to state gas volumes at base conditions.

Gas V-Cone

This functions compute the temperature, pressure and composition compensation factors to state gas volumes at base conditions according to the equation of the V-Cone flow meter.

Gas Venturi

This functions compute the temperature, pressure and composition compensation factors to state gas volumes at base conditions according to the ASME standard for measurement with gas venturi.

Liquid Flow Calculations

API Liquid Turbine

The API liquid turbine function computes the temperature, pressure and composition compensation factors for hydrocarbon liquids according to API standards (includes optional hydrometer thermal expansion correction factor). This can be used with any turbine, positive displacement or mass flow meter to correct to base temperature and pressure conditions. This function uses API 11.1 and 11.2 standards.

API Liquid Turbine for Light Hydrocarbons

This function is similar to the above and computes the temperature and pressure factors for light hydrocarbon liquids (from 500 to 653 kg/m^3). This function uses API 11.1, 11.2, 2.2 and ASTM-IP-API standards.

API Liquid Orifice

This function computes the temperature, pressure and specific gravity compensation factors to state hydrocarbon liquid volumes at base conditions according to the API 11.1,11.2 and 14 standards.

Supercompressibility Calculations

AGA 8

This function computes the supercompressibility of a natural gas. The calculation is based on the AGA 8 detailed composition standard, which is the current industry standard. This method gives an average accuracy of 0.1% over a range of 17 to 143 ^{o}F, 0 to 1750 psia. At slightly less accuracy, the standard is applicable over -200 to 400 ^{o}F, 0 to 20000 psia.

NX-19

This function computes the supercompressibility of a gas. This is a past industry standard and still utilized at some locations. The calculation can be computed using either the NX19 detailed composition analysis, gross method or methane gravity method. This standard can be used –40 to 240 ^{o}F and 0 to 5000 psig with a specific gravity from 0.554 to 1. CO_2 and N_2 compositions must be less than 15%.

Redlich-Kwong

The Redlich-Kwong function computes the supercompressibility of a gas. The calculation is based on the Redlich-Kwong equation of state with Wichert-Aziz correction for sour gas. This method gives an average accuracy of 0.915% over a range of 40 to 300 ^{o}F, 0 to 7000 psia, 0-80% sour gas

Other Calculations

AGA 5 Natural Gas Heat Content (Energy Volume)

The AGA 5 function computes the energy to volume ratio of a natural gas.

Table 1.0 Calculations and Products Supported (* in development for Q2-2003)

CALCULATION	PRODUCTS SUPPORTED		
	SYMPHONY	AC800F	AC800M/C
Gas Flow Calculations			
AGA 3 Gas Orifice (1985 & 1992)	X	X	X
AGA 7 Gas Orifice	X	X	X
Gas Annubar	X		
Gas V-Cone and VenTuri	X		
Liquid Flow Calculations			
API Liquid Turbine	X	*	*
API Liquid Turbine for Light Hydrocarbons	X	*	*
API Liquid Orifice	X	*	*
SuperCompressibility Calculations			
AGA 8	X	X	X
NX-19	X		
Redlich-Kwong	X		
Natural Gas Heat Content			
AGA 5	X	X	X

ABB Inc.
1245-70th Avenue SE
Calgary, Alberta T2H 2X8 Canada
Telephone: (403) 253-0271
Fax: (403) 258-3244
www.abb.com