



TOTALFLOW

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NGC Velocity of Sound Application

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The following is a short description of how the Velocity of Sound, VOS, or Speed of Sound, SOS, operates in the NGC 8206, 8207, and 8209 analyzers.

VOS is used in ultrasonic metering systems, USM, as a pure check on the configuration of the meter itself. A change in the VOS would be an indication of a change in the dimensions of the meter, i.e. build up on transducers or the pipe wall.

The VOS is calculated from the path distance and the flight time of the ultrasonic pulses along that path. An increase in the VOS could mean a shortening of the path length by outside agencies, such as a build up.

A real time comparison on the calculated VOS supplied by the Chromatograph using AGA 10 versus the measured VOS from the ultrasonic meter is a great tool to troubleshoot the USM. This allows the detection of spot build ups before they become a major problem.

This paper describes how the Chromatograph is set up to calculate VOS and how the data is accessed at the end of each analysis.

The following screen shot shows the speed of sound on the 2nd to last line of the display in the NGC set up screen.

| | Item | Value | |
|---------|------------------------------|--------------------------|----------------------------|
| 38.4.38 | Ideal CV | 1051.3856 | Btu/SCF |
| 38.4.39 | Superior (Dry) CV | 1056.3197 | Btu/SCF |
| 38.4.40 | Inferior (Wet) CV | 1038.8127 | Btu/SCF |
| 38.4.41 | Superior WOBBE | 1336.3719 | Btu/SCF |
| 38.4.42 | Inferior WOBBE | 1314.2235 | Btu/SCF |
| 38.4.43 | Relative Density | 0.624793 | |
| 38.4.15 | Normal Density | 0.765906 | kg/m3 |
| 38.4.44 | Compressibility | 0.997632 | |
| 38.4.45 | Total Unnormalized | 100.0000 | % using new factors |
| 38.4.53 | Total Unnormalized | 116.9981 | % using old factors |
| 38.4.46 | Total Liquids | 1.9284 | USgal/MCF |
| 38.4.48 | Methane Number | 84.9855 | |
| 38.4.56 | Speed of Sound | 1301.6504 | ft/s |
| 38.2.5 | Last Calibration Time | 11/14/07 14:31:36 | |

This calculation is based wholly on the programming of the AGA 10 Velocity of Sound calculation standard in the 32 bit processor of the NGC. When this application is



selected, it will run automatically at the end of each successfully completed analysis cycle. Note that in the screen shot below, the pressure and temperature are zeros:

| | Item | Value | Units |
|------------|---------------------------|----------|-------|
| 38.183.104 | Live Pressure Register | 0.0.0 | |
| 38.4.135 | Live Pressure | 0.0000 | psia |
| 38.183.105 | Live Temperature Register | 0.0.0 | |
| 38.4.134 | Live Temperature | 0.0000 | deg F |
| 38.4.54 | Speed of Sound | 413.7831 | m/s |

The application will default to the base pressure and base temperature for its calculation parameters after the first calculation cycle. The user may enter a selected pressure and temperature or use a live input for each if it is available. The live input is selected by entering the App Array Register number for the correct pressure and temperature inputs as needed.

If the measurement units of velocity need to be changed, this is done on a different screen. Under the heading of Units Conversion, pick the Flow Units tab. The following screen shots show how this is accomplished.

| Variable Group | Units | Multiplier | Rate Units |
|------------------------|-------|------------|------------|
| 6.16.34 Speed of Sound | m | x1.0 | Qty/Second |

Select the distance units and send them. If the unit of time needs changing, it can also be done in a similar manner:

| Variable Group | Units | Multiplier | Rate Units |
|------------------------|-------|------------|------------|
| 6.16.34 Speed of Sound | ft | x1.0 | Qty/Second |

The results can be transmitted via Modbus register and are part of the normal NGC results output as shown in the first screen shot.

For more detailed information, please consult the NGC Operations and Maintenance Manual.