EMRC FLOW MONITOR TRAINING

1. Theory of Operation:

Refer to diagram pages (1) and (2)

Determining velocity by measuring differential pressure (Delta P):

Stack testing team will use a type S pitot and manometer and take several readings of Delta P in each port. Delta P is measured in inches of water. For example, the team would take 12 readings, add them together and divide by 12. This is the average Delta P.

Refer to page (3)

The stationary pitot should be in a representative spot to measure the average Delta P.

Refer to page (4)

The average Delta P and the stack temperature can be used to determine gas velocity in Feet / Second. Using Feet/ Second and the stack area, the Cubic Feet per Minuit can be calculated.

The EMRC monitor puts out two 4-20 MA signals: One for Delta P in Inches Of Water, and one for Stack Temperature in Degrees F. Using these two variables and several constants, the stack CFM can be calculated. This can be Actual Wet Cubic Feet per Minuit/Hour or Standard Wet Cubic Feet per Minuit/Hour. Refer to page (4) for the constants involved.

The calculation is done in the DCS. The operator should be able to access this equation and be able to put in a correction factor if needed. Always have your stack testing team do a preliminary test to see if a correction factor is needed.

For a more specific explanation of the calculation contact our office.

2. Installation

Refer to page (3)

The pitot and the thermocouple flange assembly should be installed in the stack. The pitot lines and thermocouple line bundle should be terminated at the flange assembly. The bundle is brought down to the instrument cabinet and terminated there. Remember to install a drip loop by bringing the pitot lines up at least a foot before bringing down the stack. This insures the any condensation droplets do not come down the lines. The measurement of pressure does not have stack gas in the lines, and the purge will blow out any condensate droplets. Check to make sure the pitot is straight up and down. If the bore thru fittings are tightened too much, it will have a tendency to twist the pitot. Once a representative spot is chosen, the excess 3/8” tubing can be cut off. You would need new ferules to resecure to the pitot. At this time you could replace the 3/8” Teflon ferules in the bore thru fittings with stainless.

Refer to page (5)

The high and low pitot line is attached to the solenoid block at the bottom of the cabinet. Observe the manometer, if it should show a negative reading, the lines should be swapped. The T/C line is terminated at TB-1.

Terminals:

TB-1: Type K T/C wire connection

TB-2: 4-20 MA Outputs. 1 & 2 Delta P 3 & 4 Stack Temp

TB-3 External activation:

Momentary dry contact from 1 to 2 will activate a calibration sequence. Momentary dry contact from 3 to 4 will activate a purge sequence. By momentary we mean about 3 seconds. This is essentially switching the 24 VDC back to the controller inputs. This must be the same 24VDC that powers the controller. If there is a question about the DCS contact closures, you can test by placing a jumper across these terminals to check activation.

TB-3 Contact closures out:

5 & 6 will give a dry contact closure when there is a purge sequence. When the pitot is being purged, the Delta P will go to zero. The track/hold will tell the DCS to ignore the Delta p signal until the contact opens back up.

7 & 8 will give a contact closure when the system is in span.

9 & 10 will give a contact closure when the system is in zero.

Instrument Air:

The cabinet needs two connections for instrument air. The internal connection provides purge air and a regulator drops the pressure to be used as span air. The regulator will drop the pressure to about 14 inches of water and the needle valve restricts the pressure down to about 2 inches. We will talk more about the span air later. The external air connection is to supply the Bebco cabinet purge device. We recommend around 90 Psi for Inst air.

Power:

The monitor needs 115 VAC. This is brought in to the 7 amp breaker in the cabinet. A ground bar is available for chassis ground.

3. System Flow

With the pitot installed and the tubing bundle secured to the fittings in the cabinet, the DP transmitter and manometer will read the differential pressure. Even with the power off, the manometer will see the pressure.

The 3 way valves on the Rosemount transmitter should be facing in. These can be turned outwards for a manual zero. With the valves turned out, the high side and the low side of the DP transmitter and manometer will be vented to the cabinet. You can use the high side valve to introduce any pressure you want to the DP transmitter and manometer. Hook a ¼" piece of tubing to the outward fitting, and blow into it as you observe the manometer. Once you see the value you want, turn the valve halfway back and lock in that pressure. Remember to turn the valves back for normal operation.

The pressure goes thru the solenoid block and filters to the 3 way valves, where it goes to the transmitter and manometer. The manometer valves can be kept closed when not being used.

Functions:

Refer to page (8)

Zero: When the monitor is in zero, the high and low side of the transmitter and manometer are vented to the cabinet.

Refer to page (9)

Span: The low side remains vented and span air is introduced to the high side. SV7 also opens and allows span air pressure to the pressure switch. The pressure switch controls SV6 which is allowing the span air pressure to the high side. When the pressure switch reaches the set point, power is cut off to SV6 the span air pressure will be locked into the high side.

The needle valve controls how quickly the pressure climbs to the span set point. There should be a slow rate of climb, perhaps 5 seconds or more. You will see an overshoot because of the dead band of the switch. The whole point is to see a repeatable value every 24 hours. That value can be between 50 and 70 percent of the range value of the Rosemount transmitter. There is a span set point adjustment on the pressure switch.

Refer to page (10)

Purge: The monitor will go into zero for the purge cycle. This isolates the components from the high pressure purge air. First SV1 and then SV2 will open allowing the purge air up the lines and out the end of the pitot. High and Low purge refers to the high and low side of the pitot.

Components:

Refer to page (11)

Rosemount Transmitter: The Rosemount transmitter should be zeroed at installation. There are two ways to zero the transmitter. A Hart communicator can be used to communicate with the transmitter, or it can be done manually. To manually zero the transmitter, turn the three way valves outward. Locate the zero button under the silver plate on the front of the

transmitter. Press and hold for 3 seconds. Do not press the span button as that will rerange the transmitter.

Temperature Transmitter: The temp transmitter can be adjusted using the menu on the Moore Temp Transmitter.

Refer to pages (12) & (13)

Controller: The Crouzet controller is a programmable relay timer. The 1 amp breaker next to the Crouzet can be used as a reset. The A and B buttons on the controller can be used to initiate a calibration or purge sequence. The external activation inputs will look for contact closures from the DCS. Jumpers can also be placed to have a timed activation of the two functions. There is a button that can be pressed to give the DCS the track/hold signal, and another button to take it out of track /hold. This can be used for a maintenance signal. Refer to page (13) for controller output designations. The timing diagram can be seen on page (14)

Power supplies: There are two 24VDC power supplies, one for the Rosemount current loop, the other for the Crouzet controller.

Pressure Switch: The Dwyer pressure switch can be adjusted by pulling the gray cap and using a straight slot screwdriver .

Regulator: Span air regulation with needle valve.

Solenoid block: The solenoids can be replaced by removing two screws that hold each solenoid to the block. If replacing, do not over tighten. The standalone valve can be taken off the panel by loosening the aluminum plate.

Manometer :The manometer should be zeroed for accurate readings. Manometer fluid can be added by removing the high side ¼” tubing and adding fluid down thru the valve. These can be closed when not in use.