Built-in Purge Control Functions

Why clean a sensor?

As the velocity sensor was calibrated clean, operating it clean also preserves the best calibration. Any build up of material on a thermal sensor tends to insulate it and will cause it to lose less heat to the process fluid so it will read lower than when it was calibrated clean. Operating the sensor dirty, then field calibrating with a correction factor to read the proper flow rate can be done, but tends to be unstable. After a process stops and cools down, the sensor build up tends to contract and often will crack and flake off. When the process restarts the sensor will now read higher. So the pre and post shutdown data at the same operating point will not match since the dirt which was partly insulating the sensor has now flaked off. This problem can be largely avoided with an automatic cleaning system.

The purge version of the product is designed to provide an automated cleaning method with high velocity gas on the velocity sensor to shear off as much deposit as possible. The purge method is very effective at increasing the intervals between manual cleaning and in many cases may eliminate the need for manual cleaning and significantly reducing the cost of ownership. The purge gas can be at ambient temperature or heated to the process temperature. The heated versions have the advantage of not condensing any of the process gas on the sensor in the middle of cleaning which could act to “cement” the dirt on the sensor instead of blowing it off.

Integrated Purge Controller

A version of the MFT B-Series hardware is available for single point or multipoint applications which have a purge control timer and data hold function built-in to the flow transmitter. An example is the model 454PFTB. It is designed to directly drive a solenoid (up to 12 W at 24 VDC) to provide the compressed gas cleaning to the sensor.

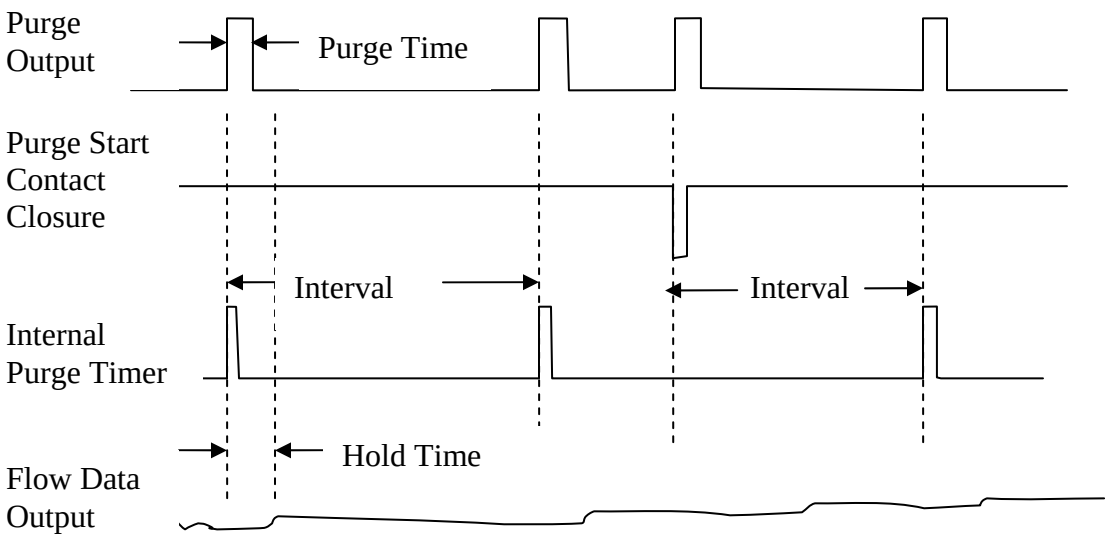
The cleaning sequence can be initiated from:

- Internal flow meter timer
- External contact closure
- Write Coil command via Modbus.

Since the data is held during the cleaning cycle, this makes it easier to have the cleaning control asynchronous with the process operation (use its internal timer which is independent of the process operation). For applications that need a tighter control of the operation, the contact closure initiated from outside the meter is the best approach. The only verification that the cleaning cycle is on, is from one of the Modbus registers. Since the flow, velocity and temperature

variables are held during the purge cycle on the 4-20 mA interfaces, LCD as well as the Modbus interface this operation is largely transparent unless it was initiated externally. If the sensor was dirty and cleaned, you will see the flow rate and velocity numbers increase according to the meter filter time constant settings following the data hold during a sensor cleaning purge.

For the K-BAR 2000PB, only one of the sensor control boards need have the solenoid drive modifications as all units will respond to the external trigger command at the same time and mask the purge blast from the output data.



Purge Controller Wiring

The purge controller setup is a mater of connecting a 24 VDC 12 W max. solenoid to the DO2 or second solid state relay. Pin # TB6-1 is +24 VDC and TB6-2 is the GND connection. See field wiring diagram 342038, sheet 2 for an example of the solenoid wiring. The wiring gage and length is not critical for this connection and will generally be short for this application. We recommend 18 AWG (1.02 mm) wire.

> *Note, the above wring information only works for the purge version, model 454PFTB-16.*

To activate the purge with an external contact closure: The contact closure is on pins TB6-8 or digital input 1 (DI1) and GND, TB6-5. The activation is a pulse whose width must be at least 25 ms long and the purge will start on the leading edge (or falling from logic high to low).

Purge Relay Assignment

If not already configured, the Relay #2 must be assigned to “Purge” instead of alarm or pulsed totalizer output.

Enter *Program Mode*, press **P** and the **654321** access code and **E**. Then advance to the screen:

```
PRESS E TO SET
RELAY ASSIGNMENT
```

by pressing the **P** key. Now press **E** to see:

```
PRESS ENTER TO
ASSIGN RELAY 1
```

Use the **^** or **v** key to select relay 2 or press 2 then **E** for enter.

```
ASSIGN TO ^V
ALARM OUTPUT
```

Press the **^** key until you see “PURGE OUTPUT” then **E** for enter.

The relay #2 is now assigned to the purge output function.

When exiting *Program Mode*, do not forget to save the changes to the EEPROM by selecting yes when prompted so that your changes will be remembered after a power cycle or re-boot.

Purge Controller Configuration Changes

To control the purge timer options of the flow meter you enter *Program Mode* by pressing the **P** key then the **654321** tech code and **E** for enter. Advance to the purge menu area by pressing **P** until you see this screen:

```
PRESS E TO SET
PURGE TIMER DATA
```

If you see the screen

```
RELAY OUTPUT 2
WAS NOT ASSIGNED
```

Then you need to set the relay output first, see section above.

Press **E** to set the purge timer data. The next screen is:

```
PURGE OUT IS OFF
^=ON V=OFF
```

Now press the **^** key to select ON and then **E** to accept the change.
Next the screen for purge solenoid open time will be shown:

```
ENTER PURGE TIME
IN MSEC  500
```

You just type in the number of ms needed to keep the sensor clean. A short blast generally works best. Longer times may be needed along with longer hold times to allow the sensor to recover from the purge.

```
ENTER INTERVAL
IN MIN 60
```

The interval time is used to set the number of times in a day the purge will occur. At 60 minutes, we will be doing one purge per hour and 24 purges each day. Finally we have the screen to specify the data hold time. This hold applies to the flow rate, velocity and temperature signals as seen on the 4-20 mA interface, Modbus and the LCD.

If you are using the external purge contact closure to start the purge, set the interval time to a value higher than will be used by the external closure to prevent the internal timer from purging X minutes from your last externally commanded purge.

The next screen is:

```
ENTER HOLD TIME
IN SEC 4.00
```

The hold time is also a function of the purge gas temperature compared to the process gas being measured. The larger the temperature difference between these two, the more hold time will be needed. Also, lower flow rates tend to need more recovery time following a purge than at high flow rates.

Remember, the readings will change following a purge just because the sensor is cleaner, no mater what hold time is used. So a shift will occur, but the large flow spike from the purge will be masked off by the hold time. The rate at which the shift occurs is filtered by the meter time constant setting.

Modbus operation and monitoring of the purge cleaning

The purge sequence can be triggered by writing a 1 to the Modbus coil #8 (Register 0X). This operation does not require that the purge menu be turned on for internal or external contact closure. Once stared, it will ignore additional purge commands. The Modbus purge trigger, is independent of the internal timer. So if the timer is schedule to fire every 60 minutes, extra purge commands on Modbus will still be performed without affecting the internal timer purge sequence.

The status of the purge via Modbus is provided at coil status #8, (Register 1X). A value of 1 indicates it is in the middle of a purge cycle, 0 indicates it is idle.