Application Note: 3

Data Industrial®
A BadgerMeter, Inc. Company

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MARKETS
- ✓ Energy
- General
- Irrigation
- Municipal
- Semiconductor

JOHNSON CONTROLS BUILDING MANAGEMENT SYSTEM

PRODUCTS

200	✓
4000	
310	✓
320	
330	
340	
340LW	
340N2	
600	✓
800	
1400	
1500	
1550	
2100	
2200	
2300	
HTT	
SDI	
WSS	

The System

Johnson Controls has manufactured many computer-based systems capable of monitoring all aspects of building operation, such as the JC85, JC8500, and Metasys. A large part of the computer's operation is dedicated to energy management with energy transferal, measured in Btu's calculated from flow and temperature differential data. This Btu data can be used to proportion energy costs based on actual usage or monitor system performance.

The Problem

Computer systems require inputs from a large number of diverse data points. For HVAC energy management, these primarily include temperature and flow measurements. Although relatively inexpensive temperature sensors have been available for some time, cost effective, easy to install and easy to computer interface flow sensors have not been available.

The Solution

Data Industrial's 220 Series sensors are easy to install with models available permitting installation and removal form fully pressurized, active piping systems. Their low impedance 8 VPP signal permits each sensor to be located up to 2000 feet from the input device. In some installations using the JC systems, it is possible to interface this sensor directly with the computer to provide the most cost effective flow data available anywhere. If analog signals are required, Data Industrial provides a Model 310 2-wire 4-20 mA transmitter.

Specific Recommendations

Sensors: Specify Model 220B where pipe sizes are 3" or larger and valving permits easy isolation of sensors for installation and service without complete drain down of the entire system.

Specify Series 228 sensors for pipe sizes below 3".

Specify the Model 225B sensor for installations where pressures are below 200 psi, drain down is possible for installation, but valving causes drain down to be impractical for service once a system is put into operation. Specify the Model 226B sensor for installations where pressures are as great as 400 psi or installation is to be into fully pressurized, active pipe lines.

* The above sensors are also available in 316 stainless steel - order with the suffix "SS".

Specify pulse output, our 600 Series pulse transmitters provide scalable pulses, if the computer is being used to totalize flow or Btu data, or if higher degrees of accuracy are required. Although many systems can accept pulse inputs, the resultant increase in loop time frequently restricts the number of pulse inputs a system can handle. As a result of this trade-off between computer speed and accuracy, many systems will have both pulse and analog inputs specified depending on system size and function.

Examples of Flow Inputs:

I. Analog Input of 4-20 mA.

A. Equipment Required

1. 220 Series sensor
2. Model 310-00 Transmitter

B. Scaling/Calibration

1. Specify pipe ID or size and schedule, as well as full scale flow rate, and flow that 4 MA is to represent .

Example: 4" Sch 40 or 4.026 ID
4 mA = 0 GPM
20 mA = 400 GPM

As a rule of thumb, 20 mA is generally selected to represent a flow that is about 120% of the actual expected maximum flow to allow a margin of safety in case flow turns out to be slightly higher than predicted.

2. Use the Johnson Controls' calculated point program routine to enter slope and offset.

II. Pulse Direct From Sensor

A. Equipment Required

1. 220 Series Sensor

B. Scaling/Calibration

1. The sensor output is an 8 VPP rectangular wave form as described in Application Note A-88-480-005. In brief, its frequency output is generated by an 8 V zener diode which is shunted by an NPN transistor for 5 ms, twice per revolution of the impeller. This relationship between the frequency and flow is a linear proportion over the sensors 1-30 ft/second operational range as described by the equation:

FREQ = (GPM/K) - Offset or
GPM = K (FREQ + Offset)

A table of K and offset values for standard pipe sizes and an application note describing the sensors interface characteristics is available. If you require copies, please contact Data Industrial.

2. Use UPL (User Programming Language) to enter calibration equation.

C. Connections