Monitoring Considerations in a 2,000 Foot Manifold Spacing Design

Why Flow Analysis?

The primary advantage of the 2,000 foot manifold spacing design is the ability to maximize cable protection. Because of the relatively close spacing of air sources, the pneumatic resistance of cable between a potential leak and an air source is very low. For most cable leaks, air flow will increase while pressure drops will be minimized. This is why the system is monitored for flow increases in Standard Cubic Feet per Hour (SCFH) rather than pressure drops in Pounds per Square Inch (PSI).

The "weak spot" in the system is the cable midpoint between two air sources. This is where the pneumatic resistance between the source (manifold) and the cable leak is the greatest. If a leak occurs near the midpoint, pressure drops will be greater and flow increases will be less.

Flow Monitoring Example

Figure 1 shows an example of a cable leak that has occurred between two air pipe manifolds. As shown, the pressure in the cable has dropped from 8 PSI to 4 PSI (a 4 pound drop). A cable leak of this size (seriousness) will cause a flow increase at the manifolds of 4 SCFH (assuming a cable pneumatic resistance of 1.0 per 1,000 feet).

Monitoring Requirements

Limitations of Stepped Devices

What this example indicates is that in order to monitor for cable leaks that cause a 4 PSI drop in cable pressure, the flow transducer must be able to detect leaks that cause a 4 SCFH flow increase at the manifold. The existing flow transducers used in the New York City area (0–95 SCFH range) have "steps" of 5.0 SCFH. With steps of 5 SCFH, a "change" of one step of flow indicated by the printout could be as little as 0.2 SCFH (just passing a step) to as high as 9.9 SCFH (almost passing two steps). With these devices, it is possible to have an actual flow increase of 4.9 SCFH and not be able to detect it.

Monitoring Weakness

Considering this information, it is obvious that the installation of flow transducers with steps of 5 SCFH will result in a "blind spot" between the two manifolds where cables will be unmonitored. In fact, typical monitoring requires that any device pass two steps (in this case, 10 SCFH) before a critical alarm is sent. Alarming for one step results in a massive number of nuisance alarms (in and out of alarm). Transducers with steps of 5 SCFH will only be able to monitor for 4 PSI pressure drops in ca-

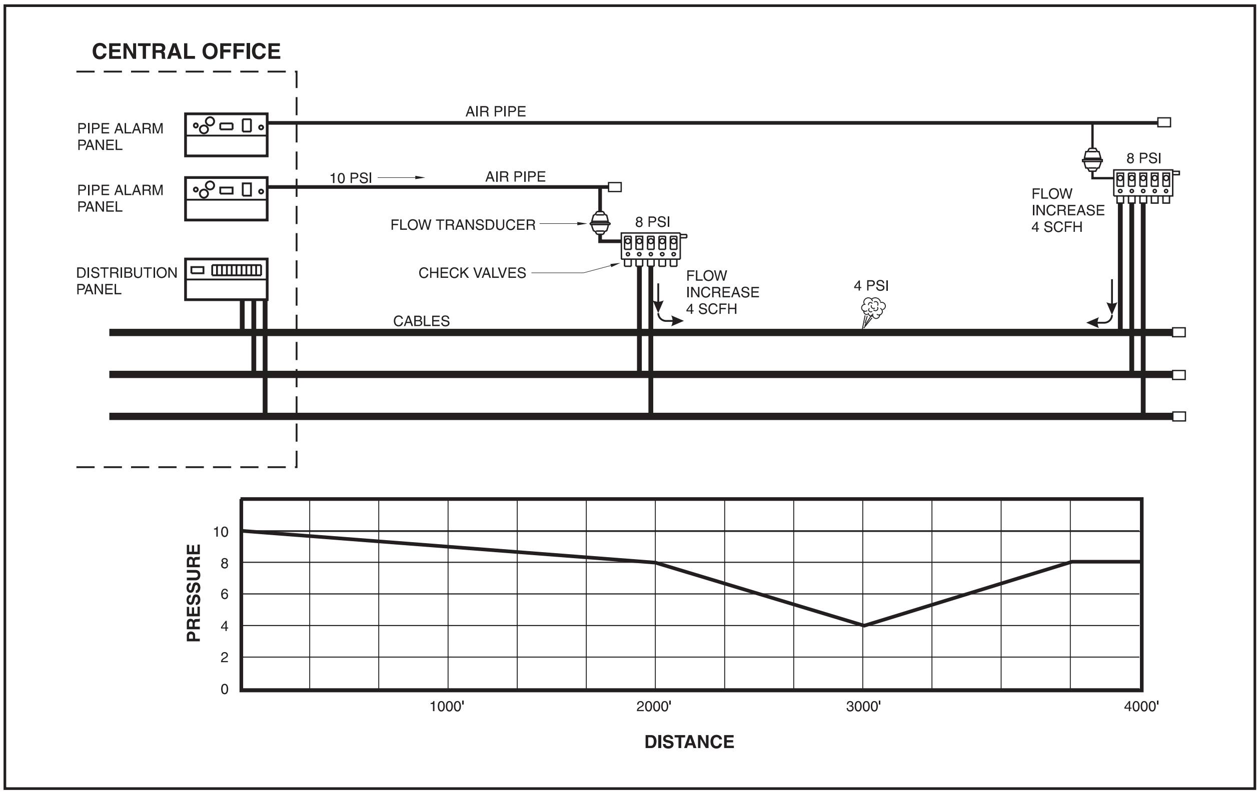

Figure 1—Leak Midway Between Manifolds

bles within 400 feet of the manifold. With 2,000 foot manifold spacing this leaves a blind spot of 1,200 feet between the manifolds (see Figure 2). This lack of effective monitoring is obviously unacceptable.

System Studies Flow Transducers

Advantages of High Resolution Monitoring

The flow transducers developed by System Studies Incorporated utilize an electronic “chip” design that enables them to be very sensitive to air flow changes. These transducers can detect changes in flow as small as 1.0 SCFH. Because of this, a drop of 4 PSI and a flow increase of 4 SCFH can easily be detected. With these devices the cables are completely monitored, and there are no weak or blind spots in the system (see Figure 3). If the System Studies flow transducer were set to alarm at 3 steps instead of 4, a 4 PSI pressure drop could be detected anywhere within 1,333 feet of an air source.

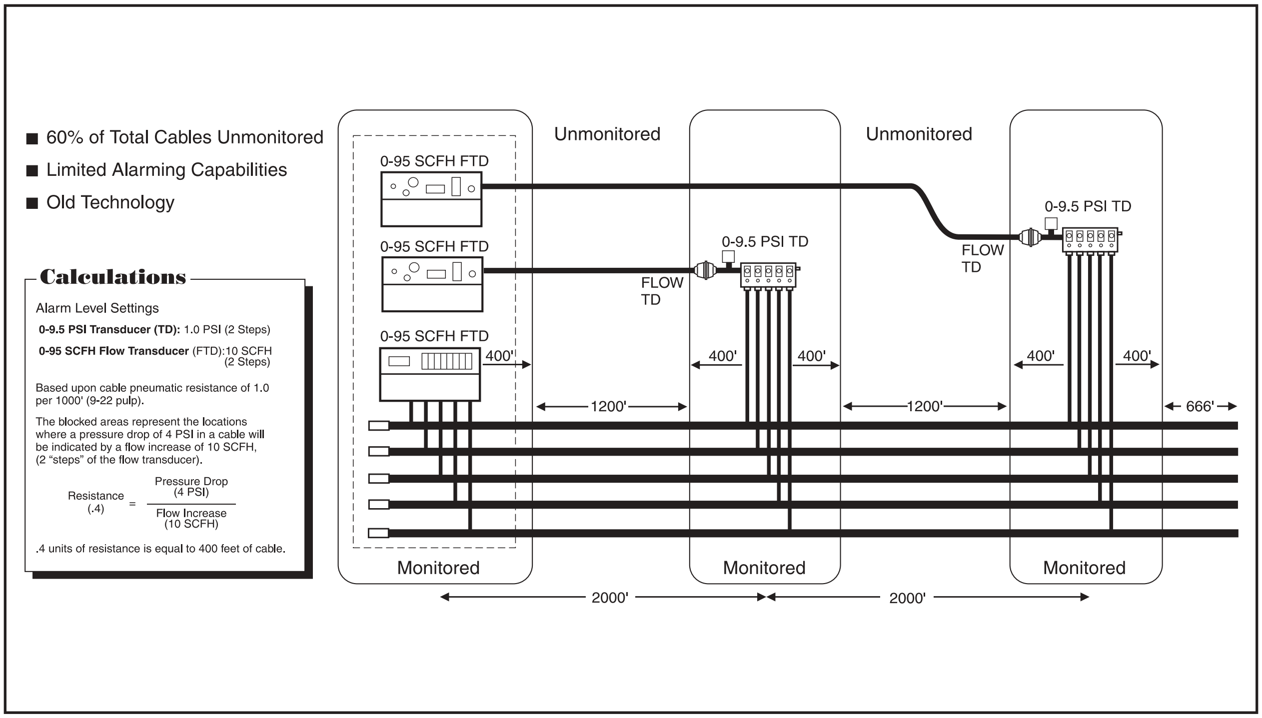

Figure 2—20 Stepped Transducers (Existing Resistive Devices)

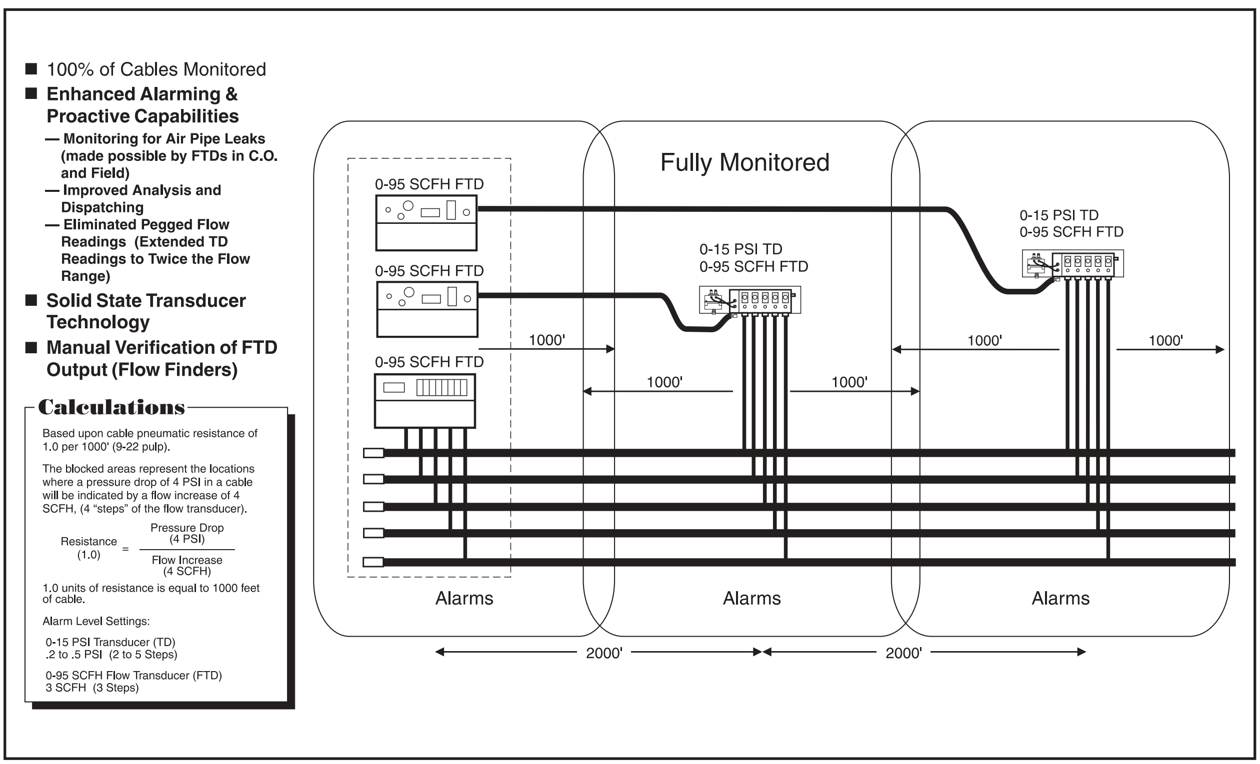

Figure 3—High Resolution Transducer (Loop Current Devices)

Conclusion

There are three goals of a successful cable pressure system:

1) maximize cable protection

2) monitor all cable sections

3) provide tools for leak locating

Designing a system only to protect the cables will result in leaks occurring that will not be detected. Large undetected leaks will eventually go wet (fail). When this occurs, the other monitoring system—better known as the customer—will kick into action. In order to prevent this from happening, you need to use monitoring equipment with the resolution possible to detect changes in your system, no matter where they occur.

The High Resolution Transducers from System Studies Incorporated offer the type of information you need to be able to respond to leaks before that customer alarm comes in. Please call System Studies Incorporated if you would like additional information on the new Pressure and Flow Transducers.