

ANOTHER ORIGINAL TECHNIQUE TO IMPROVE YOUR PNEUMATIC SYSTEMS.

Check out an excellent article in the April 2007, issue of Machine Design, “**Self-Monitoring pneumatic systems**” makes the case for repeated monitoring, repair and improvement of pneumatic systems. This article suggested that segments of a pneumatic system be monitored as well as the total system.

In recent discussion a friend mentioned he had discovered a 3/4 inch pipe inside a silo that had broken and dumped compressed air for an unknown period of time. A check up once a month would have detected that broken pipe and stopped the waste early.

I would like to share another technique for monitoring and measuring air flow.

If that is not something you have an interest in today and cannot think of anyone who might be, you still may want to save this idea. You won't find it elsewhere.

As pneumatic devices wear or leaks become greater the amount of compressed air wasted will increase. When you spend time and effort finding and fixing leaks it would be worth while to be able to see the result. If you check your compressed air system periodically as part of your preventative maintenance program you can measure the air flow with instrumentation and keep records by data logging. If you prefer to spend less of what might be saved and increase the saving here is a home grown technique for you.

REQUIREMENTS:

The only device(s) you will require is a known or calibrated valve, orifice or flow path.

You can determine the flow of any device with the pressure decay technique of my previous articles, measure with a flow meter, or trust the rating given by the manufacturer. Use the internet to find Lee or another company that sells orifices.

If you chose a valve that is rated at a C_v of .79 try this. $C_v \times .0336 = d^2$ [Orifice diameter squared.] Then the [square root of the $.79 \times .0336 = .163$ diameter.

When you have an orifice or flow device tee it into the air line you are testing with a ball valve or other device to open or close the flow through it. You will also require a shut off valve for the line being tested to shut off the inlet air.

TEST

1. Record the existing pressure (P1) then block the supply.
2. Record the time (T1) for convenient pressure decay.
3. Open the supply valve to pressurize to the initial pressure.
4. Block the supply and open the orifice flow simultaneously.
5. Time the pressure decay to the same level as step #2 = (T2).

DO THE MATH

- A. If your calibrated orifice is rated in C_v then $Q_c = .4872 \times C_v \times (P1+14.7)$.
- B. If rated by diameter $Q_c = 14.5 \times d^2$ (Dia. Squared) $\times (P1+14.7)$

Find the flow rate, Q_c , of your calibrated device at the pressure (P1+14.7)

The flow that you are testing for is: $Q_t = T2 / (T1-T2) \times Q_c$

For example let P1 = 100 psig, T1 = 17 sec. T2 = 11 sec., Orifice $C_v = .79$ (.163 Dia)

From Formula A above: $Q_c = .4872 \times .79 \times 114.7$
Then $Q_c = 44.15$ SCFM

Or from Formula B:

$Q_c = 14.5 \times .163 \times .163 \times 114.7 = 41.19$ SCFM

Therefore $Q_t = 11/6 \times 44.15 = 80.94$ SCFM

This technique is simple and inexpensive. Leave it in place at multiple places (or quick connects) to use frequently to help find leaks, repairs and improvements. Obviously this will work for other flow applications as well.

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