

Psst...

YOUR COMPRESSOR IS TRYING TO TELL YOU SOMETHING

BY RON MARSHALL FOR THE COMPRESSED AIR CHALLENGE

If you've ever been in your industrial plant during a shutdown, you probably noticed that your compressed air system was trying to send you a message. That hissing sound you heard was your money going down the drain. Compressed air is expensive; you don't get a lot out of your system for what you put in. And having a leaky system makes matters even worse.

The energy input to an air compressor at one end of the system is much higher than what comes out the shaft of an air tool at the other end. About eight horsepower is consumed for every one horsepower of work produced by the tool. This makes the system just 10-15% percent efficient. But if a substantial amount of compressed air leaks out even before it gets to the tool, the efficiency falls even more.



Leaks like this one add to your operating costs.



Studies done by the U.S. Department of Energy (USDOE) and others show that leakage levels are typically around 20-30% of the installed compressor output. This waste can go even higher if nobody cares to find and fix leakage points in a system. Unmaintained systems can have very high levels of leakage, with some extreme cases leaking 80% of the compressor capacity.

How much is your plant leaking? That's a very good question that deserves an answer. And cupping your hand to your ear during plant production outages can lead you closer to the answer. Is your plant quiet, or does it sound like a pit of angry vipers?

In many cases, you can go to your compressor room armed with a watch and a calculator, and come up with an answer to your leakage

question in short order. If your compressor runs start/stop or load/unload, you can do a timer test to calculate the percentage of time your air compressor is loaded and producing air compared to its run time. If this test is done during a time where there is no production, the result is your leakage level in percent of the running compressor. If you know the compressor output, most compressors produce about 4 cubic feet per minute per rated horsepower. Then you can calculate the cubic feet per minute leakage rate.

How much is this flow rate costing you? Well, if you know your energy rate, you can calculate this, too, on your handy calculator. Typical air compressors will consume between 20 and 30 kilowatts per 100 cfm; for this article, let's use 25 kW/100 cfm. Then your cost will be the flow in cfm x 25 x operating hours x energy rate divided by 100.

Let's do an example calculation.

Let's say that during your test, your compressor was loaded an average

of 20 seconds and unloaded for an average of 50 seconds per cycle. This means the compressor has a total cycle time of 70 seconds. Being loaded for 20 seconds every 70 seconds means the compressor is 28% loaded. If the air compressor is a 25-hp unit with an output of about 100 cfm, the leak level would be about 28 cfm.

At 25 kW per 100 cfm, this level would consume 7 kW (25 / 100 x 28 cfm). And if you pay 10 cents per kWh and operate a two-shift operation for 4,200 hours per year, this 7 kW would cost you \$2,940 per year in extra electricity costs (7 kW x 4,200 hours x \$0.10).

If your air compressor does not load and unload, different tests may be required. More information on doing leakage tests appears at www.compressedairchallenge.org/library/factsheets/factsheet07.pdf. The easiest way to measure leaks, however, is to simply install a permanently mounted flow meter. Then you can do the test on a regular basis as part of a special efficiency measurement.

SOME MORE QUESTIONS YOU CAN ASK (AND ANSWER)

Why is my compressor cycle time so short?

Due to lack of adequate storage. In the example above, the total cycle time was 70 seconds. This means that there is only about 1.6 gallons of capacity per cfm. Best practices storage size for peak efficiency would be between 5 and 10 gallons per cfm, resulting in a cycle time of around 4 minutes, which will increase the compressor efficiency.

Does my compressor need to run at night and on the weekend?

Unnecessary compressor run time not only costs you energy, but also consumes operating hours, resulting in higher maintenance costs and reduced machine life. If you don't need compressed air during production downtimes, then turn it off! If your plant can't be shut down, then turn off the air to individual machines.

Why don't I just fix the leaks and save the money?

Very good question. It is easy to fix most leaks, and many factories find that setting up a leakage detection and repair program saves significant dollars. In some cases, it can prevent the expensive purchase of a new air compressor.

Learn more about measuring compressed air leakage at one of the Compressed Air Challenge seminars or download a fact sheet from the website library. For a schedule of events, see www.compressedairchallenge.org.