COMPRESSED AIR ENERGY SAVINGS

Thermal Mass Flowmeters Find Wasted Cash

In this era of rising energy costs and global competitiveness, compressed air waste in facilities can be a major financial drain to the bottom line. Air may be free, but compressed air certainly isn't. According to Cary Carlisle, an expert compressed air auditor and seasoned technician from Air Compressor Supply, Inc. (ACS), over a 10-year period, electricity costs make up 76 percent of a factory's operating costs. In many cases, the electricity used by a compressed air system in a factory makes up the largest percentage of an increasingly expensive electricity bill. Monitoring compressed air usage, identifying compressed air waste and inefficiencies, and making investments in new compressed air equipment are tangible ways that businesses can cut their operating costs by lowering their electricity bill.

ACS, located in Tulsa and Oklahoma City, Oklahoma, does just this. ACS is a leader in specifying and selling compressed air equipment to the manufacturing and general process industries. They are also an authorized dealer for Gardner-Denver, one of the largest air compressor manufacturers in the world. According to Carlisle, his goal when conducting his compressed air audits is "to recommend more energy efficient ways to manage his customer's compressed air system and/or to upgrade to more energy efficient compressed air equipment." Carlisle and other expert auditors can only make these types of energy saving recommendations with extremely accurate compressed air measurement data, creating a baseline of compressed air usage — including identifying system inefficiencies and detecting compressed air leaks.

If savings starts with accurate compressed air measurement data, facilities managers and auditors have an important decision to make. Which measurement technology will provide the most accurate compressed air mass flow measurement necessary to create an accurate usage profile? Gardner-Denver recommends that ACS technicians use Sierra Instruments' thermal mass flowmeters for accurate mass flow measurement of compressed air.

Using thermal mass flowmeters for their compressed air audits, ACS technicians tell their customers exactly how many dollars are silently leaking off their bottom line every year. Carlisle explains, that "over the years, through his audits, he has reported to his customers that they will save from $7,500 to $44,000 annually by improved system management and/or replacing their old air compressors with more energy efficient models—a cost saving investment with relatively short-term payback."

According to the "Compressed Air Challenge," a private-public partnership devoted to helping U.S. industry tune up its compressed air systems, "by following an action plan, end-users can reduce operating costs by 10 to 15 percent a year." (Hugh Cook, "Compressed Air Challenge," plantservices.com, 2007, p. 1)

In the past, some facilities managers and auditors have opted to use temperature and pressure compensated orifice plates to measure their compressed air mass flow rates, but thermal mass flow technology, a direct mass flow measurement technology, has key advantages that make it a much more effective technology for today's compressed air applications.

Compressed air is a "Killer Ap" for thermal mass flowmeters because of accuracy, turndown, and easy single point insertion. High accuracy of 1.0 percent of reading and large

turndown ratios are critical in assessing a facility's baseline compressed air usage. Turndown is a thermal mass flow meter's biggest asset in this application. With a true 100:1 turndown, a single Sierra meter has the flexibility to accurately measure not only high flow rates when a facility's compressed air distribution system is at full load, but to also excel at very low-end flow rates to detect costly leaks.

Conversely, orifice plates have a limited turndown ratio of 10:1. At low flows, there is a very small differential pressure gradient, so these low flows get lost in the noise of making the measurement. This limitation renders orifice plates ineffective in compressed air applications in which leak detection is critical. These very low undetected flows, or leaks, are silent cash drains that occur in compressed air systems 24/7. The goal for facilities managers and auditors is to measure and then find these leaks and fix them. It is estimated that a ¼-inch leak in a compressed air system equals about $8,000 per year leaking off a company's bottom line.

Orifice plates simply are not the technology to do this critical job of leak detection in modern, energy-efficient compressed air systems.

Since 2002, Carlisle has taken Gardner-Denver's advice and used Sierra's Model 620S Fast-Flo® Thermal Insertion Mass Flow Meter for all his compressed air audits.

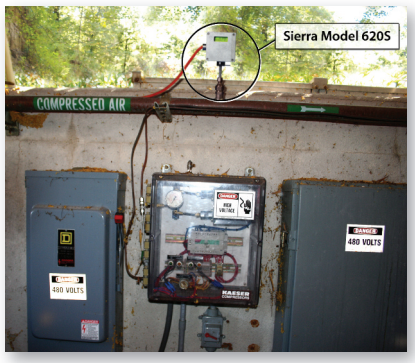
In a recent case study at two factory plants, Carlisle discovered that one plant at his customer's factory was using 30 percent more compressed air than the other at essentially the same production levels. Carlisle created a compressed air usage profile from the mass flow rates taken with his Model 620S and translated these mass flow and amperage usage rates into KW usage and dollarized the energy needed to produce the compressed air. Carlisle successfully put a price tag on his customer's compressed air usage and immediately implemented energy saving solutions.

Carlisle explains that "our competitors often assume or estimate flow rates, but with Sierra's thermal products and ACS field auditing services, we take the guess work out of something as important as a company's bottom line." For Carlisle, Gardner-Denver's recommendation to use Sierra's thermal mass meters is proving to be a good one.

Carlisle has been very pleased with the Model 620S' performance. Sierra's meters measure mass flow directly without temperature and pressure compensation. Even with changes in pressure throughout the line, thermal meters maintain their 1 percent accuracy of reading. Therefore, large changes in pressure throughout the line, which are typical in any compressed air system, do not affect the meter's accuracy. With careful calibration, thermal meters can be made virtually independent of temperature and pressure swings and maintain their accuracy over a very wide range.

Orifice plates, however, must be compensated for changes in pressure and temperature to indirectly calculate mass flow rates. Volumetric or non-compensate meters like orifice plates have a 5 to 10 percent reduction in accuracy even with small changes in operating pressure. This means that facilities managers and auditors must take compressed air measurements and compensate to get accurate mass flow rates. If the pressure is not read exactly where the meter is measuring, the converted mass flow rate will be incorrect.

For example, if the air comes out of the compressor at 120 psi, but the



pressure is measured downstream at 110 psi, there is almost 8 percent error, which looks like a leak. Even though temperature has a smaller effect on these types of instruments, a 10 degree F change in temperature will still lead to a two percent error.

These inaccurately compensated mass flow measurements of compressed air tell auditors the "wrong story," which often means they make faulty recommendations that don't actually improve their customer's compressed air efficiency.

Nothing pleases a technician more than the ease-of-use of his measurement instruments. All thermal insertion mass meters require only one pipe penetration and for Carlisle, conducting his air audits has been easy. He simply walks up to the compressed air system, inserts the sensor probe into the air line without even shutting the system down, and begins taking vital compressed air data. Carlisle has three Model 620S meters of his own and is interested in adding optional backlit display readouts and remote monitoring capability to his units. Because that want to continue to monitor ongoing savings and immediately find new leaks "many of his customers want to keep Sierra's thermal meter in their line even after his audit is completed," says Carlisle.

Sierra Instruments
800-866-0200
www.sierrainstruments.com