POWER SMART PROFILES
Manitoba Hydro

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Inco Cuts Compressed Air Demand by 50 Percent, Saves Millions

Inco Manitoba, in Thompson, has cut its compressed air demand in half, and saved $2 million in annual operating costs as well as another $3 million in capital costs.

The company achieved these results by applying concepts from a Manitoba Hydro sponsored compressed air workshop, and by acting on the findings of a follow-up facilities audit. Savings were realized by reducing leaks, lowering artificial demand, and eliminating several compressed air end uses.

Powerhouse at Inco, with compressors totalling 23 000 hp. Compressed air from the powerhouse serves the mining complex through a network of pipes 13 km long.

Bigger Not Always Better

Inco operates the second largest compressed air powerhouse in North America, with a total installed capacity of 100,000 cfm of compressed air at 100 psi.

Five large centrifugal compressors and one reciprocating compressor, with ratings from 1000 - 6000 hp, supply compressed air to surrounding facilities.

Most of the compressors were bought in the 1960s when energy was cheap and big capacity compressors were the way to go.

Inco's philosophy was to apply the brute force method of running enough compressors to supply even the largest surge. They consumed large amounts of power even when they were not needed.

New Thinking

Several years ago, despite its size, the powerhouse was not keeping adequate pressure. Further, a new mine was to be opened, which would need compressed air to run tools and equipment. A second compressed air power house was planned, at a cost of more than $2 million.

Then Inco heard of a compressed air initiative under Manitoba Hydro's Power Smart Performance Optimization Program. The turning point was a compressed air seminar in the spring of 1995, sponsored by Manitoba Hydro.

"We were so impressed by the seminar and presenter Scot Foss, an internationally known compressed air expert, that we sponsored a second seminar for more of our people," says Dave Armstrong, Superintendent of Utilities at Inco.

"Manitoba Hydro also helped support an audit of our compressed air operation. The seminar and audit made us look at our system in a different way," he says.

"For starters, we had always assumed the mine was causing our problems. We discovered it was actually the smelter."

This is a classic case, according to Rob Armstrong, Manager of Hydro's Business Engineering Solutions Group.

"Our program encourages a systems analysis approach to solving production problems in an energy efficient way.

"With compressed air, it involves analyzing end uses, improving distribution and storage, and optimizing supply equipment and controls."

"In that way, companies can better understand their systems, setting the stage for energy efficient solutions."

Focus on End Uses

An air monitoring system, already in place at Inco, proved invaluable for auditing the system to determine where air was going. It helped focus on areas with the greatest need, determine the results of changes, and identify abnormal system events.

Armed with a new understanding of its air system, Inco started addressing problems. Leaks were identified as a significant air demand, consuming more than 50 percent of total air production.

The problem was that the departments in control of managing leaks did not pay the compressor power bill.

Geoff Lamontagne, Power House Stationary Engineer, explains the solution. "Once we started metering individual users of utilities and charging them for their portion of the cost, demand dropped substantially."

Inco also started asking users to justify the air they wanted. This approach paid off in a large drop in air demand in the mines, where supply pipes to abandoned locations were still pressurized and leaking. They also eliminated most compressed air powered aspiration of flue vents, where high pressure air was used to promote air movement up a stack. Some sparging applications, where bubbles of compressed air are used to mix liquids, were also eliminated.

The focus on costs led to some surprises. "During a plant shutdown we heard noise from a pipe rack in our smelter," Dave Armstrong says. "It was coming from a 2-inch air pipe, installed years ago and left wide open to boost air flow in a low pressure pipe."

Sealing the pipe had no effect on line pressure, but it helped reduce smelter air demand by 30 percent.

Improving Distribution

With so much air flowing through the lines because of leaks, pressure drops were a concern. In some distribution lines, pressures were too low to feed the new mine. (Doubling air flow causes a fourfold drop in pressure due to friction losses.)

In one section of the facility they replaced an 8-inch-diameter pipe with a 12-inch pipe left over from another project. The larger diameter pipe delivers more compressed air where it is needed. It also stores air for more even pressure in spite of sudden draws.

This control valve lowers pressure to reduce artificial demand.

Controlling Artificial Demand

One of the key concepts introduced in the seminars was artificial demand.

Artificial demand refers to the extra air that must be produced to satisfy the flow caused by higher than necessary line pressures.

As Dave Armstrong puts it: "The higher the pressure you supply, the more air you use."

In following through on this concept, Inco found they could run the smelter at lower pressures than the mine, which required 100 psi.

"We installed a control valve between the compressors and the load," Armstrong says. "The valve lets the compressors generate air at their rated design point, for optimum efficiency. It also lowers pressure on the downstream side—one of the keys to system efficiency—and maintains a set pressure in the plant."

After installing the flow control valve, Inco started dropping pressure to the smelter by 1 psi per week. The major problem to emerge was that the mud guns would not operate. The mud guns, used to plug furnaces after a tap, required at least 85 psi to operate properly. Luckily the mud guns were ready to be replaced, and were converted to more efficient hydraulic operation. The smelter now operates at an extremely stable pressure of 83 psi, for a proportionate reduction in artificial demand.

Awesome Savings

Instead of adding a new power house, Inco met its needs for compressed air through efficiency measures.

In doing so, the company cut average air demand by about 20 000 cfm for a 50 percent savings.

Ron Marshall, Industrial Systems Officer at Manitoba Hydro, says the compressed air retrofits, as well as avoided projects since the seminar and audit, have saved Inco $1.9 million annually in electricity, water, and maintenance costs.

Of this, electrical savings add up to 30 gigawatt hours and 5.6 megawatts peak.

Inco has also avoided spending some $2 million on the new powerhouse, and another $800,000 on a rebuild of a now redundant compressor.

Since costs associated with the project were less than $100,000, payback was immediate.

"These figures reflect changes that took place simply as a result of a new awareness of the costs associated with compressed air," Marshall says.

"In Inco's case the company transferred awareness into action through the hard work and diligence of their staff. The results speak for themselves!"

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