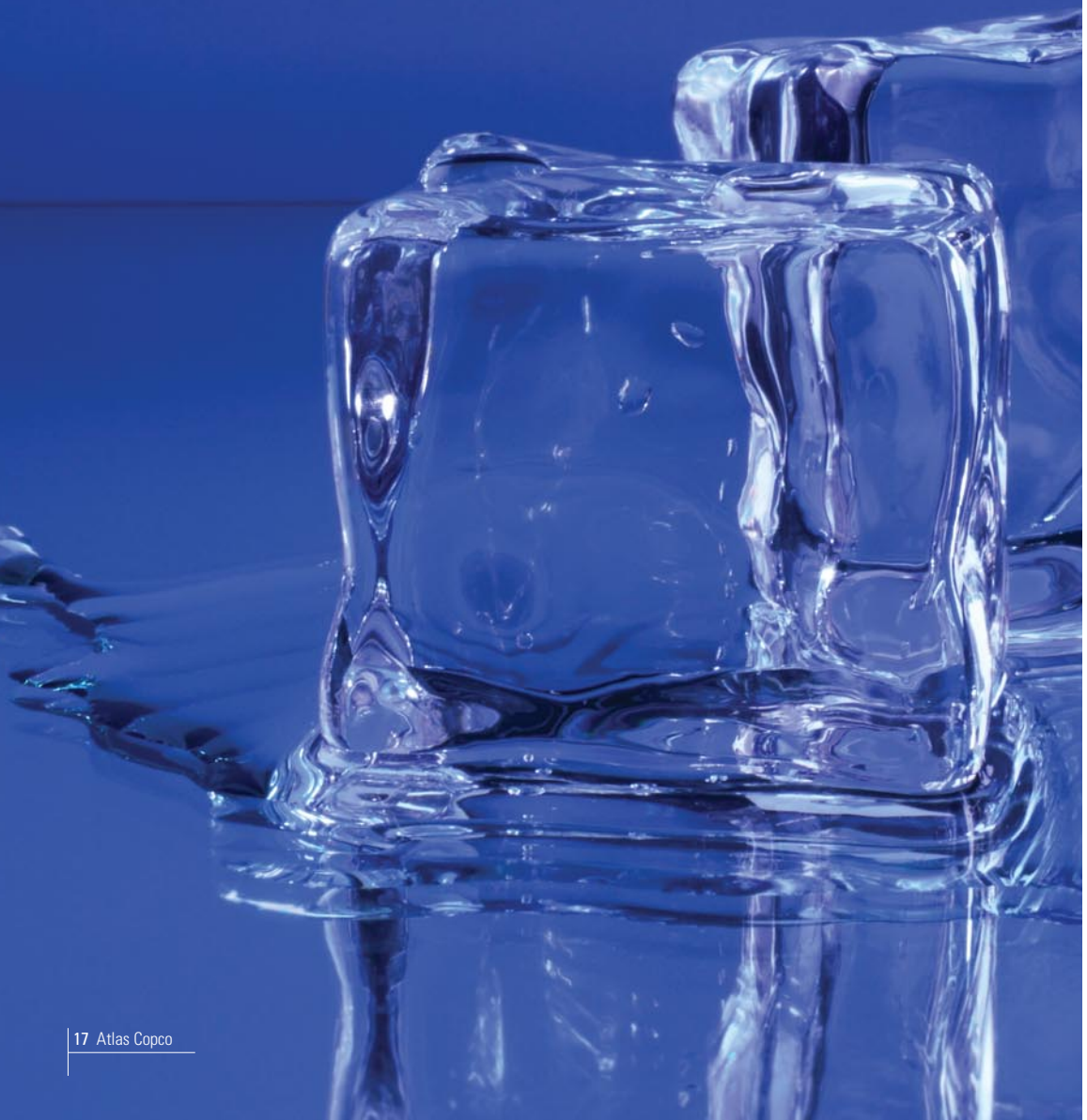
The Cool Side of Energy Efficiency

Air System Upgrades at Bally Refrigerated Boxes



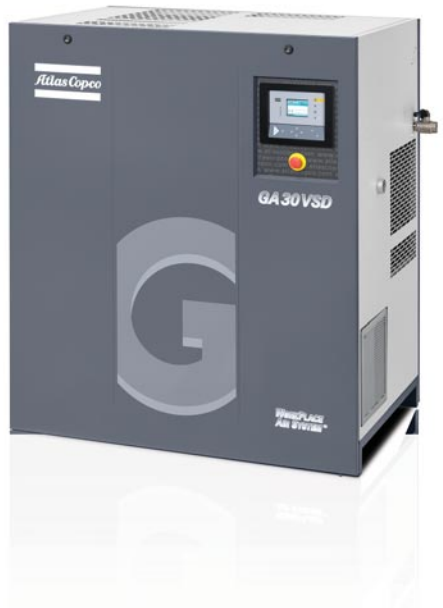
Did You Know?

The Patent Board of Global Industrial Equipment Manufacturers recognized Atlas Copco for the quality of our patent portfolio.

You probably heard your grandmother call her refrigerator the ice box. That owes to the days when food storage containers literally were boxes cooled by blocks of ice. Back in those days, Bally Refrigerated Boxes, Inc., began a business making cases and coolers in Bally, Pennsylvania. The company introduced the use of insulated refrigerated structures over seventy-five years ago, and today continues to keep things cool with an extensive range of innovative products:

- Walk-in Coolers and Freezers
- Replacement and Retrofit Doors
- Refrigerated Buildings
- Modular Structures
- Blast Chillers
- Mortuary Coolers
- Refrigeration Products

Bally has long emphasized energy efficiency in its products. It's little surprise then that the technical staff at the company's facility in Morehead City, NC, which primarily makes walk-in coolers and freezers, recently initiated an energy efficiency program. Key elements of the program included right-sizing an off-peak compressed air system, upgrading the main compressor to take advantage of variable speed drive technology and energy recovery, and reducing costs through planned maintenance over the long term.



"Our energy-saving philosophy drives us to do projects like the compressed air system upgrades," according to Ted Jennings, Facilities Manager at Bally Refrigerated Boxes. "What got us started was wanting to reduce our cost of producing compressed air during non-production times."

Jennings explains that critical systems in the plant need compressed air even when production is shut down at night and on the weekends. "We have air pads on chemical storage tanks that require compressed air, but they need a lot less air than our main compressor was able to provide cost-effectively."

What Bally needed was a compressor the right size for the task. Consider an analogy. When 40 people need to go from one place to another together, a bus is an efficient means of getting them there. When 4 people are traveling together they could take the bus, but a car is more efficient. On weekends, Bally's main compressor was essentially a bus doing a car's job.

To determine what size compressor was appropriate for the job, Randy Leath, Sales Engineer for Industrial and Oil-free Air for Atlas Copco Compressors LLC, conducted an MBox energy use profile. The MBox profile measures production of compressed air in real time over a seven day period. With hard data in hand, Leath and Jennings analyzed air demand for the plant's various processes.

"Our metal working presses, shears, stamping, and CNC turret presses require quite a bit of compressed air for operation," according to Jennings. "In molds where we inject polyurethane foam, proper expansion of that foam requires holding the mold closed to maintain dimensions. Some molds are held tight with hydraulics, others with air. The thermostat system for building climate control is on air. We also have a variety of small hand tools that are pneumatic. On the weekends our

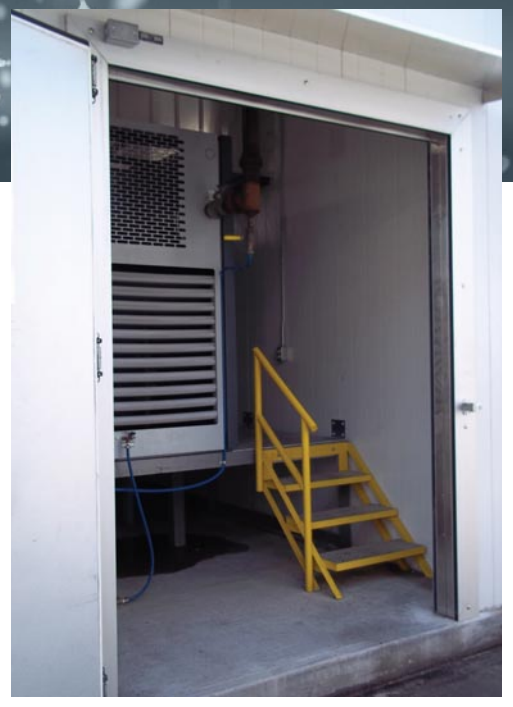
Manufacturing engineers who increase the efficiency of pneumatic processes often face an unintended consequence: an air compressor that is oversized for a process that has become more efficient. Even a compressor that is long since paid for may cost more money to operate than a new compressor properly sized for the job. Power providers frequently offer rebates to manufacturers that upgrade to new technology and payback on the investment is rapid, frequently a matter of months.

biggest air demand is for the air pad which has to be on top of our chemical storage tanks at all time."

Leath wanted to identify the air demands that may still be there nights and weekends when the rest of the plant is at 0 PSI. "The air pad application was obvious, but there were also two foam machines with their own compressors and an overhead crane system with its own compressor. With an Atlas Copco GA18 Variable Speed Drive Full Feature compressor providing air for these machines during off-peak periods, the main compressor and the dedicated compressors for the foam machine and crane don't have to operate on weekends. The GA18VSDFF provides precisely the air that's required using much less energy. Reducing the operating hours on all those dedicated compressors also helps cut maintenance costs."

Energy efficiency is especially important with compressed air because energy can account for 75% of an air compressor's total cost of ownership. "A capital investment that significantly reduces energy consumption typically pays for itself quickly," says Leath. "That was the case with Bally."

Bally's power company offered a rebate of $26,000 that covered a year's worth of energy savings and installation costs. "When you factor in our out of pocket costs of $5,445 and annual energy savings of $20,138, the



project paid for itself in less than three months," Jennings explains. "We'd have been crazy not to buy the new compressor."

About a year later, Bally experienced a catastrophic failure of their main compressor. The system switched over to a backup machine so production could continue. However, the cost to repair the main machine, which was based on older technology, made facilities managers look for better options. Randy Leath came back.

"I set up another MBox study," Leath explains. "The results showed variations in air demand throughout the daily production cycle, which is a textbook case for a compressor with variable speed drive. Bally had a couple places where they could use heat recovered from an air compressor so we started talking about energy recovery as well."

Two possibilities were evaluated. The company's production process includes molds that use hot water to regulate temperature. The differential temperature on these molds is very tight so a high level of engineering would be required to make energy recovery useful. There is also a closed loop hot water system that supplies building heat.

"Building heat offered a much bigger target with less engineering, so we chose a hot water loop for the building," Jennings explains. "The system is up and running well. We are able to get a good temperature difference in and out of the energy recovery system, from 15° to 25° depending on load on the compressor. Heat recovery is operational any time we are using the compressor and the heating system is on. It's weather dependent, but it should be operational for about four months of the year."

In addition to energy savings from heat recovery, the new compressor features Atlas Copco's Variable Speed Drive technology which saves money by matching air production to demand automatically in real time.

"Manufacturers looking at air compressor efficiency need to understand the difference between variable displacement compressors and a compressor with variable speed drive," Leath explains. "Both approaches have energy savings in mind but they go about it in different ways. Variable displacement compressors rely on three control systems to function in unison. The variable capacity valve, inlet valve and pressure switch are each controlled independently but need to be tuned for the best efficiency. Over time, the pressure settings often drift or even get stuck. This means the inlet valve can start closing before the variable capacity valve has turned back all the way, which reduces the possible energy savings. In contrast, variable speed drive adjusts the compressor's operating speed in real time so production exactly matches demand. The customer simply selects the desired pressure set points. That's it. The system is fully automatic and no tuning is required. Atlas Copco VSD compressors, like the ones Bally Refrigerated Boxes chose, use variable speed drive. Amp readings confirm that the company is realizing substantial energy savings with the switch to variable speed drive."

Commitment: *Describe the influence of environmental stewardship on decision making at Bally Refrigerated Boxes. How does "green thinking" impact your bottom line?*

Bally: *We design energy savings into the products we sell with the R value and physical characteristics of the insulating foam. Our energy-saving philosophy is also inwardly driven with projects like the compressed air system upgrades and energy efficient lighting. Chemicals are part of our process so we strive to stay ahead of the curve being responsible in terms of how we manage those products, like with our air pillows and containment dyke. In our experience, energy efficiency is a selling point for customers as well as environmental stewardship. It's great how being green and saving money fit so nicely together.*

"We carefully considered repairing the old compressor before we decided on buying a new machine," says Jennings. "We had owned it for seven years. We added up maintenance costs and considered the cost to complete the repair. That exercise actually drove us toward both a new compressor and a long-term maintenance agreement."

Bob Sommers, Service Sales Manager for Atlas Copco in North Carolina, worked with Jennings on a long-term maintenance program. "Ted Jennings asked me about a ten-year Total Responsibility proposal," says Sommers. "It's pretty unusual for a customer to ask for a 10-year plan, but Ted was able to pull service records on the old compressor so he could compare those numbers to what I was offering. Most people don't think about forecasting out for 10 years but Ted did. By being proactive he's locking in his maintenance costs for 10 years. Bally has the advantage of a well-established operation where a 10 year forward look is reasonable, but most companies can comfortably forecast maintenance for 2 to 5 years."

"We found ourselves in the undesirable position of facing a catastrophic failure," says Jennings, "and we didn't want to do that again. When we considered the cost of Atlas Copco's 10-year Total Responsibility Plan as proposed by Bob Sommers, it was about the same as we'd spent the past seven years, so we're getting an additional three years of value for the same cost. We will be way ahead of the game compared to our other situation. It's a fixed cost that we can budget so we won't get hit with a large bill in any given year. It also will include a compressor overhaul during the plan term."

One aspect of this project that sets it apart is the location of the new GA90VSD compressor. "We located the compressor inside of a Bally Box," Jennings explains. "We wanted to elevate the compressor to guard against drainage issues that we can get during hurricanes, so we built a stand and then built a Bally Box around it. It's vented and ducted and there's a door for security and access. The enclosure turned out great and it's made entirely from things we fabricate in-house."

Not every manufacturer will have the opportunity to utilize its own products like Bally when installing a new compressed air system. However, most can improve energy efficiency significantly as Bally has done by right-sizing compressed air production, recovering and reusing heat energy, utilizing variable speed drive technology and nailing down maintenance costs for the long term.

Project: isolate off-peak air production with GA18VSDFF compressor

- *Power company rebate amount for the GA18VSDFF compressor – $16,333*
- *GA18VSDFF project cost (out of pocket to Bally) – $5,445*
- *Annual energy savings – $20,138*
- *Payback period – 0.27 years*

Project: upgrade to GA90VSD compressor with Energy Recovery

- *Annual energy savings – $5,676*
- *Annual building heating savings from Energy Recovery – $2,033.*
- *Payback period for the Energy Recovery system alone – 3 years (Figure takes into consideration the recent switch from propane to natural gas which cut heating cost by 60%. Payback period increases with a lower-cost heat source).*

Learn more about Bally Boxes:

www.ballyrefboxes.com