

November / December 2007

## COMPRESSED AIR

# BEST PRACTICES



A photograph of a blue NASCAR race car mounted on a large industrial test rig in a factory. The rig is a complex piece of machinery with various pipes, hoses, and electrical connections. A man in a white shirt is sitting at a desk in the foreground, working on a computer. The background shows a large industrial facility with high ceilings and various pieces of equipment.

## Air Treatment & Chillers for NASCAR

INDUSTRY PROFILES:

**Aerzen USA**

**John Henry Foster Minnesota**

*Illustration: Motivair Corporation and Haas Racing*

**BEKO'S 25TH ANNIVERSARY**

# AUDITING FOR ENERGY SAVINGS WITH JOHN HENRY FOSTER MINNESOTA

## History

Since 1938, John Henry Foster Minnesota Inc.™ (JHF) has promoted a progressive culture by seeking opportunities for cutting edge technology and providing clients with exceptional value. Many of our employees have been with us for two to three decades. These employees have grown with the company and have acquired tremendous knowledge and experience over the years to address customers' needs. Because employees at JHF are trained and practiced, we can obtain results. Dedication in taking care of our employees and providing clients with first-class service has been part of JHF for nearly 70 years.



Ron Nordby from John Henry Foster Minnesota

## Differentiators

The John Henry Foster Minnesota mission is to offer consultative sales versus commodity selling to our clients. By providing both capital equipment and pneumatic components consultatively, we have the ability to partner with both the supply side and demand side of compressed air systems. JHF is a leader in providing innovative solutions and consistent value to customers with this sales process and technical development. JHF is one of very few firms in the country that is structured to work with both sides of compressed air and has since the firm's beginnings. Industries in the 1940's were smaller and companies could sell both, but today companies either focus on one or the other due to difficulties in training staff and manufacturers who tend to team with distributors, who focus in their area of expertise.

We anticipate industry drivers of our customers to be the exclusive provider by bundling our services into a single point of contact. By anticipating the needs of customers, JHF has expanded and further explored new areas, such as fluid cooling and vacuum markets. Another application we now focus on is identifying energy saving opportunities for clients, or an Air System Audit. In order to gather the appropriate information to complete an analysis, we work with both ends of the compressed air system; the supply of air and the use of air. Working with each touch point to find energy loss, JHF can determine corrective actions and opportunities on both the production floor and the compressor room. JHF was one of the first distributors in the country involved in Air System Audits; we created and designed our own equipment, wrote analysis software and customized electronic control and monitoring equipment — another example of our innovation and resourceful approach.

John Henry Foster Minnesota also brings this resourcefulness to our mobile service agreement program and differentiates us from other providers. This service increases our market share by allowing our expertise to be brought directly to the customers' air compressor rooms and plants, enabling us to deliver a short response time to problems, installation support and preventative maintenance. We are also providing a local presence to the communities that we serve.

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## Air System Auditing to Reduce Energy Costs and Environmental Impact

### INTRODUCTION

A large Midwestern packaging firm in business for more than 70 years providing corrugated containers to a wide range of industries, use compressed air to run their corrugators' glue unit, offering just-in-time solutions to help customers keep their packaging costs to a minimum.

The packaging firm built a state-of-the-art facility in the 1990s to accommodate their growing business. While it served them well over the past decade, they were looking for new ways to improve their plant's efficiency and reduce their environmental impact. The firm decided to replace an existing glue unit, which was operating at less than full capacity. Their purchasing group went to Xcel Energy to explore rebate possibilities offered through the Compressed Air Efficiency program.

### ACTIONS

John Henry Foster Minnesota was hired to analyze their entire compressed air system, offering a bigger picture of the opportunities for improvement in their system, and enabling them to choose the improvements that would make the biggest impact on their bottom line. The study revealed energy being unnecessarily lost throughout their system. It was running at a high operating pressure, which caused significant amounts of blow off as a result of artificial demand; plus, the existing dryer ran continuously and the unit's drains were slowly but constantly leaking air.

### SOLUTIONS

John Henry Foster Minnesota's efficiency study enabled the plant managers at the packaging firm to see precisely how their compressed air system was operating and provided them with an action-plan to improve it. The new air compressor unit the packaging firm had been considering was actually oversized for their needs, so they decided instead to install a 200 horsepower, variable speed compressor, along with a 1,200 SCFM cycling dryer. The variable speed compressor and cycling dryer reduced the amount of energy used during production, while the addition of no-air-loss drains eliminated the leakage from the former drains. A new demand receiver, pressure controller and mist eliminator allowed the overall operating pressure to be reduced, saving thousands of dollars per year in operating costs and also extending the life of the equipment.

### BENEFITS AND RESULTS

The new equipment matches load to demand, dramatically reducing losses from blow off and leaks. Less than a year after making the improvements, the packaging firm has seen significant savings on their electric bills, as well as improvements in their plant's response times and ability to serve customers in the most cost-effective manner. The new system also reduces the amount of downtime needed for maintenance, troubleshooting and repair. The packaging company is now on track to save over \$20,000 annually on electric costs, which offsets their system investment in about four years when factoring in the rebates provided by Xcel Energy through their Compressed Air Efficiency program.

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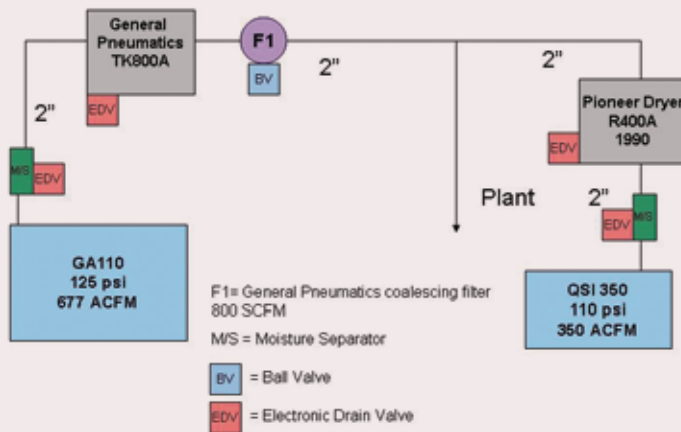
# AUDITING FOR ENERGY SAVINGS WITH JOHN HENRY FOSTER MINNESOTA

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## Current Layout

### Plant Air Demands

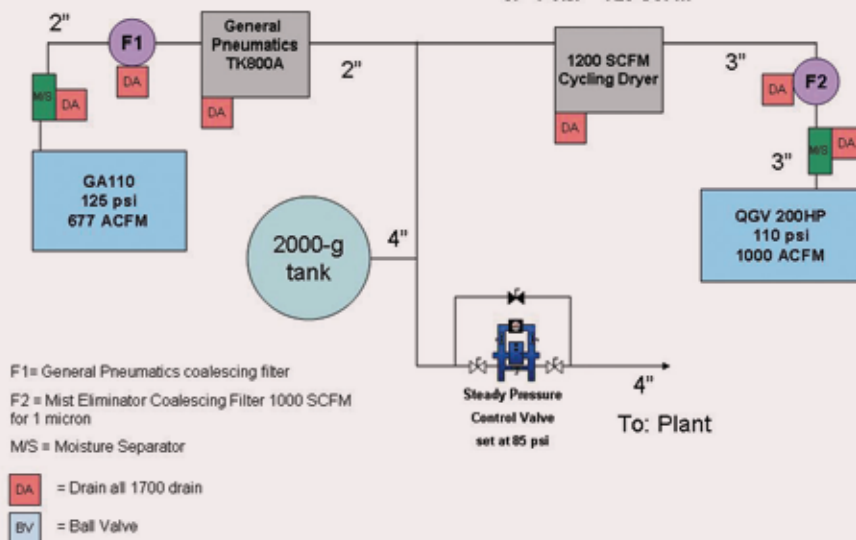
1. Demand (production) – 825 SCFM
2. Demand (non-production) – 335 SCFM
3. Peak – 910 SCFM



## Proposed Layout

### Plant Air Demands

1. Demand (production) – 625 SCFM
2. Demand (non-production) – 220 SCFM
3. Peak – 725 SCFM



## Auditing Air Compression and Fluid Cooling Processes

### INTRODUCTION

A large printing company retained John Henry Foster Minnesota to perform a dual audit to evaluate and maximize their air compression and fluid cooling system processes.

### CURRENT OPERATIONAL STATUS

#### Fluid Cooling System

The fluid cooling system consists of four 100 ton chillers, a 120 ton chiller, three 160A dry coolers, one APV Heat Exchanger and five condensers for the chillers. The chillers are used for both process cooling and industrial cooling in the mechanical room. Process load consisted of providing 58°F water to cool the printing presses, while the industrial load also involved the cooling of air compressors, vacuum pumps and refrigerated air dryers. The total cost to run the fluid cooling system for industrial cooling was \$62,000 annually in electrical costs.

#### Compressed Air and Vacuum System

The compressed air and vacuum system consisted of five 150 hp rotary screw air compressors. Three of the five compressors were modulating and two were variable displacement compressors with networking capabilities. The vacuum system included four rotary screw vacuum pumps. While there was some compressed air and vacuum used in the web-based press operations, the majority of the demand existed in the stitching and binding areas. The average flow during week-day production is 2460 cfm with maximum of 2827 cfm, while plant pressure swayed from 88.8 to 113.5 psi with an average of 98.1 psi.

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## CHALLENGES

The intent of this study was to evaluate the efficiency of the existing air compression and fluid cooling systems, and provide recommendations to improve performance, reliability and efficiency. The JHF air systems audit produced two design challenges.

### Fluid Cooling System

For the fluid cooling side, the issues were a lack of chiller capacity, a needed reduction in operating costs and an increase in overall system reliability. Chiller capacity was completely utilized and with the new installation of a printing press, an additional chiller would be required. This would not only require a capital expenditure of \$300,000, but also result in additional operational and maintenance costs. With the compressed air, vacuum systems and printing operations dependant on chilled water for cooling, a failure in the chiller system would result in a partial shutdown in all plant production areas.

### Compressed Air System

The compressed air system has an adequate capacity albeit operating at an inefficient level. Without the benefit of demand storage and regulation, the plant suffered from wide pressure fluctuations of approximately 25 psi. This created the need to maintain a high operating pressure on the system resulting in higher than necessary air leakage, artificial demand and operational costs. Also, without the benefit of a central control system, the compressors were not being controlled efficiently; thus resulting in higher than necessary pressure levels and the inability to effectively match horsepower to demand.

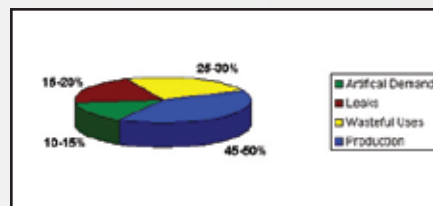
## SOLUTIONS

### Fluid Cooling System

After performing the fluid cooling audit, it was determined that the compressed air and vacuum systems could be separated from the chiller system. By sizing the coolers on all industrial equipment to handle warmer water (up to 105°F), JHF suggested installing a dry cooler system that would not only operate the compressed air and vacuum systems effectively, but also do so without utilizing trim water. This resulted in the customer removing 120 ton of online chiller — more than enough to accommodate the new printing press.

### Compressed Air System

Data from the compressor air audit not only verified that no additional compressed air capacity was needed, but also identified areas to increase system efficiency. It was determined that by proper utilization of demand storage and regulation, we could effectively reduce the plant pressure from as high as 113 psi to a maximum of 88 psi, thus eliminating the wide pressure fluctuations. The audit also provided the information needed to justify the application of a flow/pressure based centralized compressor controller to efficiently match demand to compressor online horsepower. With this information, the compressed air system was designed with 3,000 gallons of storage as well as demand regulation and a flow/pressure based centralized compressor controller.



## BENEFITS

### Fluid Cooling System

The addition of the dry cooler resulted in the customer removing 120 ton of online chiller — more than enough to accommodate the new printing press operation. This eliminated the need for an additional chiller and saved \$300,000 in capital expenditures as well as additional operating and maintenance costs. With the projected new fluid cooling system in operation, the plant could save over \$53,000 annually with a capital investment of \$273,604. With a rebate of \$75,628 from Minnesota Power, the payback for the project is under four years.

### Compressed Air System

The compressed air system costs approximately \$190,515 annually in electrical and maintenance costs. With the appropriate modifications JHF suggested, it is expected to save over \$34,000 annually with a capital investment of \$78,977. With a \$29,556 rebate from a local utility to purchase the needed equipment, the return on investment in 1.4 years should be realized.

## RESULTS

The air compressor and fluid cooling audit resulted in significant savings to the facility's total operating cost.

Fixing tagged leaks in the system, utilizing rebates for purchasing needed equipment, adding dry storage tanks, a steady pressure control valve, flow/pressure based compressor controller and drains all contributed to providing maximum performance efficiency and desired reliability.

## AUDITING FOR ENERGY SAVINGS WITH JOHN HENRY FOSTER MINNESOTA

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### *Pros and Cons of Selling Pneumatics and Compressed Air Systems*

John Henry Foster Minnesota provides an infrastructure to support its sales professionals, who are educated, trained and focused in both arenas. We also have a technical support system consisting of teams of specialists in pneumatic component and capital equipment applications. These professionals range from master electricians, mechanical engineers, electrical engineers, service coordinators, mechanics and piping experts. JHF has a significant advantage over companies that have one-sided representatives, as this infrastructure allows the flexibility to present and address the complete system from design through implementation, thus being involved with the entire client organization including; machine design, engineering, planning, production and plant management. Clients need their systems to function properly and reliability is vital to their production floors. Due to downsizing, clients do not always have the expertise to handle the systems. Their jobs usually depend upon the systems running continuously. Downtime results in lost revenue, quality control issues, product recalls and diminished speed to market. Our strategic process brings additional value to the client by limiting their need to outsource costly expertise to administer the entire system.

One drawback to the structure of providing consultative sales in a full-service environment is that it forces our sales professionals to be knowledgeable and educated in both applications and products. We compete with one-sided representatives, which increases demand on our product knowledge. For a sales professional to become self-sufficient and profitable, it takes five to seven years of training and experience.

Clients that purchase air compressors for the supply side of the business typically have long periods of time before an upgrade or repurchase. Since we are a full-service organization and pneumatic components are a consumable product, our sales professionals have the ability to utilize that time to work with the clients to fulfill their pneumatics and fluid power needs. This allows for continued contact and relationship building with the client; therefore we are then aware of the client's growth and expansion plans. John Henry Foster Minnesota is based on creating partnerships with clients and as their business needs change, we align to bring new solutions.

### *Market's Served*

John Henry Foster Minnesota is involved with virtually every industry since motion control technology and power generation is used in some form in industrial applications. The typical company JHF services ranges from smaller mid-sized industries to Fortune 500 companies. The industry type is very diverse, such as agricultural and meat processing plants, to large industrial manufacturers, such as hospitals and printing facilities.

### *Conclusion*

For more than 70 years, John Henry Foster Minnesota has been the Midwest's leading air compressor systems distributor and service provider. The JHF teams of air automation experts bring customized client solutions in consistency, reliability and profitability. We demonstrate the latest trends in world-class compressed air automation, air compressors, pneumatic components and electrical controls, plus 80/20 aluminum framing systems.

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