John Henry Foster

SATELLITE

Your knowledge warehouse for the compressed air industry

FALL 2011

INTRODUCING CAMERON PLANT AIR CENTRIFUGAL COMPRESSORS

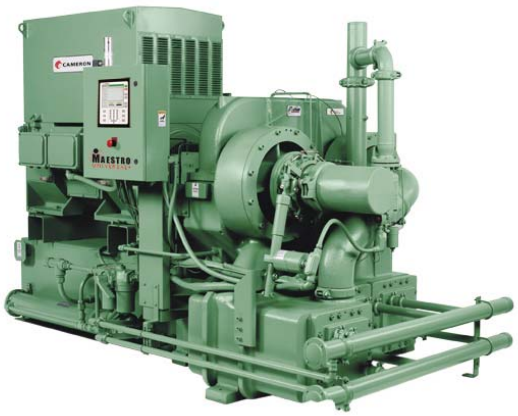
By Ron Nordby - Vice President, Sales & Marketing

John Henry Foster is pleased to announce the addition of Cameron's Turbo-Air® (TA) Series Compressors designed specifically for plant air applications.

TA compressors offer outstanding performance and design flexibility for plant and process air applications such as food and beverage, automotive, pharmaceuticals, electronics, and general industrial facilities. Cameron's commitment to delivering cutting-edge solutions in the centrifugal compressor market over the past 50 years has made them a leading competitor in today's industry. They offer the most advanced package available for easy, low-cost installation and operation. Integral gear centrifugal compressors offer significant advantages over outdated, less efficient and more costly designs.

KEY ADVANTAGES:

- **100% Oil-Free Air** – Ensures the highest quality of compressed air and eliminates expense and maintenance requirements associated with oil-flooded technologies.



- **Simple Installation** – Complete package design including coolers, controls, drive motor and lubrication system with minimum external connections.
- **State-of-The-Art Controls** – Easy-to-use, totally automatic operation incorporating the most advanced control system technology for improved efficiency.
- **Compact Design** – No other compressor can match the minimum floor space requirement of the TA series centrifugal.
- **Reliability** – State-of-the-art hydrostatic unlimited life pinion bearing design, no wearing parts and non-contact air and oil seals result in unparallel reliability.
- **Reduced Maintenance** – Long life lubricant, few consumable parts and easy access to all serviceable areas reduce maintenance costs.
- **Efficient Operation** – Excellent part and full-load efficiency with true unload capability results in the most efficient oil-free compressor design at all load levels.

To complement the world class design of their plant air products, Cameron also offers an industry leading 5-year air end warranty. This combination of innovative design, along with an added protection warranty program provides assurance that your investment is fully protected by John Henry Foster and Cameron.

To support your productivity and efficiency needs with this innovative product, please contact us at 651.452.8452 or visit www.jhfoster.com.

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Control Storage

One of the most misunderstood concepts in a compressed air system is control (wet) storage

By Ron Nordby - Vice President, Sales & Marketing

When evaluating a compressed air system and the proper application of storage, one of the most misunderstood concepts is control storage. It is often referred to as wet, primary, or in some cases demand storage; however, the term control storage is more reflective of its main function - to maximize the effective operation of the compressor control. For the purpose of this article, I have limited the definition of control storage to; any storage created between the air compressor discharge and before any cleanup equipment, i.e. filters and air dryers. While one can argue that control storage shares some commonality of purpose with the more commonly applied demand (dry) storage (storage created after cleanup equipment and before demand regulation), it differs in the location of the storage and its functionality. It is not that unusual in compressed air system design to integrate both control and demand storage taking into account the primary function of both.

While control storage was originally an integral component of a reciprocating air compressor installation, this article will only briefly explore that application. The content of this article will focus instead on rotary screw installations since the rotary screw air compressor has essentially replaced the reciprocating as the compressor of choice in industrial applications. It should also be noted that in compressed air systems where reciprocating and rotary screw air compressors are operating together, control storage should always be utilized.

The reciprocating air compressor, up until the 1960's, was the air compressor of choice and utilized extensively in general industrial plants. Control storage was always an integral part of a reciprocating air compressor installation; whether it was a tank mount configuration for 25 hp or smaller units, or a stand-alone vertical or horizontal configuration for larger hp.

Typical Supply Side Diagram

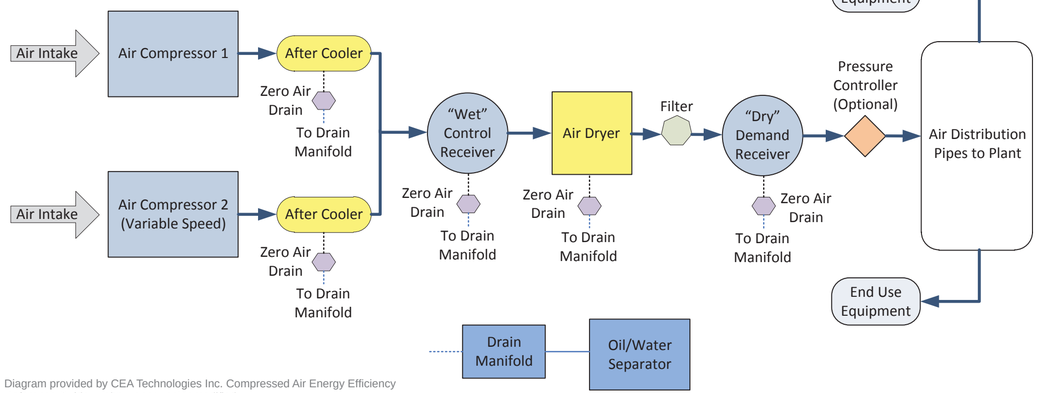

Diagram provided by CEA Technologies Inc. Compressed Air Energy Efficiency Reference Guide. John Henry Foster modified.

Three main reasons determined why control storage was always used in conjunction with reciprocating air compressors:

- Reduce the pulsations from the compressor discharge
- Provide condensate removal through condensation and settling
- Eliminate short cycling of the compressor controls

Starting in the 1960's with the universal acceptance of rotary screw technology (both oil-flooded and oil-free), the reciprocating air compressor has virtually been replaced within the general industrial market. The demise of the market for reciprocating air compressors has led to a misunderstanding of when and how to apply control storage. This lack of understanding seems to have coincided with two major advantages inherent in rotary screw design - the elimination of pulsations at the compressor discharge and the development of alternative control schemes such as modulation, variable displacement and variable speed.

Over the last 30 years, there has been a perception that control storage is no longer required, as its function has been replaced by the flexibility of the modern compressor controls. Therefore, the question becomes "Is control storage an outdated concept?" The answer is no, control storage is not an outdated concept; however its role has become more application specific. The discussion now becomes "Where should control storage be applied and is it a required component of an air compressor system regardless of control type?" While there is not a clear yes or no answer, there are a few general principles that can be applied when taking into account the four basic types of compressor controls offered on rotary screw air compressors:

- Modulation Control
- Load/No Load Control
- Variable Displacement
- Variable Speed Drive (VSD)

MODULATION CONTROL

Rotary screw compressors with modulation control do not necessarily require control storage. While modulation control is not the most efficient control at partial compressor loads, its smooth control reaction to changes in compressor load minimize the need for control storage. The only exception would be very low demand loads, where the compressor would operate for a sustained period of time outside of the modulation range. It should be noted that in reality this is a very uncommon occurrence.

LOAD/NO LOAD (ON-LINE/OFF-LINE) CONTROL

Load/no load (also referred to as on-line/off-line) control, which is predominant in oil-free and some manufacturers of oil-flooded rotary screws, does require control storage. Without the proper amount to control storage, the short cycling of the controls will occur causing premature wear and failure of the compressor control system. This is exhibited in rapid loading and unloading of the air compressors at less than full load conditions, sometimes misdiagnosed as a high load condition. Most of the load/no load controls are set at a 7-10 psig differential, which is monitored at the compressor discharge. When a load/no load compressor is piped into a compressed air distribution system, the control differential of the air compressor is reduced by the pressure drop across the clean-up equipment. Essentially any pressure drop created by filters, dryers and piping will subtract from the controls differential. This could easily result in a true controls differential of 2-7 psig instead of the normal 10 psig and result in a short cycling in the compressor controls. Properly applied control storage will create a buffer between the sensing point of the compressor controls and clean-up equipment providing time to smooth out the compressor controls reaction. Optimally, a control storage ratio of 3-5 gal./cfm output is recommended.

VARIABLE DISPLACEMENT

Variable displacement controls are similar to modulation in the fact that as long as the plant load stays within the operational range of this type of control, then control storage is not necessarily required. However, it needs to be understood that the control range of a variable displacement control is narrower than that of a modulation control. Variable displacement control will only operate at loads of 50% or higher. Below 50%, the compressor operation will revert to a load/no load or modulation control. Should the compressor operate below the 50% level, control storage (3-5 gal./cfm output) should be applied.

VARIABLE SPEED DRIVE (VSD)

Variable speed drive controls are also similar to both modulation and variable displacement in that as long as the compressor operation is within the operational range of the VSD, a case can be made that control storage provides little benefit. As with the case of the variable displacement control, the operator must be aware of the turndown capability of the VSD, which can vary from manufacturer to manufacturer and even within models of a manufacturer's product line. If the compressor operates below the turndown range of a VSD compressor, then control storage should be applied (3-5 gal./cfm output).

The rational of utilizing control storage solely as a liquid knockout tank on compressor control schemes that otherwise would not normally require control storage is problematic. In order for control storage to be effective in condensate removal, sufficient cooling and a reduction in velocity of the compressed air would have to take place. While some condensate will be discharged from the system at this location, if the sole function is just condensate removal, the cost of high quality separators and condensate drains on the compressor would be more effective and will produce a much better ROI.

As is the case with all types of storage, knowledge of the compressed air system is required to maximize the value it would add to a compressed air system. Without application knowledge, the benefits of storage can

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The role of control storage is more application specific than 30 years ago. The question you should be asking today ....

Where should control storage be applied and is it a required component of an air compressor system regardless of control type?

be greatly compromised. Control storage is a tool that can significantly improve the reliability and operation of an air compressor system, but needs to be properly evaluated.

It is not possible to cover all the aspects regarding the application of control storage within the contents of this article. There are other specific applications that can arise in the design of compressed air systems that may require the use of control storage. For questions concerning control storage or any other types of storage and related applications, please contact us at 651.452.8452 or visit www.jhfoster.com.

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Case Study - G3 Ethernet

Ethernet is an open architecture, high-level communication network

By Brian Antony, Account Manager

A leading manufacturer of custom automation and high-precision specialty equipment contacted John Henry Foster (JHF) to assist in the redesign of an existing printer plate insertion machine. The goal was not only to increase reliability, but to simplify and speed up the production capability of their current product offering.

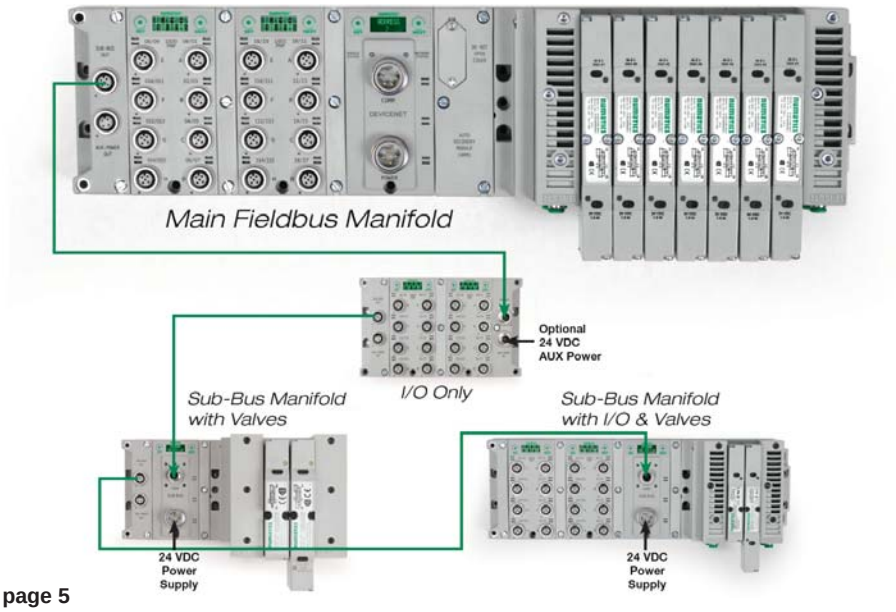
CHALLENGES

Printing processes, such as offset lithography, use printing plates to transfer images to paper or other substrates. Printing facilities are very interested in equipment that not only prints faster, but also decreases the machine's setup time when changing plate size. In the past, this was a very time consuming process resulting in higher printing costs. After thorough review of the current machine operation, automation specialists from JHF concluded that the primary issue revolved around the varying thicknesses of the existing printer plates and the need to apply consistent pressure regardless of thickness. These varying thicknesses resulted in a load resistance that was not consistent and would ultimately result in inaccurate positioning.

SOLUTIONS AND BENEFITS

After reviewing possible solutions, two types of components were identified – electric and/or pneumatic.

Next-generation electronic platform allows easy access to connections and is simple to assemble, install and maintain.



Since each option had its advantages, JHF determined that a combination of both pneumatic and electric components would be able to address all the issues in a cost effective and simplified fashion. In order to achieve the goals of the project, the new approach would require the control and monitoring of all the individual components including 40 pneumatic actuators, 8 electronic regulators and 80 sensors with cables. The magnitude of the design dictated the need for an Ethernet capable open architecture, high-level communication network that provided high-speed, high-throughput capabilities with built-in flexibility.

It became obvious that the only solution able to accommodate the high level of control and flexibility required, would be through the application of G3 Ethernet Fieldbus technology. The G3 air valve technology with its high level of diagnostic and control capability, along with the modular design and advanced wiring concept, would successfully integrate both the pneumatic and electrical requirements. A G3 fieldbus valve stack consisting of 28 solenoids, 40 input connections, 40 output connections, 8 analog communication ports was selected. Key features of the G3 Ethernet Fieldbus technology is the built-in plug-and-play wiring concept and multiple monitoring screens that incorporate built-in digital diagnostic capabilities. These features greatly simplify the design and reduce overall set up time.

RESULTS

The G3 valve technology exceeded all expectations of the redesign project. The advanced control and monitoring capabilities made it possible to increase production rates and simplify the operation, resulting in reducing operational costs along with increased reliability and quality improvements. Additional benefits of the G3 valve technology included the flexibility to allow for future modifications and enhancements necessary to meet the demands associated with high performance requirements within the printing industry.

For further information regarding G3 valve technology, please contact us at 651.452.8452 or visit www.jhfoster.com.

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John Henry Foster (www.jhfoster.com) is dedicated to serving our clients with the most cutting-edge products available on the market today. With over 70 years of experience, we are one of the Midwest's leading compressed air systems distributors and service providers and are uniquely qualified to assist our clients from design to build. We provide both capital and pneumatic components consultatively, allowing us to partner with both the supply and demand sides of compressed air systems.

Our team of experts provides customized solutions that impact our clients' consistency, reliability and profitability, while continuing to demonstrate our knowledge of the latest industry trends and solutions. Headquartered in Eagan, Minn. with a facility in Fargo, N.D., John Henry Foster employs over 75 technical, service and professional staff.

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In the News!

Please join us at one of John Henry Foster's upcoming sponsored events.

Fluid Power & Pneumatics Product Display Luncheon

Our commitment for excellent customer service and product knowledge is the reason we have developed Product and Technology Luncheons. Since time is valuable, we bring the latest products and innovative system technology right to your local area. We've built our reputation marketing only premium quality industrial-grade compressed air system equipment, components, and accessories. Whether you're planning to buy cylinders, valves, fittings, or other pneumatic equipment, take full advantage of our compressed air system expertise for all of your needs. Maximizing your efficiency can result in a positive impact on your bottom line.

Our luncheons highlight how to:

- Keep you current on the latest products and technology.
- Save you time and money with our industrial–grade systems and components.

We provide:

- An informal, two-hour session with complimentary lunch buffet.
- Technical experts available to answer questions regarding Compressed Air, Fluid Power Components, and/or Service Maintenance and Training.

JHF will be at MinnPack on Nov. 2-3. Booth 325! We'd love to see you!

11/16/11 Mason City, IA – Clarion Inn Hotel
11:00 a.m. - 1:30 p.m.

11/17/11 Mankato, MN – Best Western PLUS Hotel
11:00 a.m. - 1:30 p.m.

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