Compressor Works™

ACI Services, Inc.

Volume 11, Issue VII

December 2007

Modern Replacements for Old Valve-In-Head Compressor Cylinders

ACI Services has introduced a new line of modern cylinders to replace old valve-in-head cylinders. Common from most OEMs before the 1970s, valve-in-head cylinders, as shown in Figures 1 and 2, featured a three-piece design having large vertical joints with both gas and

Figure 1

Figure 2

coolant passages running through them. The three cylinder sections are held together with multiple large bolts that must by tightened properly to provide the prescribed crush on the large flat gasket in each joint as shown in Figure 3. In

Figure 3

some designs, many of the fasteners are very difficult to reach, making it difficult to properly torque them as shown in figure 4. In many cylinders, some of the fasteners can only be accessed though the valve pockets.

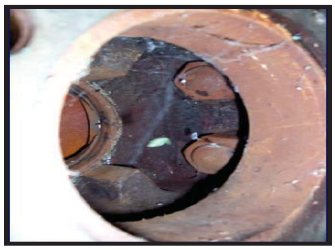


Figure 4

With the ban of asbestos gaskets in the early 1970s, many of these cylinders have been leak-prone, creating environmental and safety issues for the plants in which they are installed. Unless properly sealed, gas can leak into coolant, coolant into gas (with low pressure systems), and both gas and coolant can leak into the compressor station or the atmosphere. Some OEMs derated the MAWP of the cylinders after they were introduced, leaving a user stuck with less pressure capability than originally intended.

ACI Services has designed standard replacements for many of these old, unsafe and maintenance "unfriendly" cylinders. With its extensive successful experience, ACI can design a custom replacement cylinder for essentially any existing cylinder model. The modern valve-in-barrel design is a bolt-in replacement for the original cylinder, so that mounting, bottle flange connections, and supports do not have to be changed. An example is shown in Figure 5, showing the new cylinders installed before final painting to match the original components that were reused. The ability to reuse existing parts greatly reduces the cost and time for cylinder replacement.

Figure 5

The valve-in-barrel design improves reliability and safety by completely eliminating the large, flat gasketed joints and most of the fasteners. Fewer fasteners and elimination of the large, flat gaskets mean less labor, downtime and maintenance frustration. The new cylinders greatly reduce the risk of gas and coolant leaks, making them safer and environmentally friendly.

In many cases the replacement cylinders provide a higher MAWP rating than the old cylinders, depending on the rating of the main connecting flanges. Usually, the cylinders can be designed to utilize existing compressor valves, unloaders, rod packing and other components, reducing the cost of conversion and preserving the value of user spares inventory.

Please contact ACI to identify how to improve your compressor stations.

Inside this issue:

Look for ACI at these Events in 2008:

January 30-31 Gas Electric Partnership; Houston, TX

February 26-28 Gas Compressor Association Expo; Galveston, TX

March 3-5 Gulf South Rotating Machinery Symposium; Baton Rouge, LA

April 22-23 The Gas Compressor Institute; Liberal, KS

May 13-15 Eastern Gas Compression Roundtable; Coraopolis, PA

June 10-12 Global Petroleum Show; Calgary, AB Canada

September 8-11 Turbomachinery Symposium; Houston, TX

October 6-8 Gas Machinery Conference; Albuquerque, NM

Avoid Performance Surprises with New Compression

When specifying new unit performance requirements, buyers can benefit by requiring a detailed, full-map review of the proposed unit's performance across its entire operating map to clearly identify that unit's potentials and shortcomings.

Great things are done when men and mountains meet—William Blake

A full-map review does require some effort since millions of prospective operating points are calculated. Nonetheless, the results can be effectively reduced to concise and manageable sets of plots, tables, and charts. A thorough review should cover all load steps, a sufficient number of speeds, various suction temperature combinations to each stage, and sufficient combinations of suction and discharge pressures. Failure to fully cover the expected operating map can lead to missed areas of unsafe operating map, failure to realize a unit's full potential, forcing overly complex performance algorithms in control panels, etc.

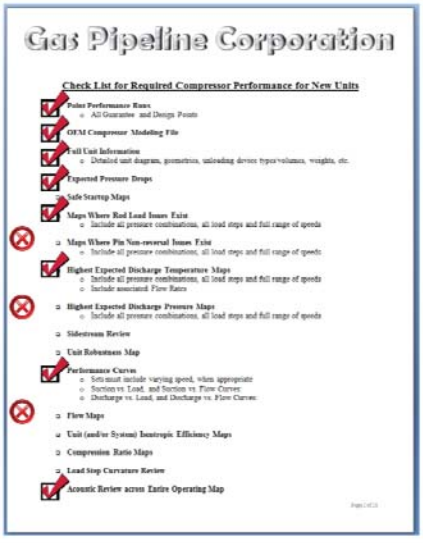
The most significant reason for requiring a full-map review is to make sure that the unit being purchased can operate safely and effectively across the pressures and flow rates expected from it. A few additional hours of effort by the packager to review the full map can save the end-user from years of being stuck with a misapplied compressor. As such, it becomes prudent to require a full-map review during the initial bidding process, and another one after the final unit configuration has been selected.

Some of the critical topics that need to be covered via a Full Performance Review are:

- Guarantee/Design Points
- Compressor Modeling Files
- Hardware Disclosures
- Effects of Attenuation Devices
- Automation Complexity
- Performance Curves
- Rod Load Violations
- Pin Reversal Violations
- Safe Startup Maps
- Flow Maps
- Compression Ratios
- Pressure Drops
- Discharge Temperatures
- Sidestreams
- Interstage Pressures

ACI Custom Designed Cylinders can make compressors more efficient, increase revenues, and reduce fuel usage.

Fortunately, a document already exists that can help end-users identify what performance requirements should be required from bidding packagers/OEMs. Released in 2007 as an article in *CompressorTech*[Two] and mentioned at the GMC 2007 in the New Technology Updates, "Specifying Required Performance when Purchasing Reciprocating Compressors" serves to identify and explain various types of reports, plots, graphs, tables and point performance runs that are useful for determining unit potentials across a defined operating map.


Gas Pipeline Corporation

Check List for Required Compressor Performance for New Units

Point Performance Runs
- All Guarantee and Design Points

OEM Compressor Modeling File

Full Unit Information
- Detailed unit diagram, geometries, unloading device types/volumes, weights, etc.

Expected Pressure Drops

Safe Startup Maps

Maps Where Rod Load Issues Exist
- Include all pressure combinations, all load steps and full range of speeds

Maps Where Pin Non-reversal Issues Exist
- Include all pressure combinations, all load steps and full range of speeds

Highest Expected Discharge Temperature Maps
- Include all pressure combinations, all load steps and full range of speeds
- Include associated Flow Rates

Highest Expected Discharge Pressure Maps
- Include all pressure combinations, all load steps and full range of speeds

Sidestream Review

Unit Robustness Map

Performance Curves
- Sets must include varying speed, when appropriate
- Suction vs. Load, and Suction vs. Flow Curves:
- Discharge vs. Load, and Discharge vs. Flow Curves:

Flow Maps

Unit (and/or System) Isentropic Efficiency Maps

Compression Ratio Maps

Load Step Curvature Review

Acoustic Review across Entire Operating Map

With availability in both PDF and MS Word format, end-users can easily integrate only the sections that interest them with their project specifications given to bidding packagers. Using the included check list, both packager and end-user can quickly identify which items still need to be performed, which items are complete, and which items may need additional attention.

End-users needing to know more about the potential shortcomings of various proposed compressor packages can download this free document from the ACI website: **www.ACIServicesInc.com**.

ACI EnviroLine™ Packing Leakage Monitor

ACI's EnviroLine™ Packing Leakage Monitor provides real solutions for companies challenged with lowering fugitive emissions from reciprocating compressors.

The system consists of a properly sized orifice, a differential pressure gauge assembly, and associated tubing and fittings housed in a modular panel design. Installed in the packing vent line system, it provides a safe, reliable, and cost effective means to monitor and quantify leakage rates from piston rod packing, as well as other vent systems.

The prepackaged, 12-in x 12-in modular design panel provides for easy installation via one inlet and one outlet connection. For systems where multiple measurement points are required, the monitor can be rack mounted with an appropriate number of valves.

The EnviroLine™ Packing Leakage Monitor is custom designed for your application. No matter the working pressure, compressed gas medium, or location. ACI will work with you to ensure the system is designed with your operating requirements in mind.

Take the step now to implement your plan to reduce fugitive emissions by ordering your monitor today.

Front and Back view of the Standard EnviroLine™ Packing Leakage Monitor

ACI Participates in the GMC2007

The Gas Machinery Conference was held in Dallas, TX on October 1-3. ACI participated in all facets of the conference including presenting three (3) technical papers and one (1) short course with other industry professionals.

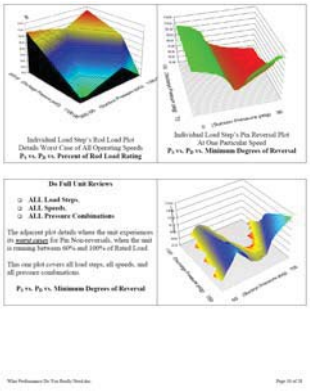
Chad Brahler and Hap Schadler of DCP Midstream discussed how *One Compressor OEM May Not Have the Optimum Equipment Selection*.

Norm Shade and Glen Chatfield of Optimum Power Technology presented *An Investigation of the Application of Finite Amplitude Wave Tuning Technology for Controlling Reciprocating Compressor Pulsations*.

Dwayne Hickman, Joe Fernandez of Ariel, and Kelly Eberle of BETA presented a paper discussing *Integrating Compressor Performance with the Effects of Pressure Pulsation Across a Unit's Entire Operating Map*.

Dwayne Hickman, George Mathia of Dominion and Ron Miller of Basic Systems offered a short course on *An Automation Method for Optimizing and Controlling a Reciprocating Compressor Using Load Step, Speed, and Suction Pressure Control*.

Visit **www.GMRC.org** for more information.



*Visit **www.ACIServicesInc.com** to download the ACI's latest GMC / CompressorTech[Two] New Technology Document*

ACI Team Member Profile — Bob Painter

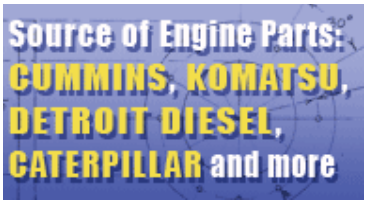
ACI Services, Inc. is pleased to announce Robert (Bob) R. Painter has joined the ACI team as Sales Manager for North America. He reports to Chad Brahler, Vice President of Sales and Marketing. Bob's responsibilities include supporting direct sales to all customers marketed out of the corporate headquarters in Cambridge, Ohio as well as working with the outside sales force throughout North America. Bob comes to ACI with a Mechanical Engineering Degree from the United States Military Academy at West Point, NY. After seven years of active duty, including one tour in Desert Storm, Bob joined the Pharmaceutical and Medical Sales field where he gained most of his sales management experience. Although new to the industry, Bob is "thrilled to be part of such a great team at such an exciting time".

Please do not hesitate to give Bob a call to introduce yourself or to put him to work for you. He is always looking for an opportunity where he can work with you to apply ACI resources and solve your compression problems. He can be reached at 740-435-0240 ext. 525 or on his cell phone at 740-391-8901.

Bob Painter

Sales Manager

(740) 435-0240 ext. 525



Contact Bob to find out more on how ACI can assist you with sourcing your engine components!!!

ACI Services, Inc.

ACI Services, Inc.
125 Steubenville Ave.
PO Box 487
Cambridge, OH 43725

Phone: (740) 435-0240
Fax: (740) 435-0260
E-mail: cbrahler@aciservicesinc.com

The Innovation Resource for Reciprocating Compressors

www.ACIServicesInc.com

Norm's Notes

What a year 2007 has been! Thanks to our motivated staff, our network of alliance partners and distributors, and many loyal customers, ACI has enjoyed another record year for sales, new orders and backlog. We've expanded our office, completely filled our Cambridge facility, and grown our most important asset – our team. I'd like to welcome Bob Painter in sales, Glenn Shafer in engineering, Barb Brahler, Derek McIntire, and Jeff Ferrell in production, and Stephanie Youngs in administration, all of whom have joined ACI since our last issue of *Compressor Works*™. Our prayers and hopes continue to be with Tom Drenan as he continues his rehab after an extended illness, and we wish Phyllis Kovalski well upon her retirement after 8 years of service.

Our momentum continues to build in supplying compressor optimization, automation, reliability improvement, unloaders, custom cylinders, replacement parts, cylinder reapplications and more. We continually introduce new products and invest in new technologies such as our new EnviroLine™ replacement cylinders and packing leakage monitors as well as our patent-pending PulseBuster™ pulsation attenuation systems, developed jointly with Optimum Power Technologies and supported by the GMRC.

We humbly thank everyone who made 2007 such a wonderful success and we look forward to an even greater year in 2008!

W. Norm Shade
President
ACI Services, Inc.

VALVE-IN-HEAD CYLINDER
OBSOLETE

Replace old, troublesome Valve-in-Head Cylinders with ACI's safe, modern and reliable bolt-in-place EnviroLine cylinders like these.

ACI Services has developed a standard replacement for aging, unsafe and troublesome valve-in-head cylinders. ACI's new valve-in-barrel cylinders are bolt-in replacements for the old cylinders. Mounting, bottle flange connections and supports don't have to change.

The ACI EnviroLine™ valve-in-barrel design improves reliability and safety and reduces maintenance costs while delivering a safer and more environmentally friendly solution. In most cases, ACI EnviroLine cylinders even provide a higher MAWP rating than the old cylinders they replace.

For more info, call us at (740) 435-0240.

ACI EnviroLine
The Science of Compliance™

ACI Services, Inc. · Cambridge, Ohio · (740) 435-0240 · ACIServicesInc.com