

## Pulsation Attenuation Networks (PAN)

### For Reciprocating Compressors

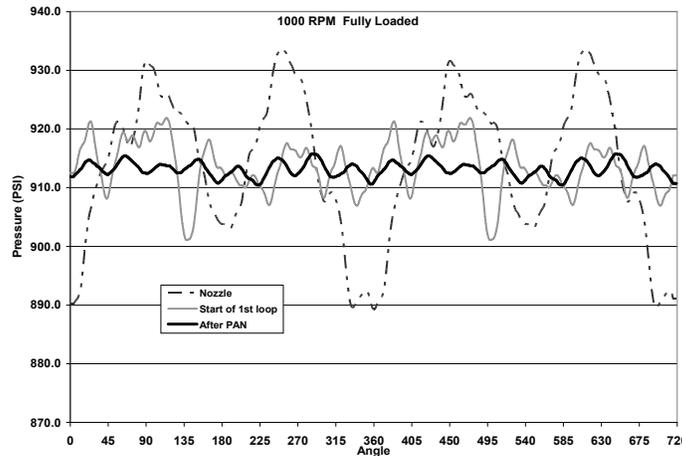
Traditional pulsation attenuation systems are carefully designed and made complex to accomplish pulsation control by adding resistance or damping to the system. This reduces the overall efficiency. ACI's patent-pending Pulsation Attenuation Network (PAN) is a new method for compressor pulsation control. A PAN is made of one or more sequential stages of tuned delay loops. The internal flow area of each loop leg is about half the flow area at the entrance and exit of the loop junctions. Continuing research has explored new proprietary PAN geometries that completely eliminate the need for traditional pulsation bottles, choke tubes and orifices, with the potential for lower cost and lower pressure losses in the system piping.



**1<sup>st</sup> Generation Field Test PAN on a Superior MH64 compressor**

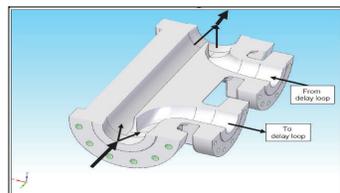
Extensive computer simulations showed that properly configured PANs would effectively control compressor pulsations with very little resultant system pressure loss. The PAN design concept has also been field tested with great results.

With many years of R&D, Optimum Power Technology



**At 1000 rpm & 912 psig, a bottle-less discharge PAN reduced line pulsation to 5.3 psi PIP & saved 5.5 psi system loss compared to bottles.**

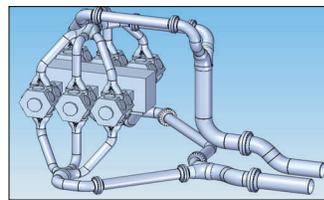
ACI's development partner, created *Virtual Compressor*, an unsteady flow dynamic gas modeler/simulator. Whether upgrading an existing station or a building new one, the ACI/OPT team can accurately model the compressor station and optimize the PAN geometry to maximize flow and efficiency.



**PulseBusters TST™ junction**

ACI's patent-pending PulseBusters TST™ products facilitate the design and construction of new and retrofit PAN systems with standard pipe and fittings. Designed and built to rigorous specifications, ACI TSTs are critical elements of any PAN system.

A 2<sup>nd</sup> generation PAN concept looks even more promising. Using *Virtual Compressor*, we have successfully designed PANs that do not require tuned loops, yet provide pulsation control that is likely better than any currently installed bottle system while still incurring much less pressure loss.



**2<sup>nd</sup> Generation PAN Design Manifold Concept**

These 'Clean Sheet' designs are performed at the design stage of a new installation to produce the most efficient design possible.

For more information please contact: Optimum's Roy Houston at 412-257-9070 or ACI's Norm Shade at 740-435-0240.

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### Look for ACI at these Events in 2010:

Sept 27-30, Gas Compressor Conference; Norman, OK

Sept 20-23, Turbo-machinery Symposium; Houston, TX

Oct 4-6, Gas Machinery Conference; Phoenix, AZ

### Compression Problem Solvers



**We Optimize it  
We Design It  
We Build It**

## ACI Develops Compressor Performance Software

GE Oil & Gas®, a major reciprocating compressor OEM, has contracted with ACI to develop their new OEM performance software to model GE's HSR line of reciprocating compressors (which includes the Gemini product line). The new software, released June 2010, offers GE packagers and end-users many advanced features, including: auto-sizing multiple design points, generation of multiple solutions to design point requests, dynamic performance curves, tables that consolidate the results of thousands of operating points, dynamic 3D Plots of compressor performance, sizing fleet units to design points, startup safety and operating safety maps, a wide range of measurement unit options, and many more features.

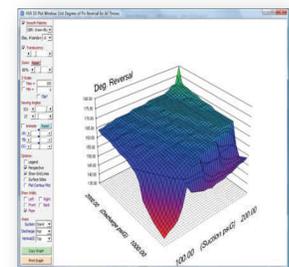
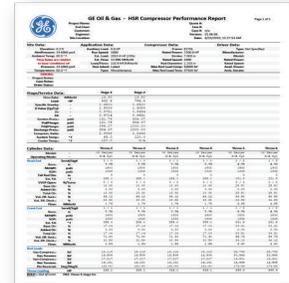
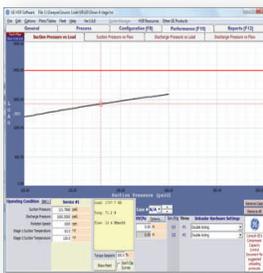
With the new HSR's features and capabilities, GE engineers and authorized packagers can quickly size units, generate unit performance, and provide detailed analyses of unit abilities across the end-user's entire operating map. Tasks that took hours

or days before can now often be completed within a few minutes.

Furthermore, the software is integrated with GE's online Quote Management System for developing quotes based on latest inventories and pricing that are kept current via the online database system.

The next major release of the HSR Software will include the VMG (Virtual Material Group) thermodynamic modeling option. This option permits sophisticated gas modeling calculations to handle dropouts of liquids and provides for better performance modeling of gases near their dew point transitions. VMG provides GE's HSR software with advanced methodologies to better handle and model process gases. With VMG's extensive database of over 5000 gases, HSR is well-positioned to provide process gas compression companies the detailed knowledge they need to optimize and control their GE compressors.

For more information, please visit GE Oil & Gas at: [www.geOilandGas.com/hsr](http://www.geOilandGas.com/hsr)



## GE Oil & Gas Announces ACI as an Authorized Parts Distributor

GE Oil & Gas® has selected ACI Services, Inc. as an Authorized Parts and Service provider of GE High Speed Reciprocating Compressors.

GE Oil & Gas offers a full line of high speed reciprocating compressors (HSR) covering the range of 60-8850 hp, with a variety of piston rod load capabilities and frame stroke combinations.

GE Oil & Gas is a global leader in the supply of technology-based equipment and services for all segments of the oil and gas industry, from drilling and production, liquefied natural gas, pipelines and storage to industrial power generation, refining and petrochemicals. They also provide pipeline integrity solutions, including inspection and data management.

ACI is very pleased to be authorized to participate as a parts distributor for GE Oil & Gas.

Components for these models are currently offered:

- M Series 60-120 hp
- H Series 200-400 hp
- A Series 400-800 hp
- DS Series 1200-2400 hp
- ES Series 2400-7200 hp
- FS Series 2400-7200 hp
- HE-S Series 7200-21600 hp
- SHM Series 2950-8850 hp

### HSR Compressor Performance Software



For more information contact Chuck Kerr at 740-435-0240 x 526 or e-mail

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Contact ACI Services, Inc. at 740-435-0240  
for all your Quality OEM Ariel Parts

### The ACI Rotavator™



Unloaded Mode



Loaded Mode

Testing continues on the innovative **Rotavator™** unloader. This is a patented single deck valve unloader assembly that provides for a low fixed clearance alternative to the patented GAS Radial unloader for reciprocating compressors. In service since 1996 in low speed compressors, additional testing is underway to develop them for high speed applications.

The **Rotavator™** is a poppet valve with a guard that is arranged so that it can be rotated, moving the poppets halfway between the seat holes to unload the compressor end. This device is intended as a more efficient and reliable alternative to finger, or fork, unloaders that have been

commonly used for years.

The **Rotavator™** is also more efficient than other available unloaders, as it does not have an actuating assembly that obstructs the flow path for gas as other available devices have.

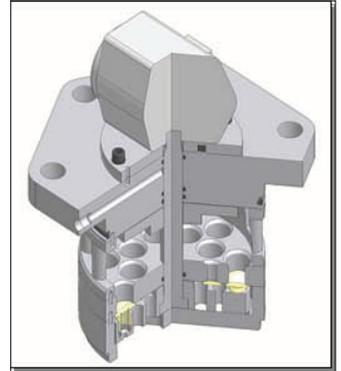
For more information, contact Brett Kyle at 816-224-0544 or e-mail

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**“Motivate your compressor  
to the next level  
with the Rotavator”**



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## ACI Welcomes David Hafvenstein to the Team as Sr. Project Engineer



After several years of engineering hydraulics systems with Caterpillar, and having just completed his Masters in Mechanical Engineering from the University of Minnesota, Dave Hafvenstein joined the ACI team in December 2009 as Sr. Project Engineer. Throughout 2010 Dave will be expanding his reciprocating compressor knowledge, developing complex thermodynamic models, mastering ACI's eRCM™ Software, working with end-users to optimize their compression needs, quoting hardware, and managing several engineering projects.

Dave has attended the Ariel Compressor School, EGCR and The Global Petroleum Show.

Dave is already an EIT, and is scheduled to take the Ohio Professional Engineer (PE) Exam in October. Dave can be reached at 740-435-0240 x 533 or email

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**The Innovation Resource  
for Reciprocating  
Compressors**

[www.ACIServicesInc.com](http://www.ACIServicesInc.com)

## Revitalized...It's a Clean Machine



Bring new life to older compressors with ACI EnviroLine® products. Waste less and deliver more gas, improve your bottom line, earn green credits with better utilization and efficiency.

ACI EnviroLine® offers unloaders, custom engineered cylinders and packing leakage monitors. ACI's eRCM™ software accurately models your machine to maximize utilization and throughput, while increasing efficiency and reducing the overall carbon footprint.

Call ACI Services today for an optimum, customized design for your old compressor and to find out how ACI EnviroLine® products can help you achieve emissions goals, while improving unit performance. Look for details on our website, [ACIServicesInc.com](http://ACIServicesInc.com).



## Norm's Notes

I am pleased to report that, thanks to our dedicated team and our loyal customers, ACI Services Inc. has remained strong throughout the industry's most recent downturn. Our long term strategy has continued unimpeded with investments in new products and expanded capabilities. On the product front, in alliance with Beta Machinery Analysis, we have introduced System Performance Model (SPM™), a comprehensive new approach to the engineering of compressor systems. Collaboration with Control Systems International has resulted in the introduction of CompresXpress™ and eRCMXpress™, advanced compressor control systems for new and retrofit compressor automation built around our powerful eRCM™ software. Our patented Rotavator™ poppet valve unloaders have been successfully introduced into several new applications, and GAS™ radial poppet valves and unloaders have been successfully retrofitted into large, high-speed pipeline compressors. Several customers are planning retrofits with our patent-pending PulseBusters™ PAN system as part of their 2011 capital plans. And more exciting products are under development.

ACI was recently renewed as an Ariel Authorized Spare Parts Distributor, continuing our long-standing relationship as both a key supplier and a customer for Ariel Corp. We're also now an authorized distributor for GE HSR compressor parts. And we are cooperating with Siemens Energy Inc. on electric conversions of existing engine driven compressors.

I'd like to acknowledge several team members who have joined ACI since our last issue: Dave Hafvenstein (software and performance); Eric Keifer, Kristen Gilcher and Terry Baker (engineering); Carolyn Moses (materials); Gaye Rogers (sales & marketing); and Danny Sawyer and Steve Nichol (GAS Products). At the end of 2009, after 42 years with ACI, Larry Burnett began a much deserved retirement, although he continues to serve us as a valuable part-time resource. We recently expanded our Cambridge campus to support our growth.

Finally, our best wishes and prayers for a safe and rapid return are extended to Lt. Cmdr. Chad Brahler, USNR, who has been called to active duty in the war effort. We

have realigned the sales and marketing staff, led by Bob Painter, Mgr. of Sales and Marketing, to carry on during Chad's absence.

ACI's roots go back 50 years, but I have never been more excited about its future as more and more OEMs and end users are recognizing the potential of our products and services to increase the flexibility, productivity, reliability and efficiency of their existing and new compressors, while reducing their "total carbon footprint" in the process.



W. Norm Shade, PE, President

