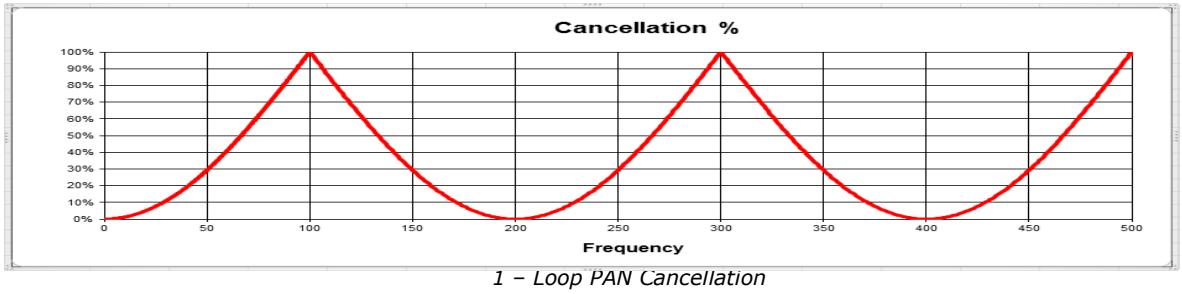
Patented

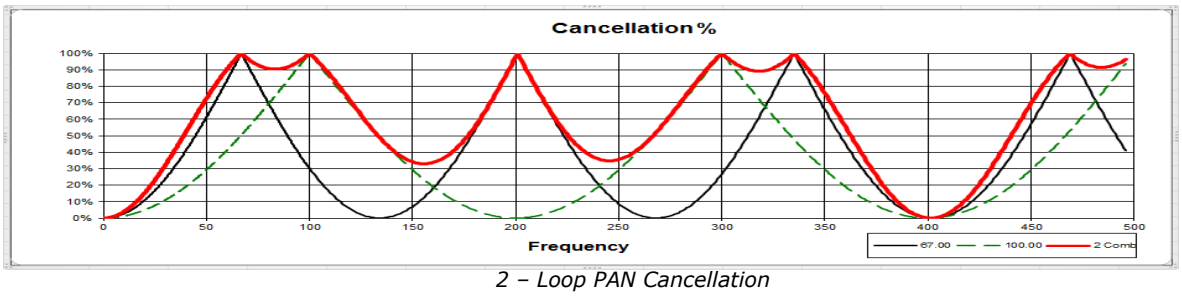
Pulsation Attenuation Networks – PAN™ Filter

Pipeline Pulsation and Noise Attenuation Feed-Forward Comb-Filters with Zero Pressure Loss

Each loop cancels its fundamental frequency and ALL odd harmonics



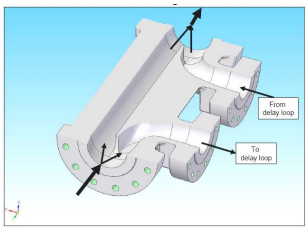
1 – Loop PAN Cancellation



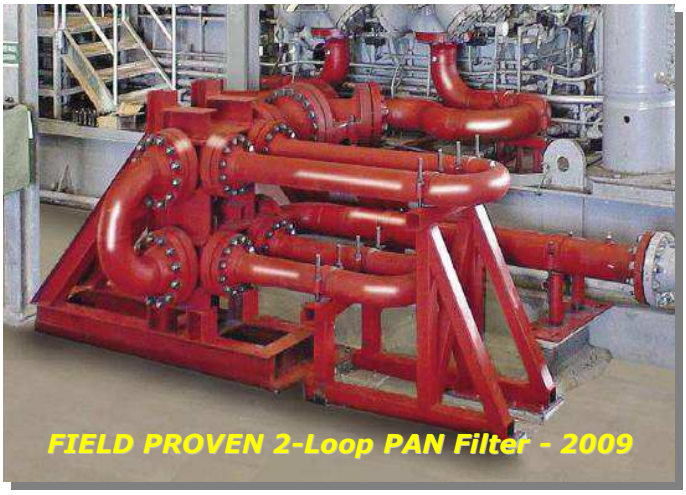
2 – Loop PAN Cancellation

TUNING SECTION TRANSITIONS (TSTs)

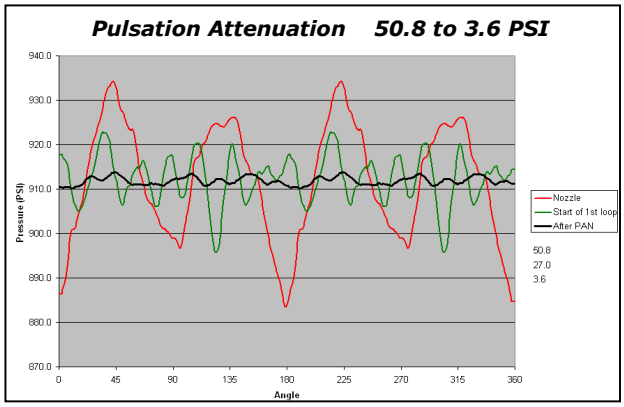
ACI's TST™ products facilitate the design and construction of new and retrofit PAN Filter systems with standard pipe and components. Designed and built to rigorous specifications, ACI TST's are critical elements of any PAN system.

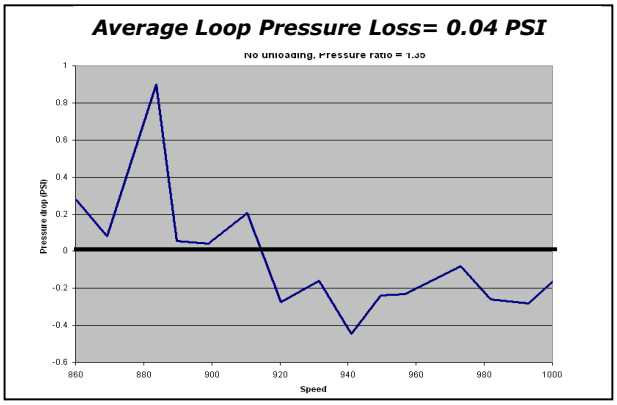


Cutaway of a TST junction
(Patent Pending)

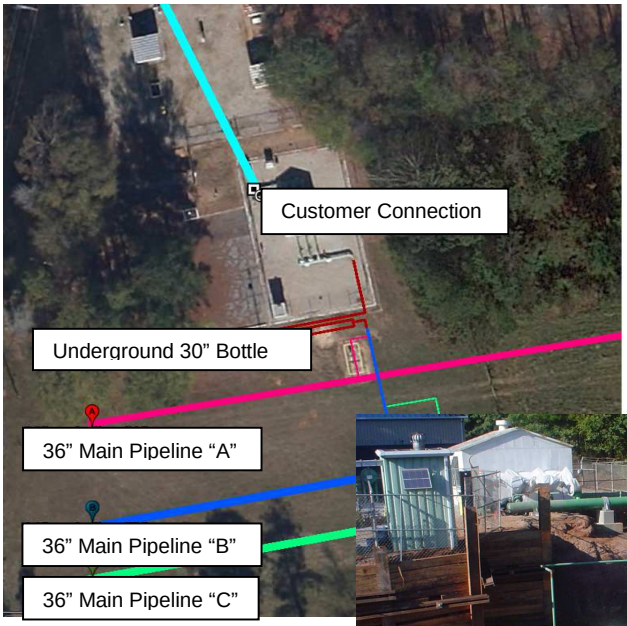


Measurements





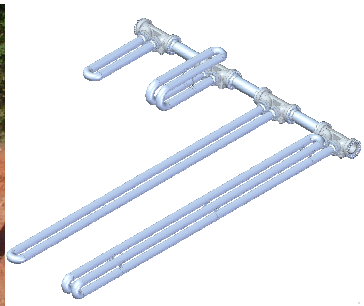
Pulsation Attenuation Network – PAN™ Filter
Meter Station APPLICATION



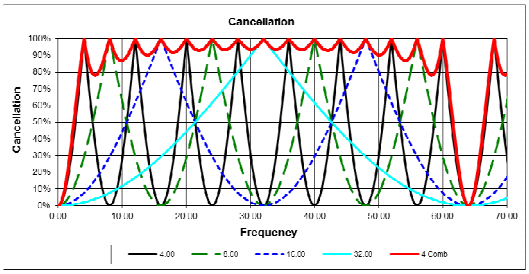
Pulsation and pressure loss problems occur at many meter stations. PAN Filters replace Pulsation Bottles to cost effectively solve many of these problems with standard piping and TST's. No orifice plates, bottles or choke tubes.

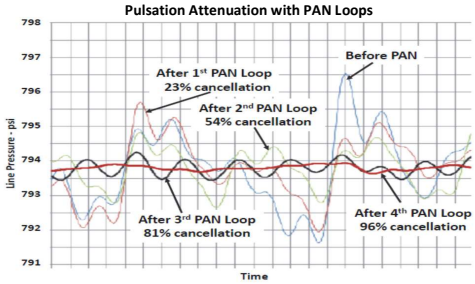
- ✓ ***Reduces Pulsation***
- ✓ ***Virtually eliminates pressure loss***
- ✓ ***Increase Flow***
- ✓ ***Increases Reliability***
- ✓ ***Improves Accuracy***

Meter Station with significant pressure loss from Pulsation Bottle replaced with a 4-Loop PAN Filter (at right)



4-Loop PAN Filter





PAN Technology is a winner of the 2014 Shale Gas Innovation contest

SERVICES

OPTIMUM and ACI can provide complete studies and solutions to most of your pulsation and noise problems using our unique proprietary Virtual Pumping Station simulation and design software.

- ❑ We take detailed pressure measurements of the pulsataion/noise problem.
- ❑ We perform Fourier analysis on the pressure waves.
- ❑ We design one or more loops to cancel the problem frequencies.
- ❑ We build the TSTs and PAN Filters with industry standard pipe.
- ❑ We install and verify its effectiveness.
- ❑ If conditions change, it's easy to change the lengths of the loops to re-tune the PAN.

ACI Services, Inc.

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OPTIMUM PUMPING TECHNOLOGY

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PERFORMANCE AUGMENTATION NETWORKS (PAN)

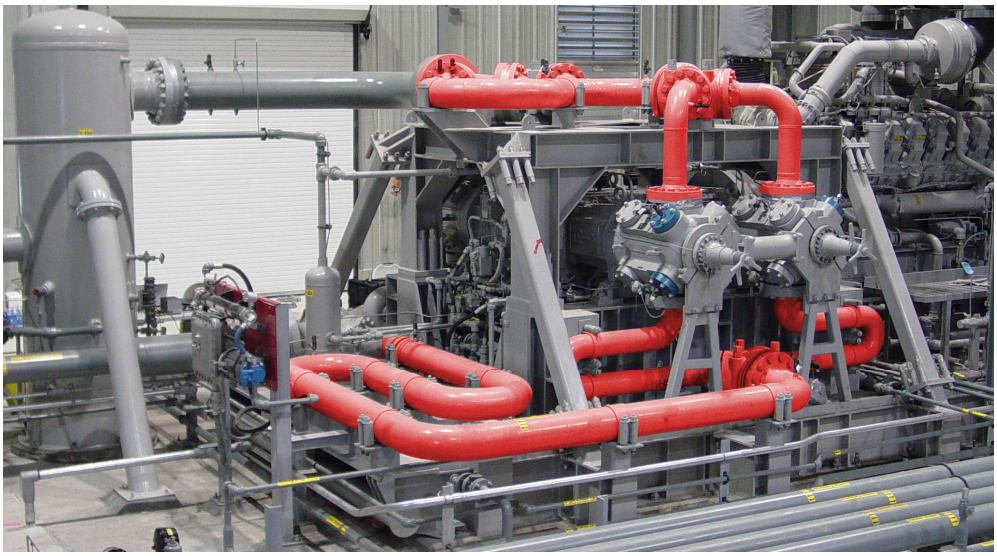
PAN™ Hi-Performance Compressor Manifold

The Reliable Hi-Performance Alternative to Bottles

OPTIMUM - ACI Ariel JGT/4 Caterpillar G3516

Midstream Compressor with PAN™ Hi-Performance Compressor Manifold

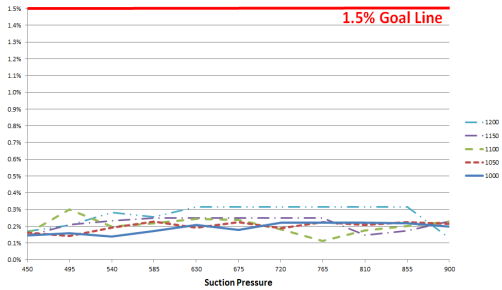
OPTIMUM created an optimized model-based design for this PAN compressor using its proprietary Virtual Pumping Station and Automated Design Software. ACI Services took this design spec and created a reliable midstream skid package for this popular Caterpillar/Ariel reciprocating compressor. The customer wanted more flow over a wide operating range (Suction 450-900psig and Discharge 1000-1200psig). The Gas Machinery Research Council co-sponsored the development of this PAN compressor package which was installed in November 2014 and there are now multiple working packages in operation.



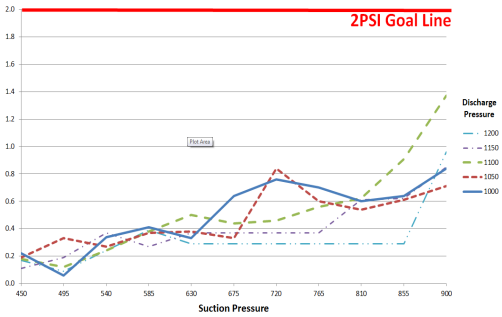
ENERFLEX Skid Mounted PAN Compressor Package

***PREDICTIONS:* Goal < 1.5%**

SUCTION PULSATION



DISCHARGE PRESSURE LOSS



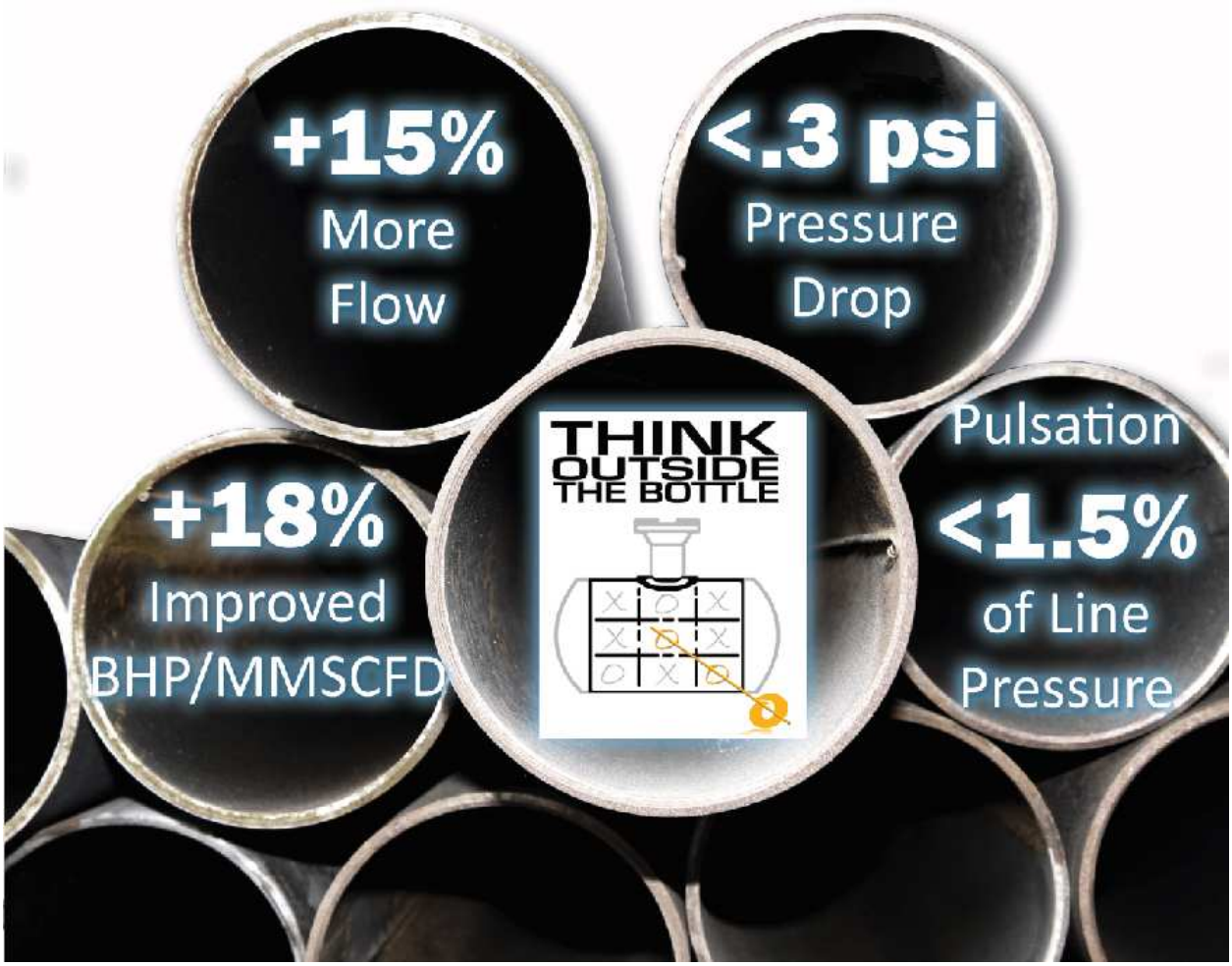
FIELD TEST GOALS:

- High Speed (~ 1400RPM)
- Pulsation to <1.5% of line pressure under all operating conditions
- 90% reduction in system pressure loss
- Vibration and stress levels consistent with API 618 M5 requirements
- 10% reduction in compressor BHP/MMSCFD at high flow operating condition (compared to bottle system)

Successful GMRC Full-Scale PAN Field Test Results

PAN Technology has been the subject of the largest research project ever undertaken by the GMRC with participation from many industry leaders. These field tests of PAN technology employed redundant measurements by multiple parties to ensure accurate data collection.

This 600+ page report to the GMRC and 2015 GMC short course proves conclusively that PAN technology delivers on its promises.



Winner of the 2014 Shale Gas Innovation contest

- ✓ *Pulsation Control*
- ✓ *Near-Zero Pressure Loss*
- ✓ *Greater Compressor Efficiency*
- ✓ *Greater Flow*

Why use bottles when a PAN system delivers better results?

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