



**Compress***Xpress*<sup>TM</sup>

## **New Concepts in Reciprocating Compressor Control**

Gas/Electric Partnership  
February 9, 2012

# Controlling a Reciprocating Compressor

## Priorities:

- Operate safely
- Operate within regulations
- Operate efficiently
- Supportable by the user
- Economically justifiable



## It's all science...but it feels like an art

- Control the immeasurable
  - Rod load
  - Pin reversal angle
  - Fuel torque
  - Load torque
  - Adiabatic efficiency
  - Emissions



# Goal: Find the Safest, Most Efficient Operating Point

**Until now, only determined by OFF-line modeling**

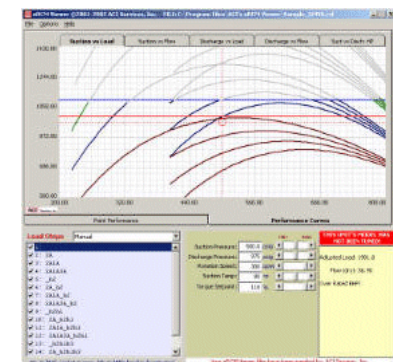
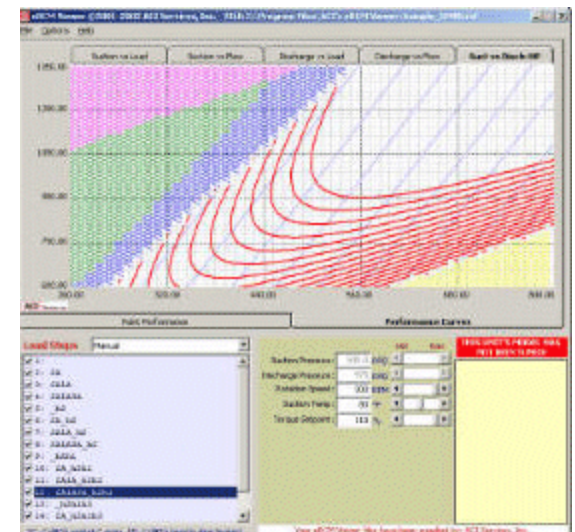
ACI Services' eRCM software is the gold standard for off-line reciprocating compressor modeling

Inputs:

- Physical characteristics of the unit
- Current operating conditions

Outputs:

- Hundreds of calculated, immeasurable variables
- Safe operating map for all possible conditions:
  - ✓ For every load step
  - ✓ For every operating parameter (Speed, Suct, Disch, Flow)
- Optimum load step for given operating conditions



## 2 Options for Reciprocating Unit Control

### Pre-Packaged Unit Panel Product

#### ■ Pros:

- Affordable
- Supports SAFE operation
- Quick delivery

#### ■ Cons:

- No complex load step control
- No advanced calculations
  - rod load
  - pin reversal angle
- No optimization
- Cannot run eRCM embedded

### Custom-Build Unit Panel

#### ■ Pros:

- Can incorporate simplified calculations
- Flexibility to add lots of unique control strategies

#### ■ Cons:

- Can be pricey
- Requires detailed specs
- 3-6 month delivery is fast
- Leaves you vulnerable to the integrator or engineer who programmed it
- Cannot run eRCM embedded

## A Third Option – CompresXpress

### ■ A compressor unit control panel product

- Embeds eRCM™ (real-time compressor model)
- Protects unit at all operating conditions

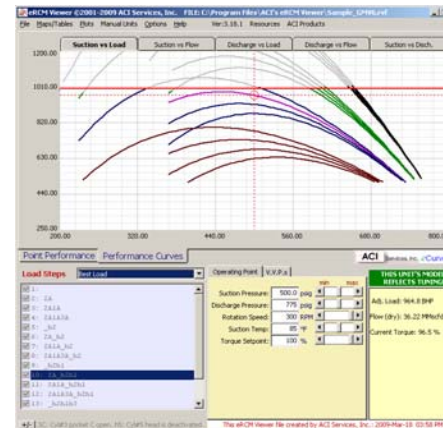
### ■ A purpose-built product for

- Sequential and regulatory control for unit and load step
- Color graphic display
- Alarm and shutdown management/equipment protection
- Built-in diagnostics
- Historical data archiving and trending
- SCADA RTU functionality



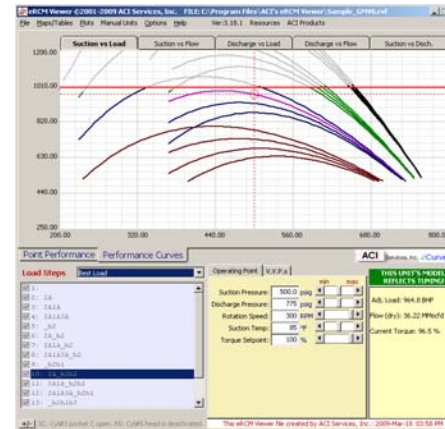
## What's new?

- **CompresXpress is the only UCP with the processing and computational power to run eRCM**
- **eRCM is embedded in CompresXpress**
- **eRCM automatically and continuously calculates the maximum safe load step for each compressor based on current conditions**
- **CompresXpress then directly adjusts the compressor based on eRCM's calculations**



# Known Results

- **Runs compressors safely at full load**
- **Can increase throughput (or capacity) by 5 to 15% or more**
- **Reduces fuel and maintenance costs**
- **Eliminates manual calculations required to optimize performance**
- **Extends compressor life**



## Additional CompresXpress Innovations

- **Single integrated operations and configuration touchscreen interface**
- **Safe unloader control with eRCM**
- **Operator re-configuration capability without requiring a programmer – it's not a black box**
- **Real-time I/O and communications diagnostics**
- **Standard SCADA interface**
- **Unit level and historical archiving and trending**
- **Store and forward capabilities can be configured**
- **Custom reports or report building tools available**





## Additional CompresXpress Innovations

- **Finished product – not a PLC project**
- **Acquisition and long-term costs can be 1/3 that of a traditional PLC**
- **Application-specific training available**
- **Hardware independent**
- **Hardware upgrades do not require re-engineering**
- **24x7x365 application support is available**
- **Inherent RTU functionality**
- **Tracks performance, manages data, and generates reports for RICE-MACT obligations**



## CompresXpress Options

- **For existing UCPs with advanced functionality**  
(such as PLCs with MODBUS communications capabilities)

**CompresXpress™ 1000** available from ACI Services

- **For UCP replacement**

**CompresXpress™ 3000** available from CSI

# Corporate Overview

## **CSI**

- Established in 1968
- 40+ years delivering oil & gas systems:
  - Gas compressor control
  - Pipeline SCADA
  - Terminal automation

## **ACI Services**

- Provides engineered compressor products and services worldwide
- Specializes in design and manufacture of compressor cylinders and unloaders
- Offers engineering services including thermodynamic performance reviews, acoustic studies, and more

## Summary

- ▣ **Recip compressor control is a science but feels like an art**
- ▣ **The safest, most efficient operating points are tedious to achieve – even with the help of eRCM’s off-line modeling**
- ▣ **CompresXpress embeds eRCM in the UCP allowing the controller to automatically adjust to changing conditions**
- ▣ **Runs compressors safely at full load**
- ▣ **Can increase throughput, reduce fuel costs, and extend compressor life**
- ▣ **Lower cost & higher value than traditional PLC-based UCPs**
- ▣ **Uses non-proprietary components and is more open than a traditional PLC-based UCP – it’s not a black box**