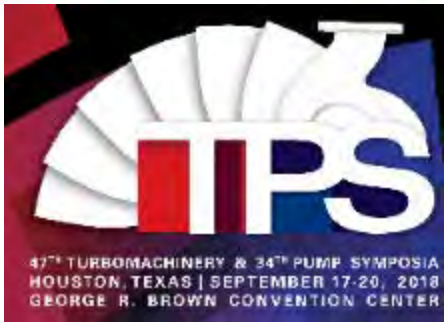

Field Performance Testing Centrifugal and Reciprocating Compressors

Presenters:
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Presenter Bios

Dr. Brun is currently the Program Director of the Machinery Program at Southwest Research Institute in San Antonio, Texas. Dr. Brun's research interests are in the areas of turbomachinery oil & gas machinery, power generation, aero-thermal fluid dynamics, process system analysis, energy management, advanced thermodynamic cycles, instrumentation and measurement, and combustion technology. He is widely experienced in performance prediction, off-design function, testing, degradation, uncertainty diagnostics, and root-cause failure analysis of gas turbines, combined-cycle power plants, reciprocating compressors, centrifugal compressors, steam turbines, and pumps. Dr Brun received his Ph.D. and M.Sc. in Mechanical and Aerospace Engineering from the University of Virginia and a B.Sc. in Aerospace Engineering from the University of Florida.

Hector Delgado is a Group Leader at Southwest Research Institute (SwRI) leading and working on many projects, including turbomachinery root cause failure analyses (RCFA); rotordynamic studies; machinery field testing; and fatigue assessment of mechanical components. Mr. Delgado received B.S. and M.S. degrees both in Mechanical Engineering from the University of Nuevo Leon in Mexico and UTSA, respectively. Mr. Delgado's research interests are in the areas of turbomachinery dynamics, RCFA, and mechanical design.

Presenter Bios

Nathan Poerner is a Senior Research Engineer in the Fluid Machinery Section at Southwest Research Institute in San Antonio, TX. He earned B.S. and M.S. degrees in Mechanical Engineering at Texas Tech University. His work experience has primarily been in field measurements and troubleshooting mechanical systems, specifically pulsation and mechanical resonance issues. This work is supported by mechanical and fluid simulations and modeling. And he is involved in numerous research projects focused on rotating and reciprocating machinery.

Dr. Tim Allison is the manager for the Rotating Machinery Dynamics Section at Southwest Research Institute in San Antonio, TX. His research at SwRI includes turbomachinery and test rig design, finite element analysis, modal testing, instrumentation, and performance testing for applications including centrifugal compressors, gas turbines, reciprocating compressor valves, and test rigs for rotordynamics, blade dynamics, and aerodynamic performance. He holds a Ph.D. in Mechanical Engineering from Virginia Polytechnic Institute and State University and has authored over 30 technical papers related to machinery and piping systems

Abstract

Field performance testing is often necessary to verify guaranteed aerodynamic and mechanical performance of new machinery and can also be used to monitor long-term machinery performance, track degradation patterns, and determine appropriate maintenance. In order to obtain useful performance data, it is necessary to use appropriate instrumentation and installation practices, accurate performance calculation methodology (including equation of state), and uncertainty analysis. Guidance for performance testing of reciprocating and centrifugal compressor standards can be found in various standards including ASME PTC-10, API 618, or ISO 1217. This tutorial provides a detailed overview of performance testing and topics, including basic theory and calculations, instrumentation selection and location, installation and measurement accuracy, test methodology, and sources of uncertainty.

Outline

- Benefits
- Basic Definitions
- Centrifugal Compressor Overview
  - Types
  - Arrangements
  - Individual Component Overview
- Field Performance Testing for Centrifugal Compressors
  - Operating Principle
  - Equations of State
  - Non-Dimensional Parameters
  - Testing and Performance Calculations
  - Useful Test Standards and Publications
  - Pulsation in Centrifugal Compressors
- Reciprocating Compressor Overview
  - Types
  - Arrangements
  - Component Overview

Outline

- Field Testing of Reciprocating Compressors
  - Performance Characteristics
  - Useful References and Standards
  - Practical Considerations
  - Performance Evaluation
- Instrumentation and Uncertainty
  - Pressure and Temperature
  - Flow Rate
  - Uncertainty and Error Sources
  - Data Acquisition
- Modal Testing
  - Basic Theory
  - Experimental Techniques
  - Analysis Tools
  - Demonstration