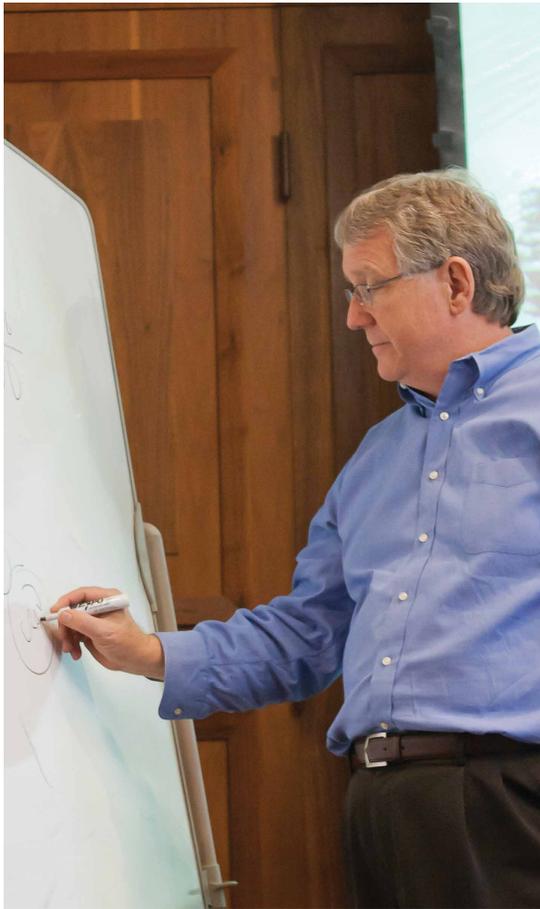


# COMPRESSION SPECIALISTS

TRAINING & TECHNICAL SERVICES



SINCE 1964

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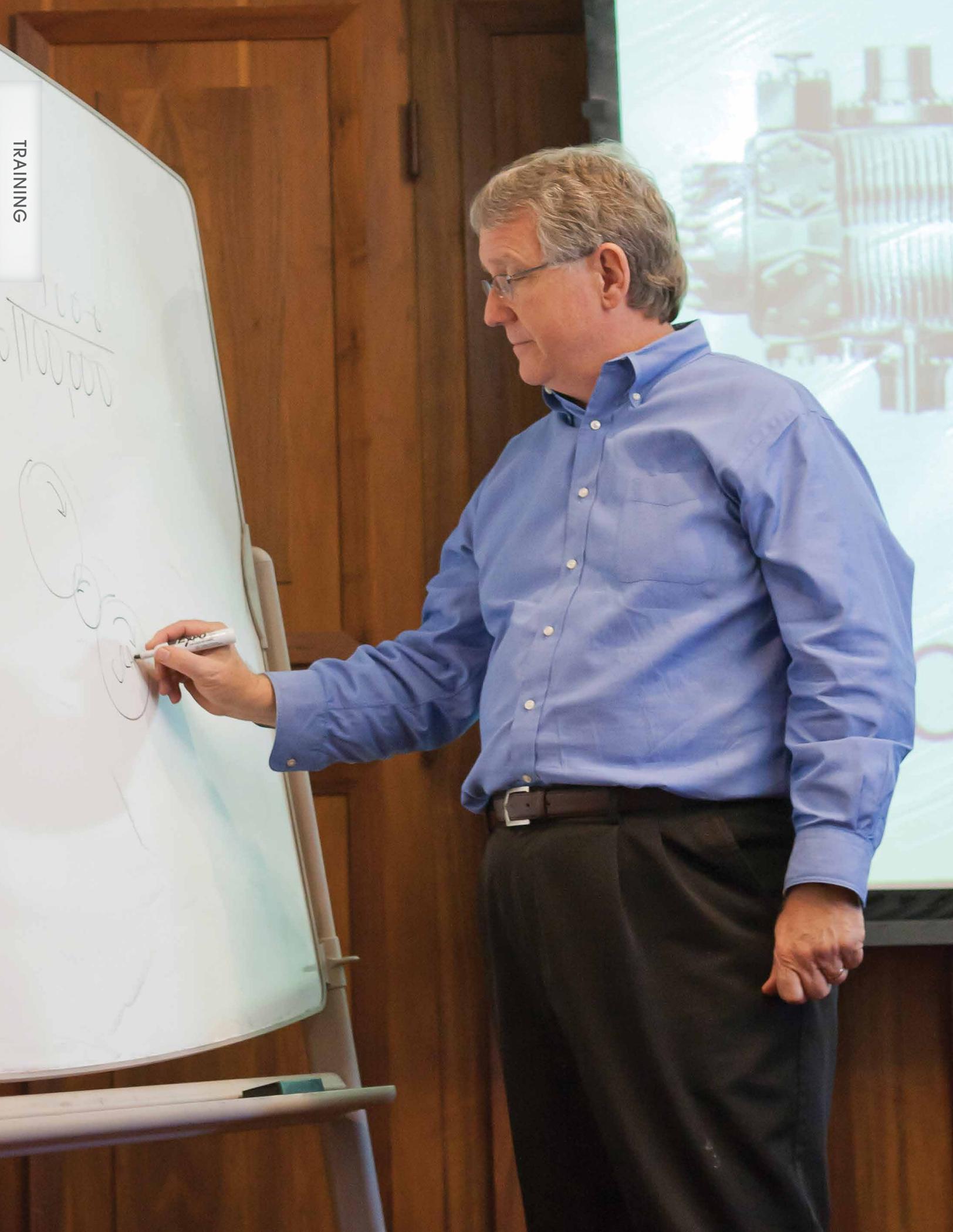
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CECO has been delivering quality OEM Superior<sup>SM</sup> products and services to the gas transmission, gas processing, and petrochemical industries since 1964. CECO's Training and Technical Services division continues in the same tradition of quality and value.

CECO Training and Technical Services is the industry leader for expert-led training, equipment analysis, technical writing, program audits and failure investigation. Our compressor specialists have, on average, 30 years of experience in the oil and gas industry. Their knowledge of the industry makes us the industry experts for compressor and engine training and technical services.

You can trust our compressor specialists for expert training courses, equipment analysis and technical writing. CECO Training & Technical Services Instructor-led training provides the knowledge, skill, and expertise needed to operate, maintain, and analyze the health and performance of your equipment.



## CUSTOMIZED COURSES

We recognize no two companies are exactly alike and neither are your training needs. We will work with you to create a customized course that will satisfy specific training needs for your company.

You can choose to have one of our expert instructors lead the customized course or we can create a trainer's kit to allow one of your own subject matter experts to lead the class. The trainer's kit includes lesson plans, presentations and presenter's notes, providing your Subject Matter Experts with the necessary tools to teach the customized course.

## TRAINING COURSES

CECO's well-organized training courses provide in-depth learning both in the classroom and during hands-on exercises. Where printed workbooks and online learn centers provide a simple solution to training needs, instructor-led training provides the expertise and experience of our knowledgeable trainers. CECO instructors bring great value to the training courses that printed workbooks and web-based training alone cannot provide.

CECO also offers fundamental training for smaller groups. By partnering with the Gas Machinery Research Council, we're able to provide open enrollment courses throughout the year in cities across the country.

## STANDARD COURSE LIST

- » Applied Principles of Reciprocating Engines & Compressors
- » Applied Principles of High Speed Reciprocating Engines & Compressors
- » Combustion Characteristics
- » Combustion Characteristics for High Speed Engines
- » Compressor Characteristics
- » Compressor Integrity & Alignment
- » Coupling & Shaft Alignment
- » Crankshaft Web Deflections & WebMap2® Software Training
- » Engine Balance
- » Force-Feed Lubrication
- » Fundamentals of Electric Motors
- » Fundamentals of Troubleshooting
- » Fundamentals of Turbocharger Operations
- » Gas Turbines I: Operating Principles of Gas Turbines and Centrifugal Compressors
- » Gas Turbines II: Maintain and Troubleshoot Gas Turbines and Centrifugal Compressors
- » Ingersoll-Rand XLE Training
- » Maintenance and Performance Analysis
- » One-on-One Equipment Analyst Training
- » Operations Maintenance
- » Pipeline Pigging
- » Precision Measurement



## HORSEPOWER CURVE DEVELOPMENT

Key measurements include the horsepower and torque of the engine. Integrated compressor performance measurement also is a major component of a maintenance alarm system.

### Program Description:

Using empirical compressor performance data collected over the operating range of the unit, horsepower curves and critical compressor algorithms are developed.

### Program Features Include:

- » Onsite Testing (up to 48 Hours to Collect Compressor Performance Data)
- » Computer Generated HP Curves

Scheduling includes up to 48 hours of onsite testing and 3-4 weeks to analyze, calculate and develop compressor HP curves.

### Where Testing Is Applicable:

To equipment where horsepower and torque readings are valuable. This may include units that have broad operating ranges, engines with predictive maintenance systems and equipment that is to be operated optimally.

### Note:

When used in combination with a control system, horsepower curves can be used to automatically load or unload compressors as operating conditions change.

## PERFORMANCE TESTING

These services are a comprehensive analysis and evaluation program to enhance unit performance. The objective for these services is to optimize throughput in terms of HP/mmcf/d and compressor efficiency, balance Brake Specific Fuel Consumption and emission rates, and operate the unit as close to rated load as possible for all operating conditions. Baseline equipment performance system-wide allows companies to easily identify areas for improvement.

## EQUIPMENT ANALYSIS

Mechanical and Performance Analysis is a service that is designed to use data taken during on-site testing of engines, compressors, and auxiliary equipment to identify mechanical and performance deficiencies. Recommended corrective measures are prioritized in a digital report along with the supporting data. Regularly scheduled analysis allows trending of performance and wear of components.

We offer comprehensive analysis that enhance engine and compressor performance with qualified analysts possessing an average of 30 years of experience in the oil and gas industry.

Our goal is to provide you with the highest quality expertise which supports your business objective of maximizing revenues through safe efficient and reliable operations. We look forward to meeting your analysis service needs.

## COMPRESSOR EFFICIENCY STUDIES

Compressor throughput is important to most companies. Unfortunately, most companies lose out on potential throughput by not optimizing their compressor performance.

### **Program Description:**

This service is a comprehensive analysis and evaluation program to enhance compressor performance. The objective: optimize throughput in terms of HP/mmcf pumped and compressor efficiency.

### **Program Features Include:**

- » Onsite Testing (Comprehensive Compressor Analysis and Evaluation of Operating and Loading Procedures)
- » Recommendations for Repairs, Upgrades, and Enhancement
- » Development of Standard Baseline Compressor Performance Indicators (HP/mmcf & Compressor Efficiency)

The program typically includes 2-3 days onsite testing and 1-2 weeks to document and prepare optimized procedures and controls.

### **Where Testing Is Applicable:**

Large reciprocating compressors in gas service.

## AIR/FUEL RATIO GRID DEVELOPMENT

Optimum engine performance requires operators to know and understand the operation of their equipment. Key measurements include brake specific fuel consumption and emission rates of the engine. Accurate operating grids ensure a fuel efficient compliant engine and are a major component of a maintenance alarm system.

### Program Description:

Using empirical engine performance data collected over the operating range of the unit, air/fuel mixture grids and critical engine algorithms are developed.

### Program Features Include:

- » Onsite Testing (up to 48 Hours to Collect Engine Performance Data)
- » Computer Generated Air/Fuel Mixture Grids

Scheduling includes up to 48 hours of onsite testing and 3-4 weeks to analyze, calculate and develop air/fuel mixture grids.

### Where Testing is Applicable:

To equipment where fuel consumption and emission rates are valuable. This may include units that have broad operating ranges, engines with predictive maintenance systems and equipment that is to be operated optimally.

### Note:

When used in combination with a control system, air/fuel mixture grids can be used to automatically maintain the optimum mixture as operating conditions change.



# APPLIED PRINCIPLES OF RECIPROCATING ENGINES & COMPRESSORS



**TRAINING & TECHNICAL SERVICES**



## TECHNICAL WRITING

CECO Training and Technical Services has the ability and expertise to create customized documentation that will meet the specific needs of each client. We can design courses based on our existing task lists or start from the ground up and build tailor-made tasks that fit the clients' requirements. As companies grow, so does their need for Operations and Maintenance manuals. CECO works closely with our clients to build O&M manuals that lead to more efficient maintenance activities and operational awareness.

Rather than hiring a CECO instructor to teach a training course, clients sometimes prefer that their own SMEs lead the course. In these instances CECO can provide class materials and a special license with a Trainer's Kit that contains:

- » Lesson Plans
- » PowerPoint Presentations
- » Presenter's Notes

Courses may be selected from our course listing or custom built to fit specific client needs. To learn more please contact CECO Training and Technical Services.

## SOFTWARE

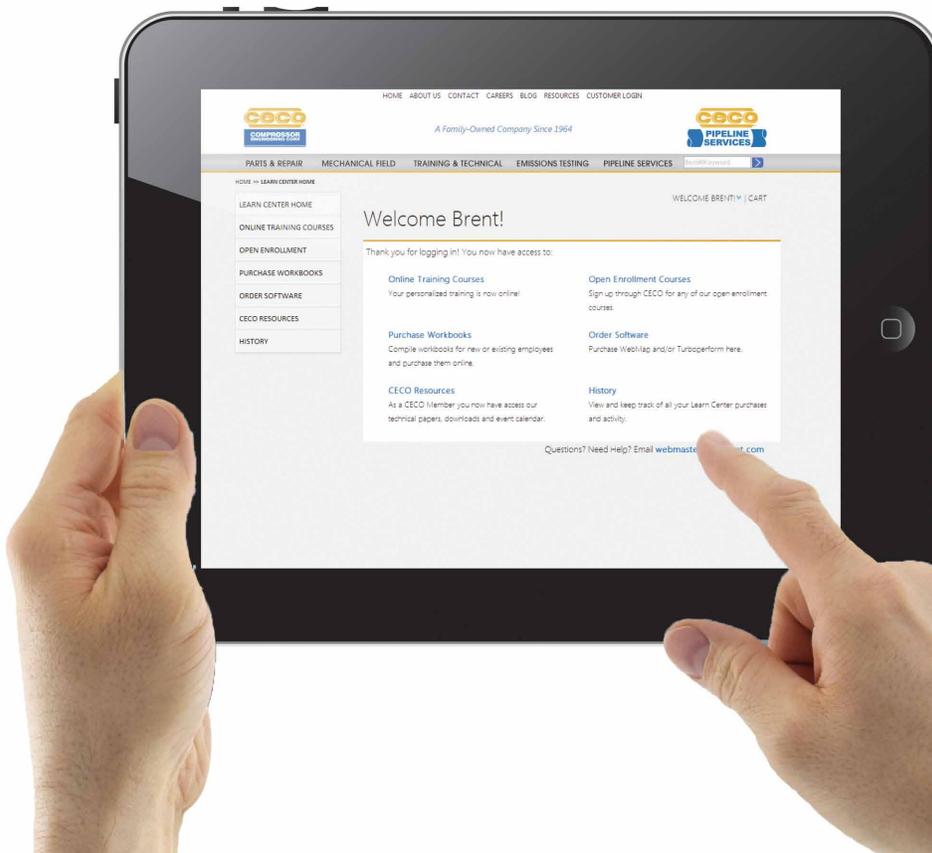
CECO has teamed with the Gas Machinery Research Council (GMRC) and Southwest Research Institute to provide software programs that ensure your compressor station runs smoothly and at its best capacity. The use of these programs provides engine and compressor analysis, allowing you to understand the intricate workings of your engines, turbines, and compressors while organizing data into information you can use. With the knowledge you gain, you can quickly identify problem areas and fix them.

## WORKBOOKS

CECO Training and Technical Services has identified over 500 “tasks” or topics that are crucial to successfully running a compressor station. These topics can be combined into workbooks for detailed self-study for new and existing field personnel. Each workbook may be prebuilt with related tasks covering one topic, or custom-configured to include any number of topics and tasks. Workbooks may be compiled and purchased online with a few clicks of the mouse.

## LEARN CENTER

CECO introduces the all-new Learn Center. Finally an easy, online program for compressor and engine training where your training history is tracked for you. In the Learn Center you'll have access to online training modules, workbooks, open enrollment courses, software and other CECO resources. Individual modules or tasks can be purchased online allowing you to complete Operator Qualification requirements whenever it is convenient.





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## PROGRAM AUDIT

Over the years CECO Training and Technical Services has been involved with clients to audit their existing training programs for improvement or assist in developing employee skills evaluations to determine their training needs. This requires close cooperation between CECO and the client to accurately determine current performance and to realistically measure achievable results once changes are implemented.

## EXPERT WITNESS

CECO Training and Technical Services has the education, training and experience to provide technical knowledge and a high level of expertise when an expert witness is needed. CECO can review the following types of data:

- » Operational Data from the Time in Question
- » Equipment Maintenance History
- » Personnel Training Records and Interviews
- » Operating and Maintenance Procedures
- » Original Equipment Manufacturer Specifications
- » Any Additional Data That Is Provided by the Client

## FAILURE INVESTIGATION

Few organizations have the unique expertise available from CECO Technical and Training Services. While adhering to government mandates, we incorporate several industry standard methodologies along with our expertise to quickly determine the root cause of the failure and provide actionable recommendations to prevent further incidents.

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