

COURSE CATALOG

TRAINING & TECHNICAL SERVICES



**COMPRESSOR
ENGINEERING CORP.**

SINCE 1964

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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.

Well organized classroom training courses provide in-depth learning. Where CECO's printed workbooks and online learn center provide a simple solution to training needs, Instructor-led training provides the expertise and experience of CECO's knowledgeable trainers. They are available to answer questions as they arise and guide instruction tailored to each client's very specific needs. The benefits of a knowledgeable instructor bring great value to CECO's training classes that printed workbooks and web-based training alone cannot provide.

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 SME with the necessary tools to teach the customized course.

Do you only have a few employees that need fundamental training? CECO partners with industry wide organizations to offer open enrollment courses throughout the year to meet your needs.

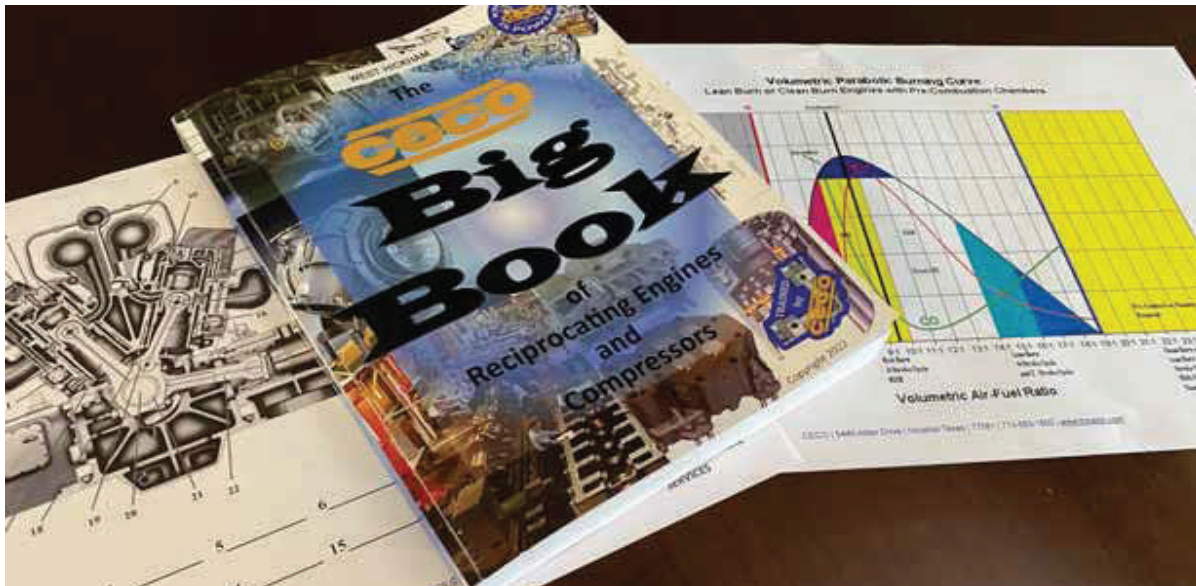


APPLIED PRINCIPLES OF RECIPROCATING ENGINES & COMPRESSORS

Applied Principles of Reciprocating Engines and Compressors provides a solid understanding of how reciprocating engines and compressors should operate and what may cause them to malfunction. Designed for any employee involved in the operation and maintenance of two-stroke and four-stroke cycle reciprocating engines and compressors, this course covers everything from the valve train, power train, and subsystems, to the cycles of events and combustion conditions.

Hours: 36

Prerequisites: None



COMBUSTION CHARACTERISTICS

Combustion Characteristics covers all aspects of combustion and emissions, with a primary focus on troubleshooting operating changes on a variety of reciprocating engines - two-stroke cycle (2SC) and four-stroke cycle (4SC) engines, as well as naturally aspirated 4SC engines used as generators. Students of this course will receive instruction covering peak firing pressure (PFP), mean effective pressure (MEP), exhaust temperatures, turbocharger speed, fuel consumption, and emissions.

Hours: 32

Prerequisites: Applied Principles of Reciprocating Engines & Compressors



COMPRESSOR CHARACTERISTICS

Compressor Characteristics outfits operators with knowledge that enables them to troubleshoot compressor operating changes and improve unit operations. This course provides students a comprehensive study of reciprocating compressors, thermodynamic & gas laws, and the effect of unloading devices on gas compression. With a focus on horsepower curves - how to read them, and how to use them to improve unit operations.

Hours: 24

Prerequisites: Applied Principles of Reciprocating Engines & Compressors

APPLIED PRINCIPLES OF HIGH-SPEED RECIPROCATING ENGINES & COMPRESSORS

Applied Principles of High-Speed Reciprocating Engines and Compressors provides a solid foundation to any employee involved in the operation and maintenance of high-speed reciprocating engines and compressors. The course teaches all major parts and pieces, how the equipment should operate and what may cause malfunctions.

Hours: 32

Prerequisites: None

COMBUSTION CHARACTERISTICS FOR HIGH-SPEED ENGINES

Combustion Characteristics for High-Speed Engines focuses on all aspects of combustion and emissions. It is a course on how to troubleshoot operating changes on high-speed reciprocating engines. The main purpose of the course is to discuss the topics of peak firing pressure (PFP), mean effective pressure (MEP), exhaust temperatures, turbocharger speed, fuel consumption, and emissions.

Hours: 24

Prerequisites: Applied Principles of Reciprocating Engines & Compressors

COUPLING & SHAFT ALIGNMENT

Coupling and Shaft Alignment is a fundamental course that instructs those in attendance how to monitor, measure, and correct equipment alignment. The class includes the steps and procedures for the rim and face alignment method as well as the reverse dial alignment method.

Hours: 16

Prerequisites: None



OPERATIONS MAINTENANCE

This course teaches fundamental concepts of reciprocating engine & compressor operation, general maintenance guidelines and procedures for reciprocating equipment.

Hours: 16 | Prerequisites: None

OIL ANALYSIS

Oil Analysis is a study of lubricating oil, it's properties and importance in engine lubrication & heat removal. Students learn how to monitor oil conditions so that you know when to change oil, add oil, check or replace components that the oil system lubricates.

Hours: 4 | Prerequisites: None

CRANKSHAFT WEB DEFLECTIONS & WEBMAP2 SOFTWARE TRAINING

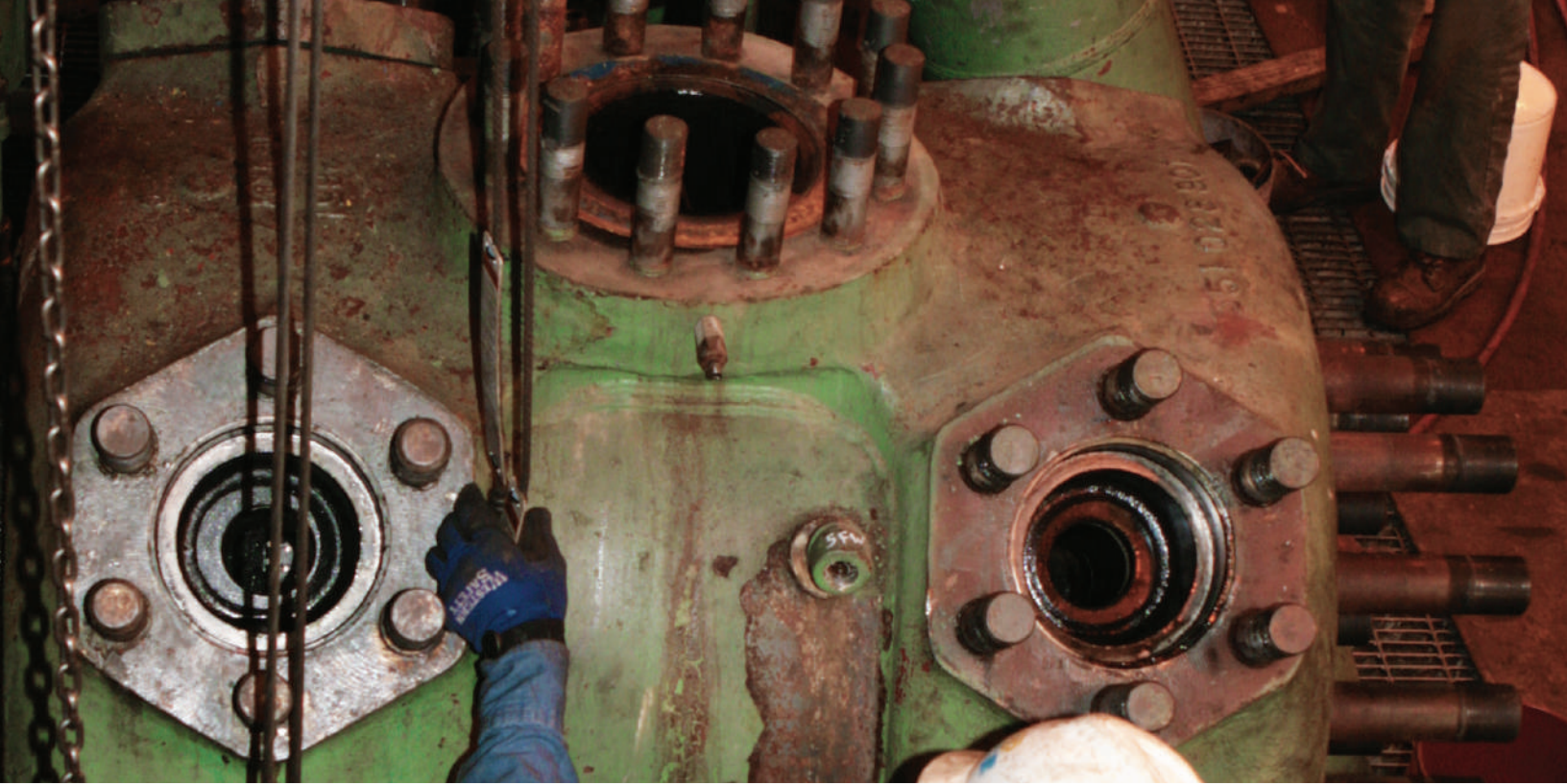
Crankshaft Web Deflections & WebMap2 provides attendees with the fundamentals of performing crankshaft web deflections. The course covers the theory, purpose, required steps and procedures, and interpretation of web deflection data using the WebMap2 software.

Hours: 8 | Prerequisites: None

COMPRESSOR INTEGRITY & ALIGNMENT

Compressor Integrity and Alignment arms personnel in attendance with knowledge allowing them to improve maintenance practices that can potentially compromise compressor integrity, including alignment, rod runout, and clearances. Instruction covers the proper methods to detect critical problems as well as necessary start-up and operating verification procedures.

Hours: 4 | Prerequisites: None



MAINTENANCE & PERFORMANCE ANALYSIS

Maintenance and Performance Analysis is an advanced level course that focuses on the skills and expertise necessary to effectively analyze and predict engine performance and reliability.

Hours: 36

Prerequisites: Applied Principles Of Reciprocating Engines & Compressors,
Compressor Characteristics, Combustion Characteristics



GAS TURBINES I: OPERATING PRINCIPLES OF GAS TURBINES & CENTRIFUGAL COMPRESSORS

Gas Turbines I: Operating Principles of Gas Turbines & Centrifugal Compressors offers a solid foundation to employees involved in the operation and maintenance of gas turbine engines and centrifugal compressors. The course provides a detailed study from the air compressor and the combustor to the events of surge and stall in the gas compressor while teaching the components and subsystems of the unit, its normal and abnormal operating conditions, and how to conduct a startup.

Hours: 24

Prerequisites: None

GAS TURBINES II: MAINTAIN & TROUBLESHOOT GAS TURBINES & CENTRIFUGAL COMPRESSORS

Gas Turbines II: Maintain and Troubleshoot Gas Turbines and Centrifugal Compressors continues where Gas Turbines I left off. It provides training for any employee whose job includes scheduling maintenance, preventive maintenance, and troubleshooting of such equipment. The course also dives into theoretical hands-on elements of the job - checking, maintaining, and troubleshooting gas turbine engines and centrifugal compressors.

Hours: 24

Prerequisites: Gas Turbines I

ENGINE BALANCE & OPERATION

CECO's Engine Balance & Operation course provides students with a comprehensive study of the air delivery, exhaust, fuel, and ignition systems of a reciprocating engine, as well as the use of the equipment needed to properly conduct an engine balance procedure. The on-site class covers the evaluation of normal and abnormal combustion conditions and the systems that are responsible for combustion - air delivery, fuel delivery, and ignition. Students will have the opportunity to engage in hands-on exercises using the equipment to properly balance reciprocating engines.

Hours: 16

Prerequisites: None

FUNDAMENTALS OF ELECTRIC MOTORS

Fundamentals of Electric Motors is a detailed study of electric motors as the prime mover for a gas compressor (centrifugal, reciprocating, or rotary screw), focusing on the components, subsystems, and operation of the equipment. This course uses customized drawing binders of station schematics enabling attendees to apply what they have learned to their specific site.

Hours: 24

Prerequisites: None

FORCE-FEED LUBRICATION

The Force-Feed Lubrication Systems course provides employees with an understanding of the oil system used to provide oil lubrication for wear surfaces not in direct contact with the main oil system, such as rod packing, compressor cylinder liners, and power cylinders above the ports (two-stroke cycle engines).

Hours: 8

Prerequisites: None

FUNDAMENTALS OF TROUBLESHOOTING

Fundamentals of Troubleshooting provides a solid foundation of basic troubleshooting techniques and their applications and limitations.

Hours: 24

Prerequisites: Applied Principles of Engines & Compressors, Compressor Characteristics, Combustion Characteristics

FUNDAMENTALS OF TURBOCHARGER OPERATIONS

Fundamentals of Turbocharger Operations teaches operating parameters of turbochargers, essential components, preventive maintenance items, troubleshooting skills, and how to monitor performance.

Hours: 8

Prerequisites: None



ONE-ON-ONE EQUIPMENT ANALYST TRAINING

One-on-One Equipment Analyst Training topics are covered from an operations perspective and are intended to teach practical, useful engine troubleshooting and assessment skills.

Hours: 24

Prerequisites: Applied Principles of Reciprocating Engines & Compressors,
Compressor Characteristics, Combustion Characteristics

PIPELINE PIGGING

Pipeline Pigging begins with a study of the different types of pipeline pigs and their components, then teaches the student each step of the pigging process; specifically, the preparation, launch, recovery, documentation, and maintenance.

Hours: 8

Prerequisites: None

PRECISION MEASUREMENT

Precision Measurement is a hands-on course on the basic concepts and the application of precision measurement tools. This course covers basic measurement, mathematics, and the hands-on use of various measurement tools.

Hours: 8

Prerequisites: None

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