GE Power

Product Training Course Catalog

Waukesha* gas engines

* Indicates a trademark of the General Electric Company

Waukesha* Product Training

Your Most Powerful Service

Product Training is an essential component in satisfying the knowledge and skill needs of our Global Partners and end-customers. GE's Waukesha gas engines demonstrates this commitment by offering three global training centers.

Waukesha gas engines Worldwide Product Training Locations

Our North American training center is located at the Waukesha gas engine headquarters in Waukesha, Wisconsin. This fully equipped 16,000 square foot training facility features multiple classrooms to accommodate up to 25 students in each lecture-based class.

The shop area includes eight training engines that are available for certified and non-certified classes. Both a running VHP GL and a brand new VGF SE with APM are used to optimize the hands-on experience.

Our European training center is part of the GE Jenbacher gas engine complex in Jenbach Austria.

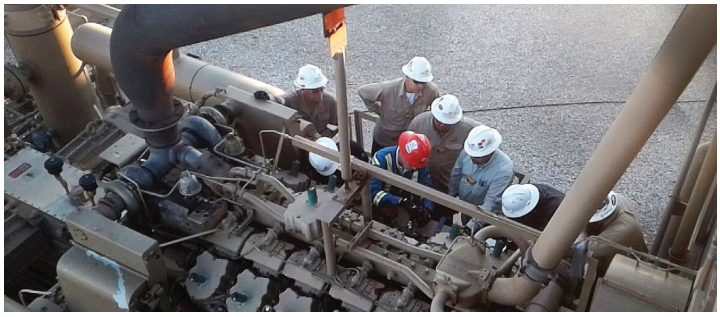
This facility offers five classrooms to support all lecture based courses provided by Waukesha gas engine.

Our Far East training center is part of the new Souer distribution complex in Phitsanulok Thailand.

This facility features a large state-of-the -art classroom stocked with engine parts and components to support all aspects of training. An air conditioned shop with Training engines to support VGF, VHP, and 275GL+ engine classes provides an excellent environment for the hands-on portions of the training classes.

Course Offerings at our Worldwide Training Centers

The following courses are available for those who are responsible for the packaging, commissioning, operation, maintenance, and repair of Waukesha gas engines worldwide.



To view our latest course schedule, visit our new Training Website and click on Training Offering on the top menu to determine the course(s) and date(s) you would like to attend.

https://waukesha-training.gepower.com

Classes fill on a first come, first serve basis. Please contact your local Waukesha gas engines parts or service distributor for information on pricing and registration.

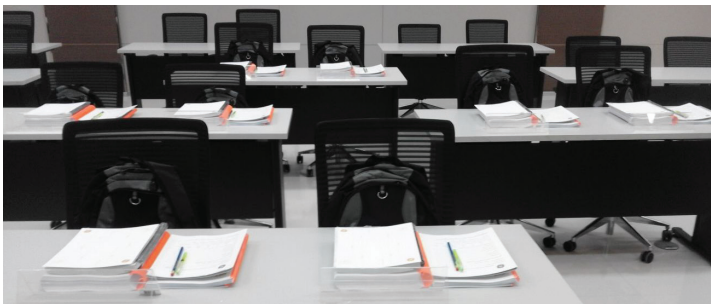
- All scheduled courses are subject to change. GE Power may cancel scheduled courses if minimum enrollments are not met.
- A wait list is available online for course registration. Overflow course dates may be scheduled based on demand.

Please contact our training coordinator for more information at ***waukesha.ptc@ge.com***

GE Power, Product Training Center
1101 W. St. Paul Ave. Waukesha, WI 53188

Training Offered at Your Location

Waukesha gas engines provides customers the option of hosting GET, ESM, and custom seminars at their facility or a local conference center. Contact the Waukesha Product Training Center to discuss your specific needs.



Training Offered by Request

Waukesha gas engines provide customized seminars to its' partners, customers and packagers upon request.

Non-certified seminars are designed to provide end users a training option when the fully certified curriculum is not required. Seminars focus on supplementing the functional knowledge of your teams, or provide training to staff on legacy products, new product releases, and updates. Seminars are not, however, a replacement for the certified content, but provide tailored content to address your needs operating, maintaining, commissioning or packaging Waukesha gas engines.

Course Topics

- P9394 Engine Technology
- ESM2 Controls Technology
- AFR2 Controls Technology
- APM - Remote Monitoring Technology
- APG 2000/3000 (12V/18V220GL)
- ATGL Engine Technolon with CEC
- APG 1000 (16V150LTD)
- Engine Emissions and Compliance
- Custom Engine Controls CEC

*Customer Seminars are not limited to the above listed topics.

Expert training for improved operations

GE Training uses extensive engine expertise and decades of industry knowledge to help improve the skillsets of your technicians, helping them work better, faster and smarter.

- Advanced technical training in multiple languages - via our multi-lingual instructors or via an interpreter
- Available on your jobsite
- Training from the latest product information
- Highly knowledgeable and skilled technical trainers
- Hands-on activities and in-class exercises to drive home the knowledge and skills technicians need

Waukesha Factory Trainers

GE Power assigns instructors for specific courses based on experience and availability.

Carl D. Jahns, Lead Training Specialist

Courses: All Courses Languages: English

As a Business and Engineering Professional, Carl brings over 25 years engine experience to the Waukesha gas engines training team. Carl has a broad range of experience including product development, field service, and engine maintenance/repair. His interactions with Waukesha channel partners to improve the service offering to customers brings a real world technical perspective to the training needs of our customers. Carl's ability to simplify complex topics and relate to technicians allows him to enhance both the classroom and shop learning experience.

Bachelor of Science Degree – Business Administration
Cardinal Stritch University Trained in Mechanical Engineering Technology, Milwaukee School of Engineering

Matthew Walloch, Lead Training Specialist

Courses: All Courses Languages: English

Matt joins the team as a professional technician trainer with over 15 years' experience in 3 diverse industries. As a trade and business school graduate, with production line experience, he brings a unique perspective to the table. Previous training, troubleshooting, and production experience in Electrical, Hydraulic, and Water Treatment give Matt the fundamentals to make complex concepts understandable. He enjoys training so he can guide people to a discovery moment and learn from their experiences to make each class better. Matt looks forward to meeting you in a class that will help you serve our customer better.

Bachelor of Science Degree – Business Administration

Ralf Schulz, Technical Support Specialist

Courses: All Courses Languages: German, English

With more than 25 years of experience, Ralf joined Waukesha gas engines in 2010.
He started his career as electrician volunteer in 1982 in an ore mine in Germany, followed by a 15 year stay in German Air Force, where he received his master's degree in power generation with reciprocating engines. In 2004, Ralf studied in State Certified Engineer Electro Technology in Lörrach, Germany and did his trainer examination at Handwerkskammer Freiburg, Germany.

Ralf's main responsibility is within Field Service with strengths on troubleshooting and maintenance, commissioning, and evaluation. Together with Waukesha channel partners, he's in continual contact with our end customers to increase satisfaction with Waukesha Gas Engines.

As a native German speaker, Ralf excels in conducting training courses held in Jenbach/Austria (German or English language) as well as field training. He also helps the Training Center with reviewing translated German training material to ensure the highest quality of interpretation.

Waukesha Certification

Waukesha offers a modern cost effective, blended training offering for all Distributed Power products focused on service excellence and maximizing the value customers get from our engines.

- Classroom Instruction Certified and Non-certified
- Annual Exam
- eTraining Library
- Quarterly Field Tech Excellence Webinar
- New Website My Team & Reports

* Re-certification Packages are only available to channel partners

There are 3 certifications available to Field Technicians employed by Waukesha gas engine Channel Partners: VHP Certified Technician, VGF Certified Technician and 275GL+ Certified Technician. To establish and maintain their Certification, a technician needs to successfully complete the GET, ESM, and Engine classes, as well as the relevant digital trainings available as part of the Yearly Recertification Package*. Technicians can view their Training Plan and Certification Status by accessing the My Training Status page of our Waukesha Product Training Center Website

Please see WEDA 619 for details on how technician status levels affect the return on Warranty reimbursement rates. Website access is available as part of our Yearly Recertification Package, which also includes eTrainings, recorded Webinars, and the ability to download certificates.

Please contact your company's training administrator for more information and to get signed up for this package today.

Go for the Gold

Since 1986, we have offered optional Gold Master Certification for technicians employed by Waukesha gas engines Distributors – achieved by earning certification in six of the classes that comprise the Product Training Center's core curriculum. Gold Master Certification is a recognition acknowledging outstanding dedication to their employer and their craft. Accordingly, each technician in this elite group is presented with a set of gold engraved, specially-commissioned Snap-On® wrenches.

Contact the Waukesha PTC

Ashley Grosskreutz, Training Coordinator

In February of 2017, we launched our new training website, a one-stop-shop where you can browse our up-to-date training offerings and request courses online and review schedule changes at:

https://waukesha-training.gepower.com

We are also available to further discuss training opportunities that work for your organization. For answers to any other training-related questions, please call your local parts and service distributor, or contact us at (262) 549-2681 or waukesha.ptc@ge.com.

Registrant information including (hotel accommodations, travel recommendations, meals, etc.) is available on our Training Website under Participant Information. Lunch and beverages will be provided at all our worldwide training center for each day of class.

Note: Special meal requirements/restrictions must be communicated to in advance so accommodations can be made.

Waukesha Authorized Technical Trainers (WATTs)

We are proud of our trainer community. With nearly 200 years combined experience working in the industry our training team bring passion, expertise, and real-life experience to their presentations and hands-on coursework. We are able to provide the best experience for our students to develop the skills and knowledge needed to get the maximum value from our engines.

Manuel E Chaves, International Technical Trainer, Contractor, Tecnologia Americana

Courses: All Courses Languages: Spanish, Portuguese and English

Manuel Chaves has been with Waukesha Gas Engine for 22 years. Doing various roles; as Field Service Engineer, part time Trainer and Service Development Leader. Some of the major functions have been:

- Providing technical assistance and troubleshooting assistance for OEM's, Distributors and Customers.
- Conducting : engine inspections , failures analysis, repair procedures.
- Assist Distributors with Engine installations, start-ups and product updates.

Today Manuel continues bringing to Waukesha these experiences as an International Trainer. He also has been translating training material to Spanish. Traveling teaching international Technical Training schools in English or in a Spanish.

Bachelor of Science Degree, Mechanical Engineering – California State University. LA.
Associate Science Degree – Glendale Community College , CA

Alasdair McGillivray Tait, Training Specialist, Souer Co., Ltd

Courses: GET and ESM Languages: English

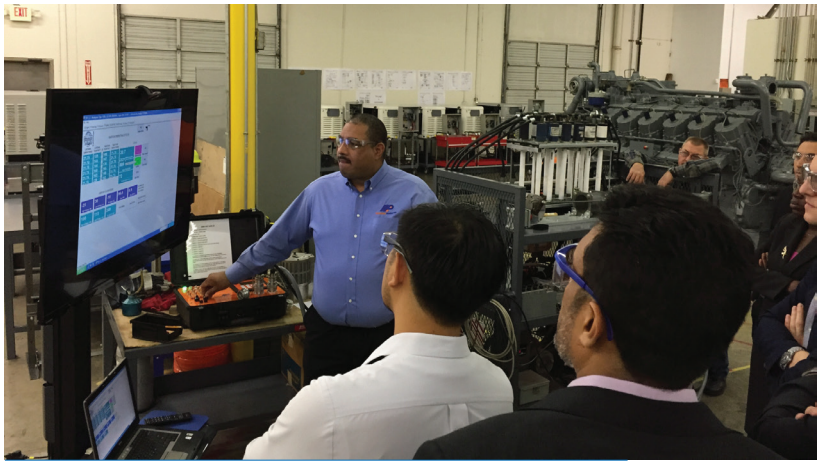
His background for the last 21 years has been in education, management, teaching and development. While managing Souer Co. Ltd's Training Centre, Alasdair also oversees the customer repairs & overhauls, assists in hands on workshop duties, writes the condition & overhaul reports, and updates ISO documentation for the workshop.

Alasdair received the accolade of becoming a GE Waukesha Gold Certified Technician in August 2011 after successfully completing seven GE Waukesha training courses. During the same month he also successfully passed his GET audit, becoming a GE Waukesha Authorized Technical Trainer. Since then Alasdair has also become certified to conduct ESM training courses.

Souer Co., Ltd has developed GE Waukesha's most advanced ESM simulator, which has benefited students greatly since it's launch in 2010.

Alasdair is available to travel internationally to deliver training at customer premises and has conducted courses in Europe and Asia.

NC - Business Studies – Langside College,
NC – Sport and Recreation in the Community – Glasgow College
TEFL (Teaching English as a Foreign Language) Accreditation



Training Facility Shop Area in Sugarland, Texas

Training Facility Classroom in Phitsanulok, Thailand

Patrick Clophus, Training Manager, Waukesha-Pearce Industries, Inc.

Courses: GET and ESM Languages: English

Employed for the past 15 years by WPI, Patrick spent his first five years as Training Coordinator and conducted classes for the WPI technician training program. During these five years Patrick began conducting Waukesha and Generac Power Systems factory certified training courses. In 2003 Patrick was promoted to Technical Support Representative. During his time as technical support representative Patrick maintained the responsibility of coordinating the training program and conducting certified Waukesha training courses for WPI technicians, customers, and Power Partners.

In 2010 Patrick was reassigned to Training Manager with the main responsibility to manage the new WPI training center and staff.

Patrick attended numerous training courses held by various engine and equipment manufacturers and is a Waukesha Engine Division Gold Master Certified Technician.

Associate of Applied Science Degree in Diesel Mechanics – Lamar Institute of Technology 1987.
Bachelor of Science Degree in Industrial Technology – Lamar University in Beaumont, Texas 1989
Texas Vocational Education Certification 1994

Darryl Chandler, Training Instructor, Waukesha-Pearce Industries, LLC

Courses: GET Languages: English

Darryl Chandler has been with Waukesha-Pearce, LLC for the past 3 years. At WPI he is primarily responsible for conducting Generac Power Systems factory certified training courses that instruct students in the servicing, installation, testing and repair of Generac air and liquid cooled, gaseous and diesel fueled generators, transfer switches, load shed modules and associated equipment that are used for residual and commercial applications.

He begin his career in the United Stated Air Force as an Electrical Power Production Technician then went on to become an Training Instructor at Sheppard Air Force Base in Wichita Falls, Texas. He was responsible for the operation, maintenance, and troubleshooting of electrical power generating equipment and associated systems supplying prime and standby power worldwide. He has a strong background instructing basic electrical/electronic theory covering alternating and direct current principles, troubleshooting diesel generators, automatic transfer switches, alternators, and uninterruptible power supplies.

After retiring he worked for Stewart & Stevenson as a Gas Turbine and Diesel Generator instructor and at Texas A&M University support the development and execution of regional and multifunctional Weapons of Mass Destruction/Terrorism Incident Exercise Program for the Texas Department of Emergency Management.

Bachelor of Science in Occupational Education – Wayland Baptist University in Plainview, Texas 1993
Masters of Science in Education – University of North Texas in Denton, Texas 1997
Training and Development Professional Certification Program – Texas A&M University in College Station, Texas 2014

Gas Engine Technology (GET) Course

Note that course daily agendas and detailed outlines are subject to change.

Course Name	Gas Engine Technology
Training Category	Technical Theory and Application
Course Description	This course is the foundation for all engines. The information can be applied to virtually all gas engines and is very comprehensive in all areas of engine maintenance, operation and troubleshooting. GET is a required prerequisite for all other Waukesha training.
Course Length	4 ½ Days
Language	Courses are generally taught in English with English language materials. Contact Waukesha Product Training if you need a course / course materials in a language other than English. *Note: Bilingual Homework and Exams in Russian and Spanish are presently available for request at time of registration.*
Course Audience	This course is recommended for anyone who is responsible for the care and maintenance of Waukesha products, but also for those who desire a thorough understanding of gas engine theory and technology not easily attained in the field.
Prerequisite	None, but the student should be knowledgeable in internal combustion engines and understand basic engine terminology.
Safety Requirements	GET does not include an engine lab so safety shoes are not required. A production facility tour will require safety glasses that will be provided.
Recommended Clothing	The course consists of training in the classroom. Casual attire is recommended.
Course Objectives	The program thoroughly covers the fundamentals of gas engine technology with specific references to Waukesha products. Given classroom instruction on theory and essential systems knowledge, homework, and reviews students will learn overview knowledge of: • Breathing Systems • Cooling Systems • Lubrication • Fuels • Combustion Theory • Ignition • Mounting and Alignment • EGA
Supporting Materials	Students receive product manuals and a separate manual of the instructor's slides and notes. Additional materials include handouts or other aids for learning may also be provided to students.

Day 1

Introduction

Engine Products and Features

Cooling Systems

Mounting and Alignment

Day 2

Homework Review

Combustion Theory

Fuel Systems

Day 3

Homework Review

Fuel Systems

Exhaust Gas Analysis

Lubrication

Day 4

Homework Review

Plant Tour

Breathing

Ignition

Day 5 (Noon finish)

Note: *This is a half day ending at 12:00 PM. Lunch is not provided.*

Test Introduction

Course examination

Test Review and Class Closure

GET Course Overview

Course Topics

Cooling System
- Design requirements
- Jacket water conditioning
- Scale deposit
- Cavitation erosion
- Corrosion

Mounting and Alignment
- Crankcase deflection
- Coupling alignment
- Linear and torsional vibration
- Single bearing generator alignment

Combustion Theory
- Detonation
- Preignition
- Rich burn vs. lean burn principles

Gas Fuel System
- Gas fuel composition
- Lean and stoichimetric combustion theory
- Detonation & preignition
- System operation, maintenance and troubleshooting
- System adjustment

Exhaust Gas Analysis (EGA)
- Test location & procedures for best accuracy
- Testing Prep & expectations for RB/LB

Lubrication System
- Oil specification and performance
- Understanding oil analysis
- System requirements

Air Induction and Exhaust Systems/Breathing
- Design requirements
- Maintenance
- Breather adjustment
- Back Pressure

Ignition System Fundamentals
- Waukesha ignition system history/overview
- Magneto
- CEC (Customer Engine Control)
- ESM Engine Control System
- ESM2
- Knock detection
- Spark plug function, application and troubleshooting

ESM* Control Systems Course

Note that course daily agendas and detailed outlines are subject to change.

Course Name	ESM
Training Category	Technical Theory and Application
Course Description	This course is fundamental for all engine families. The focus is on the hardware and theory of engine control systems addressing both the operation, maintenance and packaging of various generations. The course includes comprehensive instruction on topics including ignition, governing, detonation detection, wiring, air-fuel control, and the safety and shutdown systems. ESM is a required prerequisite for all engine courses.
Course Length	4 ½ Days
Language	Courses are generally taught in English with English language materials. Contact Waukesha Product Training if you need a course / course materials in a language other than English.
Course Audience	This course is designed specifically for technicians who will be responsible to install, program, adjust, and troubleshoot the Engine System Manager (ESM and ESM2).
Prerequisite	GET (a Waukesha course that is foundational to all other Waukesha training programs) is highly recommended. The ESM course is taught with the understanding that the attendants understand governing and are thoroughly experienced with adjusting fuel systems. In addition, they must know how to troubleshoot electrical systems, and perform basic tasks on a laptop computer using Microsoft Windows®.
Safety Requirements	This is a classroom coarse. A demonstration at a running engine is provided, required safety glasses and toe clips will be provided. A laptop is suggested.
Recommended Clothing	The course consists of training in the classroom. Casual attire is recommended.
Course Objectives	Given classroom instruction on theory and essential systems knowledge, homework, and reviews students will learn overview knowledge of: • Features and Benefits • ESM Hardware and Software • HMIs • Fiuel Controls • Packaging • Power Supplies • Wiring • Fault Diagnosis • Upgrades • Troubleshooting
Supporting Materials	Students receive product manuals and a separate manual of the instructor's slides and notes. Additional materials include handouts or other aids for learning may also be provided to students.

Day 1

Introduction

Theory and Components

Control Software

Day 2

Homework

Control Software

Fuel Control System

Power Supply & Wiring

Day 3

Homework

Power Supply & Wiring

Q & A with Guests

Packaging and Installation

E-Help/Fault Diagnosis

Day 4

Homework

E-Help/Fault Diagnosis

Homework: Fault Diagnosis

Troubleshooting

Homework: Troubleshooting

Simulator Demo

Day 5 (Noon finish)

Note: *This is a half day ending at 12:00 PM. Lunch is not provided.*

Test Introduction

Course examination

Test Review and Class Closure

ESM Course Overview

Course Topics

Theory and components
- Benefits
- Key Components
- Functional Overview
- Upgrades

Control Software & Customer interface
- Human Machine Interface HMI
- Installation
- Operation and use

Fuel control systems
- ESM1/AFR1
- ESM1/AFR2
- ESM2/AFR2
- Evolution
- Setup
- Maintenance & fault codes.

Packaging and Installation
- Packaging Requirements & options
- Power Distribution Box
- AC/DC circuits
- Wire size requirements
- Analog vs digital signals
- Installation for trouble-free operation
- Connections to driven equipment
- Configuration

Fault Diagnosis & Troubleshooting
- E-help
- ESP® (Electronic Service Program software)
- Mechanical/electrical
- Scenarios

VHP* Technology Course

Note that course daily agendas and detailed outlines are subject to change.

Course Name	VHP Technology
Training Category	Technical Theory and Application
Course Description	The course provides and overview of the designs, specification and adjustments that are unique to the VHP Waukesha Engine and includes presentations on the Engine System Manager.
Course Length	4 ½ Days
Language	Courses are generally taught in English with English language materials. Contact Waukesha Product Training if you need a course / course materials in a language other than English. *Note: Bilingual Homework and Exams in Spanish are presently available for request at time of registration.*
Course Audience	Recommended for those responsible for the operation and maintenance of Waukesha VHP engines. Distributors, OEM and Power Energy Partner technician and users / operators of VHP engines are encouraged to attend this course.
Prerequisite	GET-and ESM are required prerequisite for VHP training.
Safety Requirements	Z 87.1 approved safety glasses and toe protection must be worn during the shop portion of this course. (Note: These items are also provided to students at the Waukesha Product Training Center.)
Recommended Clothing	The course consists of training in the classroom and hands on lab work. It is recommended to bring suitable clothing for the lab sections of the training course.
Course Objectives	The program thoroughly covers those designs, specifications and adjustments that are unique to the VHP engine family. A fully operational VHP 2900GL Enginator® will be used for "hands on" fuel system adjustment and emissions equipment training. Students will. Given classroom instruction on theory and essential systems knowledge, homework, reviews and hands on training, students will learn procedures to perform: • Cylinder Head Overhaul • Power Cylinder Removal, Installation and Inspection • Adjustment of the fuel system to bring the exhaust emissions into compliance • Crankshaft and Camshaft Overhaul
Supporting Materials	Students receive product manuals and a separate manual of the instructor's slides and notes. Additional materials include handouts or other aids for learning may also be provided to students.

Day 1

Introduction

Engine Models and Features

Cooling Systems

VHP Product Update / Series 4

Mounting and Alignment

Day 2

Homework Review

Fuels

Shop Safety Presentation

Hands-on Shop Work

Day 3

Homework Review

Governor

Lubrication

Breathing

Hands-on Shop Work

Day 4

Homework Review

Hands-on Shop Work

Question & Answer

Hands-on Shop Work

Day 5 (Noon finish)

Note: *This is a half day ending at 12:00 PM. Lunch is not provided.*

Test Introduction

Course examination

Test Review and Class Closure

VHP Course Overview

Course Topics

General Topics

- VHP Design Features
- VHP Service Updates
- Series Four* Features
- Series Four Service

Cooling Systems

- Standard
- Hot Water/Ebullient
- Service

Governor

- Linkage Adjustment

Fuel Systems (Stoichiometric and Lean Burn Technology)

- Theory of Operation
- Component Description
- Setup and Adjustment
- Prechamber Controls

Lubrication

- System Description
- Specifications
- Service

Breathing Systems

- Specifications
- Adjustments
- Service

Hands-on Shop Activities

Power Cylinder Removal, Installation and Inspection

- Remove & replace piston
- Piston inspection
- Remove & replace connecting rod
- Connecting rod inspection and rebuilding
- Remove & replace cylinder liner
- Cylinder inspection and measuring protrusion

Cylinder Head Overhaul

- Disassembly
- Remove & replace valve seats
- Remove & replace valve guides
- Head inspection
- Seat grinding
- Adjusting valves
- Series Four head overhaul

Crankshaft and Camshaft Overhaul

- Identify correct crankshaft & bearing combination
- Main bearing inspection and cap torquing
- Cap torquing
- Crank and camshaft endplay measurement and adjustment
- Crankshaft wear sleeve and gear cover removal, inspection and installation
- Remove & replace front gear cover
- Gear train inspection and disassembly
- Oil and water pump evaluation

Running Engine Demonstrations

- Students will operate a lean burn and rich burn engine to demonstrate theory learned in the classroom

VGF* Technology Course

Note that course daily agendas and detailed outlines are subject to change.

Course Name	VGF Technology
Training Category	Technical Theory and Application
Course Description	The course thoroughly covers the designs, specification and adjustments that are unique to the VGF engine family. An F18 (6 cylinder 18 liter) and an L36 (12 cylinder 36 liter) engine are used for hands-on overhaul procedures. A comprehensive evaluation at the end of the course is used to evaluate student learning.
Course Length	4 ½ Days
Language	The course materials may be provided in multiple languages depending upon the location. Courses provided at the Waukesha Product Training Center are taught in English. *Note: Bilingual Homework and Exams in Spanish are presently available for request at time of registration.*
Course Audience	Recommended for those responsible for the operation and maintenance of Dresser Waukesha VGF engines. Distributors, OEM and Power Energy Partner technician and users / operators of VGF engines are encouraged to attend this course.
Prerequisite	GET-and ESM are required prerequisite for VHP training.
Safety Requirements	Z 87.1 approved safety glasses and toe protection must be worn during the shop portion of this course. (Note: These items are also provided to students.)
Recommended Clothing	The course consists of training in the classroom and hands on lab work. It is recommended to bring suitable clothing for the lab sections of the training course.
Course Objectives	Given classroom instruction on theory and essential systems knowledge, homework, reviews and hands on training, students will learn procedures to perform: • Cylinder head overhaul • Power cylinder overhaul • Crankshaft, camshaft, gear train and pump overhaul
Supporting Materials	Students receive VGF manuals and a separate manual of the instructor's slides and notes. Additional materials include handouts of recent service bulletins or other aids for learning.

Day 1

Introduction

Engine Design Features

Breathing Systems

KDM

Lab Safety Video

Lab Work

Day 2

Homework Review (Features, Breathing Systems, KDM)

Fuel Systems

Lab Work

Day 3

Homework Review (Fuel System)

Cooling (with Homework)

Lubrication (with Homework)

Question and Answer

Lab Work

Day 4

VGF SE updates and controls demonstration

Running engine exercise for classes taught at Waukesha

Day 5 (Noon finish)

Note: *This is a half day ending at 12:00 PM. Lunch is not provided.*

Test Introduction

Course examination

Test Review and Class Closure

VGF Course Overview

Course Topics

General Topics

- VGF Design Features
- VGF Service Updates
- Service & maintenance
- VGF Warranty and Start-up requirements

Breathing Systems

- Specifications
- Adjustments
- Service

Fuel Systems (16 & 24.5:1 AFR)

- Theory of Operation
- Component Description
- Adjustments
- Troubleshooting

Cooling Systems

- Standard
- Hot Water
- Service

Lubrication

- System Description
- Specifications
- Service

CEC Ignition Systems

- Description
- Setup & Operation
- KDM. DSM, and AFM

Hands-on Shop Activities

Power Cylinder removal, installation and inspection

- Remove & replace piston
- Piston inspection
- Remove & replace connecting rod
- Connecting rod inspection and rebuilding
- Remove & replace cylinder liner
- Cylinder inspection and measuring protrusion

Cylinder Head overhaul

- Disassembly
- Remove & replace valve seats
- Remove & replace valve guides
- Head inspection
- Seat grinding
- Adjusting valves

Crankshaft and Camshaft Overhaul

- Crank and camshaft endplay measurement and adjustment
- Camshaft and follower service
- Damper service
- Lube oil system service
- Cam bushing removal and replacement
- Cooling system and pumps
- Remove & replace front gear cover
- Gear train inspection and disassembly

Running VGF SE exercise (For Waukesha location only)

- ESM operation
- AFR2 fuel system set-up

275GL* Technology Course

Note that course daily agendas and detailed outlines are subject to change.

Course Name	275GL Technology
Training Category	Technical Theory and Application
Course Description	The course provides and overview of the designs, specification and adjustments that are unique to the 275GL+ Waukesha Engine and includes presentations on the Engine System Manager.
Course Length	4 ½ Days
Language	Courses are generally taught in English with English language materials. Contact Dresser Waukesha Product Training if you need a course / course materials in a language other than English.
Course Audience	Recommended for those responsible for the operation and maintenance of Waukesha 275GL engines. Distributors, OEM and Power Energy Partner technician and users / operators of 275GL engines are encouraged to attend this course.
Prerequisite	GET-and ESM are required prerequisite for VHP training.
Safety Requirements	Z 87.1 approved safety glasses and toe protection must be worn during the shop portion of this course. (Note: These items are also provided to students at the Waukesha Product Training Center.)
Recommended Clothing	The course consists of training in the classroom and hands on lab work. It is recommended to bring suitable clothing for the lab sections of the training course.
Course Objectives	Given classroom instruction on theory and essential systems knowledge, homework, reviews and hands on training, students will learn procedures to perform: • Water pump, cams and valve adjustment • Cylinder Head Service • Power Cylinder Service • Crankshaft and Camshaft Overhaul
Supporting Materials	Students receive product manuals and a separate manual of the instructor's slides and notes. Additional materials include handouts or other aids for learning may also be provided to students.

Day 1

Introduction

Engine Design Features

275GL ESM

275GL ESM Fuels

Day 2

Homework Review

Fuels

Shop Safety Presentation

Hands-on Shop Work

Day 3

Homework Review

Breathing

Lubrication

Hands-on Shop Work

Day 4

Homework Review

Cooling

Commissioning

Question & Answer

Hands-on Shop Work

Day 5 (Noon finish)

Note: *This is a half day ending at 12:00 PM. Lunch is not provided.*

Test Introduction

Course examination

Test Review and Class Closure

275GL Course Overview

Course Topics

Engine Construction

- Engine construction
- Systems description

Fuel System

- System component description
- Theory of operation
- Adjustment

Breathing Systems

- Design requirements
- Maintenance
- Turbocharger inspection
- Back pressure requirements
- Crankcase breather design, operation, and service

Lubrication

- Lube system description
- System requirements & adjustment

Cooling System

- System description
- Design requirements
- System adjustments
- Maintenance requirements
- Water pump rebuilding

Application and Installation

- Installation requirements
- Engine commissioning
- Review of engine documentation

Hands-on Shop Activities

Cam and Auxiliaries

- Water pump removal and rebuild
- Cam and push-rod service
- Crankshaft web deflection
- Main bearing R&R

Power cylinder removal, installation and inspection

- Remove & replace piston
- Piston inspection
- Remove & replace connecting rod
- Connecting rod inspection and rebuilding
- Remove & replace cylinder liner
- Cylinder inspection

Cylinder Head Service

- Remove & replace cylinder head
- Disassembly
- Prechamber servicing
- Admission valve servicing
- Adjusting valves

Engine Specification & System Design (ESD) Course

Note that course daily agendas and detailed outlines are subject to change.

Course Name	Engine Specification & System Design
Training Category	Technical Theory and Application
Course Description	This course is designed for sales and marketing professionals as well as application engineers interested in improving their technical application engineering knowledge.
Course Length	4 ½ Days
Language	Courses are generally taught in English with English language materials. Contact Waukesha Product Training if you need a course / course materials in a language other than English.
Course Audience	This course is best for Distributor and OEM sales professionals and application engineers who sell or design compression, mechanical drive and/or power systems for Waukesha products. This course combines both theory and strong technical contents.
Prerequisite	None, but the student should be knowledgeable in internal combustion engines and understand basic engine terminology. GET is highly recommended.
Safety Requirements	Z 87.1 approved safety glasses and toe protection must be worn during the shop portion of this course. (Note: These items are also provided to students at the Waukesha Product Training Center.)
Recommended Clothing	The course consists of training in the classroom. Casual attire is recommended.
Course Objectives	This is not just another "basic" sales school, but rather a core review of the fundamentals necessary to apply Waukesha products. The use of technical publications and solving engineering calculations will be emphasized. Participants will be given the opportunity to solve case study problems in the design and specification process. Given classroom instruction on theory and essential systems knowledge, homework, and reviews students will learn overview knowledge of: • Waukesha Products • Specification • Installation Requirements • Packaging • Commissioning
Supporting Materials	Students receive product manuals and a separate manual of the instructor's slides and notes. Additional materials include handouts or other aids for learning may also be provided to students.

Day 1

Introduction

Overview of Waukesha Engine Products and Features

Specification Fundamentals

EngCalc

Mounting and Alignment

Day 2

Homework Review

Lubrication

Air Induction

Exhaust

Cooling Specification

Day 3

Homework Review

Fuel Systems

Life Cycle Cost Analysis

Temperature Differential

Heat Balance

Installation Requirement Activity

Day 4

Homework Review

CEC

ESM

Question & Answer

Warranty

GEneral Application Problem

Day 5 (Noon finish)

Note: *This is a half day ending at 12:00 PM. Lunch is not provided.*

Test Introduction

Course examination

Test Review and Class Closure

ESD Course Overview

Course Topics

Introduction to Waukesha Products

- Product engine families outlines
- Product features and benefits
- Gas engine construction

Specification guide

- Introduction to Waukesha's technical publications

EngCalc

- Data entry
- Site specific

Mounting and alignment

- Methods
- Measurements

Lubrication

- Lubricating oil recommendations
- System requirements

Air induction

- Air flow requirements
- SAite specific adjustments

Exhaust System

- System recommendations
- Calculating back pressure

Cooling System

- Cooling water quality and treatment requirements
- System pressure and flow requirements

Life Cycle Cost Analysis

- Features and benefits of the software
- Operational overview

Fuel Specification

- Fuel quality specifications
- Calculating low heating value
- Calculating WKI number
- System specification and selection
- Fuel consumption

Low BTU Specification

- Low BTU fuel description
- Alternate carburetion
- System specification and selection
- Engine deration
- Dual fuel applications

Cooling Water Temperature Differential

- Delta (Δ) T definition and importance
- Influencing factors
- Sample calculations

Heat Balance

- Define and measure heat input vs. output
- Exhaust heat recovery
- Elevated water temperature calculations

Packaging Overview

Failure Analysis (FA) Course

Note that course daily agendas and detailed outlines are subject to change.

Course Name	Failure Anaysis
Training Category	Technical Theory and Application This coarse is only offered to employees of Waukesha distributors and Platinum Power Packagers that meet the PPP program requirements.
Course Description	This course is offered only to Distributor Technicians. It is designed to help technicians become better diagnosticians when identifying failures and their causes. A portion of each program is devoted to teaching theory, then actual failures are analyzed. Students adopt a new vocabulary established by the American Society of Metals and will be able to communicate consistently with the Waukesha factory. It also provides a new level of insight as to when to seek professional help from metallurgical laboratories to help in the diagnostic phase of failure analysis.
Course Length	4 ½ Days
Language	Courses are generally taught in English with English language materials. Contact the Waukesha Product Training Center if you need a course / course materials in a language other than English.
Course Audience	This course is developed for Certified Technicians who investigate engine failures in the field
Prerequisite	Students must be certified technician status according to WEDA 579.
Safety Requirements	Z 87.1 approved safety glasses must be worn during certain phases of the course. (Note: These are provided to students at the Waukesha Product Training Center.)
Recommended Clothing	The course consists of training in the classroom. Casual attire is recommended.
Course Objectives	Given classroom instruction on theory and essential systems knowledge, homework, and reviews students will learn overview knowledge of: • Problem Solving • Key Terms associated with metallurgy and fail modes • How Components Fail • Failure Analysis of the Piston and Cylinder Liner • Failure Analysis of the Crankshaft • Failure Analysis of Fasteners • Failure Analysis Cylinder Head • Failure Analysis Main and Connecting Rod Bearing • Failure Analysis Gears • Failure Analysis for the Technician on Location
Supporting Materials	Students receive product manuals and a separate manual of the instructor's slides and notes. Additional materials include handouts or other aids for learning may also be provided to students.

Day 1

Introduction

Problem Solving

Definition of Terms

How Components Fail

Day 2

Homework Review

Fasteners

Bearings

Cranks

Day 3

Homework Review

Heads

Gears

Day 4

Homework Review

Pistons, Rings, Liners

Technician on Location

Day 5 (Noon finish)

Note: *This is a half day ending at 12:00 PM. Lunch is not provided.*

Test Introduction

Course examination

Test Review and Class Closure

FA Course Overview

Course Topics

How components fail

This program is the foundation of the entire school. Emphasis is placed on learning how different materials affect how components can fail. In addition to studying materials, the topics of loading, corrosion and heat treatment and more is also explained. This program establishes terminology that will be used to describe failures.

Failure analysis of the piston and cylinder liner

Piston scuffing, scoring and seizing is analyzed. Detonation damage and their causes are explored. Piston ring analysis is examined which explains many other related failures. Typical cylinder liner damage and short life is detailed as well as wear patterns.

Failure analysis of the engine crankshaft

Four crankshaft failure causes are explained: bending load fatigue, torsional fatigue, insufficient end play and poor crankshaft rebuilding related failures.

Fastener failure

Many engine failures occur because of a simple failure of a low cost fastener. An explanation of how fasteners are designed, torques and failure will be explored in detail.

Cylinder head failure analysis

Cracked heads and valve seat problems will be taught. Also, valve performance is explained to include thermal and mechanical failures as well as high valve recession. In addition to cylinder heads, valve train components such as cam shafts and lifters are taught.

Main and connecting rod bearing failure analysis

This program explains bearing construction and is followed up by understanding bearing wear before bearing failures are explored. Bearing failures are grouped into dirt contamination, fatigue, oil starvation, corrosion and mechanical distress.

Gear failure analysis

Gears are complex devices; therefore, a program dedicated to gear failures is taught. Different types of gears are explained, along with gear mesh and tooth stress. The failure of gears are grouped into surface fatigue, high and low cycle fatigue (tooth breakage) and general distress.

Failure analysis for the technician on location

Anyone who conducts the investigation at the engine site will benefit from this program. The intention is to practice proven analytical methods that will result in accurate data gathering which will help determine the root cause of a failure. Case study scenarios will be presented to allow students to practice a specific method of analytical troubleshooting.

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GE's Distributed Power business is a leading provider of engines, power equipment and services focused on power generation and gas compression at or near the point of use. Distributed Power offers a diverse product portfolio that includes highly efficient, fuel-flexible, industrial gas engines generating 100 kW to 10 MW of power for numerous industries globally. In addition, the business provides life cycle support for more than 35,000 gas engines worldwide to help you meet your business challenges and success metrics - anywhere and anytime. Backed by our service providers in more than 100 countries, GE's global service network connects with you locally for rapid response to your service needs.

GE's Distributed Power business is headquartered in Jenbach, Austria.

For more information about the Product Training Center visit:
waukesha-training.gepower.com

To access the GE Distributed Power Portal visit:
www.ge-distributedpower.com/en/dpportal

For more information about Conversions, Modifications, and Upgrades visit:
www.gepower.com/services/waukesha/upgrades/catalog

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Imagination at work

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