

## GENERAL INFORMATION ABOUT THE WOODWARD MICRONET CONTROL SYSTEM TRAINING COURSE

**Week 5 (4-days, 28 – 31 January 2019)  
in Elst, The Netherlands.**



### Course Objective:

This course is intended for customer personnel concerned with the I&C aspects of the Woodward Micronet control system for effective maintenance and troubleshooting. The purpose of the training is to provide the knowledge required to ensure consistent, trouble-free performance of the engine and its associated equipment.

### The training will cover the following subjects:

- The basic construction of the GE LM gas turbines and auxiliary systems,
- The Woodward controls hardware,
- Engine sequencing, fuel control and monitoring within the MicroNet GAP. Dynamic simulation will be used where appropriate to help visualize some of the intricate issues,
- Real-life engine problems for improved troubleshooting and problem solving. Dynamic simulation will be used where appropriate to help visualize some of the intricate issues.

### For Whom?

I&C Technicians and Supervisors, Operators and Operation Managers.

In general for those who need an in-depth understanding of the Woodward Micronet Control System.

The training course is meant for employees of companies that are (future) end users of LM gas turbines or contractors that operate the gas turbines on behalf of those companies.

### Entry Level

Thorough understanding of the gas turbine equipment and its operation. Familiarity with control system basics. The training participants should be familiar with analog and digital control techniques.

VBR advises that participants have followed the mechanical LM2500/PGT25 or LM6000 training course or have gained similar knowledge.

### Course manual

Each trainee will receive a training manual in full color, covering the relevant subjects of the training course both on paper and in digital format. The text in the course manual, supplied by VBR Turbine Partners, will be in English and they will cover all subjects handled in the course.

Additional information will be supplied on a memory stick.

### Language

The training will be conducted in English. The manuals are in English as well.

### Trainer

A qualified English-speaking senior instructor will present the course.

## Course content:

### Module 1:

- **Make acquaintance and presentation of the program**
- **An introduction to LM gas turbines**
- **Major Components of the LM2500/PGT25 and LM6000**
  - Control system compressor (IGV, VSV, VBV)
  - Combustion system
  - Turbines
  - Bearings, sumps and frames (including TBV)
  - Accessory Drive Assembly and Accessories
- **An introduction to the Auxiliary Equipment and Systems**
  - Introduction
  - Instruments on/around the gas turbine
  - Hydraulic starting system
  - Synthetic lube oil system
  - Load mineral lube oil system
  - Gas fuel system
  - Liquid Fuel and Water Injection system
  - Inlet air and ventilation system
  - Compressor water wash system

### Module 2:

- **Instrumentation, Control, Protection and Monitoring**
  - Engine functionality
  - Station Designation
  - Abbreviations and Acronyms
  - On- and off engine instrumentation
  - Control logic solvers, final elements and related components
  - Protection logic solvers and protection devices
  - Monitoring and diagnostics

### Module 3:

- **Hardware & Software Summary**
  - Introduction to Woodward Hardware
  - MicroNet+ Hardware
  - Familiarization with GAP
  - MSM Implementation
  - Technical Interfaces
  - MicroNet+ Maintenance
  - Fuel Valves

### Module 4:

- **Operations Summary**
  - Control Fundamentals and Typical Examples
    - General Control Fundamentals
    - Typical GT Start Permissives
    - Typical GT Start-up Sequence
    - Typical GT Shutdown Sequence
  - GE's LM6000 Control and Monitoring Requirements
    - I/O Requirements
    - Fuel Control Requirements
    - Special Sequences
    - HMIs for Operational Monitoring
    - Anti-Icing Control System
    - Condition and Performance Monitoring
  - Control & Monitoring
  - Control Discussions and Improvements
- **Evaluation of the training course**
  - Course evaluation
  - Issue certificates

### **Training Duration**

Monday/Tuesday/Wednesday/Thursday 09:00 – 16:00

Lunch provided by VBR 12:00 – 13:00

### **Pricing / Payment conditions**

For the Woodward Micronet & Engine Control training course, in Elst, The Netherlands, the cost will be:

**€ 2 500.- per person.** (excl. VAT, lodging and travel expenses).

### **Registration**

If you wish to participate in the course please visit: [Registration WW MicroNet training](#) and register on-line at least two (2) weeks prior to the start of class.

You can also request a registration by e-mail [training@vbr-turbinepartners.com](mailto:training@vbr-turbinepartners.com).

### **Cancellation**

If you have received a registry confirmation but are forced to cancel due to circumstances beyond your control, you can cancel the registration up to two (2) weeks before the course commencement date. The paid amount will then be refunded. After this date, or in the event of a no-show, no amount will be refunded.

VBR reserves the right to cancel or defer the course. Cancellation or deferment of the training course will be notified by VBR two (2) weeks prior to the course date. VBR is not responsible for any expenses incurred due to non-refundable airline tickets or hotel accommodations.

### **Hotel accommodation**

As an attachment to the registry confirmation, you will receive a list of hotels in or near Elst, and a map showing the route to the training location.

### **Further information**

Further information, also about in company training, can be found by visiting our [training webpage](#).

For all training related questions please contact the VBR Turbine Partners training department: e-mail: [training@vbr-turbinepartners.com](mailto:training@vbr-turbinepartners.com), or call +31 (0)88 010 9000.

### **Customer- or site-specific training courses**

If you wish information about site-specific training courses please contact the VBR Turbine Partners training department: e-mail: [training@vbr-turbinepartners.com](mailto:training@vbr-turbinepartners.com), or call: +31 (0)88 010 9000.

Best Regards,

*Fred Weenink*

Education & Training Manager