



Overview of VBR Turbine Partners technical capabilities

VBR Turbine Partners are independent ISO 9001 / 2008 certified operation & maintenance improvement experts for General Electric GE LM1600, LM2500(+) and LM6000 aeroderivative gas turbines and their auxiliary systems, control systems & packages. We support our customers to realize an improved reliability, availability & performance and a reduced total cost of ownership on their LM gas turbine operations.

MECHANICAL FIELD SERVICES

- (Semi) Annual inspection of the gas turbine unit including but not limited to:
 - Variable Stator Vane (VSV) hardware and control
 - High Pressure (HP) Recoup – Preferred Operating Range
 - Igniter plug and ignition lead
 - Flame detectors and sight glasses
 - Fuel Nozzles & Pre-mixers
 - Lube Oil & Scavenge Pump
 - Screens
 - Chip Detectors
 - External engine
 - Starter motor
 - On-engine air/oil lines
 - On-engine cable work
 - GT inlet
 - Inlet plenum
 - FOD screen
 - Non return valves
 - Gas fuel
 - Steam
 - Water
 - Liquid fuel
 - GT exhaust
 - Load coupling
 - Turbine enclosure
- Borescope inspection
- Level 1 and 2 inspection, repair, overhaul & exchange/replacement of:
 - Lube & Scavenge Pump
 - Magnetic detector Plug (Chip Detector)
 - Igniter Plug and Ignition Lead
 - Thermocouple Probe (T5.4 / T4.8) and Harness
 - Power Turbine Inlet Pressure (P5.4 / P4.8) Probe
 - Lube System Temperature Sensor (RTD)
 - Accelerometer
 - Gas Generator Outside Piping and Wiring
 - Gas Turbine Outside Piping and Wiring
 - High Pressure Compressor Inlet/Temperature (P2/T2)
 - Gas Generator (GG) Speed Sensor
 - Power Turbine (PT) Speed Transducer
 - Air/Oil Separator
 - Air/Oil Separator Cover
 - Pneumatic Starter

- Hydraulic Starter
- Ultraviolet Flame Sensing System
- Accessory Gearbox Carbon Seals
- Hydraulic Pump
- Variable Stator Vane (VSV) Controller
- Hydraulic Control Unit (HCU)
- Hydraulic Filter Housing and Element
- High Pressure Compressor (HPC) discharge Temperature (T3) Sensor
- Gas Generator Inlet Duct
- Centerbody
- Accessory Gearbox (AGB)
- Radial Drive Shaft
- Inlet Gearbox (IGB)
- Compressor Front Frame (CFF)
- A-sump Components
- Turbine Mid Frame (TMF)
- C-sump Components
- Combustion Chamber
- High Pressure Turbine (HPT) Module
 - HPT Rotor
 - HPT Stage 1 Nozzle
 - HPT Stage 2 Nozzle
 - HPT Rotor Blade
- Hot Section
- Compressor repair
- Gas Generator assembly Replacement
- Power Turbine
 - Six Stage Power Turbine Casings
 - Six Stage Power Turbine Stage 1 Rotor Blades
 - Power Turbine Forward Adapter
 - LPT Stage 1 Nozzle Assembly
- Gas Turbine Assembly replacement
- Low Pressure Turbine replacement
- Low & High Pressure Compressor incl.:
 - Compressor Stator Casings
 - Compressor Variable Stator Vanes
 - Compressor Vane Shrouds
 - Compressor Fixed Stator Vanes
 - Compressor Rotor Blades
 - HPC Bushings Repair (LM6000)
 - VSV Hardware
 - VSV Rigging
 - Variable Stator Vane Torque Shaft
- Alignment
- Vibration Analysis & Balancing
- Technical Assessment/Audit
- Auxiliary Systems Inspection & Repair
- Troubleshooting and Problem Solving
 - Compressor Stall – Variable Stator Vane (VSV) Off-Schedule Inspection

VBR Turbine Partners headquarters & warehouse

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Independent ISO 9001/2008 certified O&M improvement experts for GE LM gas turbines, auxiliaries & packages LM1600 | LM2500 | LM5000 | LM6000



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CONTROL SYSTEMS & INSTRUMENTATION FIELD SERVICES

Our Woodward & Speedtronic services include:

- Ignition Exciter replacement
- Power Turbine (PT) Speed Transducer Electrical Cable replacement
- Vibration Monitoring System functional check
- DLE mapping, full mapping on-site, corrective mapping on-site & remote
- Degradation UV cell
- Software modifications & upgrades
- On-engine/package instrumentation checks, including full loop check
- On-engine/package sensor calibration
- Overspeed protection inspection and calibration / adjustments
- Overtemperature protection inspection
- Assessment of modules: TC, RTD, actuators
- Degradation of T4.8 / T5.4
- Cleaning of control system: modules, cards
- Back up of control unit software and tunables
- Back up of HMI
- Spare parts maintenance
- Power supply check-up's
- Testing reaction time of staging valves in the field
- Speedtronic & Woodward controls cards
- Control system retrofits & re-commissioning
- New HMI based on Citect or Ixif
- FAT with using simulator
- Technical audits to increase availability/reliability/maintainability
- Commissioning / recommissioning

MAINTENANCE AGREEMENTS

- 24/7 maintenance agreements
- Maintenance management support
- Strategic maintenance planning
- Service Bulletin / Service Letter management
- Project & resource management
- Recommendations management

ENGINEERING

- Emission reduction retrofits
 - CLN NOx emission reduction
- Service interval & engine life extension
- Power plant relocation

SPARE PARTS

- Strategic spare parts planning
- Critical parts life management
- Sensors
- Probes
- On- and off-engine cables
- Lube & scavenge pumps – new/overhauled
- Starters – new / overhauled
- Valves – new / overhauled
- Actuators – new / overhauled

- LM consumables (filters, seals, gaskets etc.)
- Speedtronic & Woodward controls cards
- LM tooling and maintenance toolboxes

EDUCATION & TRAINING

- Introduction & familiarization
 - Gas turbine basics
 - Major components
 - Auxiliary systems
 - Turbine maintenance
 - Turbine operations
 - An introduction to turbine controls
- Engine control operations
- Advanced engine instrumentation/hardware
- Advanced engine control operations
- Advanced controls hardware & software
- Troubleshooting & real-life cases
- DLE mapping principles
- Performance monitoring & optimization

CONDITION MONITORING

- MetalSCAN very early warning for bearing damage (oil debris detection & monitoring system, can be combined with remote support and status reporting)
- RAPID remote engine optimization (RAPID = Reliability, Availability and Performance through Intelligent Diagnostics)
 - Remote troubleshooting & problem solving
 - Remote monitoring based on historical data with status reporting
 - Remote monitoring based on prediction by intelligent diagnostics with status reporting
 - 24/7 real-time availability of all gas turbine operation parameters

CONSULTING

Gas turbine maintenance contract monitoring:

- Preparation of the request for quotation
- Evaluation of the proposals
- Establishment of maintenance work scope
- Monitoring of the maintenance process
- Evaluation of the maintenance activities
- Assessment of the maintenance invoices

Gas turbine overhaul support :

- Preparation of the request for quotation
- Evaluation of the engine overhaul proposals
- Establishment of the overhaul work scope
- Monitoring of the depot work on the engine
- Monitoring of the testing of the engine
- Evaluation of the entire overhaul process
- Assessment of the final overhaul invoice

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