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

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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
- 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 Ifix
- FAT with using simulator
- Technical audits to increase availability/reliability/maintainability
- Commissioning / re-commissioning

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

For more information please contact info@vbr-turbinepartners.com

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Independent O&M improvement experts for GE aero-derivative gas turbines and their auxiliary systems, control systems and packages

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