PRODUCT DATA BULLETIN

Unit: LM1500 Gas Turbine Generator Package
Ref: DSSI unit number 83316

Summary Specifications

- GE-LM1500 9 MW (nominal) Natural Gas / Diesel Dual Fuel Turbine
- 9.36 MW Capable Capacity (at sea level under optimal conditions)
- GE Engine Model #: LMA1500
- Engine Serial #: 1274
- Ideal Generator Frame #: 21520-37
- Generator End Serial #: 011037-01
- Base Unit Packaged in Year 2001. All components new at that time. LM1500 aeroderivative engine rebuilt to “zero hour” condition per GE specifications.
- 12500 kVa, 60 Hz, 3 Phase, 6 Lead Non-reconnectable
- Current Voltage 13800
- 523 Amps @ 13800 Volt

Overview

The LM1500 package was originally integrated in 2001. The package was ordered by the original customer for use in the Pacific Northwest. Prior to final sale and installation, the order was cancelled. The equipment was prepared for long-term storage and subsequently sold to Diesel Service and Supply (DSSI).

Because the package was never fully commissioned, certain sub-assemblies necessary for full operation (many of which would ideally be designed for a specific operating environment) were not completed. The current package configuration includes the Base Unit of primary components, as listed in the section below. DSSI is also offering additional options for finish-out, up to full installation and after-sales warranty and service. The finish-out scenarios and options offered are also described in the sections below.

The Base Package major components were inspected by the OEMs, or their representatives, in 2009 and were certified to be in “new” condition.
Figure 1 – Installation of Similar Configuration

Figure 2 - Typical Layout Schematic
Base Unit Package

The Base Unit consists of the following major assemblies and is ready for immediate delivery (additional sub-assemblies and component parts are available as part of the Base Unit):

- Turbine Skid
- Gas Turbine
- Gearbox and Generator Skid
- Ideal Generator
- Lufkin Gearbox
- Pump House Skid
- Turbine Controls
- Generator Controls
- Generator Switchgear
- Motor Control Center
- Inlet Air Filter
- Exhaust Scroll

**Turbine Skid**

Turbine skid houses the turbine (in place) and associated valves and piping. The skid is configured for dual fuel operation; gas and liquid fuel. The gas fuel block and bleed valves, Woodward GS10 gas valve, gas manifold and gas fuel nozzles are currently installed on the skid. A Woodward liquid fuel control valve with fuel inlet and bypass piping is installed. The liquid fuel valve discharge piping is stubbed up in the turbine compartment. All CO₂ system piping is installed, including discharge nozzles. The ventilation intake and discharge dampers, turbine compartment ventilation fan, and silencer are included.

**Gas Turbine**

The LM1500 turbine is installed in the skid. The engine is currently outfitted for gas fuel but can easily be reconfigured to run on diesel. The turbine has been rebuilt to a “zero time” condition, according to GE specifications. *Need to insert language on the high-temp cans and coated blades. Put spec’s here?*
Engine was boroscoped in 2009, with no issues noted. Full warranty is available for engine from OEM representative. Warranty is not offered as part of the Base Package configuration and pricing.

**Gearbox and Generator Skid**
The gearbox and generator skid houses the gearbox and generator components and associated hardware. The skid is equipped with CO$_2$ system piping and bottle rack. The CO$_2$ bottles (2) are stored within the skid. The Neutral Grounding Resistor mounts to the roof. The generator cooling air dampers are included. The discharge hood is not provided as part of the Base Package.

**Ideal Generator**
Rated 12.5 MVA, 10 MW @ 0.8 Power Factor, 13,800 kV. with PMG.

The generator was new at the time the unit was manufactured. The generator is axial air flow with top discharge. The generator was inspected by Ideal in 2009 and tested as “new” condition. Full warranty is available for generator from OEM. Warranty is not offered as part of the Base Package configuration and pricing.
**Lufkin Gearbox**
Rated 15,000 HP, 5504 RPM Input, 1800 RPM output. The gearbox was new at the time the unit was manufactured. The high and low speed couplings, as well as the gear elements and bearings were inspected by Lufkin in 2009. The unit was deemed to be in “new” condition. Full warranty is available for generator from OEM. Warranty is not offered as part of the Base Package configuration and pricing.

**Pump House Skid**
The pump house skid houses the hydraulic and lube-oil reservoirs, motor driven pumps, filters, valves, coolers, instrumentation, and associated piping. A gauge panel is mounted on the enclosure side panel. All instrumentation and control wiring terminations are located in a junction box located on the side of the enclosure. The skid is equipped with CO₂ system piping.

The pump house is not currently equipped to deliver liquid fuel, as the unit is configured for gas. However, options are available to easily add liquid fuel capability. The Base Package is configured for gas fuel.
Turbine Controls
The turbine control panel is GE/Woodward MicroNet still in the original shipping crate. The Turbine Controls are complete and in “new” condition. The control system program resides in the control system processor and is available from the original integrator. Full warranty is available for the control panel from the OEM. Warranty is not offered as part of the Base Package configuration and pricing.

Generator Controls
The generator controls are packaged by Ideal Electric with Basler voltage regulation equipment.

Generator Switchgear
The 15 kV switchgear is still in the original shipping crate. It is equipped with a full complement of generator protective relaying, CT’s, PT’s and metering. The 15 kV vacuum circuit breaker is still in the original shipping crate.

Motor Control Center
The MCC is still in the original shipping crate and is in very good condition. There is space in the MCC for additional motor starter required for the liquid fuel pump.
Inlet Air Filter
The inlet air filter and housing is complete and includes the misting control panel, which is still in the original shipping crate. The misting skid is not included in the Base Package, but is available as an added option.
Exhaust Scroll
The exhaust scroll was constructed “new” for this project. The support structure and other exhaust components (e.g., silencer equipment) are not included in the Base Package but are available as option equipment.

Inlet Air Components
The Base Package Inlet Air system provides only the Air Filter House but does not include an air inlet plenum, inlet air silencer, silencer to filter transition ducting and expansion joint. These components must be designed to the turbine manufacturer’s requirements as not to create excessive inlet restriction/distortion, adversely affecting performance and possibly causing damage to the turbine.

Inlet Air Filter Support Structure
The Inlet Air Plenum and ducting is not designed to support the weight of the Air Filter Package and a support structure is required. The structure must be designed to safely support the weight of the components including expected wind loading at site conditions.

Exhaust Components
The turbine exhaust system supplied with the Base Unit Package includes only the exhaust plenum. An exhaust silencer, silencer to stack transition duct and high temperature expansion joint are required to complete the system. These components must be designed to the turbine manufacturer’s requirements as not to create excessive backpressure and damage to the turbine.

Exhaust Support Structure
The turbine module is not designed to support the weight of the exhaust components therefore a support structure is required. The structure must be designed to safely support the weight of the components including expected wind loading at site conditions.
Integration and Interconnect
Since the Base Unit Package was purchased prior to final integration and installation, additional work and components are required to integrate all the assemblies and build electrical interconnect and hydraulic/mechanical components in order to bring the final package to the state where it is ready to install.

Additional Options
Additional options are available for this unit that may be desired, based on installation plan and specific application. Those options are described below.

Liquid Fuel System
The unit is currently configured to operate on gaseous fuel, and the liquid fuel system contains only the fuel metering valve included on the turbine skid. In order to configure the unit for operation on diesel fuel, certain components must be designed and supplied for installation into the package. The turbine must be configured with liquid fuel nozzles and liquid fuel manifold. A fuel forwarding skid including high pressure fuel pump, duplex fuel filters, associated shutoff and drain valves, motor starter, instrumentation and wiring will also be required to complete the system.

Compressor Cleaning System
The current compressor cleaning system includes compressor cleaning nozzles mounted in the compressor inlet frame. A detergent manifold, detergent tank, pump and motor and quick disconnect lines will be required to have a fully functional compressor cleaning system.

24 V dc Battery System
The Unit Controls and skid components require a 24 V dc control power source that is not provided with the package. A complete battery system, including batteries, properly sized for the application, a battery rack and capacity sized battery charger.

Gas Turbine Removal Frame
In order to remove the engine or power turbine from the package for maintenance, a removal frame is required. The frame must be designed per the turbine manufacturer’s recommendations in order to support the turbine components for safe removal from the package.

Commissioning Spares
Certain spare parts and consumables will be required to have available on site during the commissioning phase of the project. A final list of recommended spares can be provided prior to commencement of the project.
Preparation for Shipment
Includes all preparation and packing of equipment properly prepare the equipment for shipment, including crating of ancillary equipment, moisture proof sealing of electrical components, as well as marking and handling instructions.

On-site Commissioning
Complete, turn-key installation and commissioning services are available on-site. Support level and program can be designed and implemented according to requirements and capabilities of customer’s on-site staff.

Service Plans
Service programs are available to cover ongoing maintenance, repairs and spare-parts requirements. Program will be tailored to customer’s requirements.

Warranty
Warranty plan is available for entire LM1500 package. OEM coverage is available for four major components (LM1500 engine, Ideal Generator, Lufkin Gearbox and GE/Woodward Controls). “Balance of plant” coverage is available, in addition. And, overall warranty administration is available for single-point-of-contact management of warranty activity.