



General Gas Turbine Description

The OP16 is an all-radial, single-shaft industrial gas turbine designed and manufactured specifically for power generation applications in the 1600 – 2000 KW range. It utilizes an unique turbine wheel of single-stage, radial configuration while all other gas turbines in the OP16 power range have a multi-stage, axial configuration with combinations of stator and rotor blades. The all-radial design results in the OP16 being significantly shorter in length and permits a more compact turbine-generator package.

The OP16 gas turbine features improved flow path design, metallurgy and components, which contribute to its excellent fuel economy and fuel flexibility while retaining the simplicity of the all-radial gas turbine.

Air is compressed by the single-stage centrifugal impeller operating at 26,000 RPM. The compressed air enters the turbine housing and flows into one of four combustor “cans” where fuel is injected and mixed with the air flow. Following ignition when the turbine is started, combustion is self-sustaining. The air is raised to a high temperature in the combustion process and the hot gas is directed through inlet guide vanes to the single-stage turbine wheel.

The high-temperature, high-pressure combustion gas impinges on the turbine blades and then expands through the turbine until it exits via the exhaust diffuser. The turbine provides power to drive the centrifugal compressor, with excess (useful) power driving the integral reduction gear which in turn is coupled to an electrical generator. The flow path through the OP16 – from inlet housing to exhaust diffuser – has been optimized for high efficiency: thus the basis for the name for the company – OPTimal RADial Turbines.

Through the use of the all-radial design, the compressor impeller and turbine wheel can be placed in a back-to-back configuration. This arrangement permits the rotor shaft housing to be cantilevered with all bearings located in the cold end of the turbine. Two benefits accrue from this design: the rotor is very compact and robust, and no lubricating oil

is required in the hot section of the turbine, so oil consumption is negligible. A hybrid bearing system carries the rotor with an unlimited-life tilting pad bearing taking the main radial load. High pressure air from the compressor to a labyrinth seal prevents lubricating oil from being introduced into the impeller.

The gas turbine inlet housing is mounted on the integral epicyclic speed reduction gear and is protected through the use of shear pins. The gear reduces the rotor shaft speed from 26,000 rpm to 1500 rpm or 1800 rpm for 50 Hz or 60 Hz applications, respectively. Anti-friction roller bearings are used on all gear shafts. Incorporated into the reduction gear are accessory drives for turbine starting, lubrication pump and fuel pressure pump (liquid fuel or dual fuel applications only).

The gas turbine is mounted on the generator set base with struts that provide alignment with the generator and carry both torque and axial loads. The struts insure that the turbine is within alignment tolerance of the generator at all times and minimize coupling offset and misalignment requirements.

A lubricating oil reservoir is built into the generator set base. A gear driven pump supplies cooled, filtered lube oil to the rotor and gear bearings and the oil in turn drains directly back into the oil reservoir. The lube system consists of the reservoir, air-cooled heat exchanger, duplex filters, thermostatic temperature control valve and all related and necessary piping, hoses, valves, pumps and safety monitoring sensors and switches. Regular high quality turbine lubricating oils may be satisfactorily used in the OP16.

The gas turbine is normally started by an AC motor driven hydraulic pump which in turn drives the hydraulic motor coupled to the rotor through the reduction gear. A hydraulic fluid reservoir is integral to the generator set base. The starting system consists of AC motor, hydraulic pump, hydraulic motor, oil reservoir, filters, hoses, valves and controls.

The turbine and generator are mounted on a structural base that incorporates the oil reservoir and mounting arrangements for the generator, starting and fuel systems. The generator set base is designed for three-point mounting on the installation floor, pad or deck. The three-point mounting configuration maintains alignment of the generator and turbine regardless of installation surface irregularities.

The OP16 control system assures high reliability and ease of control. An electronic governor module controls engine speed and handles generator synchronization. The programmable logic controller (PLC) interfaces with the control, monitoring and safety devices of the turbine and also provides the sequential program for generator set start and stop functions. The operator communicates with the control system through a touch screen Human Machine Interface module (HMI), which provides status, alarm and shutdown information and allows the operator to adjust action and set points as may be appropriate.