

A high-contrast, black and white photograph showing a close-up of several turbine blades. The blades are arranged in a radial pattern, with their tips pointing towards the top of the frame. The lighting highlights the metallic surfaces and the complex, curved geometry of the blades. A green horizontal band is overlaid across the middle of the image, containing the text 'OPRA Turbines'.

OPRA Turbines



About OPRA Turbines

OPRA Turbines is a rapidly growing developer and manufacturer of advanced, 2 MW OP16 turbine based generator sets, provided in single or multiple installations from 1.5 to 10.0 MW electric power demand.

The OP16 all-radial, single-shaft gas turbine utilizes a 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 OPRA OP16 turbine provides robustness, reliability and class leading efficiency and emissions performance ideally suited for a variety of applications within various markets.

Utilising its proven radial gas turbine technology, OP16 generator sets are designed for power generation in Oil & Gas, Industrial, Commercial and Marine applications.

OP16 generator sets can be provided in different configurations to meet specific customer installation requirements and site conditions.

The engineering design, component selection and maintenance accessibility of the generator packages enhance the high reliability and long life of the OP16 gas turbine.

OPRA Turbines is dedicated to further develop its position as a global supplier of high quality advanced turbine based power solutions. Technology development is vital to create value for customers.

OIL & GAS

Offshore
Land Based
Floaters

INDUSTRIAL

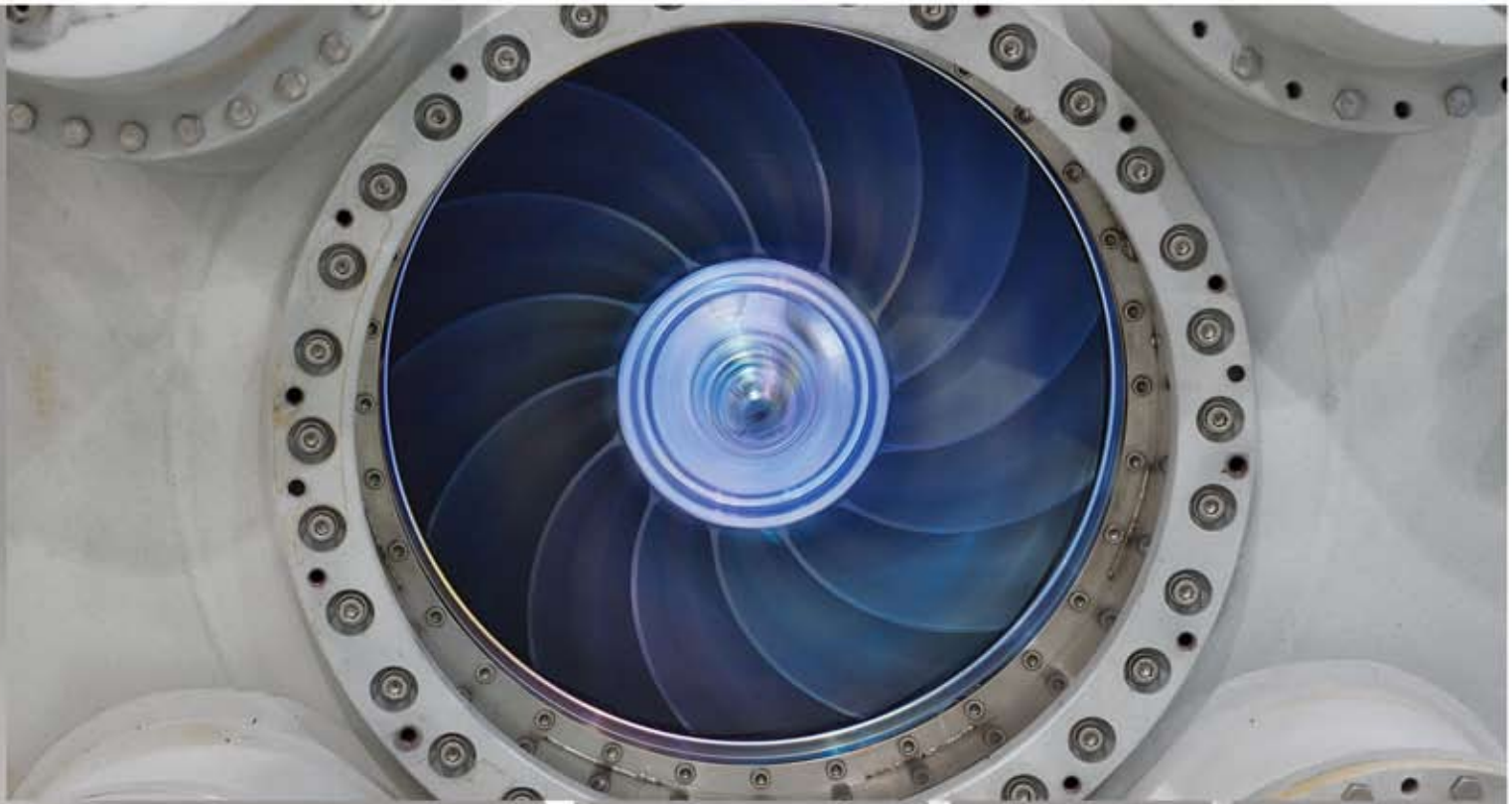
Co-/Tri-Generation
Process
Ceramics, Paper

COMMERCIAL

Airports, Hotels
Leisure Centers
Hospitals

MARINE

Cruise Ships
Tankers
Fire Vessels



OP16 Gas Turbine

The OP16 is an all-radial single-shaft industrial gas turbine. It features advanced flow path design, metallurgy and components, which contribute to its excellent fuel economy and 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 the four combustor "cans" where fuel is mixed with the air flow and injected. In the combustion chambers, the air is raised to a high temperature and the hot gas is directed through inlet guide vanes to the single-stage turbine wheel. The high-temperature, high-pressure combustion gas expands through the turbine until it exits via the exhaust diffuser. The turbine wheel provides power to drive the centrifugal compressor wheel, while excess (useful) power drives the integral reduction gear which in turn is coupled to an electrical generator.

Using the all-radial design, the compressor and turbine wheels 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. Three 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. The complete drive train is protected by means of shear pins that are located in the gear. The gear reduces the rotor shaft speed from 26,000 rpm to 1,500 rpm or 1,800 rpm for 50 Hz or 60 Hz applications, respectively. Anti-friction roller bearings are used on all gear shafts.

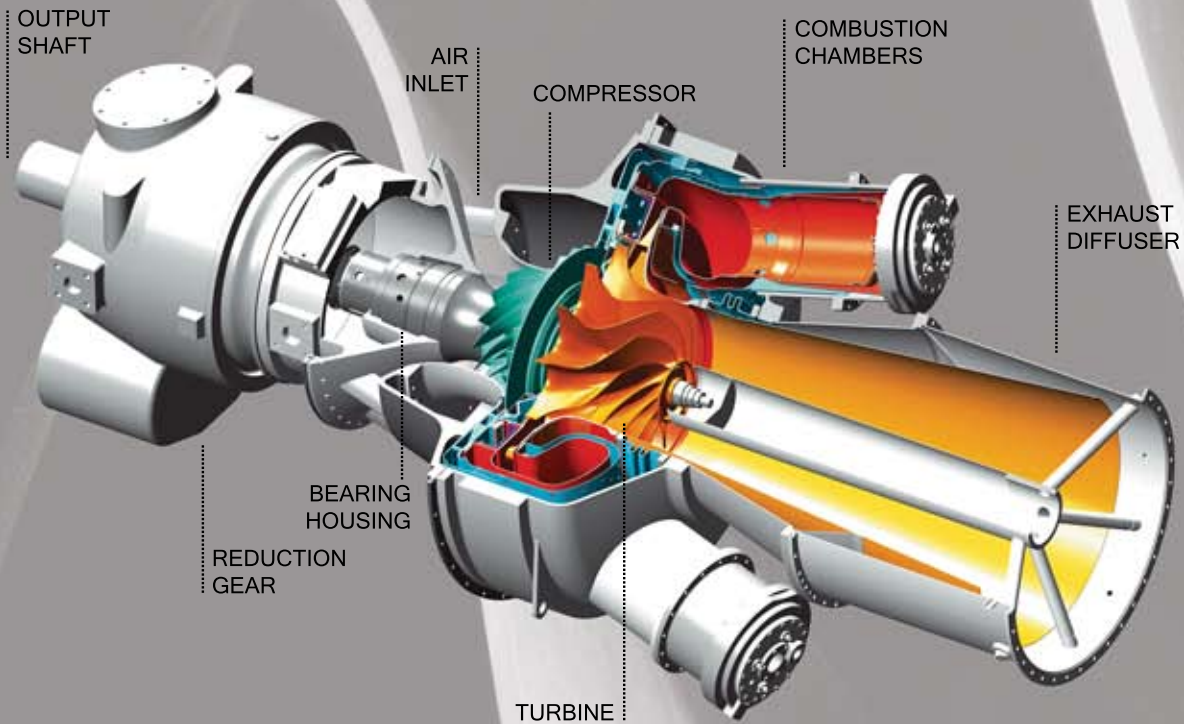
Incorporated into the reduction gear are accessory drives for turbine starting, lubrication pump and fuel pressure pump (liquid fuel or dual fuel applications only).

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. Regular turbine lubricating oils may be satisfactorily used in the OP16.

The gas turbine is normally started by an AC motor driven hydraulic pump, powering the hydraulic motor coupled to the rotor through the reduction gear.

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

OP16's 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 set points.



OP16 Innovations

SIMPLE AND ROBUST

The all-radial turbine rotor is sophisticated simplicity at its best, resulting in a robust design for high reliability and dependability. Its unique configuration, efficient flow path and advanced metallurgy results in a compact gas turbine suitable for the harshest conditions.

EFFICIENT

The OP16 industrial turbine offers the highest fuel efficiency in its power range as a simple cycle generator unit and may be utilized in a Combined Heat and Power system for high overall thermal efficiency of approx. 90%.

COMPACT

The turbine's compact size is a direct result of the all-radial rotor design and a much shorter flow path through the engine. The compact rotor allows a smaller generator set footprint and reduced installation requirements.

FUEL FLEXIBILITY

The turbine operates equally well on liquid or gas fuels and can switch under full load when specified as a dual fuel unit. The turbine runs well on low specific heat content fuels such as bio gas.

CUSTOM PACKAGE

The OP16 generator package is available in a variety of configurations to meet specific customer needs. A wide range of control and auxiliary options provide for optimum customer power solutions in tight installation spaces and harsh environments.

LOW EMISSIONS

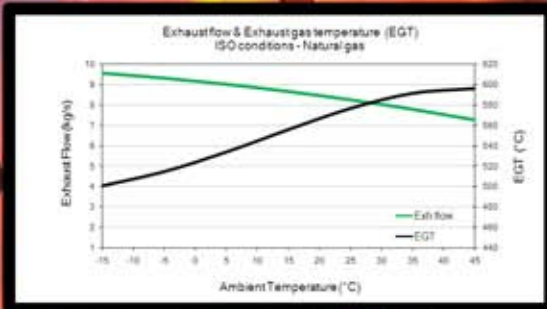
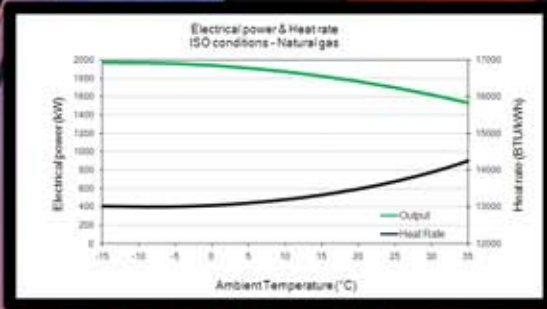
Advanced combustion technology allows the turbine to achieve guaranteed NOx exhaust levels of 25 ppm or less. Optional equipment may provide for even lower levels where specifications and requirements apply.

ECONOMICAL

With a combined high fuel efficiency, compact installed size and footprint, and excellent reliability, the generator set offers both lower installation costs and reduced operating costs.

CUSTOMER SERVICE

World class technical service, parts support, operator and maintenance training and full maintenance/service contracts are available to assure the highest level of operating reliability in remote locations anywhere in the world.



Performance

To obtain consistency in gas turbine ratings, all gas turbine performance is based on operation at standard air temperature, elevation, and inlet or exhaust pressure losses. The International Standards Organization has designated these performance conditions as 15°C ambient air temperature, sea level elevation, zero inlet and exhaust losses - also known as ISO conditions. The performance data provided is based on the OP16 operating at ISO conditions, actual performance under installation / site conditions will deviate from its rated performance.

Since the gas turbine is a flow machine, its performance is a function of the mass flow of air entering and exiting the turbine, which is influenced by ambient air temperature, pressure, and by air filter, ducting and exhaust pressure losses associated with site conditions. In general, gas turbine performance is increased at lower temperatures, elevations and inlet and exhaust losses, and falls off as all of these parameters increase. The OP16 gas turbine is rated at 1.8 MW electrical power.

Note: All performance data provided herein is preliminary and may be used for estimating purposes only until certified or presented in an OPRA proposal / quotation. For OP16 performance at expected site conditions, please contact an OPRA sales representative or one of the OPRA offices.

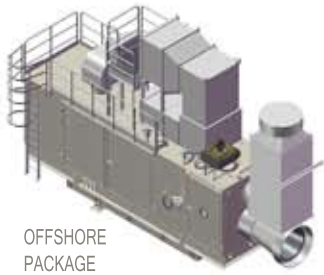
Service

OPRA products have been designed for endurance and operating stability, but continued availability and operating stability is also a function of well planned service and maintenance.

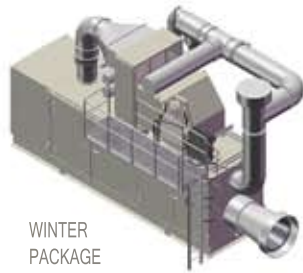
OPRA provides both scheduled inspection contracts and comprehensive service contracts and can supply spare parts and upgrades to secure reliable field performance.

To ensure ongoing operating stability and long product life, OPRA can provide several forms of service contracts :

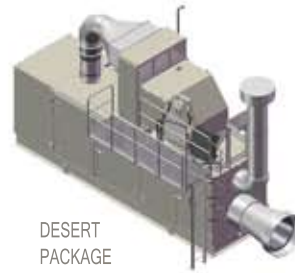
- 24/7 service hotline
- Start-up and commissioning
- Field service and inspections
- Long term service contracts
- Factory and on-site training
- Engine exchange pools
- Gas turbine major overhauls
- Product enhancements and upgrades



OFFSHORE
PACKAGE



WINTER
PACKAGE



DESERT
PACKAGE



ARCTIC
PACKAGE

OP16 Standard Equipment

OPRA OP16 ALL-RADIAL INDUSTRIAL GAS TURBINE,
rated 2,550 shaft horsepower (1.8 MWe) at ISO conditions, suitable for continuous duty service on liquid or natural gas fuel. The turbine includes integral epicyclic reduction gear with output speed shaft of 1,800 (60Hz) or 1,500 (50Hz) rpm, with overload protection and accessory drives. Also includes inlet air shroud with duct attachment flange.

SYNCHRONOUS GENERATOR,
2250 KVA, 0.8 Power factor, 3-phase, 400V. Air cooled, open drip-proof construction with self-lubricated bearings, integral exciter, and solid state voltage regulator.

COUPLING AND COUPLING GUARD

GENERATOR SET BASE,
fabricated heavy structural steel with integral turbine lubricating oil reservoir, drip pan, turbine mounting pads, generator mounting pads, and mounting locations for all on-base systems and related piping and wiring. Industrial coating system. Provisions for mounting indoor acoustic enclosure or outdoor weather protected acoustic enclosure.

LUBE OIL SYSTEM,
including gear driven oil pump, electric motor driven auxiliary pump, duplex oil filter, pressure regulation, thermostatic valve, air-cooled oil cooler with AC motor driven fan, all on-base lube oil piping and hoses.

STARTER SYSTEM,
including AC motor driven, variable volume hydraulic pump, axial piston hydraulic motor, reservoir (combined with lube oil reservoir), suction filter, hydraulic hoses and piping.

IGNITION SYSTEM,
including high energy multiplex exciter, cables and igniter plugs.

GASEOUS FUEL SYSTEM,
including on-base valves, filters, drains, metering valve, actuator controlled block and bleed valves, combustor fuel nozzles, and fuel piping.

COMPRESSOR WATER WASHING SYSTEM,
factory installed, includes spray nozzles, stainless tubing manifold for manual periodic water wash cleaning of compressor and inlet flow path.

TURBINE MONITORING INSTRUMENTATION,
includes vibration probes, speed pick-ups, pressure and temperature probes.

CONTROL SYSTEM,
enclosed cabinet with solid state logic, including starting and shutdown sequencing, speed governing, engine protection, generator protection and synchronizing, alarm and status indication, and operator control interface (HMI).

OPERATIONS AND MAINTENANCE MANUALS



OP16 Optional Equipment

ACOUSTIC ENCLOSURE,

fabricated steel with access doors and panels for full access for inspection and maintenance. Mounts directly on generator set base with appropriate interface connections for turbine inlet air, ventilation inlet and exhaust, turbine exhaust, control wiring and generator wiring. Sound attenuation is 85 dBa at 1 meter. Depending on customer requirements, the enclosure will be equipped with an integral control room which houses turbine and package control system.

CONTROL PANEL - REMOTE,

free-standing panel mimics selected controls, alarms and annunciation on generator set control panel.

DUAL FUEL SYSTEM,

provides liquid fuel system as additive to and integrated with gas fuel system, includes dual fuel nozzles and all related components. Permits switching fuels under load.

LOW NO_x CONFIGURATION,

incorporates low emission combustion system for NO_x exhaust emissions of <25 ppm @ 15% O₂.

SAFETY PACKAGE,

includes gas detection system and enclosure fire suppression system, all integrated with generator set control system annunciation and safety shutdown systems.

INLET AIR SYSTEM PACKAGE,

including air inlet filter house, with replaceable filter elements, inlet air silencer, ducting, inlet air flex section, for mounting on outdoor acoustic generator set enclosure. Package may also include servicing platform, platform rails and personnel ladder all for attachment to enclosure.

EXHAUST GAS SYSTEM PACKAGE,

including exhaust expansion joint and elbow, silencer, stack and silencer support.

ENCLOSURE VENTILATION PACKAGE,

includes ventilation air filtration integrated with inlet air package, inlet ducting, enclosure inlet and outlet sound attenuation, motor-driven fan and outlet ducting.

LOW HEAT CONTENT GAS FUEL SYSTEM,

includes combustion cans, fuel nozzles and fuel piping designed to allow the generator set to operate on low heat content fuels, such as digester or land fill gases. Approval of fuel specification required by OPRA.

ALTERNATE GENERATOR SPECS,

allows the generator set to be supplied to meet specific customer and/or pertinent specifications for alternate voltages, generator enclosures, insulation groups, output lead configuration, bearings, lubrication, and other specific requirements.

MAINTENANCE OPTIONS,

including levels from training and recommended spares to full contract maintenance. Options may be tailored to customer's specific needs.

OPRA Locations and Facilities



SOLA, NORWAY Engine assembly & engineering facility

All engine related assembly and engineering activities are located in the facility in Sola, Norway.

OPRA Turbines AS
Energiveien 22
4056 Tananger
Norway
Tel. +47 4000 6970
Fax. +47 5131 5044



HENGELO, THE NETHERLANDS Gas turbine packaging & engineering facility

Turbine package engineering, manufacturing, R&D, testing, and service activities are located in Hengelo, The Netherlands.

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Opaalstraat 60
7554 TS Hengelo (Ov.)
The Netherlands
Tel. +31 (0)74 245 2121
Fax. +31 (0)74 245 2120



AMSTERDAM, THE NETHERLANDS Corporate centre and global sales office

The company's corporate centre and global sales office is located in the Amsterdam World Trade Center.

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World Trade Center (WTC)
C tower, level 6
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1077 XX Amsterdam
The Netherlands