



The Tedinskoe oil field is operated by Lukoil Sever and the OP16s use wellhead gas to supply 1.8 MWe each.

## Power In The Wilderness

**Need for reliable power for oil fields more vital than ever**

As some large oil fields become depleted, interest in finding and commercially exploiting smaller finds continues to be strong.

Yet many of these untapped oil resources are based in remote locations battered by extreme weather with added dangers such as frozen seas or earthquakes. And remote usually equals high cost — high enough to deter production.

The conditions in parts of Russia are a perfect example of how oil exploration can be challenged by hazardous conditions. A challenge that requires reliable power.

For example, off Sakhalin Island in the far east of Russia, platforms producing oil and gas are in 50 m of stormy water and it is estimated that wind chill factors of  $-70^{\circ}\text{C}$  are possible — meaning workers can only fulfill short outdoor shifts. Two large earthquakes have struck the region over recent years, which demands that the platforms are specially designed to resist such dangers.

The Tedinskoe oil field is in northern Russia. It is also where Dutch-based Opra Turbines installed two of its OP16 combined heat and power models to provide

site heating and baseload power, with some of the heat used to supply trace heating for oil pipelines to enable winter oil pumping.

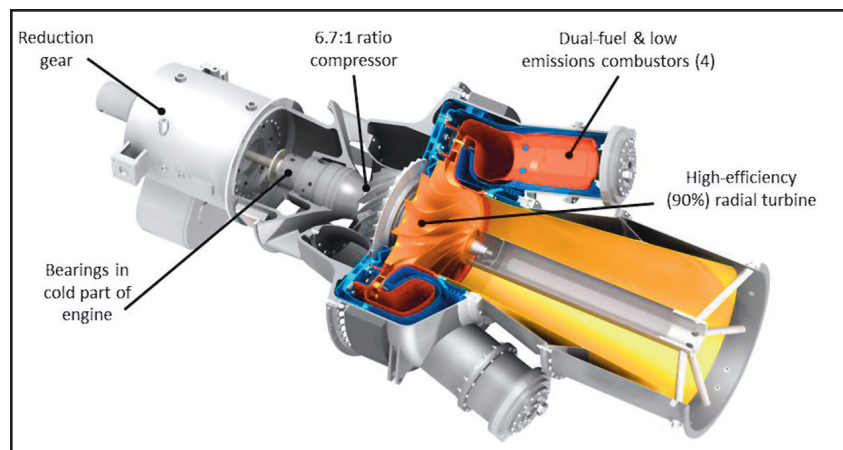
The OP16 is an all-radial single-shaft turbine aimed at power generation applications in the 1.6 to 2.0 MW range. According to the company, other gas turbines operating in that power range have a multistage axial configuration with combinations of stator and rotor blades, unlike the OP16, which Opra said has a turbine wheel of single-stage radial configuration. The result, Opra said, is a more compact, shorter and robust

gas turbine with good fuel economy and fuel flexibility.

The Tedinskoe oil field is operated by Lukoil Sever and the OP16s use wellhead gas to supply 1.8 MWe each. They are attached to hot-water boilers providing 3 MW each in thermal energy. Electrical efficiency is 26%.

The gas turbines have been in operation for six years, building up an impressive performance record. They have each achieved 48 000 hours' running time, working constantly, although 40 000 hours is the standard period between overhauls for the Opra turbines.

One of the reasons Opra turbines were selected was their ability to burn wellhead gas (associated gas) — raw natural gas from the oil well.



A cross-section of an OP16 gas turbine.

"One of the unique aspects of this project for our company is that the turbines are running successfully on the sour gas, which has a sulphur content of between 2 and 3% — which is very high, as the norm is usually around 1%," said Opra Chief Executive Fredrik Mowill.

"We can achieve this because the turbines are a simple yet robust design — radial turbines will keep on running even if, say, there is some pitting or corrosion which has taken place. The OP16s are very good at running on different types of associated gas, which has many forms — such as having high or low calorific values, or high or low sulphur content.

"To achieve 48 000 hours running on clean natural gas would be very good but to achieve it burning such a high sulphur fuel must be something of a record.

"The turbines have a planned overhaul in the second half of this year, but the customer is very happy with the way they are currently running. In remote oil field locations such as this one and in the many other similar fields in Russia, reliability and the ability to carry out maintenance quickly and efficiently is key," he added.

Opra said through the use of the all-radial design, the compressor impeller and turbine wheel can be placed back to back, which allows the rotor shaft housing to be cantilevered with

all bearings in the turbine's cold end. Benefits of this design, Opra said, are the fact that the rotor is very compact and robust, and no lubricating oil is needed in the hot section of the turbine, which the company said means oil consumption is "negligible."

Opra said it has won other CHP orders in Russia over recent years. Around two-thirds of the projects with which it is involved are oil and gas related, with approximately 45 units for both onshore and offshore use, and mostly running on associated gas. As well as in Russia, Opra has won orders from customers in the Middle East, Brazil and in the U.K. and Dutch sectors of the North Sea. 📍

---

REPRINTED FROM JULY-AUGUST 2011 DIESEL & GAS TURBINE WORLDWIDE

Copyright Diesel & Gas Turbine Publications  
Printed in U.S.A.