



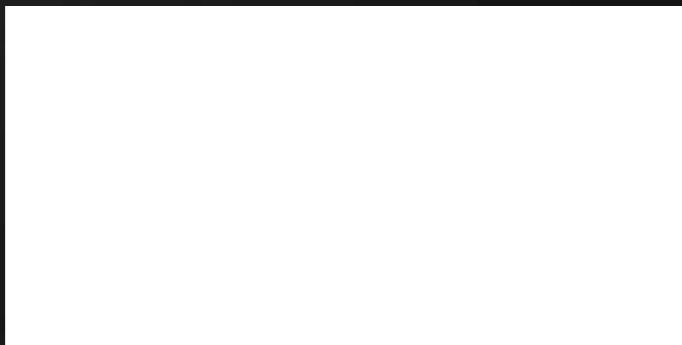
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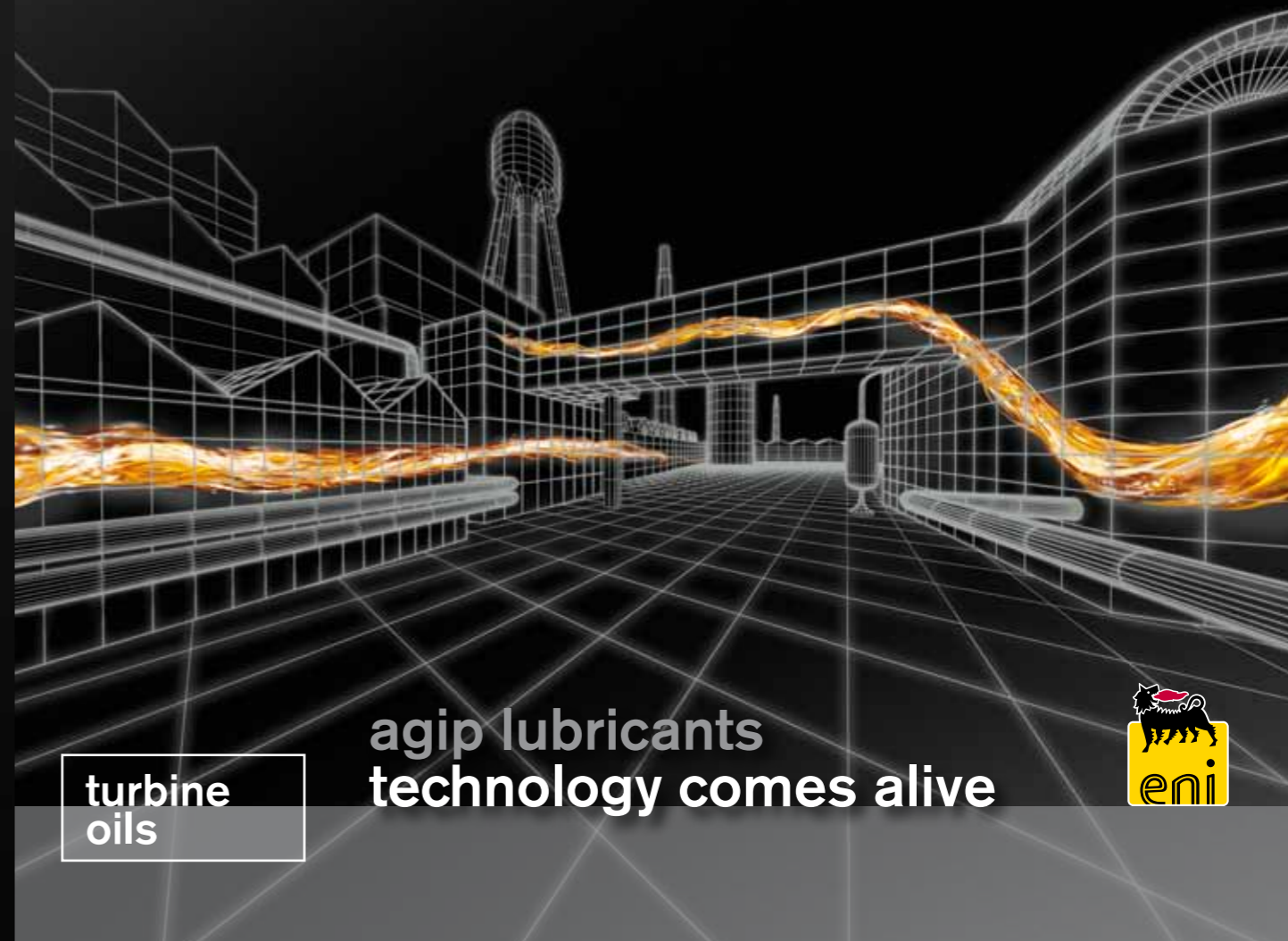


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turbine  
oils

agip lubricants  
technology comes alive



**eni**, through its **Agip brand**, is the leading company in the industrial lubricant market in Italy. Technical and commercial leadership is maintained and reinforced by **eni's** commitment to **technology, quality, environmental protection and technical customer support**.

#### technology

The internationally recognised advanced level of expertise and equipment at the San Donato Milanese laboratories generate the development of products and processes for the most modern production requirements.

#### quality

All plants in the lubricant production cycle operate in accordance to a certified quality management system in conformity with standard ISO 9002.

#### environment

Attention to the environment is one of the main guiding principles in product development and in the production cycle. All plants implement a certified environmental management system in conformity with standard ISO 14001.

#### technical support

The highly qualified technical manpower are the highly dispersed global operations, ensured outstanding technical back up support services to customers, security in total customers satisfaction.

The industrial product line includes lubricants and special products to satisfy all the lubrication requirements of any type of industrial plant at a qualitative level at the top of the market.

More information about application, characteristics and TDS is available on <https://nalis.eni.it/Alis> and by e-mail [alis@eni.it](mailto:alis@eni.it)

## turbine oils

Turbines are the fundamental and critical machinery in the electrical energy production cycle. They consist of a fixed element and a mobile element that converts the energy of a fluid, generally steam, water or combusted gas, into mechanical energy.

To ensure their maximum effectiveness a very high quality lubricant is indispensable to provide:

- the lubrication of the shaft bearings
- the removal of the heat transmitted to the bearings
- the function of hydraulic oil
- the function of gear oil.



## properties

### excellent viscosity and high viscosity index

The viscosity grades required for turbine oils range from ISO VG 32 to ISO VG 100. The lower grades are mainly used in the electricity generation sector, due to the high rotating speed of the shaft. In contrast, units containing reducers require higher viscosities, able to support the load transmitted to the teeth. The highest viscosities are for industrial turbines, naval steam turbines and water turbines. The high viscosity index limits viscosity variations with changes in temperature.

### resistance to oxidation

The oil is subjected to a strong oxidising action in use, due to heat, infiltrated water (in the case of steam turbines) and air absorbed and trapped in the circuit. It must therefore have an extremely long life and maintain its characteristics.

### antirust and anticorrosion properties

Rust and oxidised metal particles increase corrosion and oxidation and cause wear and malfunction of components.

### demulsibility

The lubricant must be able to separate rapidly and completely from water which is inevitably present in a steam turbine. The presence of water generates emulsions with oil which compromise correct lubrication because they increase viscosity and cause sludge formation.

### low foaming and air holding

The inevitable presence of air in the lubrication circuit causes the dispersion of air in oil that can result both internally and externally in the form of foam. The oil must have properties, which limit foam formation and air retention. The presence of air can break the lubricant film and accelerate the oxidation of the oil.



## the agip product range

The Agip products for steam and gas turbines are formulated with special bases oils. The technological advances in Agip turbine oils include updating the additives used.

### AGIP OTE

AGIP OTE oils are available in ISO VG viscosity grades from 32 to 100 for the lubrication of all parts of steam, gas and hydraulic turbines. Gradation 46 exceeds 5,000 hours in the Turbine Oil Stability Test (TOST) of oxidation.

AGIP OTE		32	46	68	80*	100
viscosity at 40°C	mm <sup>2</sup> /s	29.3	45.4	64.1	74.0	99.6
viscosity at 100°C	mm <sup>2</sup> /s	5.37	7.18	8.94	9.69	11.62
viscosity index	-	118	118	114	110	105
flash point v.a.	°C	230	235	245	280	260
pour point	°C	-18	-15	-15	-12	-12
mass density at 15°C	kg/l	0.850	0.856	0.861	0.869	0.872

(\*) non ISO VG gradation



AGIP OTE conform to the following classifications and specifications and/or are approved by the following international organizations or manufacturers:

- > ISO 6743/5
- > ISO – L-TSA /-TGA
- > ISO – L-THA
- > ISO 8068
- > ASTM D 4304 TYPE 1
- > BS 489:1999
- > CEI 10-8 (1994)
- > DIN 51515-1 L-TD
- > JIS K 2213 – (1983)
- > ABB HTDG 90117 E MOD. M
- > ALSTOM HTDG 90117 V0001 V
- > ANSALDO ENERGIA 3.2-0092-8430
- > GENERAL ELECTRIC GEK 28143A - TYPE I, II AND III
- > MITSUBISHI SPEC. NO. E00-001 REV.1
- > NUOVO PIGNONE N. SOS 02111/4 (OTE 46)
- > NUOVO PIGNONE SOM 17366 (OTE 32)
- > SIEMENS TLV 9013 04/01

AGIP OTE 80 is aimed essentially for use in military naval steam turbines and conforms to the following classifications and specifications:

- > NATO O-240
- > DEFENCE STANDARD 91-25 (2002)
- > M.M. O-2001

### AGIP OTE GT

AGIP OTE GT, available in ISO VG viscosity gradations from 32 to 68, are principally intended for the lubrication of high performance gas turbines. The special additives include a "mild EP" antiwear function which allows ISO gradation 46 to exceed the 9th stage in the FZG test. These characteristics make these products particularly versatile and able to lubricate both gas and steam turbines, thus they are the ideal products for plants where one lubricant in a combined cycle is required. ISO grade 46 exceeds 10,000 hours in the Turbine Oil Stability Test (TOST) of oxidation.

AGIP GT		32	46	68
viscosity at 40°C	mm <sup>2</sup> /s	29.2	45.3	64.0
viscosity at 100°C	mm <sup>2</sup> /s	5.35	7.17	8.93
viscosity index	-	118	118	114
flash point v.a.	°C	230	235	245
pour point	°C	-18	-15	-15
mass density at 15°C	kg/l	0.850	0.856	0.861



AGIP OTE GT conform to the following classifications and specifications and/or are approved by the following bodies or manufacturers:

- > ISO 6743/5
- > ISO -L-TSA /-TSE/ -TGA/ -TGB/ -TGE/ -TGSB/ -TGSE
- > ISO 8068
- > DIN 51515-1 L-TD
- > DIN 51515-2 L-TG
- > ASTM D 4304 TYPE 2
- > ALSTOM HTDG 90117 V0001V (TIPO EP)
- > ALSTOM POWER SWEDEN MAT812109
- > CATERPILLAR / SOLAR ES 9-224U
- > GM NO. LJ-03-1-97, LJ-04-1-97, LJ-06-1-97
- > GENERAL ELECTRIC GEK 28143A, TYPE IV, V AND VI
- > GENERAL ELECTRIC GEK 32568F (OTE 32GT)
- > GENERAL ELECTRIC GEK 101941 (OTE 32GT)
- > GENERAL ELECTRIC GEK 107935A (OTE 32GT)
- > GE THERMODYN ISPSH 902SDI (OTE 46GT)
- > NUOVO PIGNONE SOM 23543 (OTE 32GT)
- > NUOVO PIGNONE SOM 23687 (OTE 32GT)
- > MAN GHH BORSIG SP 079984 E 0000 E 98
- > SIEMENS TVL 9013 04 (TIPO EP)
- > SIEMENS WESTINGHOUSE M-SPEC 55125Z3

## special products range

### AGIP ALISMA 32 PV

AGIP ALISMA 32 PV is a special product for steam and gas turbines and turbo compressors which acts as a lubricant during test runs and as protection during storage, shipment and long shutdowns.

### AGIP OTE 80 EP

AGIP OTE 80 EP (non ISO VG grade) is recommended for the lubrication of naval steam turbines and gears. Conforms to MIL-PRF-17331 – NATO O-250 specifications.



### AGIP OTE TC 46

Special ISO VG 46 grade lubricant, with very low pour point, is recommended specifically for the lubrication of turbo compressors in process and/or synthesis plants, e.g. for ethylene, ammonia, etc.

### AGIP TURBO 23699

Synthetic lubricant for industrial gas turbines used in aeronautic applications that require a product conforming to MIL-L 23699D and PWA 521B specifications.

