

ACE Group

Used Gas Pipeline Pressure Station 6 Units



Description of Combustion Turbine GT 750-6M

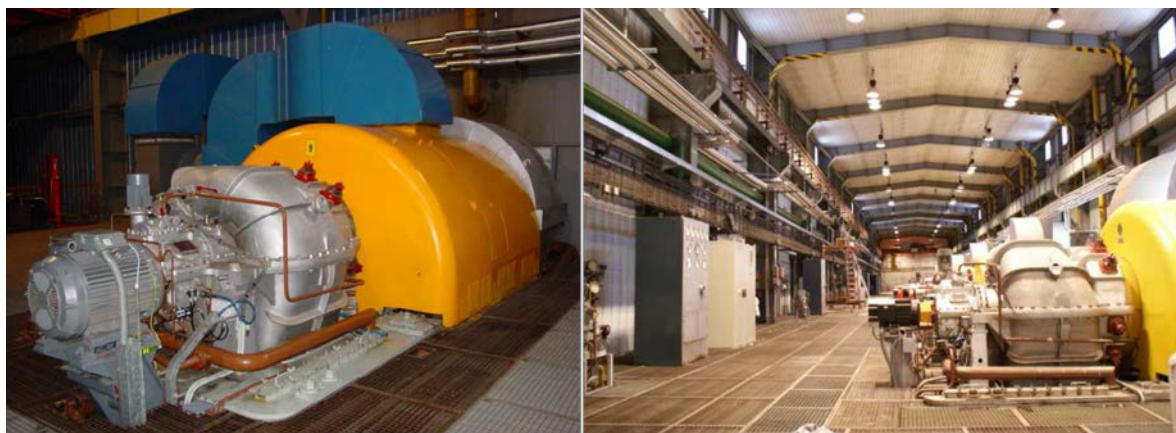
Gas compressors transporting gas in long-distance gas pipelines driven by combustion turbines with the output of 6 MW.

The combustion turbine GT 750-6M is a double-shaft unit with a generation section and a driving turbine. The generation (high pressure - HPT) turbine drives the air compressor of aggregate, the driving (low pressure - LPT) turbine is determined to the direct driving of a turbo compressor (turbo blower) connected to the gas pipeline. The aggregate works with an open circuit with regeneration. The fuel is natural gas.

After modernizing the turbine starting equipment a starting electromotor has substituted a starting expansion turbine. This solution in comparison to the original way of starting has economic, ecological, as well as safety advantages.

Cairo Rep. Office: ACE Group
3 Samir Mokhtar St., Ard Al Golf, Cairo – Egypt
Tel: 00202 26903100/200, Fax: 00202 26903500
E-mail: info@aceindustry.net
website: www.aceindustry.net

ACE Group



TechnicalParameters:

CombustionTurbineGT750–6M

Manufacturer: První brněnská strojírna - Brno

Rated power on the driving turbine coupling with considered pressure losses on the suction side and exhaust side.....6 000 kW

Rated thermal efficiency of the aggregate related to the power on the driving turbine coupling with considered losses on the suction side and exhaust side..... 27 %

Rated mean thermodynamic flue gas temperature in front of the generation turbine..... 760 °C

Maximum allowable mean thermodynamic flue gas temperature in front of the generation turbine..... 765 °C

Rated r.p.m. (speed) of generation turbine..... 5 200 1/min Rated

r.p.m. (speed) of driving turbine..... 5 300 1/min Range of

controllable r.p.m. of the driving turbine 3 800 – 5 500 1/min

Rated pressure of the surrounding air..... 0.101325 MPa

Fuel – natural gas with the heating value of 45 000 to 46 100 kJ/kg, without solid particles and liquid fractions, required pressure on the entry to the rapidly closing valve..... 0.9 MPa

The air on compressor intake must be clean so that to avoid corrosion and erosion of the flow part of the aggregate.

Minimum allowable temperature of the intake air is - 30 °C At lower temperatures of the surrounding air you should switch on preheating on the intake part of axial compressor.

Maximum ambient temperature in the engine room must not exceed..... + 35 °C

Cairo Rep. Office: ACE Group

3 Samir Mokhtar St., Ard Al Golf, Cairo – Egypt

Tel: 00202 26903100/200, Fax: 00202 26903500

E-mail: info@aceindustry.net

website: www.aceindustry.net

ACE Group

Weight of Aggregate Heaviest Parts:

Proper aggregate including frame..... approx. 52.0 t Ditto
without both rotors and oil pipeline.... approx. 44.0 t Combustion
chamber..... approx. 2.4 t Exchanger flue gas-
air.... approx. 19.4 t Relief valves.....
..... approx. 1.2 t

ACE Group

Heaviest Parts Lifted During Revision:

Cover of axial compressor (AC)..... approx. 5.5 t
Cover of turbine together with turbine outlet nozzle cover approx. 5.6 t
Rotor of generation part (HPT) approx. 6.5 t
Rotor of driving part (LPT) approx. 1.1 t

HotWaterExchanger

Manufacturer: První brněnská strojírna - Brno

Basic heating output..... 6.629 MJ/sec

Economical heating output..... 5.3 MJ/sec

Water flow quantity through exchanger..... 95 t/hr

Temperature water gradient in heat exchanger..... 130/70 °C

Maximum allowable water temperature on heat exchanger outlet..... 135 °C

Lowest inlet temperature..... 65 °C

Design pressure..... 1.57 MPa

Lowest inlet pressure..... 0.4 MPa

Lowest allowable outlet pressure..... 0.15 MPa

Setting of relief valves to overpressure..... 0.25 MPa

Flue gas temperature in front of heat exchanger..... 270 °C

Convection heating surface..... 860 m²

Convection volume of heat exchanger..... 3.5 m³

Exchanger Flue Gas-Air (Regeneration Heat Exchanger)

The air exiting from the compressor is heated before entering the combustion chamber with the heat of exhaust gases in two sections of horizontal regeneration exchanger. The exchanger is slide fitted on the pads.

In the Compressor Station Hostim there is used a horizontal regeneration heat exchanger of the tubular structure type EKOL R1500. The heat exchange between flue gas and air is solved by means of two independent horizontal exchangers connected parallel in the system. Their heat transfer surface is created by seamless tubes with inserted spiral turbulizers. The flue gas flows through the tubes and the air flows in the space between the tubes and exchanger casing.

Cairo Rep. Office: ACE Group

3 Samir Mokhtar St., Ard Al Golf, Cairo – Egypt

Tel: 00202 26903100/200, Fax: 00202 26903500

E-mail: info@aceindustry.net

website: www.aceindustry.net

ACE Group



The original plate heat exchanger due to its bad design solution significantly reduced the output and efficiency of the turbo aggregate by the compressed air escape into the exhaust tract and the repairs of this condition had short lifetime, and so the only solution was to replace the regeneration heat exchanger by a new one, i.e. type EKOL R 1500 of tubular structure that on the basis of pressure tests carried out is showing the tightness of particular sections in the long-term time horizon, and thus the output and efficiency of the turbo aggregate is significantly increased.

Cairo Rep. Office: ACE Group
3 Samir Mokhtar St., Ard Al Golf, Cairo – Egypt
Tel: 00202 26903100/200, Fax: 00202 26903500
E-mail: info@aceindustry.net
website: www.aceindustry.net

ACE Group



Combustion Chamber

The vertical combustion chamber is determined to incinerate gas fuel in the air flow with the inlet initial temperature of 400 °C and pressure 0.44 MPa that is coming from the displacement of the axial compressor of HPT through the regeneration heat exchanger in the quantity of 190 t/hr. The flue gas with the temperature of 760 °C is routed in the transfer pipeline into the gas turbine HPT and LPT.

Cairo Rep. Office: ACE Group
3 Samir Mokhtar St., Ard Al Golf, Cairo – Egypt
Tel: 00202 26903100/200, Fax: 00202 26903500
E-mail: info@aceindustry.net
website: www.aceindustry.net

ACE Group



Low Emission Circular Burner

The original design of the combustion chamber with a group gas burner has been substituted by a low emission combustion chamber. In all TS GT 750 – 6M there is used a new design of combustion chambers manufactured by the company Ekol s.r.o., with a low emission circular

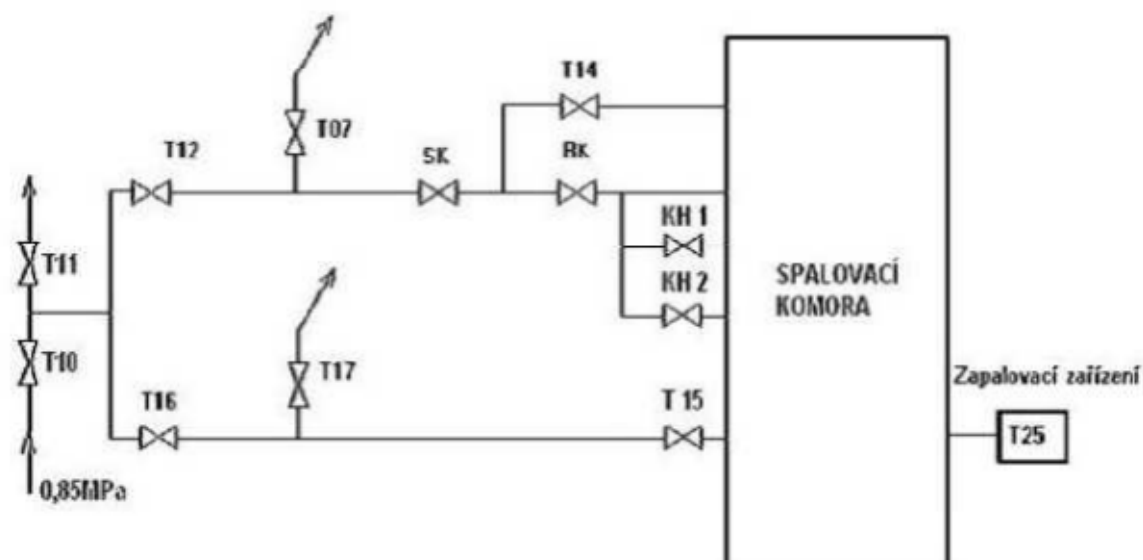
burner. This gas burner consists of 5 concentric annular rings and these ring burners are interconnected with six radial tubes for a uniform gas distribution to respective rings. The walls of two neighbouring burners create circular rings in which there are fitted vane turbulizers providing for the turbulent rotation of the incoming flow of combustion air that is necessary for the proper mixing of the mixture in the incinerating space. The shielding chamber of the pilot burner placed in the burner centre consists of two cones, cylindrical tube and vane turbulizer. At the same time this circular burner also creates the front of the flame tube. Due to this design a highly turbulent swirl is being created in the primary zone contributing together with changing the angle of gas outlet from the burner to the faster fuel mixing with the air. The incinerating area creates a homogeneous burning field and with a considerable turbulence the process of fuel incineration becomes more intensive, the mean flame temperatures are reduced and the time of flue gas stay in the area of high temperatures shortens, which decreases, above all, the production of NO_x.

The part of combustion chamber burner is also the inlet pipeline of heating gas including ignition armatures (KK). These armatures are controlled sequentially in terms of TS control algorithm from the control system.

Due to the controlled incineration there are placed armatures KH1 and KH2 on the gas distribution systems directly by the combustion chamber. These armatures pursuant to the flue gas temperature and the HPT r.p.m. carry out the control of the process of incineration by adding or reducing particular steps of circular burners (KH1 = 4th step/stage, KH2 = 5th burner step/stage)

ACE Group

Armatures of Heating Gas, See Block Diagram of Heating Gas Pipeline of Combustion Chamber.



Legend: SPALOVACÍ KOMORA – COMBUSTION CHAMBER Zapalovací zařízení – Ignition Device

TurboCompressorTD260-14-1M/T

Manufacturer: ČKD Praha

Output at temperature 20 °C and 760 mm Hg..... 22.5 10⁶ Nm³ / day

Volume output at rated pressure and temperature.... 242 m³ / min

Pressure on nozzle outlet..... 7.453 MPa Power

input..... 6 000 kW Maximum gas

temperature at outlet 48 °C

Rated Values of Turbo Compressor for Volume Flow:

Intake gas pressure..... 6.0948 MPa

Intake gas temperature..... 30 °C Gas

specific weight..... 43.5 kg/m³

Rotor r.p.m. 5 300 1/min.0

Weight of Turbo Compressor Part

Total weight without auxiliary equipment and without oil filling..... approx. 22.6 t Weight

of heaviest part (body) at embedding on foundations table..... 13.0 t Weight of

heaviest component (cover) at installation..... 5.5 t

Cairo Rep. Office: ACE Group

3 Samir Mokhtar St., Ard Al Golf, Cairo – Egypt

Tel: 00202 26903100/200, Fax: 00202 26903500

E-mail: info@aceindustry.net

website: www.aceindustry.net

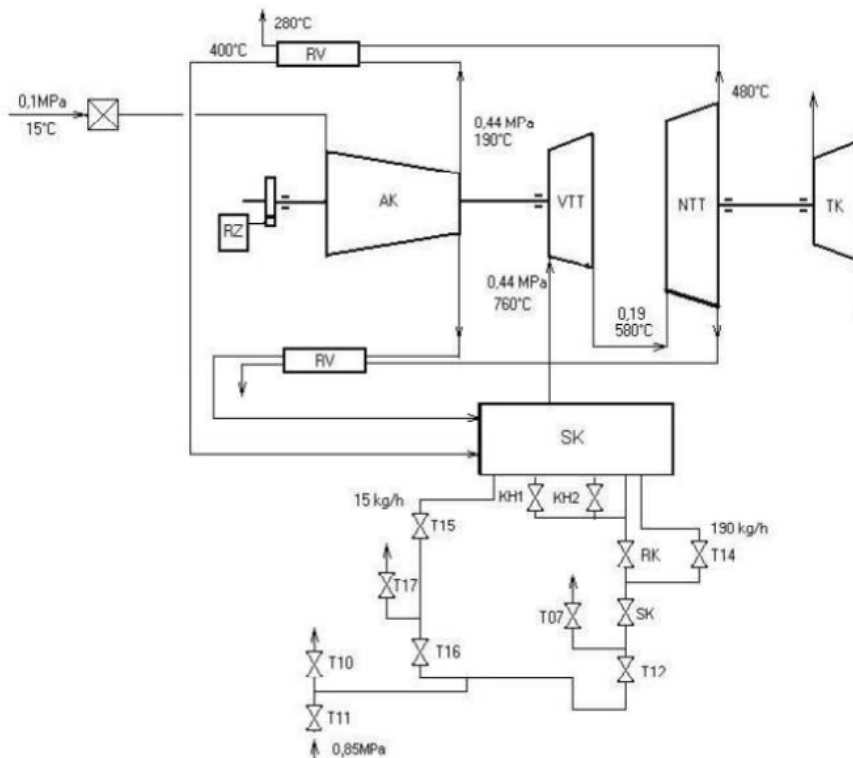
ACE Group



Cairo Rep. Office: ACE Group
3 Samir Mokhtar St., Ard Al Golf, Cairo – Egypt
Tel: 00202 26903100/200, Fax: 00202 26903500
E-mail: info@aceindustry.net
website: www.aceindustry.net

ACE Group

TurboAggregateHeatDiagram



The turbo aggregate driving unit consists of two independent turbines (generation and power) and the vertical combustion chamber. The generation (HPT) turbine drives the axial air compressor and the power (LPT) turbine drives the one-stage radial natural gas turbo blower.

Atmospheric air (0.1 MPa, 15 C) is sucked through the bag filters and intake tract noise mufflers by the axial compressor HPT. At extremely low temperatures and ice formation on the axial compressor intake it is possible to preheat the intake air by the heated air from the regeneration heat exchanger outlet. Air is compressed by 12-stage axial compressor (0.44

MPa, 190 C) and flows into the regeneration heat exchanger (tubular structure type EKOL R1500) where this air is heated by flue gas from the LPT outlet. The air heated in this way (400 C) from the regeneration heat exchanger is brought into the combustion chamber.

Simultaneously the burners of combustion chamber are supplied with natural gas (0.87 or 0.78 MPa). Gas air mixture burns with considerable excess air, flue gas expansions occurs (0.445 MPa, 760 C) in the generation (HPT), as well as the driving (LPT) turbine part while the potential energy of flue gas is converted to work. From the LPT outlet the flue gas (0.11

MPa, 480 C) passes to the regeneration heat exchanger where the part of its heat is handed over to the pressure air from the axial compressor outlet. From the regeneration heat exchanger the flue gas (280 C) passes via the exhaust pipeline through the exchanger flue gas-air into atmosphere.

Cairo Rep. Office: ACE Group

3 Samir Mokhtar St., Ard Al Golf, Cairo – Egypt

Tel: 00202 26903100/200, Fax: 00202 26903500

E-mail: info@aceindustry.net

website: www.aceindustry.net