

# TURBO-EXPANDERS



**Helium Expansion Turbine (HET) is a single shaft high-speed cryogenic machine braked by eddy current brake, designed as one stage expansion of He or other gases (N<sub>2</sub>, Ar, CO<sub>2</sub>, CH<sub>4</sub> and others)**

## **Characteristic parameters of turbo-expanders ATEKO:**

- High efficiency
- Significantly small dimensions and weight
- Turbine power is extracted by cooling liquid flowing through eddy current brake
- Oil "free" operation
- Application of fully dynamic gas (or magnetic) bearings. Gas bearings operate directly with expanded gas
- High life-time (~100 000 h) of all components
- Outlet pressure and temperature (flow rate) is possible to control by speed variation
- Application also for flammable and explosive gases
- Minimum of maintenance and spare parts consumption
- Application in liquefiers of gases technologies

Precisely balanced rotor is situated in gas bearings. Fully dynamic radial and thrust gas bearings are operating directly with expanded gas. Dynamic gas bearings don't need any additional source of the pressure bearing gas. Oil "free" gas bearings don't bring any impurities into expanded gas.

Turbo-expanders are fully hermetic without shaft sealing and so they are very tight ( $10^{-6}$  Pa m<sup>3</sup>/s).

## **Typical sizes of ATEKO turbines are:**

- HEXT: 0,1 - 2 kW, T<sub>in</sub> = 15 - 350 K
- HET: 2 - 10 kW, T<sub>in</sub> = 15 - 350 K

**Control unit** of HET is checking actual turbo-expander unit operation parameters and modifies the speed when necessary. The unit is so operating under the most efficient conditions. The PLC control unit is usually working as slave of technological equipment higher control unit.

Turbo-expander units are also supplied for various gases including permanently flammable and explosive gases (ZONE 0).

Performance maps of these custom designed units depend on real conditions.

Please contact ATEKO for further information.

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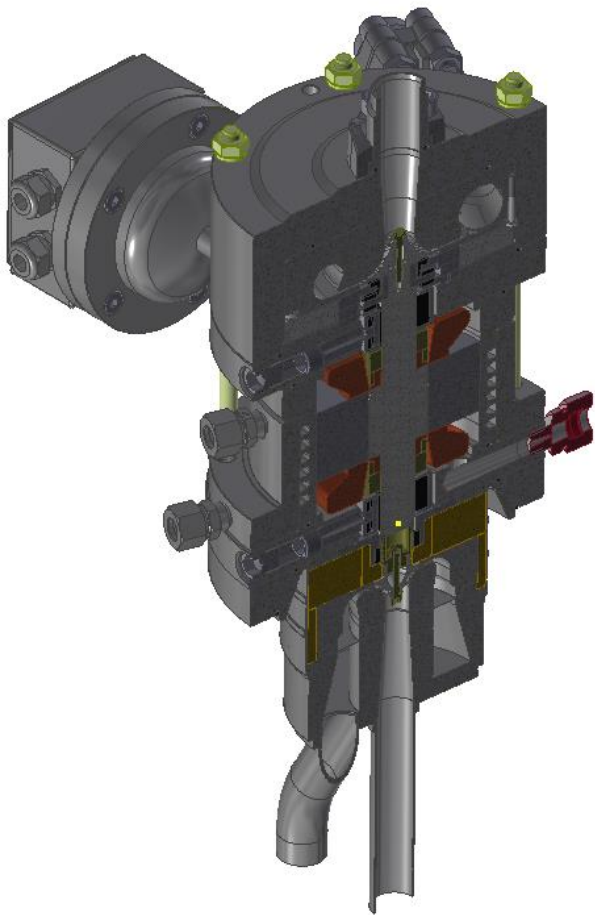


Figure 1 TEC Machine

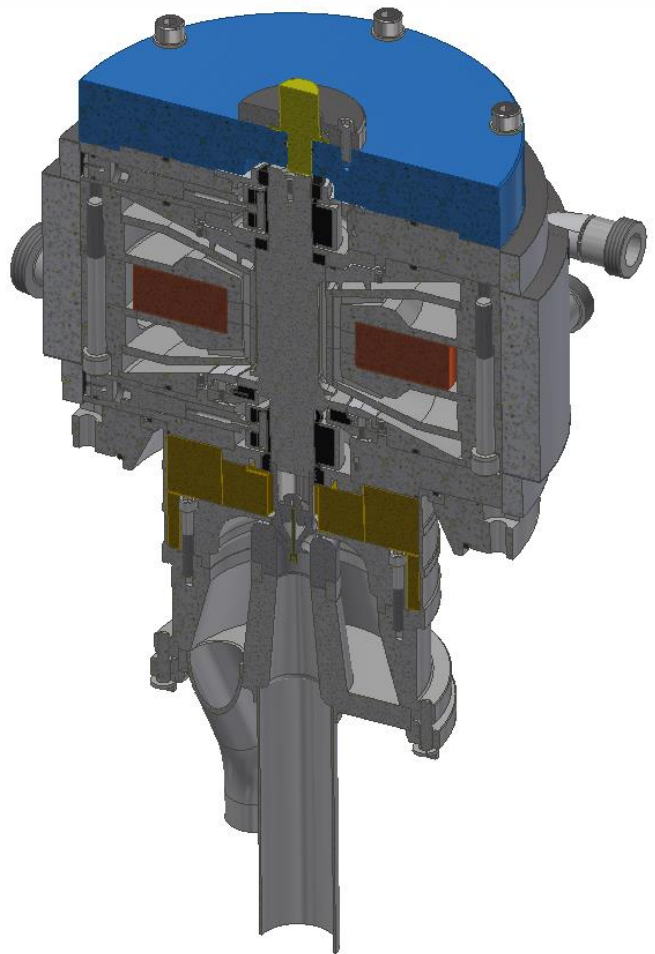


Figure 2 HET



Figure 3 Working stage



Figure 4 Nozzle ring of HET

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**HEXT** Helium turbo-expanders, „cooling power“ 90 – 2 000 W, max. 330 000 rpm, 8 types, tens pieces delivered to LINDE Company (D / CH) and other partners in years 1986 - 2005



**HET + HEXT** Helium turbo-expanders, "cooling power" 500 - 10 000 W, inlet temperature 14 K – 80 K, inlet pressure 0,5 - 2,0 MPa, max. 250 000 rpm, 2 types, 9 pieces -  
**CASIPP** HET 5x, HEXT 500 W 4x, Project of CASIPP – 2016, China.

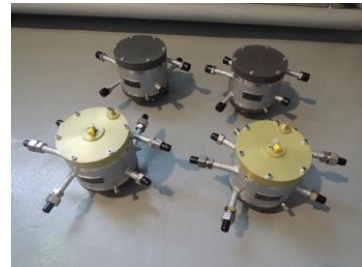


**HET + HEXT** Helium turbo-expanders, "cooling power" 500 - 10 000 W, inlet temperature 14 K – 45 K, inlet pressure 0,5 - 1,8 MPa, max. 250 000 rpm, 5 pieces, Project of TIPC – 2015, China.

**TIPC**



**HET** Korea Electric Power Corporation, 2014, 2 pcs of Helium turbo-expanders, "cooling power" 7 200 W, inlet temperature 81 K, inlet pressure 1,19 MPa, 180 000 rpm  
**KEPCO**



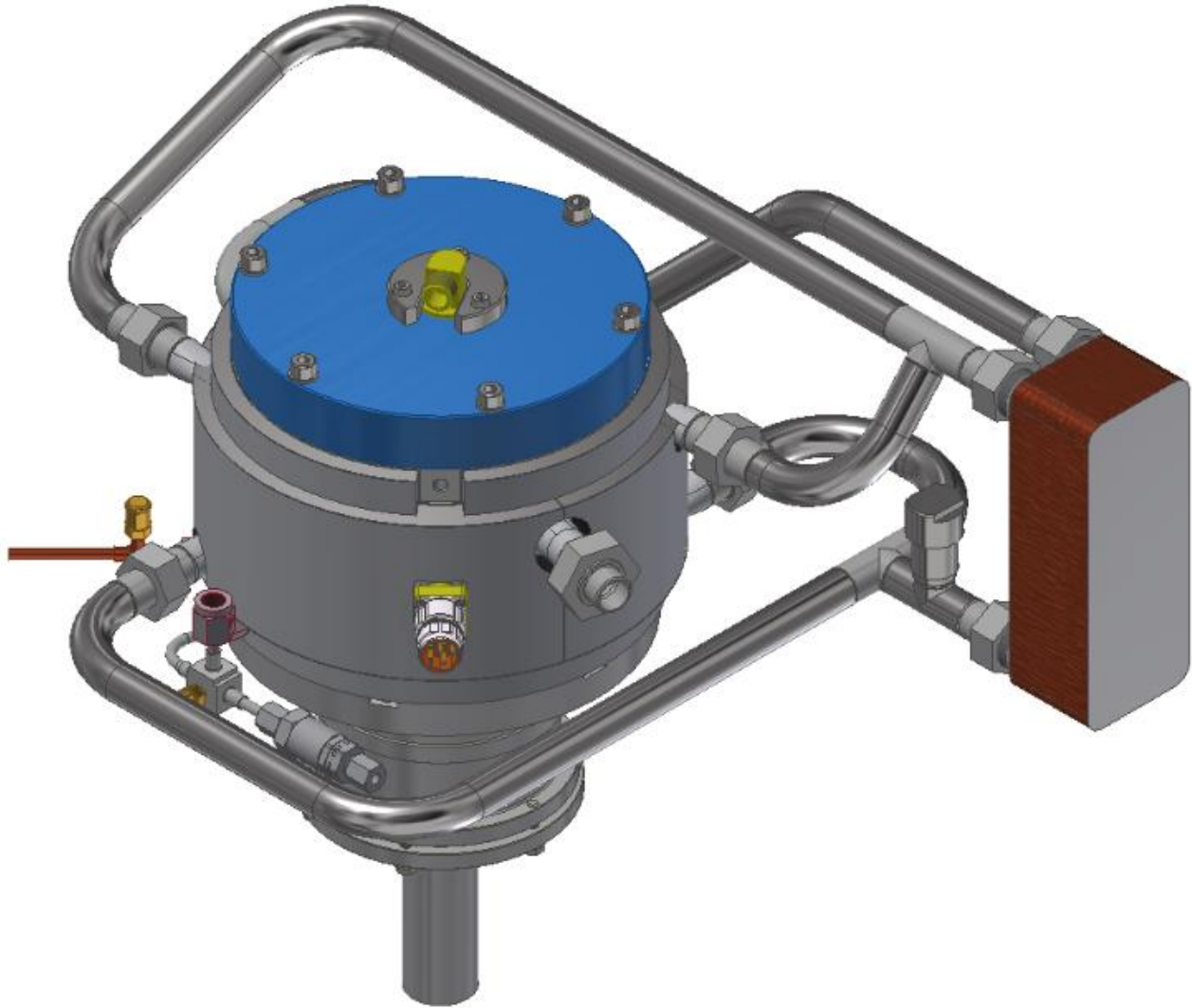
**HET CRYOMASH** Cryomash BZKM Russia 2017, 3 pcs of Helium turbo-expanders, "cooling power" 6 700 – 8 300 W, inlet temperature 20 - 35 K, inlet pressure 1,6 – 2,5 MPa, max. 171 000 rpm



**ELI** Helium turbo-expander-circulator for Brayton cycle, 2015, "cooling power" 800 W, inlet temperature 150 K, inlet pressure 1 MPa, 120 000 rpm



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