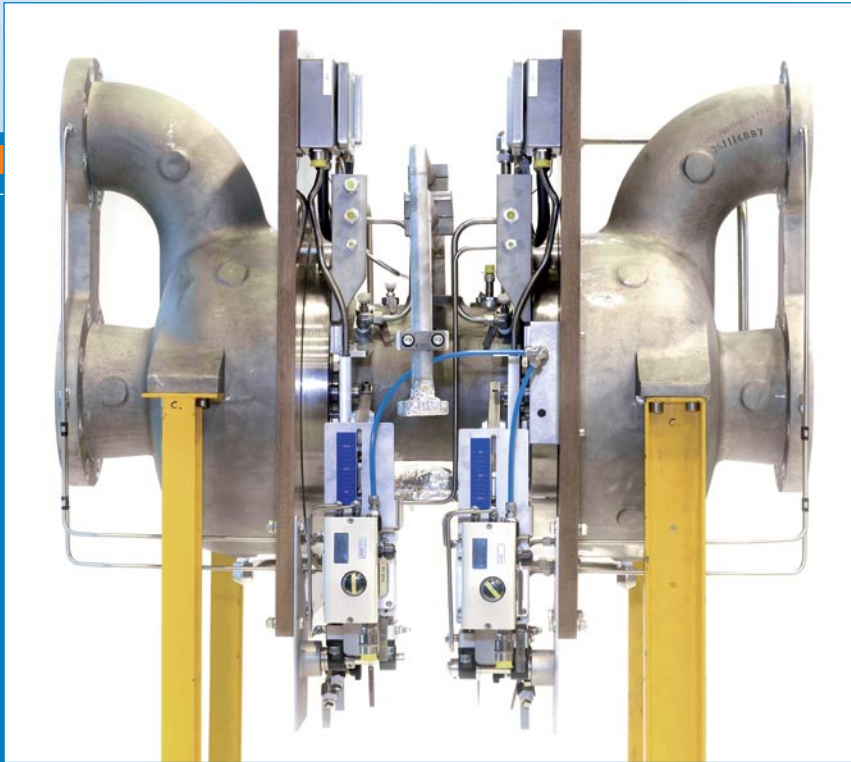


★ Expander with cryogenic compressor and oil brake TFC



★ Typical Application

Industrial Gas Industry (Air Separation Units) to provide refrigeration when a process cryogenic booster compressor is required with adjustable cold power provided by the oil brake.

★ Usual Gases Handled

Air, Nitrogen, or waste gas from air with high oxygen content possibility.

★ References

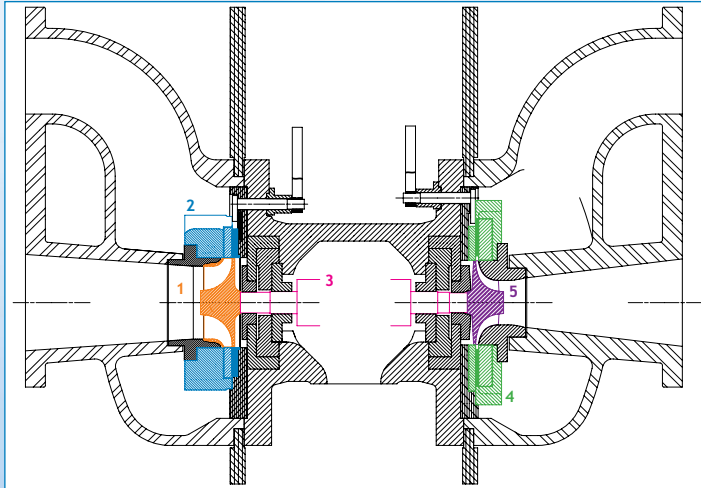
Cryostar has a unique experience in the design of these TFC, with the first unit built in 1991 and more than 50 TFC in operation sold to the major gas companies.

★ Features and benefits

- ★ Turbo expander with cryogenic compressor and variable oil brake mounted on a common shaft.
- ★ The “cartridge” design of the rotor assembly allows access to the rotating element without removing the expander casing and its cold box extension.
- ★ For easy maintenance, a spare “plug-in unit” (expander without casings) allows customer to change all internal parts within a minimum of time and with maximum reliability.
- ★ Diffuser design allows low radial loads at all operating flows.
- ★ Variable oil brake is used to adjust the cold production
- ★ A modular lube oil system is feeding the oil brake and bearings.
- ★ The standard cost effective expander package can be customized to meet the most stringent customer specifications like API614.



★ TFC Cross Section



- 1 High efficiency expander impeller
- 2 Variable inlet guide vanes for peak efficiency over wide operating range
- 3 Stiff shaft, subcritical (rigid) rotor
- 4 Variable diffuser option to offer a wider range of operation to the cryogenic booster.
- 5 High efficiency compressor impeller

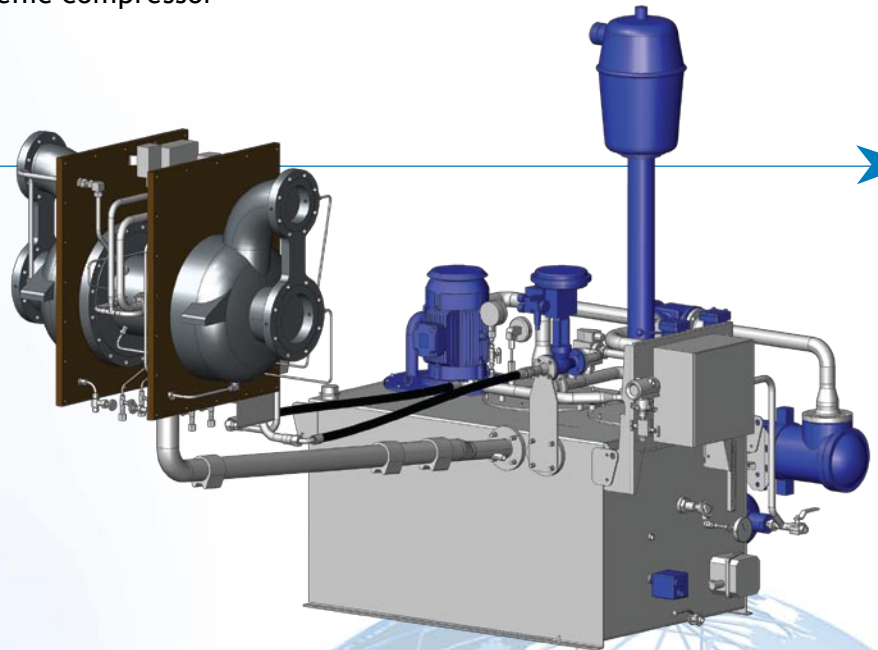
★ Sizes and type

Cryostar offers now TFC120, TFC200, TFC300, TFC400, and TFC500 depending on customer needs.

TFC 120 → 120 is the expander wheel diameter in mm
 T: Turbine (cryogenic expander)
 F: Friction Oil Brake
 C: Cryogenic compressor

★ Range of operation

- ★ Flow up to 150'000 Nm³/h (50 kg/s)
- ★ Pressures up to 70 bar and design temperature -196 °C for expander and compressor
- ★ Power generated by the expander up to 2000 kW
- ★ Up to about 300 KW of refrigeration through its oil brake



★ Other available Expander

- ★ **TC**: cryogenic expander with process compressor and oil lubricated bearings
- ★ **MTC**: cryogenic expander with process compressor and active magnetic bearings
- ★ **ECO, TP**: cryogenic expander with oil brake
- ★ **TG**: cryogenic expander with generator and oil lubricated bearings
- ★ **MTG**: cryogenic expander with high frequency generator and active magnetic bearings
- ★ **LTP, LTG**: Liquid expander with oil brake or generator

