

Air separation plant Operated with cooling system from ARCTOS

NH₃- / CO₂-Cascade refrigeration system for nitrogen cooling

Air separation plants use a technical method for gas separation, which enables the liquefaction of gas mixtures (e.g. air) and individual atmospheric gases (e.g. oxygen, nitrogen, noble gases) in large quantities.



In this case, the ARCTOS refrigeration system cools 28,000 Nm³/h of nitrogen from +30° C to -41° C.

The cooling is achieved with two refrigerant circuits connected in a cascade. Each circuit contains a natural refrigerant optimized for the operating conditions, making the task particularly energy-efficient and environmentally friendly.

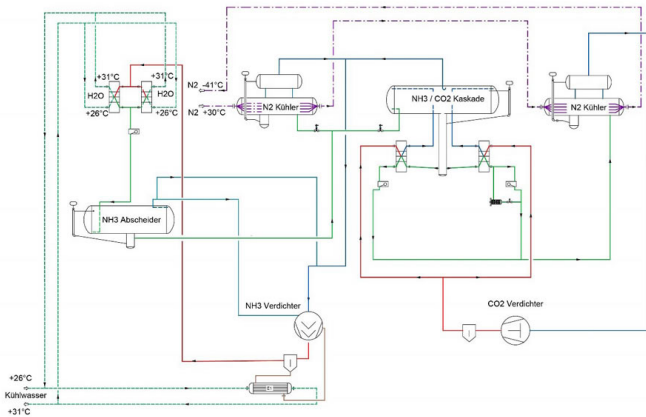
The ammonia refrigerant circuit is responsible for pre-cooling the nitrogen at an evaporation temperature of -14° C. The deep cooling is then achieved through the CO₂ circuit at an evaporation temperature of -47° C.

The energy efficiency of the NH₃ cooling process is significantly improved by the use of an open economizer compared to a simple cooling process.

Additionally, compressors equipped with frequency inverters improve the part-load characteristics and ensure a smooth and energy-saving operation of the machines.

TECHNICAL DATA

Refrigerant	NH ₃	R717 CO ₂ R744
Charge Amount	1,300 kg	1,400 kg
Maximum Operating Pressure (ND/MD/HD)	16 / 18 / 20.5 bar	25 / - / 40 bar
Evaporation Temperature	-14° C	-47° C
Condensation Temperature	+33° C	-10° C
Cooling Capacity	1,103 kW (at -14° C)	412 kW (at -47° C)
Compressor Manufacturer	Sabroe	Sabroe
Compressor Type	Scroll Compressor SAB 233SR	Piston Compressor HPC 106SV
Motor Drive Power	293 kW	108 kW
COP Value	3.76	3.81



Schematic layout of the refrigeration system

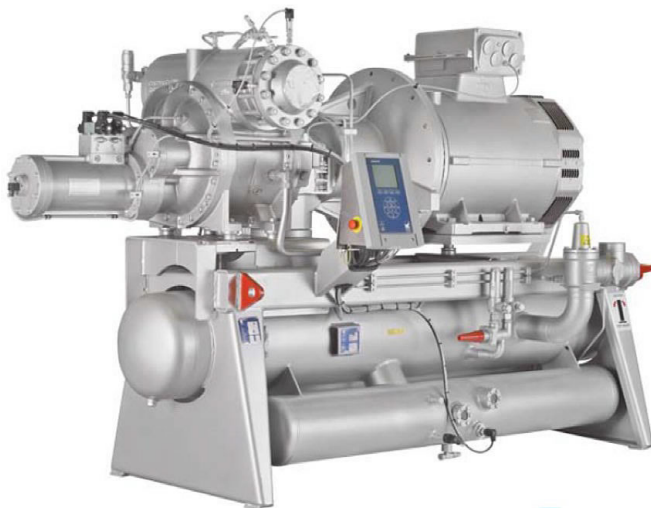
CONTROL SYSTEM

The compressor control programmed by ARCTOS allows the operation mode to be flexibly adjusted to customer requirements. In this case, the control ensures an optimized coordination between the NH₃ and CO₂ compressors.

COMPRESSOR TYPES

For the ammonia circuit, a screw compressor from the SABROE SABTM 233SR series is used. This provides a maximum cooling capacity of 1,103 kW.

The CO₂ circuit is equipped with a SABROE reciprocating compressor from the HPCTM 106SV series, reaching a cooling capacity of 412 kW at the operating point.



SABROE R717 Screw Compressor SAB(TM) 233SR



SABROE R744 Piston Compressor HPCTM 106SV

Do you have any questions or comments? We are happy to assist you:

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