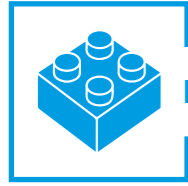




SPECIALISTS IN TECHNICAL GASES



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# Liquefaction & Refrigeration Technologies

Solutions for Chemistry, Refinery and Petro-Chemistry Applications



### CONTACT

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### Your trusted partner for cutting-edge cryogenic solutions

Cooling, like heating, is one of the most essential process steps with large impact on nearly all production ranges from chemistry, food and beverage industry, pharmaceutical and petrochemical applications, fuel production as well as in our daily live like air conditioning and refrigerators.

CRYOTEC has a wide range of experience and references in refrigeration- and cryogenic application technologies from ambient to low temperature range. Plants have been built by CRYOTEC in Wurzen / Saxony since 1880.



CRYOTEC Anlagenbau GmbH is certified per DIN EN ISO 9001

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## Technology Overview

### Refrigeration Cycles

Most of refrigeration processes using an artificial refrigerant or mixtures as transport medium and operating in a continuously closed cycle driven by compressor, whereby mechanical work will be supplied to the refrigerant and converted into coldness.

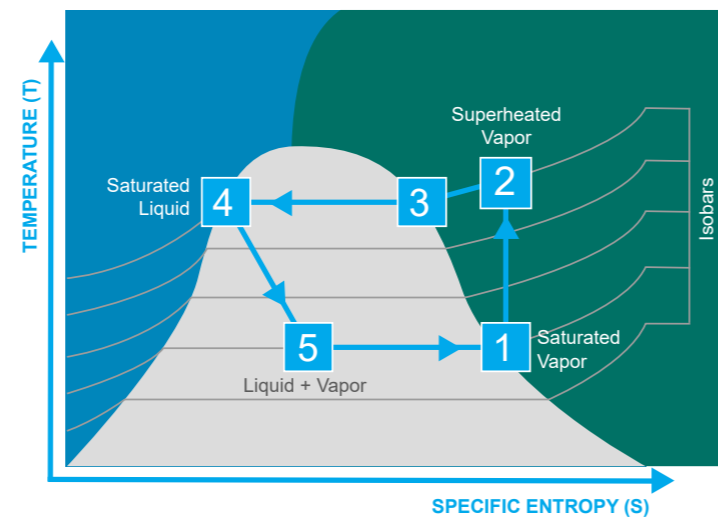
Refrigeration cycles can be divided into:

- ▶ Wet cycles - whereby the refrigerant passes from the liquid to vapor/gas phase (wet process) and back again by condensation
- ▶ Dry cycles whereby the refrigerant or working medium is permanently in the gas phase under different thermodynamic conditions through compression and expansion.

### Principle of a Wet Refrigeration Process

- 1 to 2 = Compression of vapor
- 2 to 3 = Vapor superheat removed in condenser
- 3 to 4 = Vapor converted to liquid in condenser
- 4 to 5 = Liquid flashes into liquid + vapor across expansion valve
- 5 to 1 = Liquid + vapor converted to all vapor in evaporator

Liquid  
 Vapor  
 Liquid & Vapor



### Advantages and Features of our Technologies & Solutions

- ✓ Flexible and wide operation range of capacity- and temperature application
- ✓ Environmentally friendly and cost saving concepts
- ✓ Tailor-made or standardized packages
- ✓ Pre-fabricated, skid mounted units
- ✓ Optimized refrigerants or refrigeration mixtures
- ✓ Low operating costs / energy savings
- ✓ Fully automatic operation
- ✓ Maintenance- and inspection service

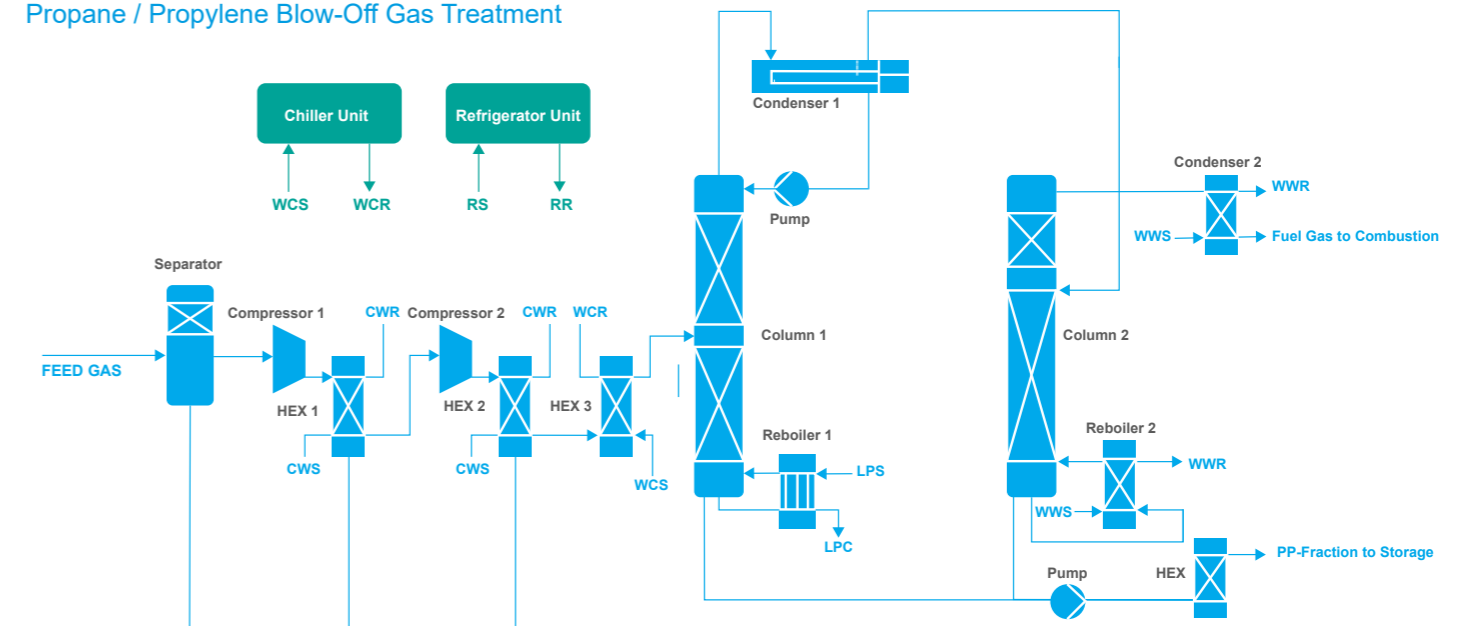
## Various Applications

Cryotec can offer a wide range of refrigeration solutions respectively plants either in standardized sizes or customized to meet client's specific needs.

- Gas to liquid applications
- LNG Plants
- Boil-off gas recovery, treatment & liquefaction
- Chemical reaction and reactor temperature controlling (process cooling systems)
- Solvent recovery systems
- CO<sub>2</sub>-Liquefaction, clean-up from different sources and for different applications, dry ice production
- VOC (Volatile Organic Compounds) recovery / separation
- Purge gas treatment, capture of substances from gas blanking systems
- Utility processing, chiller units

### Example: Blow-off Gas Recovery

Propane / Propylene Blow-Off Gas Treatment



- Cryogenic Systems
- Systems for Compression & Liquefaction of Gases
- Small Scale LNG Systems



- Polymers & Fibers
- Chemistry & Specialty Chemistry
- Renewable Energies
- Biotechnologies
- Engineering Services & Infrastructure
- Pharmaceuticals & Fine Chemistry



- Construction Engineering
- Infrastructure
- Building & Civil Engineering
- Project Management
- Technical Building Equipment



- Air Separation Systems
- CO<sub>2</sub> Technologies
- Special Applications for Technical Gases
- Building Automation
- E/I&C Technology
- Electrical Engineering & Telecommunications
- Ventilation & Air-Conditioning Systems
- Heating & Sanitary Systems



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