



Aerospace Cryogenic Cooling Solutions

Stirling Cryogenics and CryoZone based solutions for Aerospace Applications

DH Industries Technology

For over sixty years DH Industries has been designing and manufacturing systems for on-site production of cryogenic cooling power and various concepts of closed loop cryogenic cooling. We have served customers all over the world with different kinds of applications requiring such cryogenic cooling power under all possible conditions.

To cool these applications, DH Industries offers several solutions based on its two brands:

- Stirling Cryogenics, supplying Stirling Cryogenerators for the on-site production of cooling power in the range of 15 to 120K.
- CryoZone, supplying cryogenic fluid pumps and CryoFans to create closed cooling loops for LN₂ and gaseous helium.

Aerospace Applications

Typical applications in the Aerospace Industry needing cryogenic cooling power are:

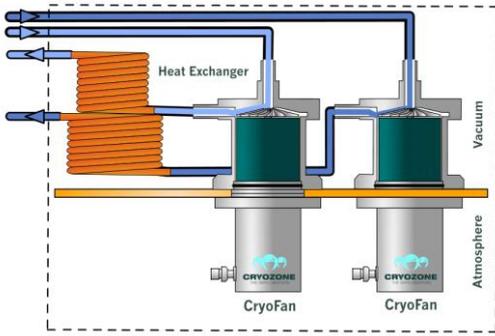
- Shroud cooling for thermal shielding
- Cryo-pumping
- Instrument cooling
- Densification of cryogenic liquid propellants
- Production of cryogenic liquids
- Boil-off gas management of cryogenic liquids.



DHI Cryogenic Cooling Solutions

Based on our brand components we provide various system concepts, adapted to the application requirements. Some examples of these systems for the Aerospace Industry are:

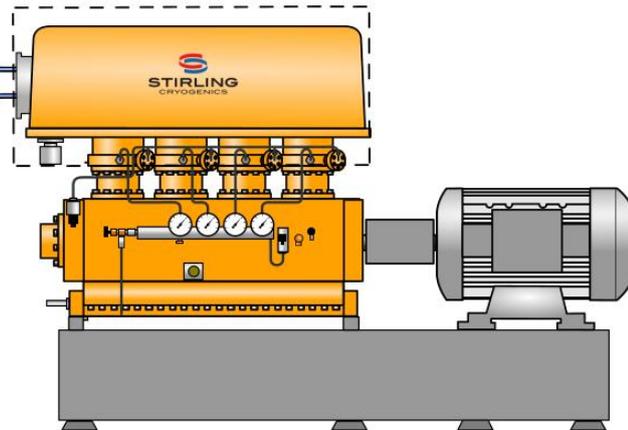
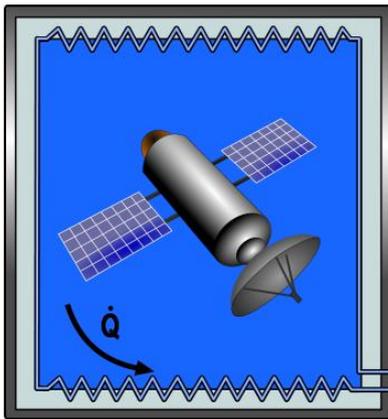
- Closed cycle cooling by helium gas or liquid nitrogen with typical temperatures of 20-30K and 70-90K, to provide distributed cooling power for a shield, cryo-pumping surface or instrument.
- On-site production of cryogenic liquids such as LN₂, LOx and LAr, to provide instrument cooling or breathing air.
- Cooling of a cryogenic liquid propellant to lower its temperature and hence increase its density to decrease on-board volume.
- Re-liquefaction systems to address boil-off for cryogenic liquids such as LH₂, LN₂, LOX, LAr, LNG etc.



Thermal shields, cryopumping and instruments

When these devices need cooling power between 15-60K, the medium to use is pressurized helium gas. This will be pumped around by our CryoZone CryoFans, connecting the application with the cold source.

This provides cooling power which can be distributed throughout the surface to be cooled, minimizing temperature distribution. Cooling power available ranges from 50 to 1 kW at 20K or higher.



Cryogenic liquids

Different applications consume different cryogenic liquids:

- Liquid nitrogen, to cool different types of instruments
- Liquid oxygen, for breathing purposes
- Liquid air, for breathing purposes.
- Liquid argon, for inerting

These fluids can be produced on-site to avoid logistics or can be re-liquefied to minimize logistics and maintain value.



Densification of cryogenic liquid propellants

The mass of liquid propellants that can be stored on-board depends on the available volume and its density. By cooling the liquid storage in a closed loop, pumping the fluid through the Stirling Cryogenerator heat exchanger, its temperature is decreased and hence density increased.

This allows for more mass in the same liquid volume.