

Cryogenic Cooling System Design Technology

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- ⇒ Engineering technology to design and construct a cooling system using a cryocooler to create the cryogenic environment (below -150℃) required by the cooling target
- ⇒ Cooling system divided into the cryogenic fluid cooling system using cryogenic fluid (liquid nitrogen, liquid helium, etc.) and the cryogenic conduction cooling system using a solid structure with good thermal conductivity.

Client / Market

- Superconducting applications (superconducting power device, superconducting magnet, NMR, MRI, etc.), gas liquefaction/re-liquefaction

Necessity of this Technology

- Various cooling system combination depending on the requirements of the cooling target (temperature, pressure, cooling load, etc.)
- Cooling system design to minimize the cooling load of a cryocooler while satisfying the requirements of the cooling target.
- Suitable design margin for basic design of the cooling system and its components.

Technical Differentiation

- Cooling system design based on design and test experience of various cryogenic cooling systems (superconducting power cable, superconducting fault current limiter, SMES, NMR, etc.)
 - Cryogenic cooling system configuration to meet the requirements of the cooling target
 - Determination of design margin for the system and its components
 - Calculation of cooling load and selection of a cryocooler according to the system design
 - System basic design (system/component specification)
 - Detailed design of a system cooling structure (conduction cooling system)

Excellence of Technology

- Track record of cryogenic fluid cooling system design and test
 - Superconducting power cable cooling system (single-phase 154 kV, 1000 MVA, 100 m) Liquid nitrogen circulation cooling (70 K, 5 bar), Stirling cryocooler: 2kW @ 77 K
 - Superconducting fault current limiter cooling system (single phase 154 kV, 2 kA) Liquid nitrogen circulation cooling (71 K, 5 bar), Stirling cryocooler: 4 kW @ 77 K
- Track record of cryogenic conduction cooling system design and test
 - SMES (Superconducting Magnetic Energy Storage)
Energy storage : 600 kJ, operating temperature: 20 K, 2 stage GM cryocooler
 - NMR (Nuclear Magnetic Resonance)
Superconducting magnet : 9.4 T, operating temperature: 20 K, 2 stage pulse tube cryocooler

DESIRED PARTNERSHIP

Technology Transfer

Licensing

Joint Research

Other



TECHNOLOGY READINESS LEVEL [TRL]

- Research, basic explanation
- Project concept or idea development
- Technology idea verification
- Prototype development
- Trial product production/evaluation in similar environment
- Pilot field demonstration
- Development and optimization of commercial model
- Commercial product demonstration
- Mass production and initial market launch

Superconducting Power Cable Cooling System



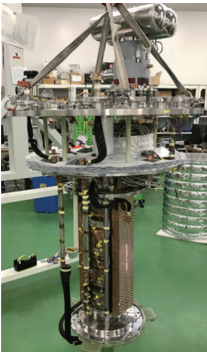
Superconducting Fault Current Limiter Cooling System



SMES Cooling System



NMR Cooling System



Current Intellectual Property Right Status

PATENT

- Pressurizing System for Cryogenic Pressure Vessel (KR1558840)
- System and Method for Superconducting Fault Current Limiter Recovery (KR1558839)
- Pressurization System using Floating Heater for Cryogenic Pressure Vessel (KR1569650)
- System and Method for Superconducting Fault Current Limiter Recovery (KR1601593)
- Recovery System for Superconducting Fault Current Limiter (KR1691983)
- Recovery System for Superconducting Fault Current Limiter (KR1691989)
- Recovery System for Superconducting Fault Current Limiter (KR1720752)

KNOW-HOW

- Cryogenic cooling system design technology