

IEA Technology Collaborative Program on High Temperature Superconductivity

July 4-5, 2017 NEDO

Cryogenics and Superconducting Technology of MAYEKAWA

July 2017



Company Profile

MAYEKAWA MFG. CO. , LTD.

Established in: **1924**
Capital: 1 billion yen
Sales: 130 billion yen (group)
Employees: 4,500
Offices: 60 in Japan, 94 Overseas

Contents: Manufacture and sales of various kinds of **refrigerators / gas compressors** mainly for **industrial freezers**, consulting engineering, plant engineering and service engineering related to agriculture, meat and seafood processing industries, food, distribution and energy



Tokyo Head
Office

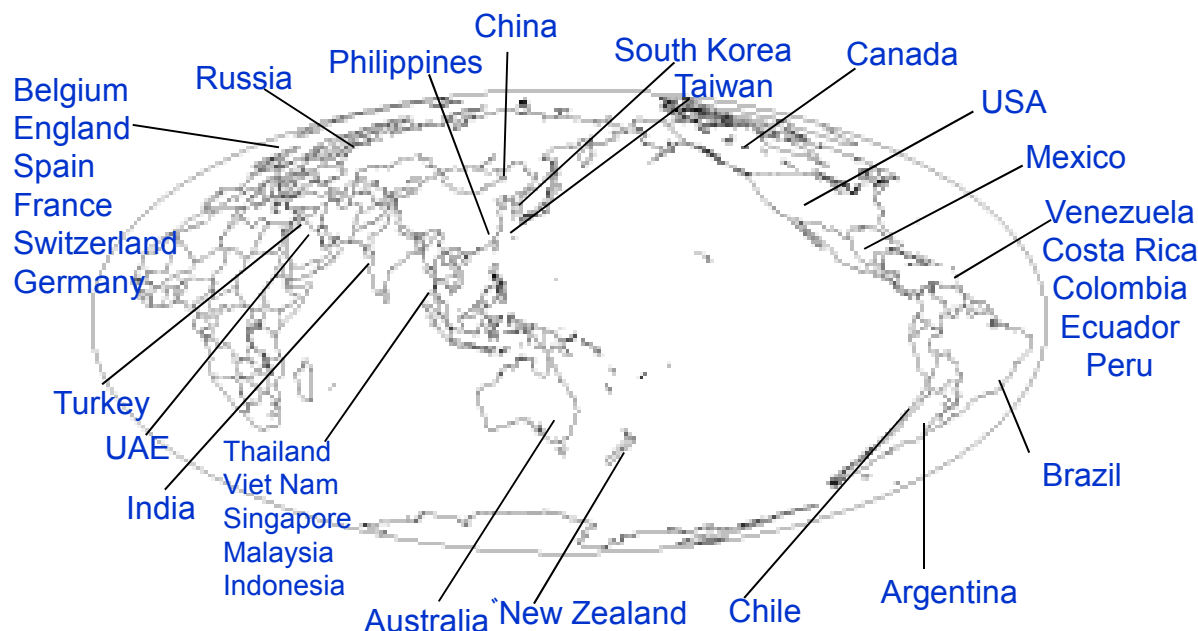


Moriya Plant



Higashi-Hiroshima
Plant

Around the world



Mayekawa is doing business globally, having **60 domestic** offices and **3 plants**, and **94 overseas** offices including **8 plants**.

Domestic plant:
Moriya, Higashi-Hiroshima, Saku

Overseas plant:
Mexico, Brazil, USA, Belgium, South Korea, India



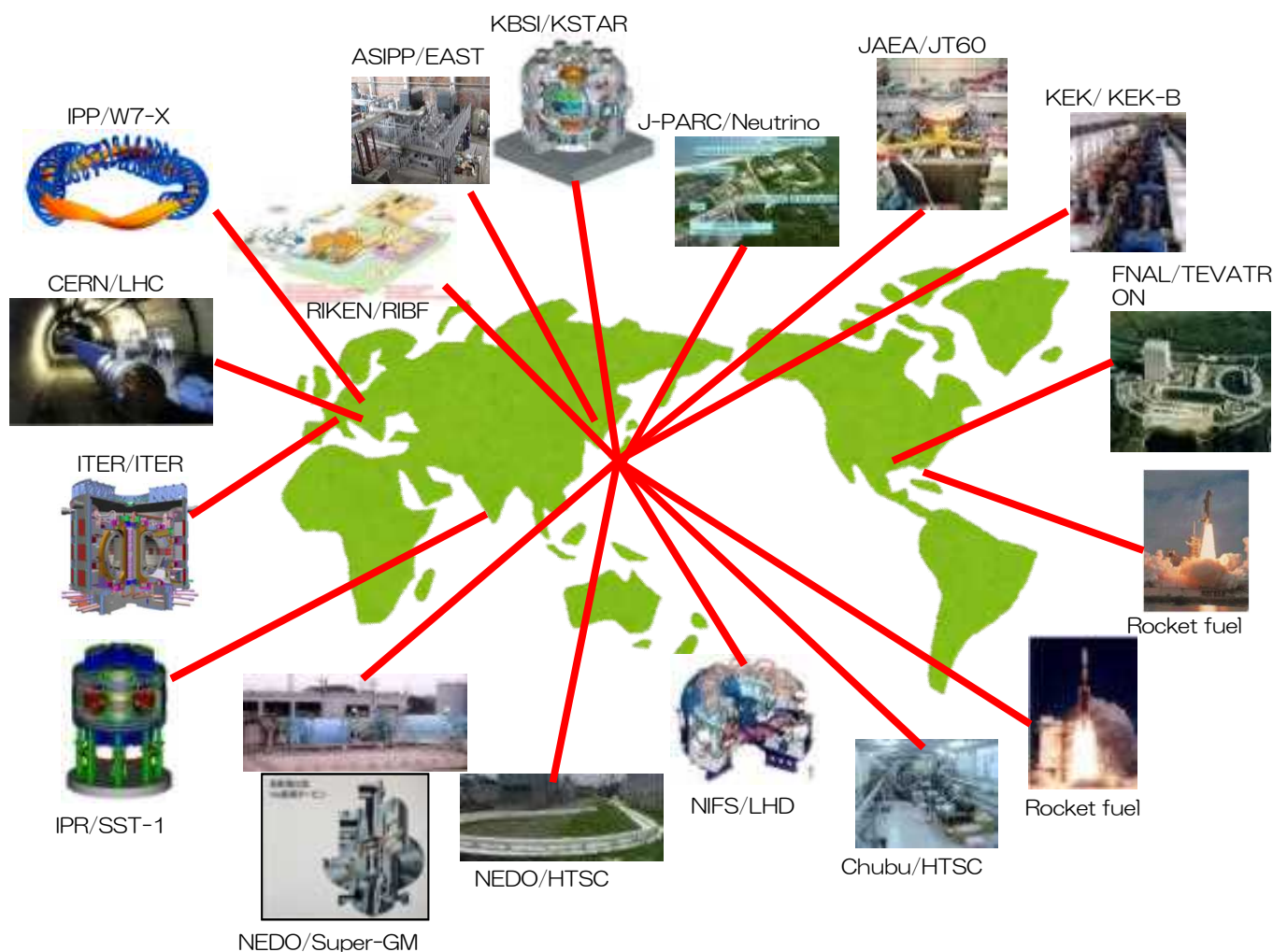
Brazil plant



Moriya plant

MAYEKAWA's Cryogenics Worldwide Business

MAYEKAWA is compressor manufacturer which has a long history

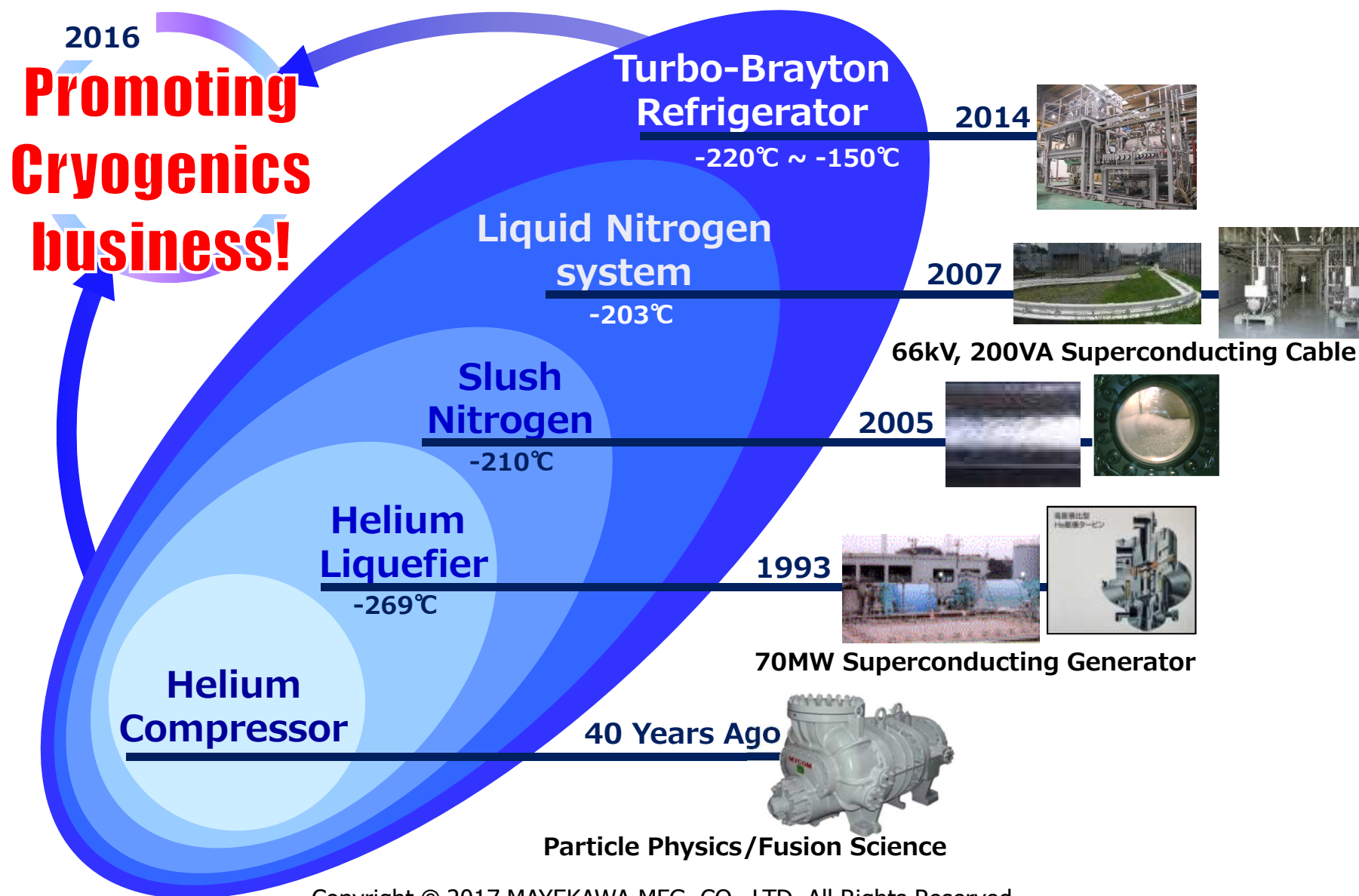


Helium Compressor

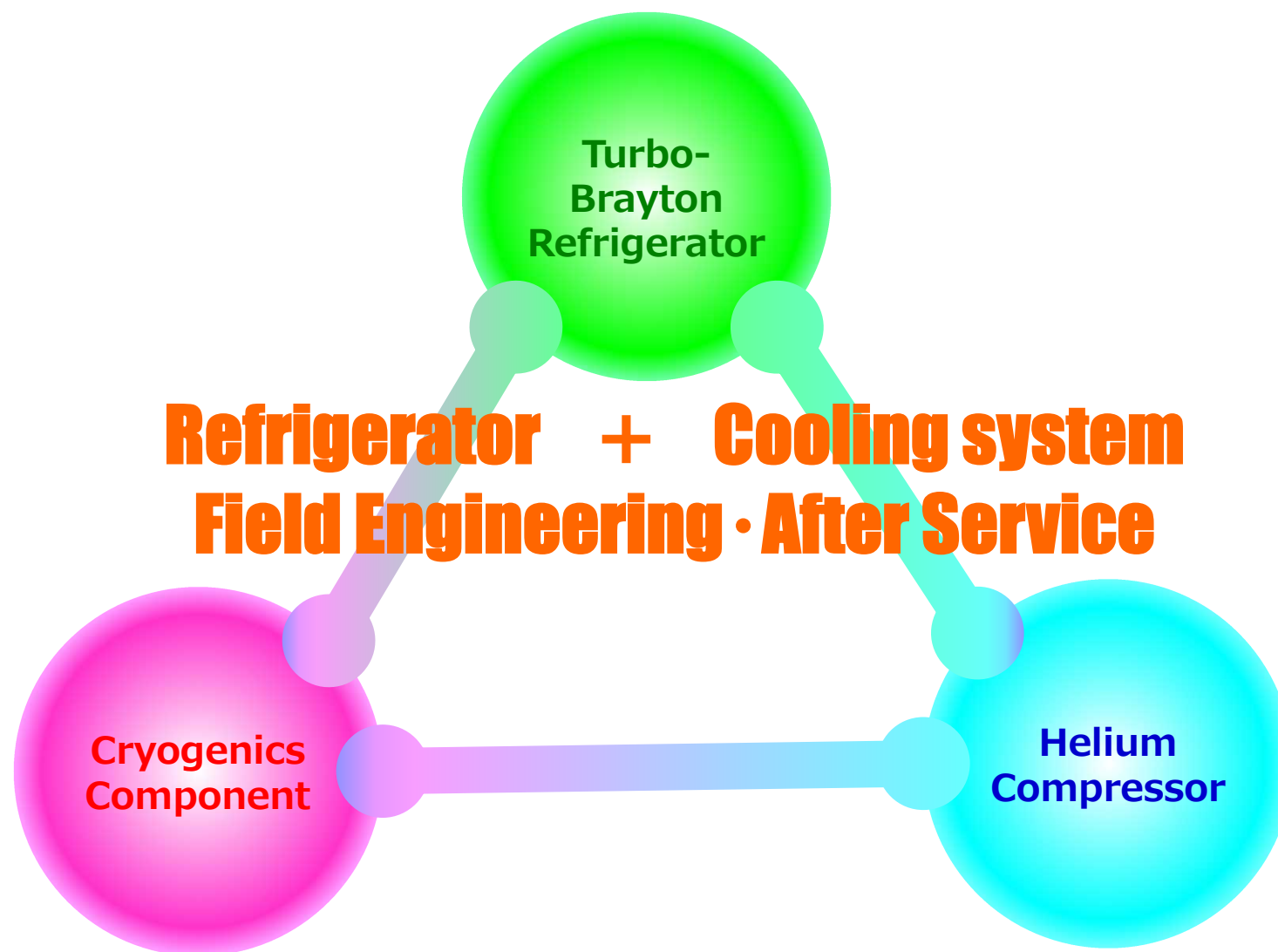


Moriya factory

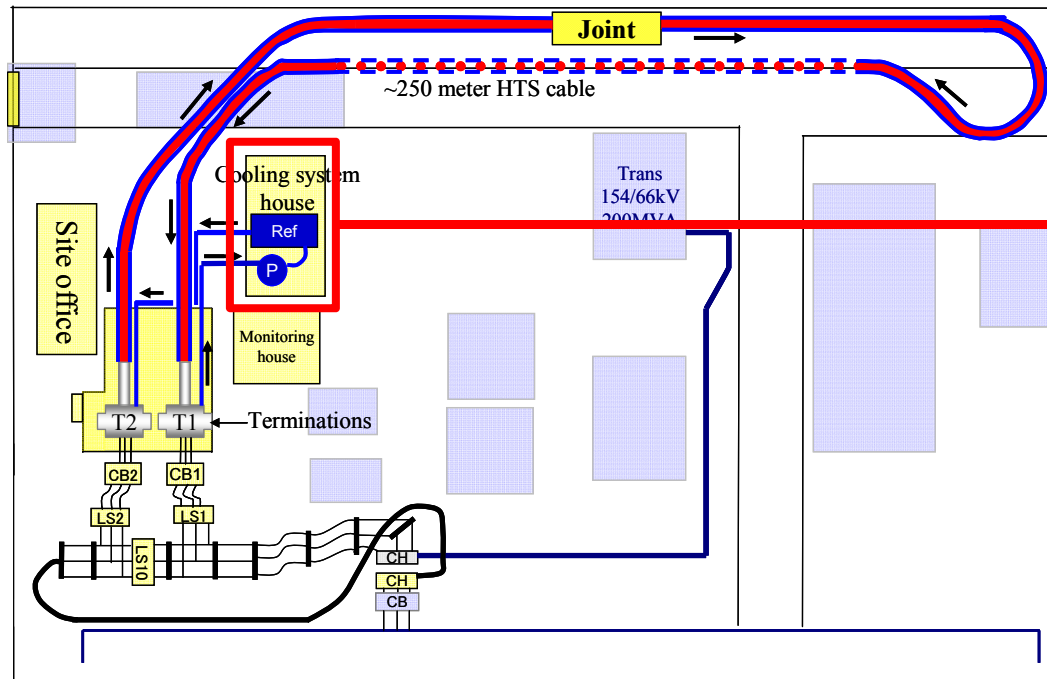
Cryogenics History of MAYEKAWA



Cryogenics Business of MAYEKAWA



HTS Cable Yokohama Demonstration Project



Brayton refrigerator



Reservoir

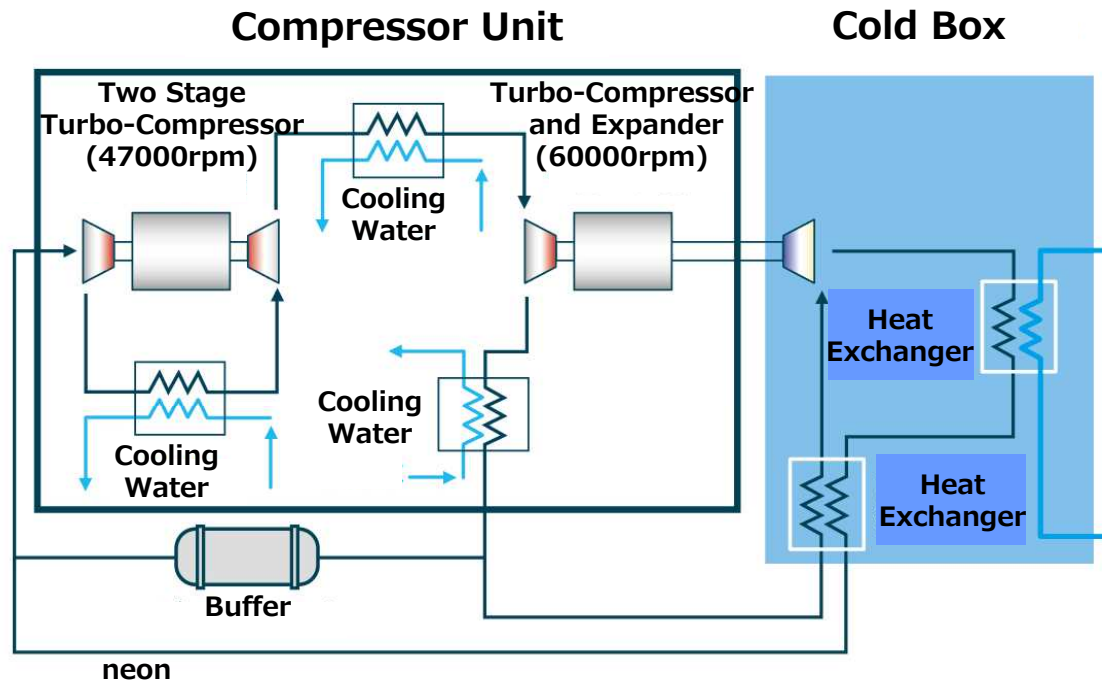


Pump Unit

Second phase of Yokohama project

- verification of reliability of Brayton refrigerator
- Continuous operation for one year in real grid

Turbo-Brayton Refrigerator for HTS Cable



● High Performance

Turbine Adiabatic Efficiency of 0.8

● High Reliability

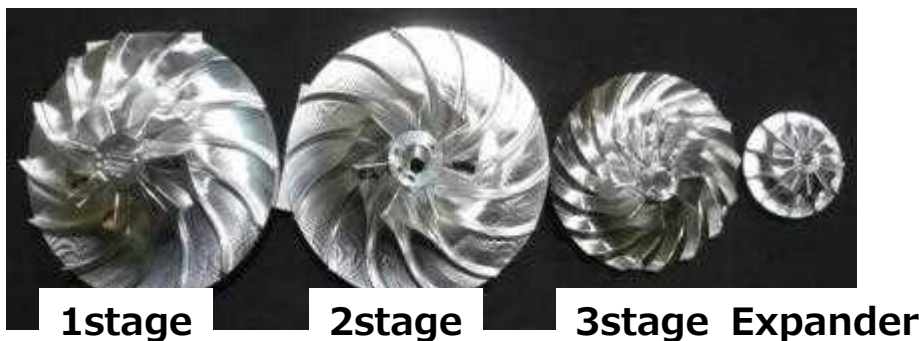
Magnetic Bearing
(Perfectly Contactless)

Cooling capacity

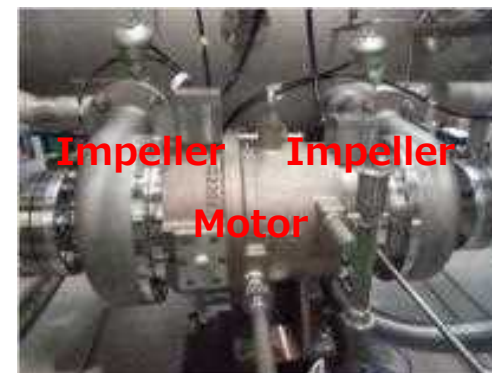
5.8 kW @ 77 K*

COP 0.1 @ 77 K*

* Liquid nitrogen temperature



Compressor



Two Stage
Turbo-Compressor

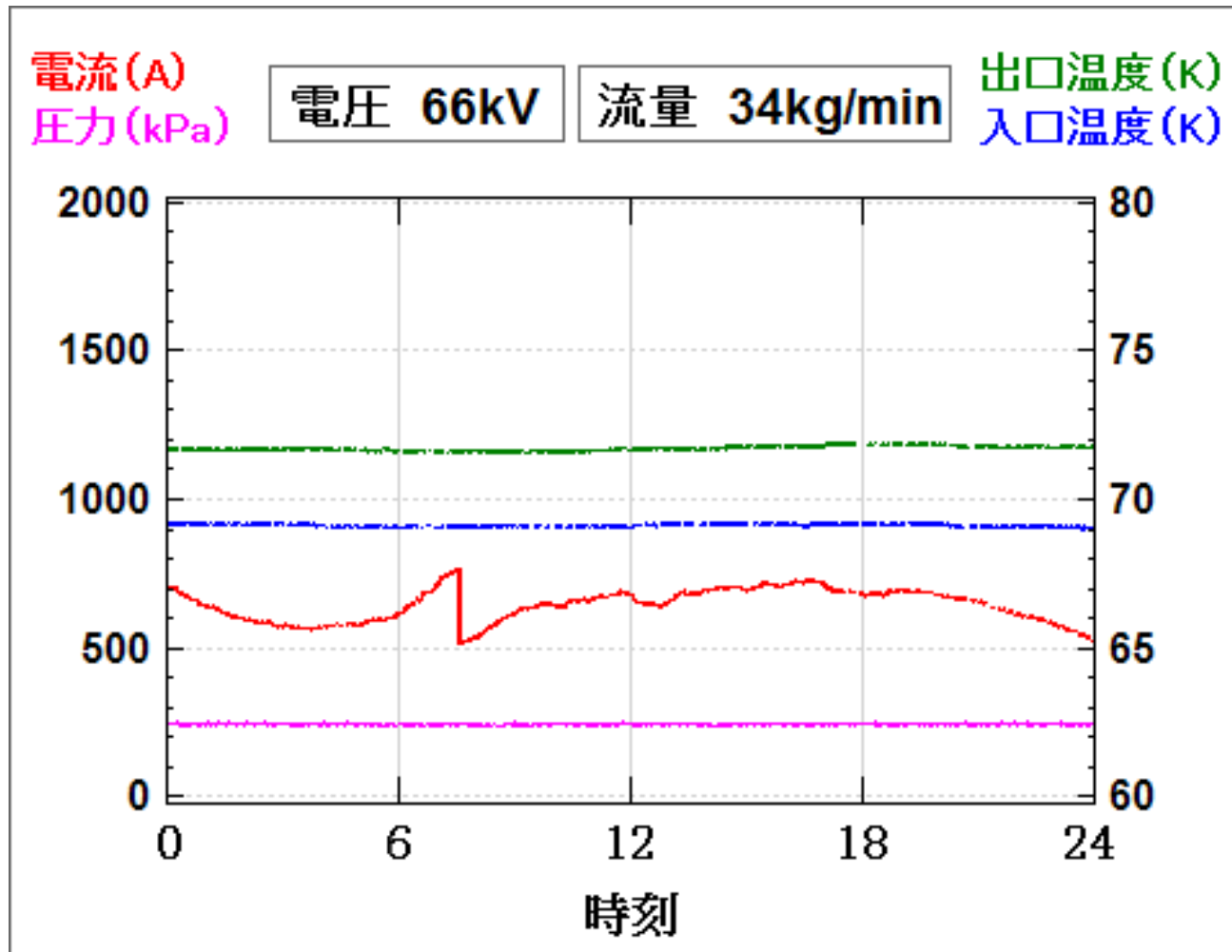


Turbo-Compressor
and Expander



Refrigerator

Result of demonstration test



2017, 7, 3

<http://www.sei.co.jp/super/cable/jissho.html#3>

Commercial Base Refrigerator “Brayton NeO”

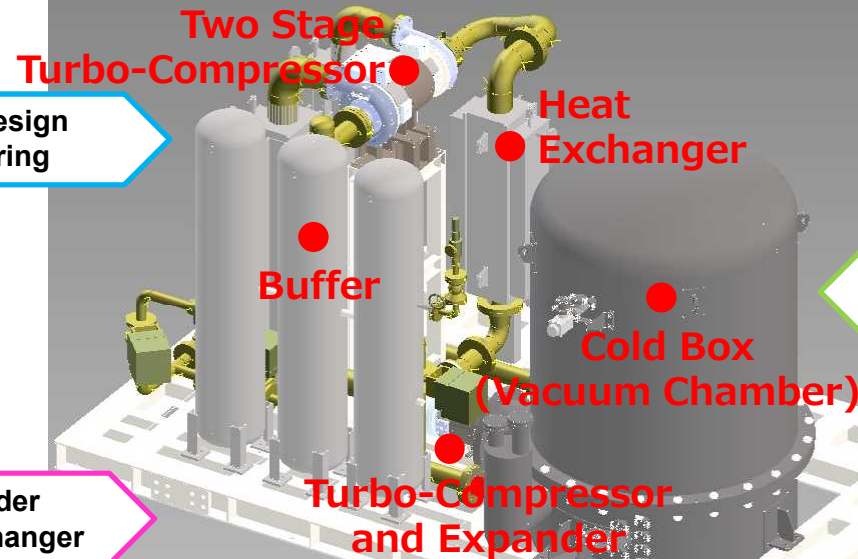


Brayton Refrigerator
for HTS Cable



Helium Liquefier

System design
Engineering

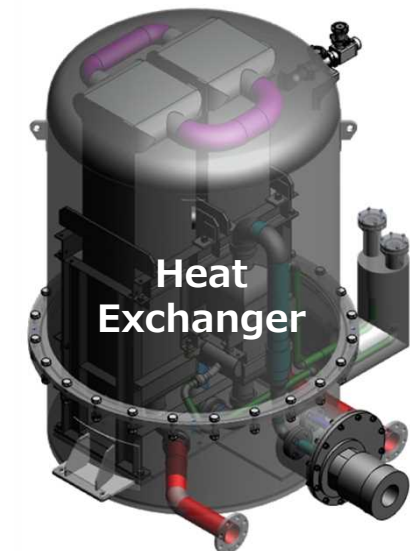


Expander
Heat Exchanger



Turbo-compressor
magnet bearing

Pascal Air



Heat
Exchanger

Cold Box

In-house R&D for commercialization

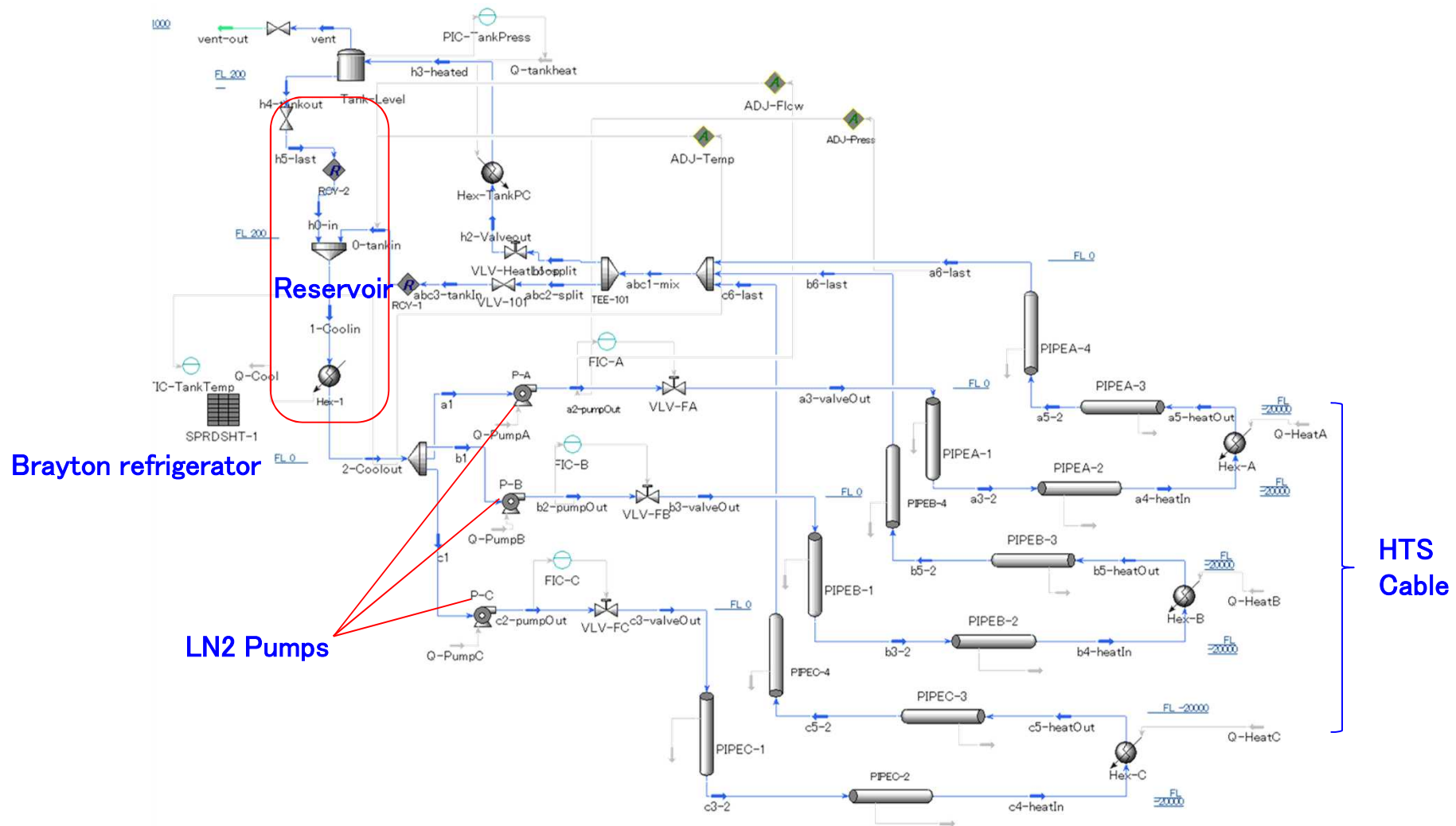
- Standardized marine container size (for export ship abroad)
- preparing to comply with regulation of ASME, CE

Specification of “Brayton NeO”

Cooling Capacity	(kW)	5	* class at 77 degrees Kelvin
Temperature Range	(K)	65 ~ 120	
COP		0.08	* class at 77 degrees Kelvin
Outer Dimensions (W×L×H)	(mm)	2,200×3,600×2,200	* include outer case exclude panel
Net Weight	(kg)	5,500	* include outer case exclude panel



Dynamic system simulation for optimization of cooling system operation





HTS cable system issue

If losses of HTS cable are more less and sustainable (unaffected vacuum insulation),

=>Cooling station is compact.

=>The number of cooling station is decreased in long cable.

=>Total cost is low.

