



Water replaces environmentally harmful refrigerants in new refrigeration and air conditioning units

Japanese and Danish companies are behind a breakthrough for climate- and environmentally friendly refrigeration and air conditioning systems with the development of a unique and competitive design with plain water as refrigerant.

The development of a new type of compressor, which is technically similar to a jet engine means that ordinary water can replace the more polluting synthetic HFC refrigerants and at the same time significant energy savings can in many cases be achieved. The new technology expected to be completed / commercialized within a few years.

Japan and Denmark, in close cooperation

The development of the new system carried out in an international collaboration with the Japanese companies Kobe Steel, Ltd., The Tokyo Electric Power Company, Incorporated, Chubu Electric Power Company, Incorporated, The Kansai Electric Power Company, Incorporated, Central Research Institute of Electric Power Industry, the Danish branch of the U.S. Company Johnson Controls Incorporated and Danish Technological Institute with financial support from the Danish Energy Agency.

The basic aerodynamic design and testing work was carried out by DTI which has invested approximately 5 million DKK in advanced testing facilities. Development work has been going on for almost seven years and has had a budget of nearly 40 million DKK.

"This is a big commitment from the Technological Institute's side, because the new technology can also be used in other fields and industries such as process industries, for example drying and concentration, high temperature heat pumps, ice generation and ice storage for future energy storage systems " said civil engineer Claus Schøn Poulsen, Centre Manager of the Centre for Refrigeration and Heat Pump Technology at the Danish Technological Institute.

All essential parts of the newly developed prototype systems are produced in Denmark by a number of Danish sub suppliers. In addition there is made use of foreign testing facilities and knowledge centers.

There is developed two different size compressors and depending on the system design and operating conditions, systems using the newly developed compressors can in many cases achieve energy savings in the range of 10 to 20%, while greenhouse gases typically can be reduced by 15 to 30% compared to HFC-based systems. Danish Energy Agency has supported this project as well as a prior comprehensive feasibility study with a total of 14 million DKK.

The international project team is world leaders and has taken a number of patents on key parts of the technology.

DEA has consistently supported a number of projects in the refrigeration area, including projects that ensure high efficiency in combination with the use of refrigerants with low global warming. Prior to this project, the DEA supported a demonstration project at LEGO, using water as refrigerant for process cooling, a plant established in cooperation between Danish Technological Institute and the former Sabroe.

Danish and Japanese production.

Production rights to the newly developed system are shared between Japanese Kobe Steel, Ltd. and Johnson Controls Denmark which is the Danish branch of the US-based company. The market potential for large refrigeration and air conditioning systems are globally at 10 to 15 billion DKK per year.



Kobe Steel Ltd. (Kobelco), together with the Japanese power companies designed and produced a prototype of a future commercial plant for the Japanese market based on the development work at the Danish Technological Institute. Testing of this prototype started last spring and after installing a newly developed type heat exchangers, the tests continues now with long-term testing and product maturation /commercialization over the next few years.

Johnson Controls is planning to establish a demonstration plant in Denmark by aversion for the global market in collaboration with Kobe Steel, Ltd., Danish Technological Institute and a large Danish customer, a facility to be used for long-term tests, product maturation /commercialization and as a showcase.

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Photos and text (JPG files enclosed)



Foto 1. *The team behind the new environment and climate friendly refrigeration and air conditioning system consists of experts from Japan, USA and Denmark*

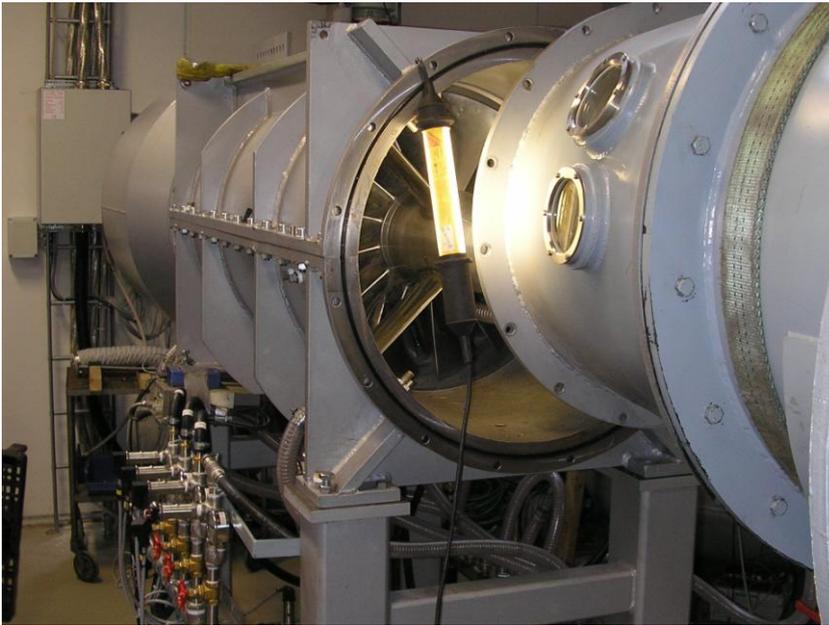


Foto 2. *The newly developed axial compressors are prerequisite for compact, highly efficient and competitively priced system using water as refrigerant.*



Foto 3. *The basic design and testing work is carried out at the Technological Institute, which provides the necessary advanced testing facilities. Development works has lasted 6-7years and have had a budget of almost 40 million DKK*