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DANFOSS' AWARD-WINNING VALVE STATION APPLIED IN A LANDMARK CO_2 REFRIGERATION PROJECT

— CASE STUDY

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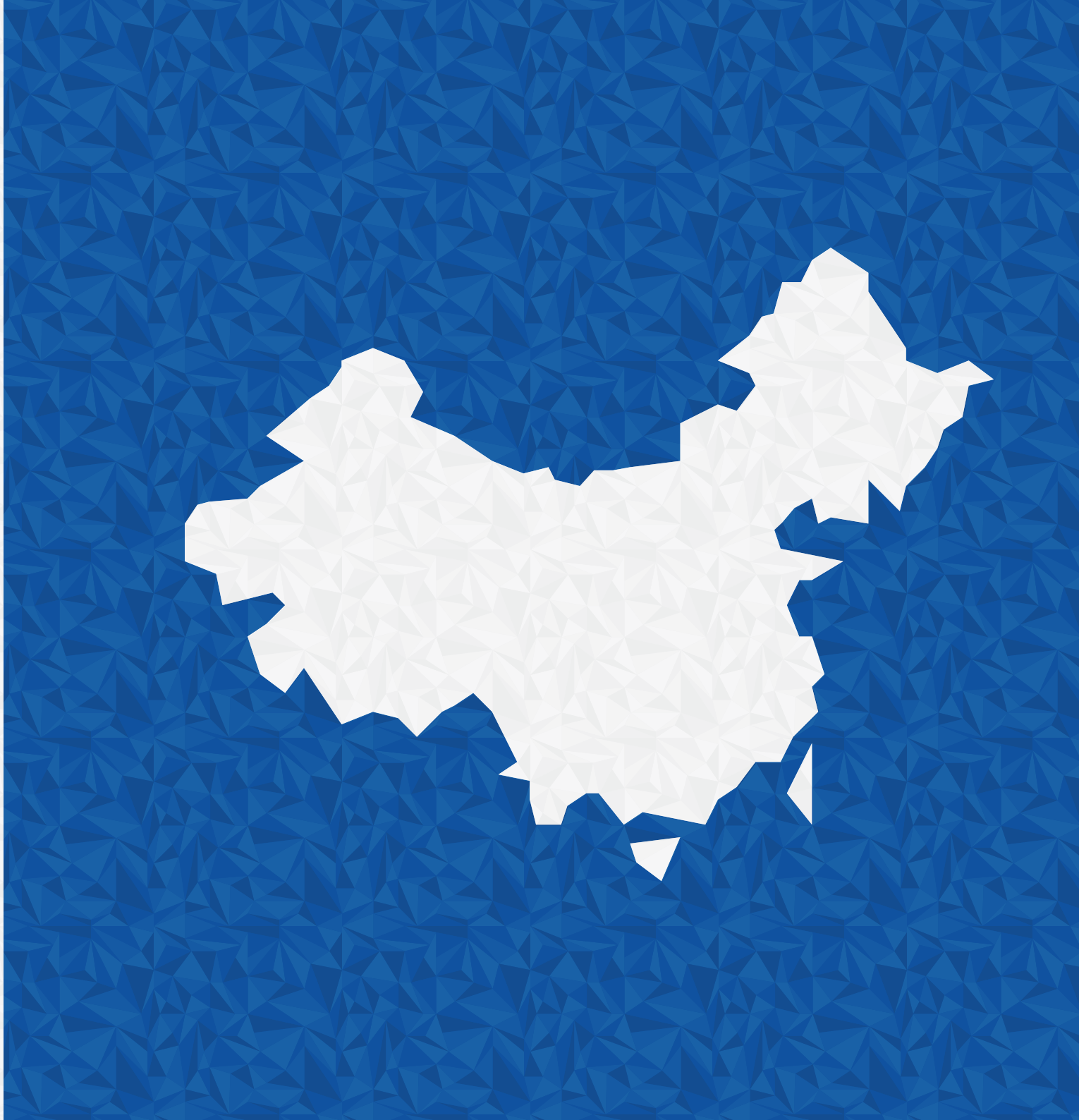

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ABOUT THE COMPANY

The Danfoss group, one of Demark's largest companies, operates in the HVAC&R and motion controls sector. Danfoss' refrigeration and air conditioning division is specialised in automatic controls, compressors and electronic sensors.

Danfoss' award-winning valve station applied in a landmark CO_2 refrigeration project

INTRODUCTION

Danfoss' award-winning valve station for industrial refrigeration, called the ICF FlexlineTM, recently achieved a major milestone in China. The whole FlexlineTM family of valves were applied in a landmark CO_2 refrigeration project at Dalian Zhangzi Island Fishery Group's scallop and sea cucumber processing centre. The Zhangzi Island is located to the north of the Yellow Sea, 56 nautical miles from the continent and as such, free from pollution. The natural environment of the island is well suited for aquaculture, which when combined with bottom-breeding technology yields high-quality seafood. Zhangzi Island's products are widely recognised as organic, green and pollution-free. Every year, Dalian Zhangzi Island distributes approximately 100 million seeds into the sea. At the bottom of the cultivation area there are so many marine creatures that it is often referred to as a "seabed bank". Three main products, Yezo scallops, trepan and abalone, all grow very well in this type of environment.

Overlooking the Zhangzi Island is a large silver building that many believe resembles a large ship. This building is the newly constructed seafood processing centre of Dalian Zhangzi Island group which combines seafood processing and cold storage. After comprehensively considering safety, the environment, and efficiency, the Zhangzi Island group decided to use CO_2 as the refrigerant for this project. Danfoss was subsequently selected as the valve supplier due to its leading CO_2 technology, vast experience with CO_2 and high quality products.

ABOUT THE SYSTEM

For this project, one major objective was to protect the environment since Zhangzi Island is located in the Changshan Islands in southern China, which are pollution-free. For the sake of environmental protection, the environmentally friendly refrigerants ammonia (R717) and CO_2 (R744) were chosen for this project.

Safety and energy savings were also major priorities for this project. With only 14.36 km^2 of land, the Zhangzi Island is highly concentrated and populated and safety of the local population is always a primary concern. In the newly developed seafood processing centre, the freezing plant utilises a NH_3/CO_2 cascade system for refrigeration, which lowers the NH_3 charge amount by over 90% and limits the NH_3 refrigerant inside of the refrigeration control room, fully satisfying the safety requirements of Zhangzi Island group. The cold storage plant utilises a CO_2 brine system and uses the abundant sea water as the cooling medium for the high-level ammonia refrigeration. The setting up of the condenser heat recovery appliance prior to the cooling process, realises a good balance between safety and environmental protection.

The reliability of the refrigeration system is an important element of the Zhangzi Island project, since the island is located far from the mainland and transportation is limited. Seafood processing depends heavily on reliable refrigeration systems and this is the main reason why Danfoss CO_2 solutions and components were used for the Zhangzi Island project. With leading TDR technology, Danfoss AKS 4100U series radar liquid level sensor was adopted for liquid level controlling of the NH_3/CO_2 cascade system, working together with the ICM series motor control valve for precise control of the refrigeration liquid level control. The feeding line of the freezing room uses the Danfoss premier product ICF series valve station, which compressed the installation area by 2/3 and reduced the welding time by 80%. The newly launched SVL Flexline™ series of refrigeration line components were also widely used.

Danfoss Industrial Refrigeration FlexlineTM platform:

FlexlineTM – a modular solution

Line Component - SVL

- Using just two basic valve housings – a straightaway and an angleway – the platform offers 5 different functions
- The backbone of the platform is the common housing, which is available as angleway or straightway. All five function modules: stop, regulating, stop/check, check and filter fit the same housing
- They all have the same high specification making selection, system design and mounting is simple and trouble-free

Valve Station – ICF:

- Only two welding ensures the safety and fast installation with an improved efficiency
- Innovative modular design can have the function modules assembled in the single housing

Control Valve – ICS:

- Direct welding form is used without flange, reducing the leakage risk by up to 80%
- The special V-port design in the ICS cone ensures optimum regulation characteristic to pilot operated main valves at partial load
- The plug-in module adopts QPQ technology to realise excellent environmental adaptation

RESULT

Ammonia is an environmental-friendly refrigerant with excellent heat exchange efficiency. It has been successfully and widely applied in large-scale refrigeration systems all over the world. However, coming from the increasing focus on safety issues, effectively reducing the charge capacity of ammonia in the refrigeration system has become a clear trend in ammonia systems, of which the NH_3/CO_2 cascade system of Zhangzi Island has its proven advantages and is becoming popular.

What other solutions can be applied? CO_2 secondary refrigerant system, air cooler evaporators are also recommended solutions to fit to different applications. For each kind of refrigeration system including an ammonia-based one, the real safety also largely depends on the operation-reliable components, installation and maintenance. Only the success of each part makes 100% safety possible.

SUMMARY

For large-scale industrial refrigeration region of China, the Zhangzi Island's new processing plant is the first to combine both CO_2 cascade & brine systems. This is one reason why it is now considered a benchmark project in the green journey for Chinese industrial refrigeration. For the fishing and seafood processing industry, refrigeration is a key requirement for practically the entire process. Accurate and stable low temperature control is crucial in pre-processing, pre-cooling, quick freezing, post-processing and refrigeration. With vast experience in this field, Danfoss provides many leading marine companies across the globe with both components and technical support. Danfoss is rapidly becoming the leading refrigeration supplier to the fishery industry due to our reliable, efficient and environmental-friendly refrigeration solutions.

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Get in touch with shecco's Market Development team to learn more about the market for natural refrigerants in China or find out how we can help you in gathering market intelligence and proactively building your business with our tailored market development services, to get your technology faster to market.

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