World-class ice rink chooses Vilter™ single screw compressors

Result

- 800 tons of ammonia refrigeration
- Maintains world-class ice even when ambient temperatures climbs into the 50s
- Integrated control algorithms
- Dual slide single screw design allows the compressor to start unloaded
- Optimum efficiency even at part load conditions

Application

The largest refrigerated outdoor skating surface in the North America with 110,000 square feet of ice surface, over five times the area of a standard hockey rink.

Customer

The Guidant John Rose Minnesota Oval is a unique outdoor recreation facility with 110,000 square feet of refrigerated ice from November to March. The Oval has a 400 meter speed skating track surrounding an infield ice area used for hockey or bandy.

Challenge

The Guidant John Rose Minnesota Oval was conceived in the early 1990s as a unique outdoor recreation facility with 110,000 square feet of refrigerated ice from November to March. This makes it the largest refrigerated outdoor skating surface in the North America. The operators wanted to install a state of the art ammonia refrigeration system. 800+ tons of refrigeration were required to circulate brine through 84 miles of underground piping.

"Our company, Commercial Refrigeration Systems, installed and commissioned the Vilter screw chiller. After 18 years the system is still running great. We have pushed this big ammonia screw chiller beyond its original design and it has exceeded all expectations.

Mark Rodorigo, CEO
Commercial Refrigeration Systems

Vilter

EMERSON
Climate Technologies

The operators wanted to maintain world-class ice, even when temperatures climb into the 50s. Longevity, reliability, efficiency, and safety of the equipment were of utmost concern. Integrated controls were required for precise control under all conditions.

Solution

The Oval opened in 1993 in Roseville, Minnesota. The Oval is an ammonia/brine system with plastic headers and plastic floor piping cast in concrete. Three Vilter VSS-1201 Ammonia single screw compressor units were installed to provide the refrigeration capacity. Each unit is rated at 268 tons when operating at -4.3° F suction temperature. Each compressor is powered by a 450 HP high efficiency motor with 96.2% nominal efficiency.

All three VSS units are equipment with Vilter microprocessors with process temperature controls. The control is designed to regulate the starting, stopping, and capacity control and are versatile enough to provide suction pressure control or individual temperature control with staggered cut-in and cutout control.

At low outdoor temperatures, the discharge pressure is allowed to float down. The built-in variable volume keeps the Vilter single-screw compressor operating at optimum efficiency with these variable compression ratios. The system was once run with one compressor producing 400 tons and requiring less than 450 HP.

The Vilter 48" diameter by 28 feet long flooded ammonia brine chiller has an integral 36" suction header accumulator. It was arranged with three suction outlets, thereby greatly simplifying the suction connections of the compressors.

The chiller is rated at 800 tons cooling, 5,681 gallons/minute of 26% calcium chloride brine from 9° F to 5° F with -4° F evaporating temperature. It weighs a little over 46,000 pounds.

The dual slide design on the Vilter single screw compressor offers the highest level of flexibility and performance optimization for screw compressors. This design actually has two slides per compression side of the gas end. The two slides are commonly referred to as the capacity slide and the volume slide. The capacity slide moves from positions of 20% to 100% of flow to allow the compressor to match the system flow requirements.

A unique feature of the dual slide design is that it allows the compressor to start completely unloaded.

This is unlike any other screw compressor. When both slides are in the open position an unrestricted flow path through the compressor is created. If for any reason the gas end is completely full of oil, the position of the slides on startup will allow the oil to be swept out of the gas end thus preventing the possibility of hydraulic lock. The slides also allow the operation at extremely low ratios down to 1.2.

Since the capacity and volume slides operate in parallel (not in series like other types of screw compressors), an important feature of the Single Screw compressor is the ability to operate with optimum efficiency even at part load conditions. Other types of screw compressors have dual slides which operate in series. This results in one of the slides blocking off some of the porting behind the other slide creating a restriction and performance penalty at part load conditions.

Single-screw compressors benefit from balanced forces around the main rotor. Balanced axial and radial forces offset one another so that, effectively, the only net force on the main rotor of the single screw compressor is gravity. The low bearing loads result in long compressor life and high reliability. Vilter is able to offer a fifteen year bearing warranty. As a result, operators can greatly reduce maintenance costs by avoiding costly bearing replacements and downtime events.

Resources

Learn more about the Vilter VSS single screw compressor at EmersonClimate.com\Vilter

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