



Refrigeration Compressors

By Eric Bradley

Refrigeration compressors used for arenas fall into two categories, the reciprocating and screw compressor. In an ammonia refrigeration system, the refrigeration compressor removes the low pressure gas from the chiller, compresses it to a high pressure superheated gas and delivers the gas to the condenser. An oil separator in the discharge gas stream removes oil used in lubricating the compressor.

The compressor commonly used on most arenas is the reciprocating type. The compressor evolved from the early vertical type slow speed compressor to the higher speed machine with the V-type block commonly used today. The reciprocating compressor requires regular maintenance and has a lower first cost for a comparably sized screw compressor. The reciprocating compressor comes in a variety of sizes from two to sixteen cylinders. The four, six and eight cylinder compressors are the most common sizes for arenas. The oil separator is comprised of a small vessel in the discharge line with a float valve returning oil to the compressor crankcase. When run at 1000 RPM, and overhauled regularly this compressor provides reliable service for the typical rink season.

A more recent development in the ammonia screw compressor. The screw compressor was originally used on larger industrial applications but is becoming quite popular on the multi-sheet ice complexes. The screw compressor consists of two interlocking lobes run at a higher speed than reciprocating compressors with an oil seal between the lobe and the casing. The low pressure gas is drawn in one end of the machine, compressed between the lobes and discharged from the other end. These compressors have no valves and can run for up to 40,000 hours between overhauls. Large quantities of oil are circulated to affect the seal between the lobes and to cool the compressor.

The oil management system is more complex than the reciprocating machine and must be closely monitored for proper operation of the compressor. The screw compressor has a higher first cost than the reciprocating compressor up to about the 80 to 100 TR range. Above the 100 TR range, the screw compressor is more competitive than the reciprocating compressor. Most screw compressors come equipped with a microprocessor to provide safety control and monitoring features. The long period between overhauls and the high capacity in a small floor space make the screw compressor attractive. The normal operating speed for a screw compressor is 3,600 RPM. However, some manufacturers are operating compressors up to 6,000 RPM. Screw compressors are generally noisier than reciprocating compressors. This must be considered when designing the facility.

In addition to screw compressors requiring less frequent overhauls than the reciprocating compressor, the screw compressor does not require water for cooling. This eliminates the cost of water, sewage

charges and the resultant maintenance costs associated with water cooling (scale build-up, corrosion, etc.).

For single sheet applications, the reciprocating compressor is still the first choice. As facility size increase, the screw compressor will be a viable alternative. Indications are the screw compressor will eventually be competitive with the reciprocating compressor in the smaller sizes (under 80 TR). When selecting the refrigeration compressors for a new rink, first cost, operating reliability, maintenance cost and equipment redundancy are the major considerations.