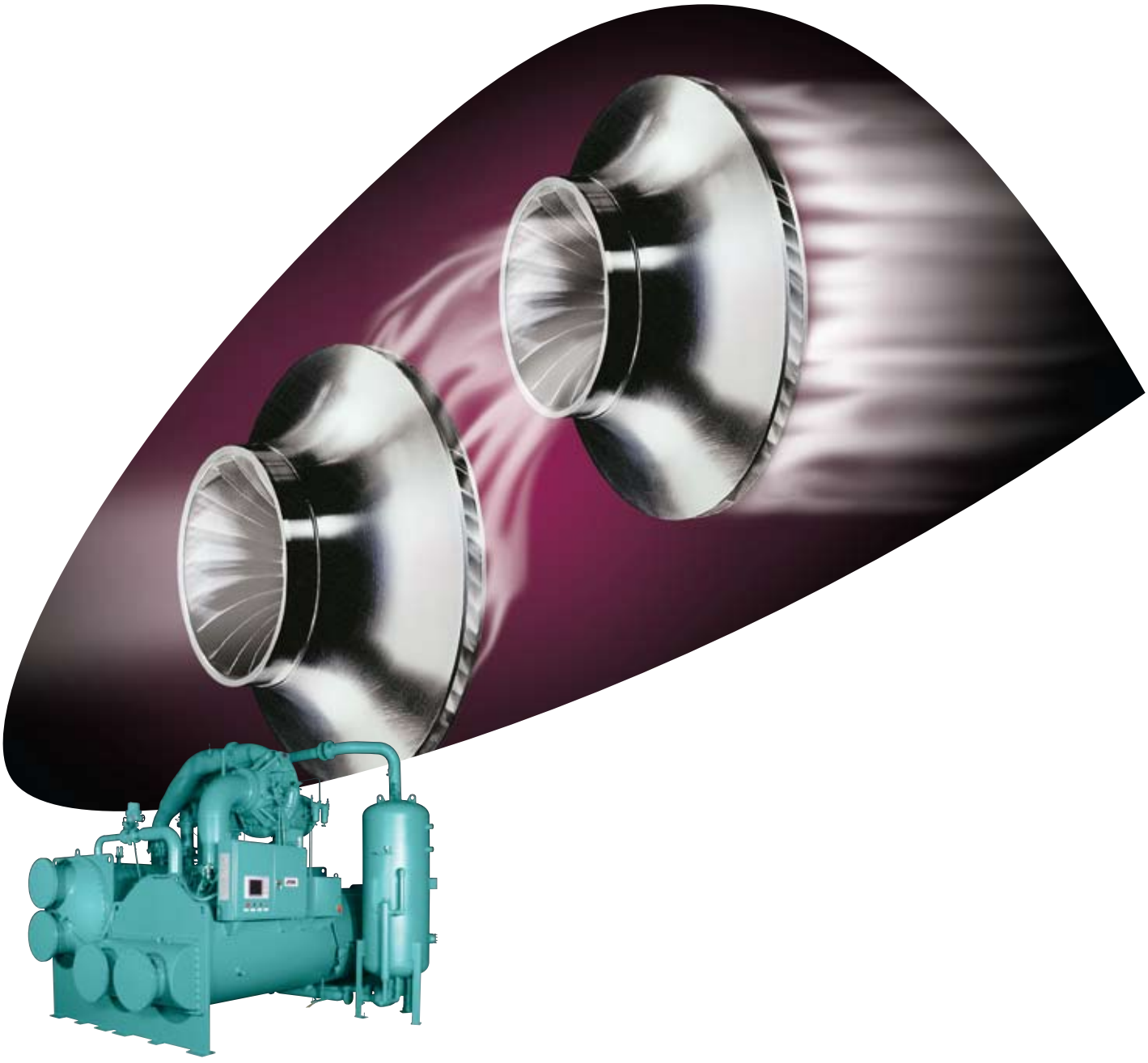
MAXE™ CYK
CENTRIFUGAL CHILLERS

The High-Head Performance Solution



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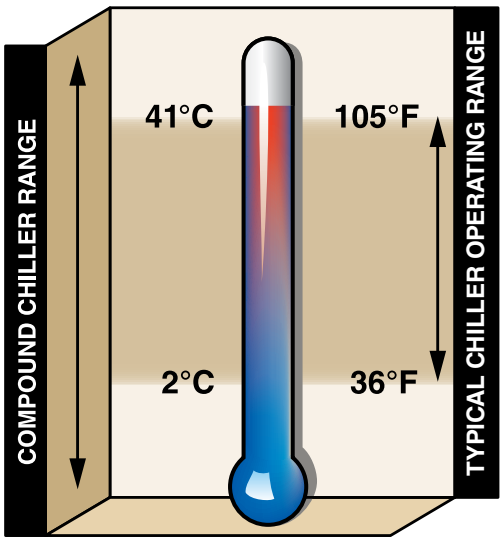
Handling applications when the pressure is on



Leaving chilled and condenser water temperatures – compound chillers operate beyond the range of standard chillers.

Performance where standard chillers can't compete

The MAXE™ CYK centrifugal chiller incorporates a design using two centrifugal compressors arranged in series to handle air-cooled, brine-chilling, and heat-pump applications at conditions outside the range of typical centrifugal chillers.

These units use the same technology employed in the renowned line of MAXE single-stage centrifugal chillers. Using HFC-134a, MAXE CYK chillers are available in a wide range of capacities:

- For air-cooled applications (air-cooled radiators): 700 to 2,300 TR at 44°F LWT (2,500 to 8,100 kWR at 7°C LWT)
- For brine chilling: 700 to 1,600 TR at 20°F LBT (2,500 to 5,600 kWR at -7°C LBT)
- For heat pump applications: 11,000 to 38,000 MBH at 155°F (maximum output temperature) 3,200 to 11,000 kWR at 68°C (maximum output temperature)

The combination of standard components and unique performance characteristics make MAXE CYK chillers the technology of choice for jobs where standard chiller designs can't compete. Compound-system technology provides energy and performance advantages for utilities, institutions, and commercial facilities.

Understanding high-head applications

Certain job-site conditions require chillers to operate beyond the limits found in typical air-conditioning applications. These extreme conditions are characterized by leaving chilled fluid temperatures below 36°F (2°C), leaving condensing fluid temperatures above 105°F (41°C), or a combination of both.

When the leaving chilled fluid or leaving condenser fluid temperature exceeds standard limits, the lift on the compressor increases dramatically. The compressor must develop higher differential pressure on the refrigerant gas in the compression phase, which results in higher head pressure.

High-head conditions are found in three typical cooling applications:

1) Air-cooled radiators for water chilling in locations that lack water for condensing.
2) Brine chilling for ice-thermal-storage applications and for light industrial-refrigeration jobs.
3) Heat pumps for producing hot water with simultaneous chilling.

High compressor head in brine applications is due to lower evaporator temperature and pressure conditions. In heat-pump and air-cooled-radiator projects, it's due to very high condenser refrigerant temperature and pressure conditions.

The chiller designed for high-head conditions

Typical air-conditioning chillers are designed within the limits of the available compression ratio of the compressor. These limits are quickly exceeded by the unique differential pressures encountered in high-head applications.

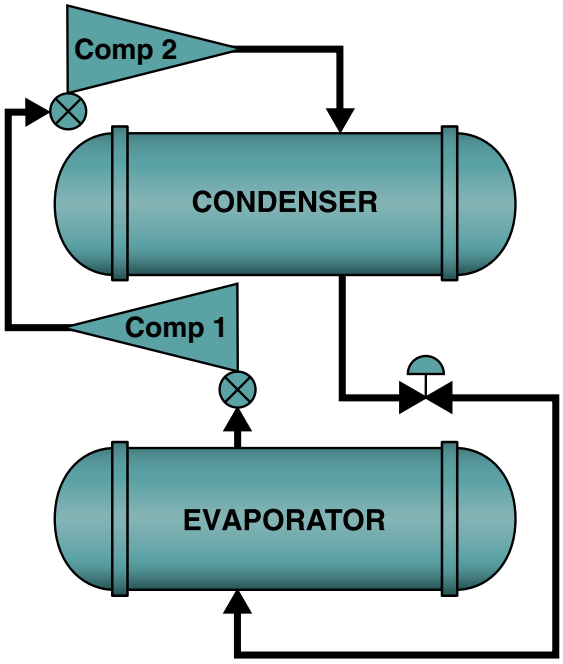
The MAXE CYK chiller overcomes these compressor-design challenges by using the principle of compounding. A compound design arranges two individual compressors in series. By flowing the refrigerant gas through two compressors, the pressure ratio becomes the sum of the two individual centrifugal compression ratios. The result is a much higher total lift pressure available to the system, which is able to handle the high head demanded by extreme conditions.

Benefits of compressor compounding

Standard components: Each MAXE CYK chiller employs common parts instead of a one-of-a-kind design. The compressors and heat exchangers use standard technology proven in the successful MAXE packaged chiller line. Each compressor is driven by a standard, open-drive, electric motor.

Compact footprint: Compressors and motors are mounted above the shells to assure the smallest footprint for this type of chiller.

Greater adaptability: With the MAXE CYK chiller, the impeller diameter, width and speed can be optimized for each stage of compression based on operating conditions.



The principal of compounding – two compressors operate in series with a common refrigerant circuit.

Superior part-load performance: Using a compound arrangement allows the use of pre-rotation-vane (PRV) capacity control for the centrifugal impellers of both compressors. Pre-rotation vanes act like a throttle on the suction side of the compressor to control compressor load. With PRV control on both compressors, the result is better off-design performance than for typical multistage compressors.

Handles varying condensing conditions: Since chillers spend most of their time operating at off-design conditions, off-design performance is a major factor in the energy-saving equation. A compound chiller can operate with a wider range of condensing-water temperatures than typical chillers. The MAXE CYK chiller unit allows one compressor to be shut off, so the chiller can run on just one compressor during low-head conditions. This practice not only ensures system stability, it allows the chiller to run more efficiently and takes advantage of cooling-water temperatures well below design.

Lower inrush current: Instead of starting a single, large motor, the MAXE CYK chiller stagger-starts the motors in sequence. Consequently, peak inrush current is reduced to about 58% compared to starting a motor for a single, large compressor.

Lower sound levels: Acoustically, with compound compressors sharing the workload, compressor RPMs are lower than in standard centrifugal designs – and lower RPMs help lower sound levels.

Economizer option: An optional economizer is available to further improve cycle efficiency for lower energy consumption.

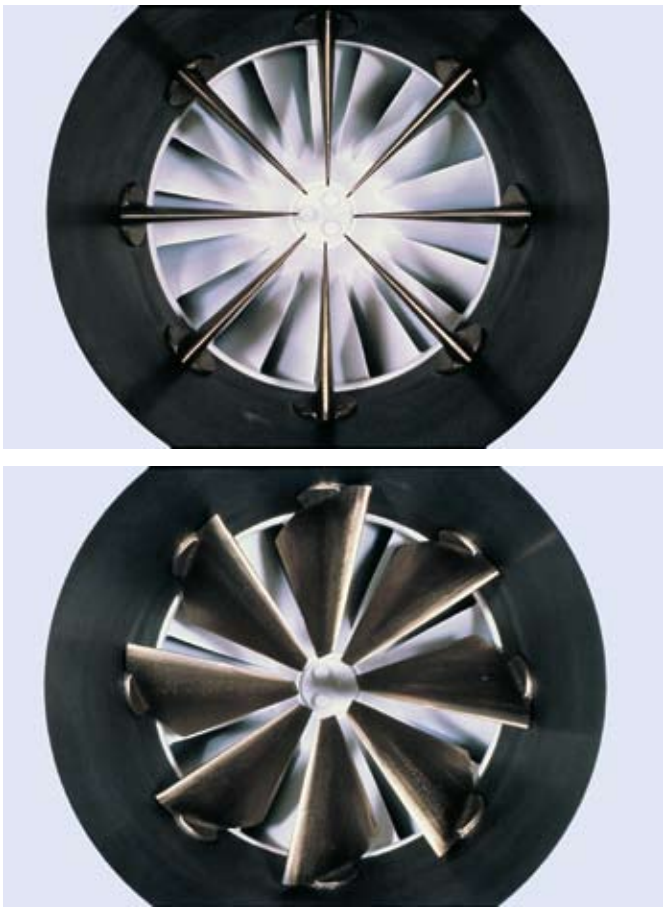
Built-in reliability

An on-board control panel simplifies operation by managing the staggered-start sequence of the compressors. The colored graphical operator interface clearly displays operating parameters, setpoints and alarms for quick response.

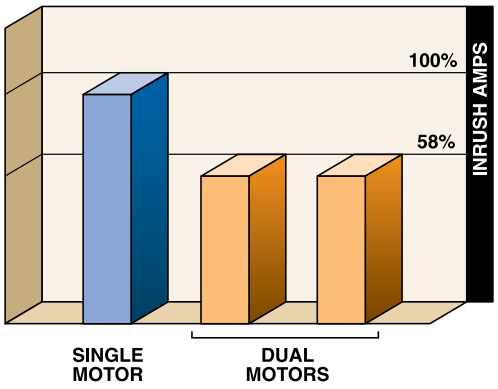
MAXE CYK chillers operate with environmentally responsible HFC-134a refrigerant with zero ozone-depletion potential, which eliminates chiller downtime for retrofit or replacement.

To further assure reliable performance, each MAXE chiller is assembled at the factory. As an option, the unit can be run-tested at design conditions prior to shipment.

For more information on innovative products designed specifically for applications that are beyond the operating parameters of standard chillers, contact your local Johnson Controls representative.



PRVs on each impeller provide better off-design performance.



Inrush reduction – sequenced starting of two smaller motors reduces inrush.

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