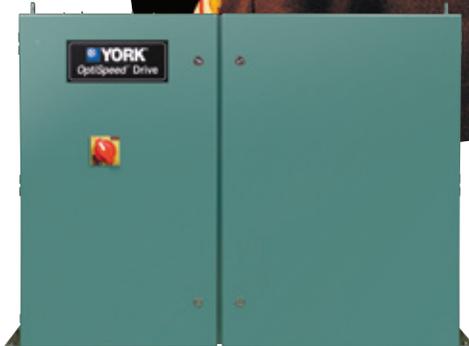


YORK® OPTISPEED™  
VARIABLE-SPEED DRIVE

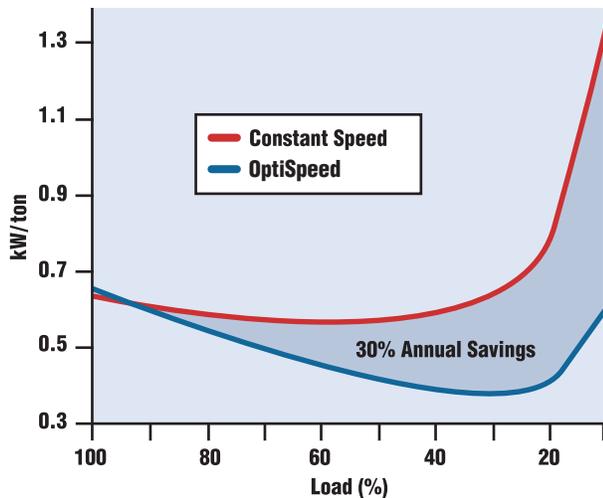
Don't get caught  
in the chiller speed trap



 **YORK**®

BY JOHNSON CONTROLS

# Slow down and cut energy use by 30%



This graph shows typical energy savings when an OptiSpeed drive is installed on a constant-speed chiller.



Pre-rotation vanes cause frictional losses as they close.

## Reduce energy costs

Energy is the number-one issue facing centrifugal-chiller owners and specifiers. Even the most efficient constant-speed chiller consumes a significant amount of energy.

Now you can reduce your energy costs by adding a YORK® OptiSpeed™ variable-speed drive, manufactured by Johnson Controls, to your new or existing chiller. The result: an average annual energy savings of 30%. These savings are possible because no constant-speed chiller, not even a high-efficiency model, can match the performance of an OptiSpeed drive under real-world operating conditions.

The OptiSpeed variable-speed drive was specifically developed for commercial air-conditioning applications. No one matches Johnson Controls experience in the application of variable-speed-drive technology to chillers. Since pioneering the concept in 1978, Johnson Controls has installed more variable-speed drive chillers than all other chiller manufacturers combined. So, the success of the OptiSpeed variable-speed drive is not based just on theoretical test findings, but real-world operating conditions.

Johnson Controls offers not only the most experience of any manufacturer, but also the widest application range. OptiSpeed drives are available up to 5,500 TR at 13,300 V.

## Superior energy efficiency

To understand how a chiller equipped with an OptiSpeed drive can offer up to 30% lower energy costs, consider the two factors that affect chiller energy consumption: load and entering-condenser-water temperature.

A reduction in either of these factors will save energy. However, the method by which the chiller is controlled has a major impact on the magnitude of these savings.

A constant-speed chiller reacts to lower load or lower entering-condenser-water temperature by closing its pre-rotation vanes (PRVs), which throttle the refrigerant flow and save some energy. However, as the vanes continue to close, they create frictional losses, which hurt the chiller's efficiency and limits its energy-saving capability.

On the other hand, an OptiSpeed drive controls compressor capacity primarily by adjusting its speed. The use of PRVs is minimal, so there are less frictional losses. The result is lower energy consumption.

### Savings on multiple-chiller plants, too

OptiSpeed drives will save in both single-chiller installations and multiple-chiller installations. In multiple-chiller installations, cycling chillers off as the building load falls will result in higher loads on the remaining chillers. This would seem to reduce the opportunity for OptiSpeed drives to save energy.

However, even though chiller loads remain high, entering-condenser-water temperature has most likely fallen. And, reductions in entering-condenser-water-temperature offer a far greater potential to enhance chiller efficiency than load reductions do. Therefore, OptiSpeed drives will deliver major energy savings in multiple-chiller plants, too.



Patented Adaptive Capacity maximizes energy savings by using its operating experience.

### Smart control for peak performance

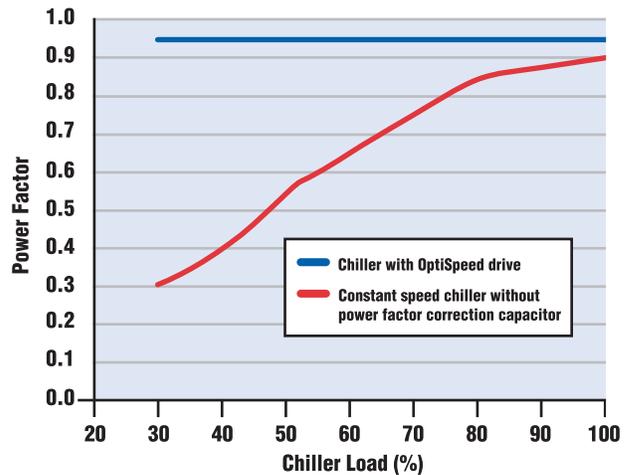
With its Adaptive Capacity Control, the OptiSpeed drive learns and remembers optimum speeds for various load and water-temperature combinations – a task that no standard variable-speed drive can accomplish. The end result? Fine-tuned chiller operation which provides maximum energy savings.

### Improved power factor lowers energy costs

Power factor is an index of how effectively your building uses electricity. A low power factor can translate into higher utility bills, because utilities often charge a premium if the usage profile doesn't meet their minimum requirements. A high power factor indicates efficient utilization of electrical power. By adding an OptiSpeed drive with a power factor in the area of 0.95 or better throughout its entire operating range, most utility requirements are met.

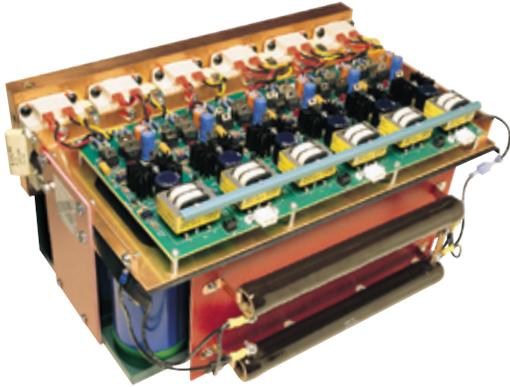


Multiple-chiller plants benefit from OptiSpeed drives.

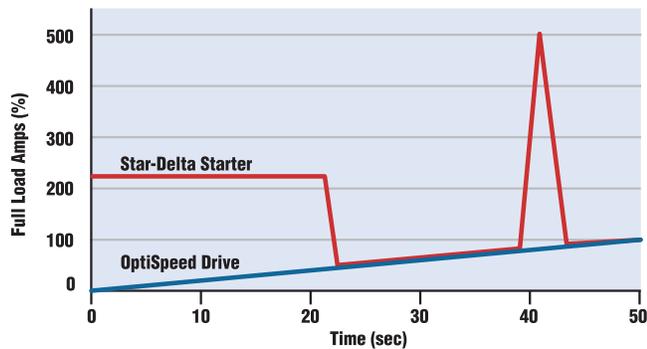


Unlike constant-speed chillers, a variable-speed chiller maintains a stable power factor.

# OptiSpeed drive delivers more than energy savings



The pole assemblies of the OptiSpeed drive start the chiller motor gently.



Compared to electro-mechanical starters, OptiSpeed drives reduce current inrush and motor wear.

## Better electrical protection

Electro-mechanical starters use a full-speed start, with inrush currents reaching as high as 250% of full-load amps. This electrical inrush causes a tremendous heat build-up, and flexing at critical points in the motor windings. Over time, this repeated flexing can damage the winding insulation and eventually cause motor failure. For this reason, a 30-minute cool-down period is mandatory before a constant-speed centrifugal chiller can be restarted.

By replacing the electro-mechanical starter with an OptiSpeed drive, the chiller's motor starts more slowly. It never draws more than 100% of its full-load amps. Motor heat is reduced, as is the likelihood of electrical shorts and burn-outs. As proof, chillers controlled by an OptiSpeed drive can be restarted in as little as 3 minutes, making quick-turn, emergency restarts possible.

For further electrical protection, the OptiSpeed drive is designed to reduce electric-current harmonic distortion, which can damage other equipment in the building. As a standard, an OptiSpeed drive reduces distortion to 26%, compared to 80% distortion caused by competitive drives. An available harmonic filter can reduce distortion to less than 4%, which meets IEEE 519-92 and is a 95% improvement over competitive drives.

## Longer equipment life

While electrical safeguards protect the electrical components of the chiller, the mechanical components benefit from lower operational speeds. Since 99% of operating hours are at less than full-speed, moving parts experience less component-wear, resulting in greater reliability and longer life.

### Easier maintenance and repair

When it's time for maintenance, one person can maintain the OptiSpeed drive because it features a modular design. If repairs are necessary, the OptiSpeed drive can be serviced on-site, without being shipped to a repair facility, reducing chiller down-time. In the unlikely event of an unexpected shut-down, the YORK OptiView™ control center provides troubleshooting messages and shut-down data, enabling quick problem identification.

Additionally, maintenance is made easier by single-source responsibility. Factory-trained service personnel service the chiller and all components, including the control systems.

### Smaller footprint

Low-voltage OptiSpeed drives are mounted directly on the chiller, which saves valuable mechanical room floor space.

Medium-voltage drives have the smallest footprint in the industry. The modular cabinet design breaks down for ease of installation, then bolts together in place.

### Lower noise levels

On a centrifugal compressor, slower speed means less noise. With an OptiSpeed drive, 99% of operating hours are spent at slower speeds, dropping noise levels as much as 10 decibels.

### Lower auxiliary-component costs

In addition to cutting energy costs, OptiSpeed drives reduce auxiliary-component costs. Their high power factor eliminates the need for a power-factor-correction capacitor. And, in applications that require a backup generator, OptiSpeed drives let you specify a smaller generator because the chiller requires 60% lower start-up amps.



The OptiView™ control center provides detailed information on the operation of the OptiSpeed drive.



The medium-voltage OptiSpeed drives fit back into the space once occupied by solid-state starters.

# Cost-effective in both new and retrofit applications



An OptiSpeed drive is the single largest energy-saving retrofit you can apply to your chiller plant.

## **Available as a retrofit**

If you currently own a constant-speed centrifugal chiller, retrofitting with a YORK OptiSpeed variable-speed drive will dramatically reduce your energy costs. It's especially cost-effective when combined with a refrigerant conversion or driveline retrofit. You'll benefit from energy savings and address the refrigerant issue at the same time. If you find yourself having to replace your starter, the OptiSpeed drive is the perfect solution, because you get a starter that's far superior to conventional types.

## **Rapid payback**

By accruing off-design energy savings during nearly 99% of your chiller's operating season, the payback for your OptiSpeed drive will be very fast. In many instances, payback can come in as little as one to three years. Plus, you'll realize substantial energy savings, month after month and year after year, over your chiller's entire life.

## **A computer analysis shows actual savings**

To see how an OptiSpeed variable-speed drive will pay off in your application, call your Johnson Controls representative today. An advanced computer analysis is available to show how much an OptiSpeed drive can reduce your energy bills.

