

# Variable Frequency Drives for Data Centres

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Applications



## Data Centres

Data centre cooling is a critical part of maintaining system performance in data centres, where servers and other electrical equipment generate large amounts of heat. Cooling systems account for around 40% of total energy consumption by a typical data centre so efficient cooling is critical to cost control.

Along with managing heat, cooling systems also maintain correct levels of humidity. This preventing build-up of static electricity and condensation, which can both lead to equipment failure.

Optidrive variable frequency drives provide precise and efficient control of fans, pumps and compressors, the components which are at the heart of most cooling systems. Optidrive VFDs' help to deliver highly reliable performance in cooling systems, whilst the energy cost savings they deliver can deliver payback on the VFD cost in months rather than years.

***"Data centres account for 2% of global electricity usage"***

*International Energy Agency, 2022.*



## Free Cooling

### Air-Side Economisers

Use outside air when ambient temperatures are cool enough to reduce the need for mechanical cooling.

### Water-Side Economisers

Use cool water sources, such as rivers or lakes, or take advantage of low outdoor temperatures to reduce chiller use.



## Computer Room Air Conditioning (CRAC) Units

These work like conventional air conditioners, using refrigerants and compressors to cool the air, which is then distributed through raised floors or overhead ducts.

## Computer Room Air Handlers (CRAH) Units

These rely on chilled water supplied by external chillers and use fans to distribute cold air.

## Hot Aisle / Cold Aisle Containment

This involves arranging server racks to separate hot exhaust air from cold intake air, improving efficiency.

## Direct and Indirect Evaporative Cooling

Uses evaporation to cool air before it enters the data centre, reducing reliance on mechanical refrigeration.

***“Reducing fan speeds by 20% can save up to 50% in energy costs”***



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# Liquid-Based Cooling

## Chilled Water Systems

Use water-cooled chillers and cooling towers to dissipate heat from the data centre environment.

## Direct-to-Chip Liquid Cooling

Delivers coolant directly to server components, providing more efficient heat dissipation.

## Immersion Cooling

Submerges servers in non-conductive liquid, which absorbs and dissipates heat effectively.

# Roles & Benefits of VFDs' in Data Centre Cooling

Variable Frequency Drives (VFDs) are critical in optimising the performance and energy efficiency of cooling systems in data centres. They control the speed of motors in cooling equipment such as fans, pumps, and compressors by adjusting the frequency and voltage of the power supplied.

## Benefits of VFDs in Data Centre Cooling

### ✓ Energy Savings

VFDs reduce power consumption by adjusting motor speeds to actual cooling demand instead of running at full capacity.

### ✓ Reduced Mechanical Wear

Slower motor speeds lead to less wear and tear, extending equipment lifespan and reducing maintenance costs.

### ✓ Improved Temperature Stability

By precisely adjusting airflow and coolant flow, Optidrive's help maintain stable and efficient cooling.

### ✓ Lower Operating Costs

Energy-efficient operation translates to lower electricity bills, improving overall data centre sustainability.

### ✓ Environmental Benefits

Reduced energy use lowers the carbon footprint, aligning with sustainability goals.

## Roles of VFDs in Cooling Processes

### ✓ Fan Control

VFDs adjust the speed of CRAC/CRAH fans based on real-time cooling demand, ensuring efficient airflow.

### ✓ Pump Regulation

In chilled water systems, VFDs control water flow by adjusting pump speeds, reducing energy consumption.

### ✓ Compressor Optimisation

In refrigerant-based cooling, VFDs modulate compressor speed, matching cooling output to heat load dynamically.

### ✓ Integration with Building Management Systems (BMS)

Optidrive VFDs' can interface with monitoring systems to optimise cooling performance automatically.

Overall, Optidrive VFDs enhance the efficiency and adaptability of data centre cooling systems, making them an essential component in modern data centre infrastructure.

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