

Power Quality Solutions for Data Center Cooling



Data Center Cooling

The skyrocketing demand for data centers is driven by the exponential growth of data for A.I., IoT, cloud storage, data analytics, security, communications, and digital currency. The cooling centers used within these centers are critical to maintaining proper operating temperatures. On average, cooling represents 40% of a data center's energy consumption. In order to reduce costs, companies drive better cooling efficiencies through the use of Variable Frequency Drives (VFDs) on the chillers, cooling towers, and electronically controlled (EC) fans and motors. As the demand for VFDs rises, so do the power quality issues. MTE power quality solutions ensure maximum obtainable efficiencies are achieved, less stress on the utility is created, and the lifespan of motors are greatly increased.

MTE Solutions Enable Data Center Efficiency, Cooling, and Uptime

COMPUTER ROOM AIR CONDITIONER COMPUTER ROOM AIR HANDLER (CRAC/CRAH)

Regulates airflow to the server racks by removing warm air and circulating cooled air throughout the data center ductwork. Also used in Evaporative Cooling which pushes air past a wet filter to cool the air.

COOLING TOWER & CHILLER

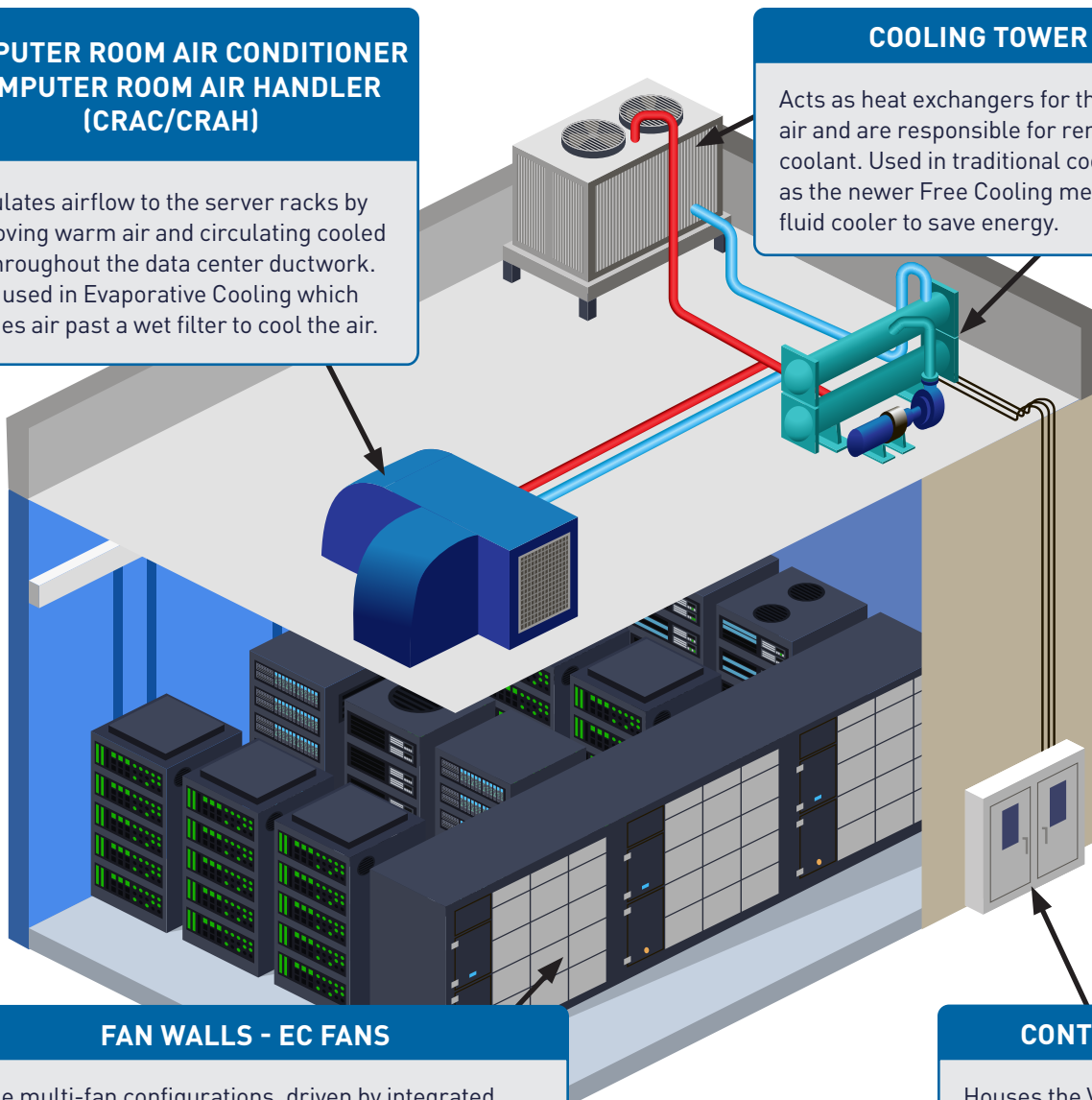
Acts as heat exchangers for the warm datacenter air and are responsible for removing heat from the coolant. Used in traditional cooling methods, as well as the newer Free Cooling method which uses a fluid cooler to save energy.

FAN WALLS - EC FANS

These multi-fan configurations, driven by integrated VFDs, help obtain optimal air flow, improve reliability, reduce sound and vibration, and eliminates ductwork.

CONTROL CABINET

Houses the VFDs used to regulate the speed of the motors controlling the HVAC equipment.



Power Quality Challenges for Data Center Cooling



Increased Efficiency Standards

Data center power consumption amounts to 3% of all electricity generated on the planet, driving the need for increased efficiency and power savings.



Uptime Requirements

Increased cloud computing demand from all sectors requires that data centers stay up and running over 99.9% of the time.



Ownership and Maintenance

Increased use of VFDs can cause electrical harmonics which are detrimental to motor life and cause electrical component wear.



Tighter Regulations

Stringent standards, such as ASHRAE 90.1 and 2023 DOE result in additional usage of VFDs and non-linear loads, thereby increasing unwanted harmonics in the system.



EC Fan Adoption

ECM fans improve energy efficiencies in < 10 HP applications, but VFD technology adds harmful harmonics throughout the building electrical system.

LINE SIDE POWER QUALITY

CHALLENGE

The significant push towards greater and greater efficiencies to save money and reduce CO2 emissions along with increased cooling demand has driven the industry to using variable controls which adds additional harmonics to the utility grid.

MTE LINE SIDE SOLUTIONS

FEATURES	BENEFITS
• Harmonic Mitigation	• IEEE-519 utility compliance
• Adaptive Passive Technology	• Compliance to IEEE-519, even below 50% load • Increases power factor, saving utility costs
• Integrated Reactor Design	• Lowers current distortion back to line and protects VFD from damage/failure due to transient voltages
• Low KVAR	• Generator compatible

LOAD SIDE POWER QUALITY

CHALLENGE

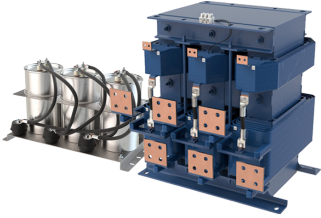
Increased use of sensors to monitor systems and environments has made it more important to keep machine communication clean. A drop in fan performance from harmonics can create significant problems.

MTE LOAD SIDE SOLUTIONS

FEATURES	BENEFITS
• Voltage Distortion Mitigation	• Motors and cable protected from damage/failure due to VFD PWM signal
• Common Mode Attenuation	• Motor bearings protected from premature failure • Critical sensors and safety detection systems protected from malfunction and failure

Featured Data Center Solutions

LINE SIDE SOLUTIONS



Matrix® AP

- Meets IEEE-519 requirements
- Adapts to load changes
 - » IEEE-519 compliant down to 50% load
- Improves system efficiency and reliability
- Extends service life of electrical equipment



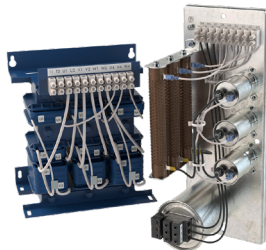
Matrix® E-Series

- Helps support IEEE-519 compliance
- 8% THID at full load, 12% THID at 40% load
 - » w/ $\geq 6\%$ impedance (DC choke/reactor)
- Modular design for easy panel integration



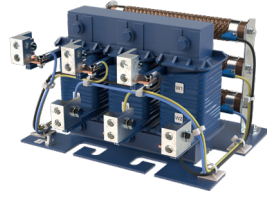
RLW/RL Reactors

- Protects against surges and transients
- Reduces:
 - » Nuisance over-voltage tripping
 - » Harmonic distortion (30-35%)



Matrix Air® EC Motor Filter

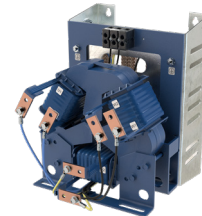
- Decreases THID by 80%
- Achieves 20-30% energy savings
- Provides low insertion losses at 5%



NEW!

dV E-Series

- Peak voltage protection and rise time reduction extends the life of motor and cables
- Small footprint and easy terminations make for smooth installation
- Lighter, more efficient, and run cooler than other dV/dt filters
- Optimal dV/dt solution for leads less than 1,000 ft



dV Sentry®

- Reduces dangerous peak voltages and eliminates reflective waves
- Reduce peak common mode voltage by over 50%
- Combines a dV/dt filter and common mode choke into one compact solution

MTE Corporation
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