Thermal Management Capabilities of the Vertiv™ NetSure™ M Series Platform

A Vertiv Application Brief

Overview

The 5G rollout in Europe, the Middle East and Africa (EMEA) is underway. As with any emerging technology standard, there are still issues to be resolved, such as securing investment to expand rollouts; evaluating which vendors to purchase networking equipment from; and determining how to develop profitable services around ultra-fast, next-generation mobile networks.

However, political, economic and technology leaders in the region realize that harnessing 5G – and after it 6G and beyond – is vital to maintaining global competitiveness. EMEA enterprises' race to transform digitally is accelerating, and they are now launching data-intensive personalized experiences and end-to-end digital services that were just analyst projections several years ago. For EMEA industrial companies, the gains with pervasive connectivity will be almost incalculable. They will be able to perform advanced analytics on torrents of data from connected equipment and business processes and use robotics process automation (RPA) to drive process optimization and further and faster than before.

How 5G Will Equip EMEA Stakeholders to Innovate

Enterprises, service providers, governmental agencies and other groups will harness 5G to innovate at market speed, benefitting from:

- Ultra-fast speeds: Are 100 times faster than LTE, with 1-10 Gb/s
- Connections: Support 100X more connections, up to 1 million devices per square km
- Latency and reliability: Decrease latency from 20 milliseconds to <1 millisecond with 99.999% reliability[i].

Globally, revenue from 5G Internet of Things (IoT) solutions is expected to reach $10 billion by 2030[ii].

How to Fulfill the Promise of 5G in EMEA

Currently, the state of 5G penetration in EMEA is changing almost daily. Telecommunications providers are racing to catch up with regions like Asia-Pacific and the United States that have forged ahead and provide the pervasive connectivity businesses need to fuel data-driven innovation. To fulfill the promise of 5G in EMEA, telecommunications providers will need to expand their radio access network (RAN) and increase the number of cell sites they deploy.

However, this opportunity is not as simple as just deploying more cell sites. 5G applications will increase rack density and corresponding heat loads, and EMEA telecommunications providers will need to plan for this change. That's a reality that the non-profit European electrical engineering standard-setting body, European Committee for Electrotechnical Standardization (CENELEC), has anticipated. This group has updated the CENELEC - EN 60950-22 standard to address battery ventilation in equipment installed outdoors[iii]. These outdoor AC and DC power enclosures will be placed everywhere connectivity is needed, including communities and neighborhoods, creating a compelling reason to evolve thermal management processes to protect individuals nearby.

Thermal Management Capabilities of the Vertiv™ NetSure™ M Series Platform

A Vertiv Application Brief

How Vertiv NetSure M series Meets Telecommunications Operators' Needs

Vertiv NetSure M series is an outdoor weatherproof enclosure platform that can be used to enable 5G applications at edge and access sites. Here's how the outdoor rack enclosure meets telecommunications' providers' needs now and in the future:

- **Provide an environment suitable for radio and IT equipment:** Telecommunications load equipment is becoming more IT-centric. As a result, outdoor telecommunications cabinets need to provide a data center hall-quality environment for IT equipment, whatever the load.

  Vertiv NetSure M series is a robust, affordable, corrosion-resistant enclosure that uses innovative thermal management technology to protect valuable IT equipment, meet regulatory requirements and adjust to environmental changes. The offering includes a fan filter, heat exchanger and air conditioner to cool equipment. The fan filter solutions are IP55-rated against dust and water ingress or even IP65-rated as dust-tight. Patent-pending Intelligent Climate Control (ICC) ensures optimal humidity control in rainy and high humidity environmental conditions, day in and day out.

- **Future-proof access sites to support higher 5G radio and IT edge heat loads:** 5G data-intensive applications are densifying racks and heat loads, and customers are placing technology equipment in telecommunications providers' outdoor enclosures and cabinets. Rack power loads of 13kW or more and thermal capacities of 4.5kW are increasingly common.

  The fan filter in Vertiv NetSure M series supports capacities of up to 5000W at +50°C. For lower loads, the heat exchanger can be used for capacities less than or equal to 120W/K, while the air conditioner can be used for those less than or equal to 2000W.

- **Use lithium-ion batteries:** The market is moving to lithium-ion batteries. They're lighter weight, longer-lasting and more reliable than valve-regulated lead acid (VRLA) batteries.

  Vertiv NetSure M series enables telecommunications providers to use either VRLA or lithium-ion batteries in thermal management solutions, providing them with additional business and operational flexibility.

- **Enable remote control over equipment:** Telecommunications providers want to minimize unnecessary trips to access sites. By so doing, they reduce OpEx costs over time.

  Operators can use the remote control functionality within Vertiv NetSure M series enclosures to optimally manage internal environmental conditions. This capability enables operators to make tradeoffs on temperature and humidity and adjust noise levels. They can also plan maintenance trips, remotely controlling the fan alarm and fan operating hours, and determine when technicians need to replace clogged filters.

- **Maintain approved noise levels:** ETSI 300753 Class 4.1E sets noise level requirements for urban, rural, or protected environmental levels.

  Vertiv NetSure M series' fan speed is balanced by the fan control unit to maintain standards-approved noise levels at that location. In addition, operators can remotely adjust the fan speed curve to optimize noise levels according to equipment heat loads and specific site locations such as close to a residential building.

- **Minimize the number of site configurations**: Telecommunications providers want to standardize outdoor weatherproof enclosure solutions and scale them across access sites.

  The Vertiv NetSure M series platform provides three standardized data cabinet enclosures that meet the telecommunications ETSI300019-4 and Safety 62368-1 standard: Vertiv NetSure M20 (20 Units of rack space); M35 (35U); and M44 (44U). Power systems are also modular where providers can also choose between Vertiv NetSure 531, 731, 5100 and 7100 (including hybrid and solar only) to meet their application requirements.

Innovating Thermal Management for Outdoor Telecommunications Enclosures

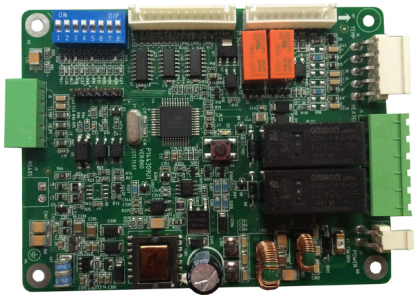
So, how does Vertiv NetSure M series protect high-density racks in diverse environmental conditions?

The M series platform uses Intelligent Climate Control (ICC), a patent-pending technology that controls relative humidity by regulating fan speed and temperature levels to meet conditions required for telecommunications and IT equipment. As a result, air conditioners and heat exchangers can now be replaced by fan filters. The ICC fan filter device consumes less energy and ensures optimal maximum humidity in the enclosure. If used across an entire access network, these energy efficiency improvements quickly add up.

Using an Innovative Fan Filter

The new fan filter provides a low equipment-supply temperature compared to the ambient temperature (ΔT) during warm conditions even up 5000W heat load at +50°C. The fans pull air through the enclosure solution to supply optimal air flow to your equipment. The fans operate on -48VDC with full performance even during grid/mains failure. Vertiv's fan filter solutions are the most energy-efficient climate solutions available on the market today, providing telecommunications operators with new options. The M5 intake filter and hood ensures IP55 protection from dust and rain, while a G2 exhaust filter secures IP55 during cold conditions when fans might not be in operation. Telecommunications providers that need a higher protection level can use the IP65 solution with a HEPA 11 intake filter and G4 exhaust filter.

Offering Intelligent Climate Control (ICC)



The new advanced ICC unit with humidity control functionality is placed on the inside of the enclosure door. It maintains a controlled operating indoor condition during variable outdoor conditions, in line with ETSI 300 019-1-3 (indoor) equipment and ETSI 300 019-1-4 (outdoor) standards. The humidity control can also be customized to address desired equipment humidity levels based on local outdoor environmental conditions.

Together, with Vertiv NetSure Control Unit (NCU), the ICC supports remote monitoring capabilities. The ICC provides data on operating fan hours, fan alarms and fan functionality tests when selected, as well as optional clogged filter alarms. Service teams can use remote functionality to plan routine and emergency maintenance for the RAN.

Protecting Equipment in Diverse Environmental Conditions with an Air Conditioner, HEX or TEC

In addition to fan filters, Vertiv NetSure M Series enclosures support air conditioners, heat exchangers (HEX) and thermo electric coolers (TECs).

Air conditioners are ideal for applications requiring battery backup, including lithium-ion batteries, to ensure internal temperatures remain low even when outdoor temperatures are high. Capacity ranges from 500W up to 2000W units using VAC and up to 2800W at -48VDC power. The air conditioner operating on -48VDC will continue to control operations even when the grid is off. The air conditioner unit operates up to +55°C with IP55 level protection and works with high efficiency fans and compressor. An LCD display is available for operating conditions. Environmentally friendly refrigerant R134A is used, and all units are Restriction of Hazardous Substances Directive (ROHS)-compliant.

The heat exchanger (HEX) unit secures internal conditions at IP55 protection levels. No external air enters the telecommunications enclosure minimizing dust ingress, and heat transfer is managed at the heat exchanger core with heat pipe technology. The capacity range is from 65-120W/K.

A thermal electrical cooler (TEC) operating on -48VDC is available for small battery backup needs in M35 enclosures. The TEC supports up to two strings of -48VDC lead-acid batteries in the battery compartment.

A combined air conditioner and fan filter unit provides 2000W cooling capacity. The combined unit uses the fan filter to cool equipment during normal environmental conditions. The air conditioner compressor keeps equipment cool during high external temperatures. The fan filter functionality consumes less energy and will continue to operate when the grid is off to maximize availability.

Ensuring Lithium-Ion Battery Support and Secure Ventilation for VRLA batteries

Vertiv NetSure M series solutions provide battery ventilation support to keep hydrogen gas buildup for closed battery compartments in line with CENELEC - EN 60950-22 standard guidance. The ventilation is controlled by NetSure power controller and runs only during discharge and charge time to minimize the impact on the air conditioner capacity.

Vertiv NetSure M series solutions can incorporate power from the grid, generators and solar panels and store it via either VRLA or lithium-ion batteries. By so doing, the updated solution supports renewable energy use, minimizing carbon emissions for on-grid, bad-grid CDC, and off-grid applications.

Conclusion

EMEA telecommunications providers want to ensure uninterrupted communications to businesses and end users, while supporting the latest B2B and B2C 5G and edge-enabled services.

Vertiv™ NetSure™ M series offers telecommunications providers a robust outdoor enclosure platform that is thermally efficient and weatherproof. The solution is protected by advanced environmental controls that they can use to deliver the high availability, reliability, and power efficiency they and their customers want.

These organizations can count on Vertiv to provide custom-configured solutions for local site needs and application requirements; high-performance thermal management of IT equipment; and deployments characterized by speed, scale, and best cost.

Protect your critical telecommunications network infrastructure with an innovative, fully optimized thermal management solution that flexibly adjusts to address local environmental conditions.

Learn more about Vertiv™ NetSure™ M series solutions today.

i Ondrej Burkacky, Stephanie Lingemann, Markus Simon, and Alexander Hoffmann, The 5G era: New horizons for advanced electronics and industrial companies, McKinsey report, January 2020, page 6, https://www.mckinsey.com/~/media/mckinsey/industries/advanced%20electronics/our%20insights/the%205g%20era%20new%20horizons%20for%20advanced%20electronics%20and%20industrial%20companies/the-5g-era-new-horizons-for-advanced-electronics-and-industrial-companies.pdf

ii The 5G era, ibid.

iii CENELEC - EN 60950-22, Information technology equipment - Safety - Part 22: Equipment to be installed outdoors, Engineering 360, Global Spec Website, https://standards.globalspec.com/std/10252721/EN%2060950-22