

Best in class: Designing and delivering Emerson's state-of-the-art global data center

A Customer Success from the Experts in Business-Critical Continuity™.



About Emerson and Emerson Network Power

Emerson (NYSE:EMR), based in St. Louis, Missouri, is a global leader in bringing technology and engineering together to provide innovative solutions for customers in industrial, commercial, and consumer markets through its network power, process management, industrial automation, climate technologies, and appliance and tools businesses. Sales in fiscal 2009 were \$20.9 billion. Emerson Network Power is a business of Emerson that provides innovative data center and telecommunications solutions and expertise in areas including AC and DC power and precision cooling systems, embedded computing and power, integrated racks and enclosures, power switching and controls, infrastructure management, and connectivity.

Background

As computing and IT technology increasingly enabled real-time global business operations over the last two decades, it was not uncommon for companies to build or lease data center facilities around the world to support those initiatives. Emerson's IT network is more extensive than most, and the company had the data centers to prove it – more than 100 data centers distributed globally in all shapes and sizes (based on a 2008 internal study). Emerson leadership saw inefficiencies in that approach and followed up the internal study with a project aimed at bringing a new global data center to the campus of the company's corporate headquarters in St. Louis.

Case Summary

Location: St. Louis, Missouri, USA

Emerson Network Power Products/Services:

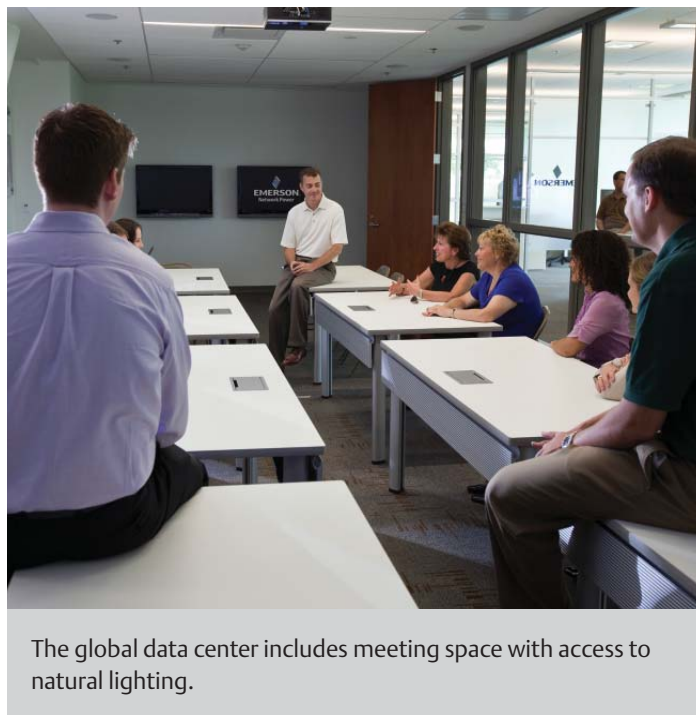
- Alber® BDS 256 XL Battery Monitoring System
- Aperture VISTA® Infrastructure Management Software
- ASCO 7000 Series Power Transfer Switches
- ASCO Generator Paralleling Switchgear
- Knurr® Miracel Racks
- Liebert® ACV® Surge Protection System
- Liebert DS™ Precision Cooling System
- Liebert FDC™ Power Distribution Cabinet
- Liebert MPX™ Rack PDU
- Liebert NX™ UPS
- Liebert NXL™ UPS
- Liebert PPC™ Power Conditioning and Distribution Cabinet
- Liebert SiteScan® Monitoring System
- Liebert XDC™ Refrigerant Chiller
- Liebert XDV™ High-Density Rack Cooling System
- NetSure™ 701 DC Power System

Critical Need: Design and build a new, best-in-class global data center supporting Emerson IT activities and enabling large data center consolidation project.



The Situation

Emerson's expansive data center network, which included more than 2,400 racks of IT equipment, was effective but incredibly inefficient – and ultimately fell short of the standards set by a technology giant ranking 117 on the 2010 Fortune 500.



The global data center includes meeting space with access to natural lighting.

That's why Emerson leadership decided in 2008 to initiate a massive consolidation project to reduce the number of corporate data centers from 100-plus to just four. The centerpiece of the project was the new global production data center in St. Louis, and the company decided almost immediately to make that facility not only the centerpiece of the consolidation, but a showpiece of data center technologies and design. With that in mind, the corporate IT staff, including then-CIO Steve Hassell, turned to Emerson's in-house experts in data center solutions – the team at Emerson Network Power.

A business of Emerson specializing in data center infrastructure technologies, Emerson Network Power includes some of the most prominent product brands

in the data center industry – including ASCO, Avocent, Aperture, Liebert and Knurr. That was the first step in building a team that ultimately changed the way the organization – and perhaps the industry – would think about data center design.

Traditionally, designing a data center was simple. The Facilities group worked with a team of architects on the building design before handing that design over to the IT staff to fill with servers and IT equipment as necessary. Fundamentally, it was a two-step process, and the people in charge of those steps felt little need to communicate beyond basic requirements. Emerson leadership believed there was a better way, and Hassell worked with his team, including Director of Global Data Center Services Todd Finders and IT Strategic Planner Keith Gislason, to make sure the new Emerson data center benefitted from a game-changing shift in design strategy.

From the beginning, Hassell, Finders and Gislason made sure the IT strategy team was included in meetings with the Facilities group and design team from Fox Architects. The detailed design of the facility became a collaborative process, with both groups challenging traditional assumptions and established practices in an effort to take what had become a fragmented process and look at it more holistically. Everything was on the table – from HVAC to power distribution to lighting. To up the ante even further, Hassell and Co. challenged everyone involved in the design to find a way to not only improve energy efficiency, but to aim for LEED Silver certification from the U.S. Green Building Council – a rarity for data centers.

Finders acknowledged that LEED Silver certification, among other ambitious project goals, served as strong motivation for the IT and Facilities teams involved in the design process. “What could have been – and often is – a contentious arrangement, instead fostered creative

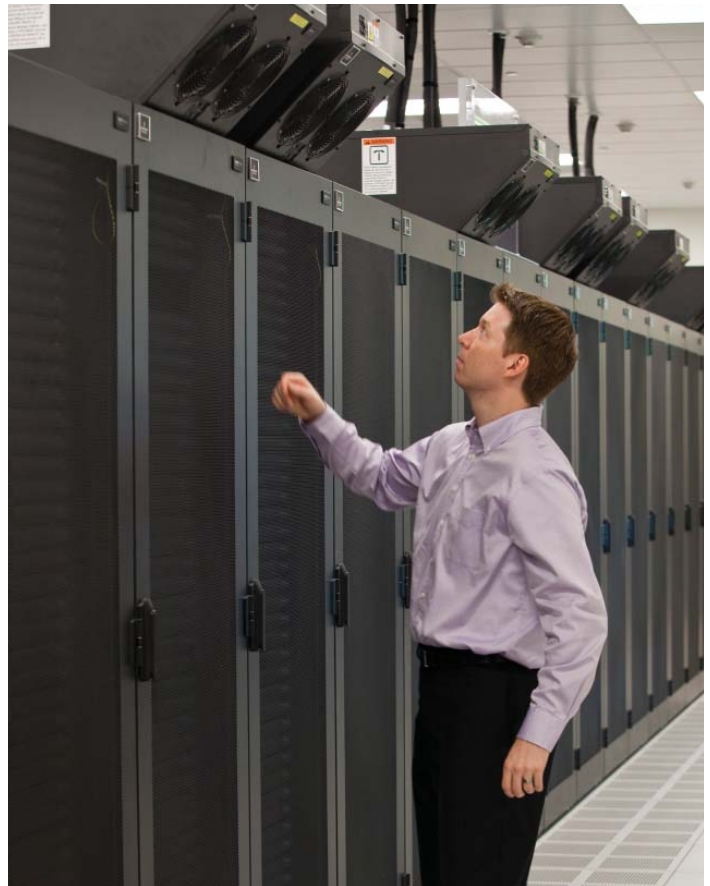
thinking that led to innovative design features and ultimately a better, more environmentally responsible data center,” Finders said.

The Solution

The new Emerson global data center in St. Louis boasts a number of state-of-the-art design elements and technologies, but none capture the unique, collaborative design process as well as the approach to the data center’s cooling system. Emerson was targeting 6,000 square feet of raised floor space when the facility went online and the ability to double that as needed. Traditionally, the cooling system for that kind of phased deployment would be fully installed when the building was built – with heat-exchange units located somewhere behind or beside the building and pipe running throughout the facility, including the full 12,000 square feet of raised floor.

The IT and Facilities teams saw this as an inefficiency – not on the scale of 100-plus data centers scattered around the world, but still avoidable. They came up with a plan to place those heat-exchange units on the roof, locating them above the IT space in the data center with space available to add units as racks were added in the data center. This saved more than 2.5 miles of copper piping and created a more scalable cooling infrastructure. Locating the heat exchangers on the roof also preserved space on the ground and helped make the data center as visually appealing on the outside as it was innovative on the inside.

Emboldened by the success of its creative approach to locating the heat exchangers, the team looked for other ways to minimize the facility’s footprint while maximizing its square-footage. With a fairly clear view of the Midwest sky – and unobstructed access to the sun to the south – solar energy became a viable complementary energy source. It also was seen as the right thing to do as a responsible corporate citizen, so Emerson moved ahead with a 7,800-square-foot rooftop solar array



Liebert XD systems from Emerson Network Power provide cooling to the rows of servers in Emerson’s global data center.

containing more than 550 solar panels—the largest such array in Missouri at the time of the facility’s opening.

On the IT side, the team designed a data center that could grow with the organization’s IT needs, with 6,000 square feet of raised floor on Day 1 and the capacity for double that. “We pushed for scalability in everything we did,” Finders said. “We designed the data center to use only as much space as needed, with provisions in place for easy expansion. Ultimately, it was about being efficient – justify every decision, challenge conventional thinking, and avoid waste at all costs.”



The Liebert NXL UPS from Emerson Network Power provides reliable power protection and advanced technology for the global data center's high-power applications.

That philosophy extended to power consumption. Data centers are notorious energy consumers, but that was another area where Emerson had an in-house solution, courtesy of Emerson Network Power. Around the same time Hassell, Finders and Co. were making plans for the data center, Emerson Network Power engineers were introducing Energy Logic – a roadmap for reducing data center energy consumption and improving energy efficiency. Energy Logic starts at the server level and triggers a cascade effect that can reduce energy consumption by up to 50 percent in some data centers. The St. Louis data center became the first to incorporate all the strategies and technologies advocated in Energy Logic. “I guess you could say we put our money where our mouth is,” Finders said.

The push for efficiency and scalability and the goal of LEED Silver Certification drove every planning discussion and debate among the design team, but one requirement trumped all other arguments. Availability was non-negotiable. With that in mind, the data center is equipped with three tiers of redundancy, with dual utility feeds, redundant Liebert UPS protection and onsite generators. The power systems retain considerable

scalability and efficiency capabilities, however. Redundant dual-bus power capacity starting at 1,350 kW and ultimate UPS system scalability up to 4,050 kW across dual paths allows power usage to be scaled to meet the facility's highest demands without sacrificing efficiency. Emerson anticipated the data center would have 99.982 percent uptime – with an average of only 1.6 hours per year of unplanned downtime. As was the case with many of the Year 1 projections, however, the data center exceeded expectations.



Emerson Network Power switchgear enables smooth power switching and controls.

The Results

Emerson's St. Louis data center went online in August of 2009 and Finders spent most of the first year transitioning some of the organization's corporate IT operations to the new facility. That initial consolidation step should be complete before the end of calendar year 2010, with several years of further consolidation of the remaining data centers spread around the globe to follow. With the initial IT operation footprint in place, there is more than enough data on the new data center to evaluate its performance in Year One. For example, that projection of 99.982 percent uptime proved to be low. The data center has yet to experience any unplanned downtime.

“We’ve had a few instances where the utility power went out or some other type of power issue took place, but the facility responded exactly the way it’s supposed to respond,” Finders said. “The Liebert UPS systems, ASCO power transfer switches and all the other Emerson Network Power equipment performed flawlessly. We have those redundant systems for a reason – so the people who rely on our data center never notice a disruption. And so far they haven’t.”

The data center remains at 6,000-square-feet of raised floor with no plans to build out that remaining 6,000-square-feet anytime soon. The plan was to make it a highly virtualized environment, but even Finders has been surprised at just how extensively the data center has virtualized. He estimates the facility is 70 percent virtualized and that 80 percent of the servers are blade servers – far surpassing even the Energy Logic recommendations of 20 percent virtualization and 20 percent blade server deployment.

The result is a private cloud supporting a service-oriented approach to Emerson’s IT systems. “The people using our data center don’t know or care what’s going on in

the cloud – they just come to us for specific IT services,” Finders said. Heavily virtualized networks utilizing blade servers also reduce the number of physical devices needed to support the network, and the racks in Emerson’s data center are lightly populated as a result. Finders said that fact, coupled with the benefits to be gained from operating a high-density facility, make it unlikely Emerson will ever outgrow the St. Louis data center.

Specifically, Emerson utilized about 90 percent of the available 340 kVA in its previous, multi-data center configuration. At the end of Year One, the new data center is utilizing just 25 percent of the available 750 kVA of the new facility. The company has closed large data centers in Chicago and Cincinnati and is on the verge of closing a legacy facility on the corporate campus. The organizational reduction in power consumption is huge and the reduction in floorspace – Finders estimates it at 75 percent – is just as dramatic. Yet the facility still is nowhere near capacity, either in terms of power use or workflow.



Liebert DS™ precision cooling systems from Emerson Network Power provide efficient, precise, reliable control of room temperature, humidity and airflow for proper operation of critical electronic equipment.



By placing the chillers on the roof, Emerson's data center planners not only conserved real estate, they eliminated more than two miles of copper pipe.

Despite the low volume, the energy-efficiency features of the new facility are paying big dividends. The solar array is producing an average of 11,400 kVAh per month with a peak of 14,250 in sun-soaked July (and close to the same in August). To put that in perspective, the array generated enough energy during its first 12 months to power nine average homes for a year. There is a tangible environmental impact as well; that same amount of power from the grid would have generated greenhouse gases equivalent to the year-long operation of 20 cars.

The solar array, energy-efficient design and building practices that diverted 80 percent of construction waste from landfills were among the factors that helped the global data center earn a 2009 Beyond Green award from the Sustainable Buildings Industry Council. Honored in the "Innovative Solution for a Niche Market Application" category, the award recognizes initiatives "that shape, inform, and catalyze the high-performance building market, as well as the real-world application of high-performance design and construction practices."

The Beyond Green award was bookended by a LEED certification that, like the data center itself, exceeded expectations. The facility received LEED Gold certification – a rare distinction for a data center, and a badge of honor for Finders and his team.

"We would be thrilled with the results of the project regardless of the LEED certification, but I know I speak for the team when I say that Gold recognition meant a lot for everyone involved," Finders said. "We feel like we've built a showpiece data center and, maybe more importantly, demonstrated a new, improved way to execute a data center design and construction project. It's impossible to overstate just how important it was to integrate the IT and Facilities teams in this effort. If there is one takeaway for organizations planning similar projects, that should be it."

Emerson Network Power.

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