

SmartAisle™

Datacenter Efficiency Management Platform

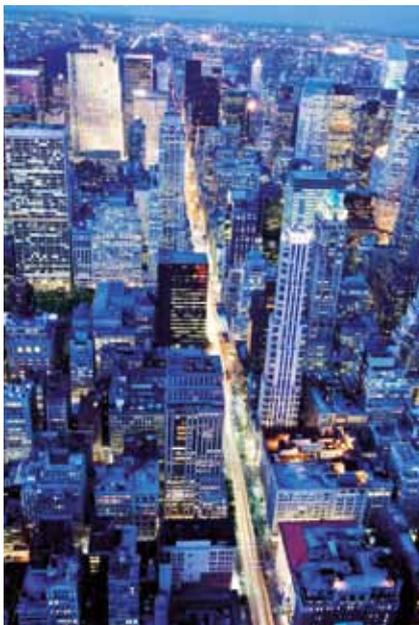




Emerson Network Power, a division of Emerson, is a global company that combines technology with design to supply innovative solutions for the benefit of its customers.

Emerson Network Power is the leader in the “**business-critical continuity**” field, thanks to the company’s products and services.

Emerson Network Power’s broad technology base and global expertise support a full spectrum of enterprise-wide solutions for today’s vital business needs.



Regardless of your size, you can’t afford for your critical business systems to go down and you can’t waste time recovering your IT infrastructure after a disruption.

Leave that to us, the experts in *business-critical continuity*: from grid to chip, from the biggest to the smallest datacenters, we are ready to serve your needs with the solutions we have developed.

More standardization, so you don’t need further budget allocations to install it. More simplification so you don’t need to be a specialist to get the best for your business. More support, so while you are enjoying doing business, we are protecting you.

That’s why we can say we OptimizeIT!

optimizeIT
Infrastructure Simplified.
Support Unparalleled.

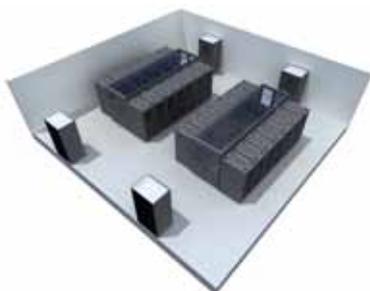
*Today, energy efficiency
is a priority to save
money and respect
the environment.*



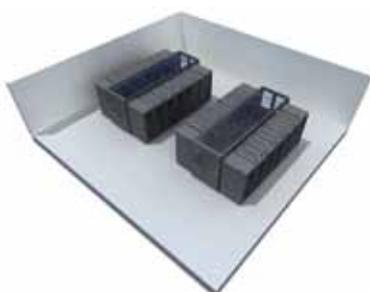


SmartAisle™

Datacenter Efficiency Management Platform



Raised floor datacenter with perimeter precision cooling (Liebert HPM)



Slab floor datacenter with Liebert CRV row-based precision cooling

Reduce energy consumption while supporting higher density for IT and networking equipment — without compromising your requirement for availability.

SmartAisle, from Emerson Network Power, is a platform of technologies designed to optimize the efficiency, design and operation of your datacenter infrastructure. The SmartAisle principle is based on the separation of cold and warm zones, and incorporates special cooling capacity and airflow management, raised floor sealing, cable entry sealing and cabinet sealing with blanking panels. But it is not just physical separation and sealing of the cold and warm zones that makes this system the most efficient. Knürr CoolFlex® solution together with Liebert HPM or Liebert CRV units with sophisticated software developed for cold aisle containment is the best way how to enhance the flexibility, reliability and efficiency of your datacenter. The control strategy is based on the main task: to provide such

cooling capacity that is actually required by IT equipment. Therefore Liebert precision cooling units for SmartAisle maintain the Temperature, Humidity and Airflow within the cold aisle containment.

SmartAisle Is Ideally Suited For:

- Hot/cold aisle architecture
- Raised floor datacenters with perimeter cooling
- Non-raised floor datacenters using row-based precision cooling systems such as Liebert CRV+ Knürr CoolLoop
- Retrofit to existing racks

Configure SmartAisle To Maximize Energy Efficiency And System Availability:

- Liebert iCOM control with SmartAisle control logic
- Temperature and Airflow sensors
- Knürr racks
- Knürr CoolFlex® cold aisle containment system
- Sealed entry doors
- Liebert precision cooling systems
- Knürr cable management system and rack accessories



*Solution with Liebert CRV
and Knürr CoolFlex® cold aisle containment*

SmartAisle™: Chilled Water System

1 Knürr CoolFlex® cold aisle containment

Physical separation of cold and warm air zones using Knürr CoolFlex® technology. Cold aisle containment ensures that the cold air distributed through the raised floor or row-based cooling units is delivered directly to IT cabinets without mixing with warm air from the hot aisle.

2 iCOM with SmartAisle Control Logic

The Liebert iCOM control system featured on Liebert Precision Cooling products brings high-level control and supervision to multiple units, allowing up to 32 cooling units to work together as a single system to optimize room performance. iCOM controller is present on Liebert HPC Chillers, Liebert HPM and Liebert CRV units. A cooling unit with SmartAisle control logic ensures the proper airflow, air temperature and humidity required by IT equipment. Dynamic fan speed and cooling capacity control provides maximum cooling efficiency.

3 Liebert HPM

Offers two versions in terms of hydraulic circuit:

- Traditional single circuit CW models
- Dual circuit CW models for high redundancy

Flexibility and the best efficiency is achieved using EC fan technology and SmartAisle control logic.

4 Liebert CRV

Row-based precision cooling systems available in 40kW version with

Savings - Chilled Water System

36.7% 47.9%

	Traditional Approach	With Cold Aisle Containment	With SmartAisle
Chiller*	54.8%	41.5%	35.2%
Pumps*	10.5%	9.7%	9.6%
Precision Cooling Unit	34.7%	12.0%	7.4%
Total	100%	63.3%	52.1%

SmartAisle solution in combination with chilled water system with free cooling is the best practice how to maximize energy efficiency. This result has been reached by enhancing free cooling effect thanks to using higher fluid temperature.

horizontal airflow. Liebert CRV units, as a standard, equipped with EC fans, variable cooling capacity control and humidity control ensure to provide the correct operating conditions for IT equipment at the best energy efficiency.

5 Liebert HPC

Wide range of high energy efficient chillers available in air or water cooled configuration and for outdoor or indoor application. Freecooling chillers in combination with SmartAisle architecture allow the achievement of extraordinary energy savings and increased system lifetime thanks.

6 Knürr Racks

The Knürr server racks allow for flexible mounting of accessories, as well as a complete cable management system. The server rails guarantee easy

mounting of all types of 19" servers and Liebert/Knürr accessories. With fully perforated doors (83% open area) this enclosure is set up for optimal thermal and airflow management.

7 SmartAisle Equipment

The SmartAisle solution also incorporates additional improvements in cooling efficiency side, which can be achieved using the following equipment:

- Cable entry sealing systems
- Cabinets sealing with trims and blanking panels
- High air flow perforated floor tiles with perforation up to 85% can offer more than doubled airflow in comparison with standard floor tiles or significantly increase efficiency thanks to minimized pressure drop.



SmartAisle™: Direct Expansion System

1 Knürr CoolFlex® cold aisle containment

Physical separation of cold and warm air zones using Knürr CoolFlex® technology. Cold Aisle Containment ensures that the cold air distributed through the raised floor or row-based cooling units is delivered directly to IT cabinets without mixing with warm air from the hot aisle.

2 iCOM with SmartAisle Control Logic

The Liebert iCOM control system featured on Liebert Precision Cooling products brings high-level control and supervision to multiple units, allowing up to 32 cooling units to work together as a single system to optimize room performance. iCOM controller is present on Liebert HPC Chillers, Liebert HPM and Liebert CRV units. A cooling unit with SmartAisle control logic ensures the proper airflow, air temperature and humidity required by IT equipment. Dynamic fan speed and cooling capacity control provides maximum cooling efficiency.

3 Liebert HPM

Offers flexibility in design with air/water cooled or freecooling single circuit DX models equipped with digital scroll compressor adaptable for variable cooling capacity needs. Flexibility and the best efficiency for all Liebert HPM units is achieved using EC fan technology.

4 Liebert CRV

Row-based precision cooling systems available in water and air cooled Direct

Savings - Direct Expansion System	20,2%		34,3%	
	Traditional Approach	With Cold Aisle Containment	With SmartAisle	
Compressor	72.2%	59.2%	55.2%	
Condenser	5.8%	5.8%	5.8%	
Evaporator Fan	22.0%	14.9%	4.7%	
Total	100%	79.8%	65.7%	

SmartAisle solution in combination with direct expansion system can offer more than 34% saving thanks to intelligent control of Digital Scroll Compressor capacity and accurate fan speed management driven by cold aisle conditions. SmartAisle solution provides consistently hot return air for more effective precision cooling system performance.

Expansion version with Digital Scroll Compressor featuring modular cooling capacity up to 35kW. Suitable for datacenters where a raised floor is not available for cooling. Liebert CRV units, as standard, are equipped with EC fans, Digital Scroll compressor and humidity control to provide the right operating conditions for IT equipment at the best energy efficiency.

5 Liebert HPA

Remote air cooled condenser for precision room cooling units equipped with variable fan speed control specific developed for Digital Scroll solutions. The Energy Efficient Solution maximises the system efficiency reducing the consumption during all year long.

6 Knürr Racks

The Knürr server racks allow for flexible mounting of accessories, as well as a complete cable management

system. The server rails guarantee easy mounting of all types of 19" servers and Liebert /Knürr accessories. With fully perforated doors (83% open area) this enclosure is set up for optimal thermal and airflow management.

7 SmartAisle Equipment

The SmartAisle solution also incorporates additional improvements in cooling efficiency which can be achieved using the following equipment:

- Cable entry sealing systems
- Cabinet sealing with trims and blanking panels
- High Air Flow Perforated Floor Tiles with perforation up to 85% can offer more than doubled airflow in comparison with standard floor tiles or significantly increase efficiency thanks to minimized pressure drop.





IT Racks and Accessories



Knürr IT Rack

- Industry leading 83% perforation for high density IT equipment
- Dozens of simple tool-less accessories
- Significant zero-U mounting space
- Roof designed for optional high density cooling



Liebert and Knürr Rack PDU

- Basic, controlled or adaptive designs
- Local and remote monitoring
- Additional in-rack sensors available
- Available in low and high density
- 2-years no-hassle replacement warranty



Knürr CoolFlex®

- Flexible design independent from rack width
- Swinging or sliding doors
- Overhead panels
- Integrated adaptive control reduces fan energy cost

Infrastructure Management



Liebert Nform

- Software solution providing centralized monitoring of a wide range of datacenter infrastructure equipment
- Leverages existing network communications
- Triggers event actions or notifications



Liebert SiteScan Web

- Software solution providing centralized monitoring of a wide range of datacenter infrastructure equipment
- Leverages existing network communications
- Triggers event actions or notifications

Precision Cooling



Liebert CRV

- 20kW to 40kW precision cooling with horizontal airflow design for both non-raised and raised floors
- Digital scroll compressor and variable speed fans for highly efficient operation
- Air, water, glycol and chilled water designs
- Liebert iCOM for intelligent control, communications and monitoring

Precision Cooling



Knürr CoolLoop

- Water cooled cabinet for side mounting on server cabinets
- Available in single units from 10 to 30kW cooling capacity
- Flexibility in terms of cooling capacity modulation from 0-100%
- In combination with Liebert HPM and SmartAisle offers ideal solution for higher density applications
- Fans with EC motor technology for highly efficient cooling



Liebert HPM

- Direct expansion version available in single units from 13kW to 35kW
- CW version available in single units from 15kW to 200kW
- Flexibility of design with air, water, CW, dual-fluid and free-cooling execution
- Liebert iCOM for intelligent control, communications and monitoring
- Digital scroll technology for variable capacity control and optimal efficiency
- EC Plug Fans maximize energy efficiency



Liebert HPM Extended

- Available in single units for 150kW and 200kW cooling capacity
- EC Plug Fans maximize energy efficiency
- Liebert iCOM for intelligent control, communications and monitoring
- Applicable for large datacentres with possibility to place fans to the raised floor
- Flexibility of design with fan in the raised floor or base module
- Optimized energy efficiency thanks to maximized coil surface and air distribution



Liebert HPC

- High Energy efficiency freecooling chiller
- For datacenter application from 42kW to 1600kW
- Freecooling option to maximize energy efficiency
- Variable cooling capacity thanks to semi-hermetic screw or multiple scroll compressors
- Liebert iCOM for intelligent control, communications and monitoring
- Liebert HPC-R available also for indoor application with ducted condenser side from 40kW to 320kW cooling capacity
- Available also for urban applications thanks to Low-noise and Quiet option

Power and UPS



Liebert APM

- Scalable capacity growth without increasing footprint
- Parallel configurations for capacity or redundancy
- Operates with up to 96% energy efficiency
- In-the-row installation
- Liebert Services – industry's largest network of service and support



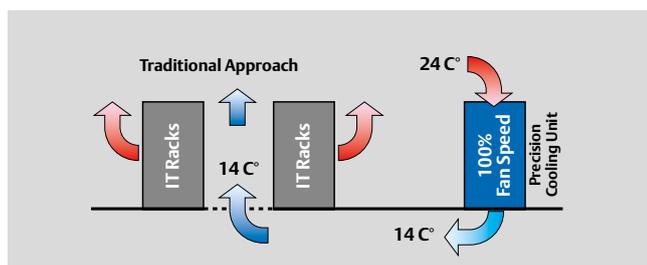
SmartAisle™ Application Scenarios: Examples Of Datacenter Rooms

Traditional Approach

The traditional approach considers open aisle architecture with the return air temperature to precision cooling units between 24-26°C having a supply air temperature between 10-14°C from the CRAC units. The heat load per rack is in the range of 3 to 5kW/rack.

Row-based cooling units can also satisfy higher heat load density but for large datacenters the space taken for the cooling units placed in the row of racks make this solution questionable. To cope with such issues, Liebert has in fact developed Liebert XD which has a zero floor space occupancy in combination with the perimeter cooling. For small and medium datacenter the in the row cooling is a preferable choice; the cooling units can be direct expansion or chilled water if the building is designed to handle water pipes, chiller and water containment systems. Usually the best choice is to use direct expansion cooling units in the small and medium capacity datacenters while using Chilled water in the large ones.

Chilled water systems deliver high energy efficiency when the chillers are equipped with Freecooling and are integrated with cooling units.

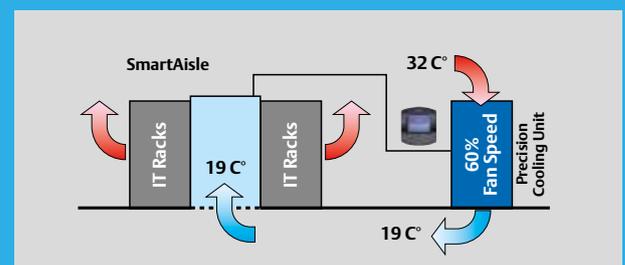


SmartAisle™

Using SmartAisle solution most of the Traditional Approach limitations can be significantly improved. SmartAisle solution increases space efficiency with heat load limit up to 12 kW/rack with Liebert HPM units and up to 20 kW/rack with Liebert CRV cooling units. SmartAisle provides always uniform and predictable temperature to all IT equipment controlling directly Cold Aisle temperature and humidity.

Optimized cooling system efficiency is achieved by optimising the return air temperature without compromising reliability.

In combination with free cooling chilled water system it can provide up to 50%+ efficiency increase and consequently fast return of investment (ROI). SmartAisle allows easy retrofit and low initial investment as it fits existing Knürr racks.

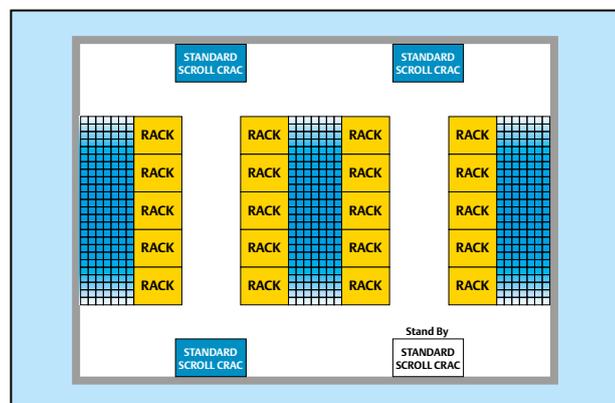


Small Datacenter

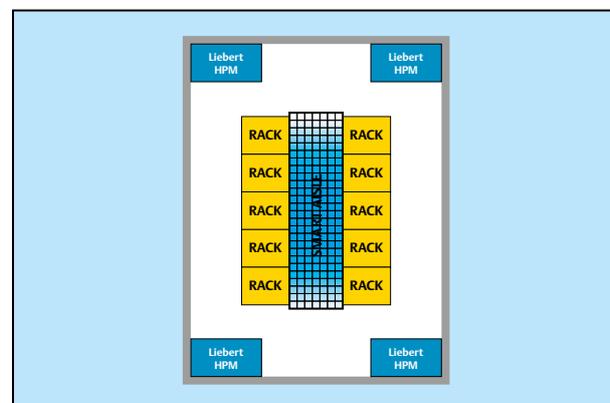
- Footprint: 20-50m²
- Up to 150 kW total heat load
- Up to 20 Racks
- Recommended solution
 - if raised floor is available: Liebert HPM Direct Expansion
 - if raised floor is not available: Liebert CRV Direct Expansion

Case Study: Direct Expansion System With Perimeter CRAC Units

Traditional Approach



SmartAisle™



SmartAisle™ Benefits:

- Pay Back Period less than 15 months (Considering price for electric energy 0.1 €/kWh)
- Reduced footprint: 42.9% saving – considering also the Datacenter footprint reduction the Pay Back Period will be significantly shorter
- Reduced Racks Qty: 50% saving
- Increased efficiency: 40.2% energy saving
- Continuous dynamic adaptation to load
- Higher reliability increase in available cooling capacity
- Minimized hot spot risks

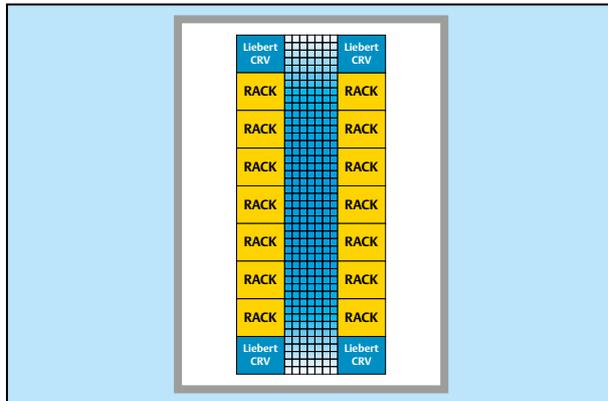
		Traditional Approach	SmartAisle
Datacenter Heatload	(kW)	100	100
Location		Munich, Germany	
Racks Qty	(-)	20	10
Min. Datacenter footprint	(m ²)	84	48
Redundancy for CRAC units	(-)	N+1	N+1
CRAC unit type	(-)	Traditional 35kW unit with standard scroll compressor	D35UA
Condenser	(-)	Dedicated condenser with VSD	HCE42
CRAC Qty	(-)	4	4
Heatload per Rack	(kW)	5	10
Annual energy consumption of the system	(kWh)	287934	172080

Small Datacenter

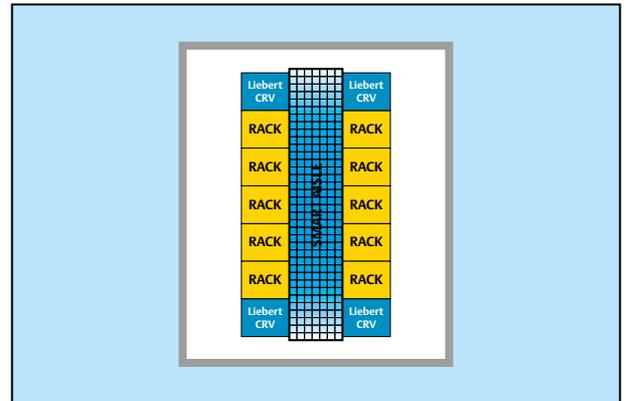
- Footprint: 20-50m²
- Up to 150 kW total heat load
- Up to 20 Racks
- Recommended solution
 - if raised floor is available: Liebert HPM Direct Expansion
 - if raised floor is not available: Liebert CRV Direct Expansion

Case Study: Direct Expansion System With Row-Based CRAC Units

Traditional Approach



SmartAisle™



SmartAisle™ Benefits:

- **Pay Back Period less than 4 months** (Considering price for electric energy 0.1 €/kWh)
- **Reduced footprint: 22,2% saving** – considering also the Datacenter footprint reduction the Pay Back Period will be reduced to 0 months
- **Reduced Racks Qty: 28% saving**
- **Increased efficiency: 9% energy saving**
- **Higher reliability** increase in available cooling capacity

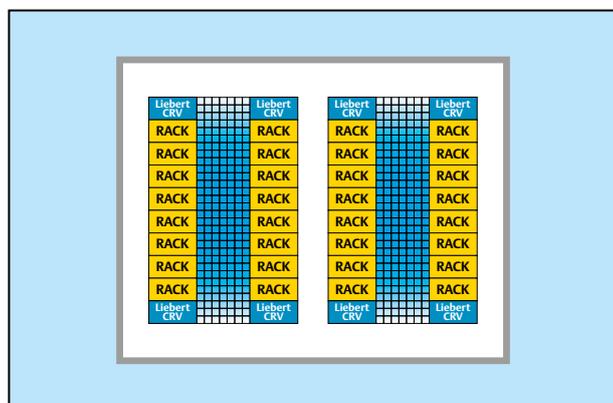
		Traditional Approach	SmartAisle
Datcenter Heatload	(kW)	100	100
Location		Munich, Germany	
Racks Qty	(-)	14	10
Min. Datacenter footprint	(m ²)	54	42
Redundancy for CRAC units	(-)	N+1	N+1
CRAC unit type	(-)	CRO35 RA	CRO35 RA
Condenser	(-)	HCR051	HCR051
CRAC Qty	(-)	4	4
Heatload per Rack	(kW)	7.15	10
Annual energy consumption of the system	(kWh)	239380	217868

Mid-Size Datacenter

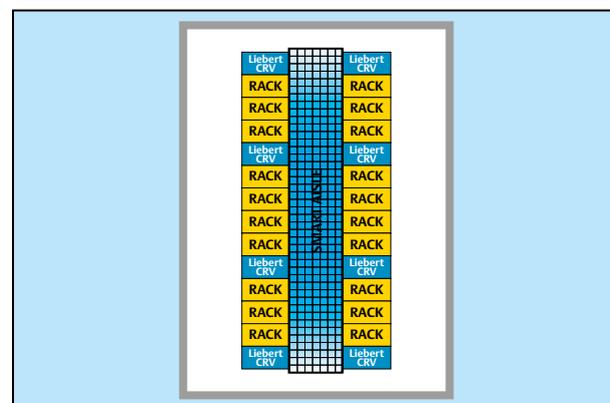
- Footprint: 50-200m²
- Total Heat load 150 - 500 kW
- Between 20 to 50 Racks
- Recommended solution
 - if raised floor is available: Liebert HPM CW
 - if raised floor is not available: Liebert CRV CW

Case Study: Chilled Water System With Row-Based CRAC Units

Traditional Approach



SmartAisle™



SmartAisle™ benefits:

- Pay Back Period 0 months (immediate return of investment thanks to saving on investment to racks)
- Reduced Racks Qty: 37,5% saving
- Reduced footprint: 29.4% saving
- Increased efficiency: 9% energy saving
- Higher reliability increase in available cooling capacity

		Traditional Approach	SmartAisle
Datacenter Heatload	(kW)	200	200
Location		Munich, Germany	
Racks Qty	(-)	32	20
Min. Datacenter footprint	(m ²)	93.5	66
Redundancy for CRAC units	(-)	N+1	N+1
CRAC unit type	(-)	CR040 RC	CR040 RC
CRAC Qty	(-)	8	8
Freecooling Chiller	(-)	SBH023	SBH023
Fluid 35% Ethylene Glycol	(°C)	10/15	14/19
Heatload per Rack	(kW)	6.25	10
Annual energy consumption of the system	(kWh)	304438	242670

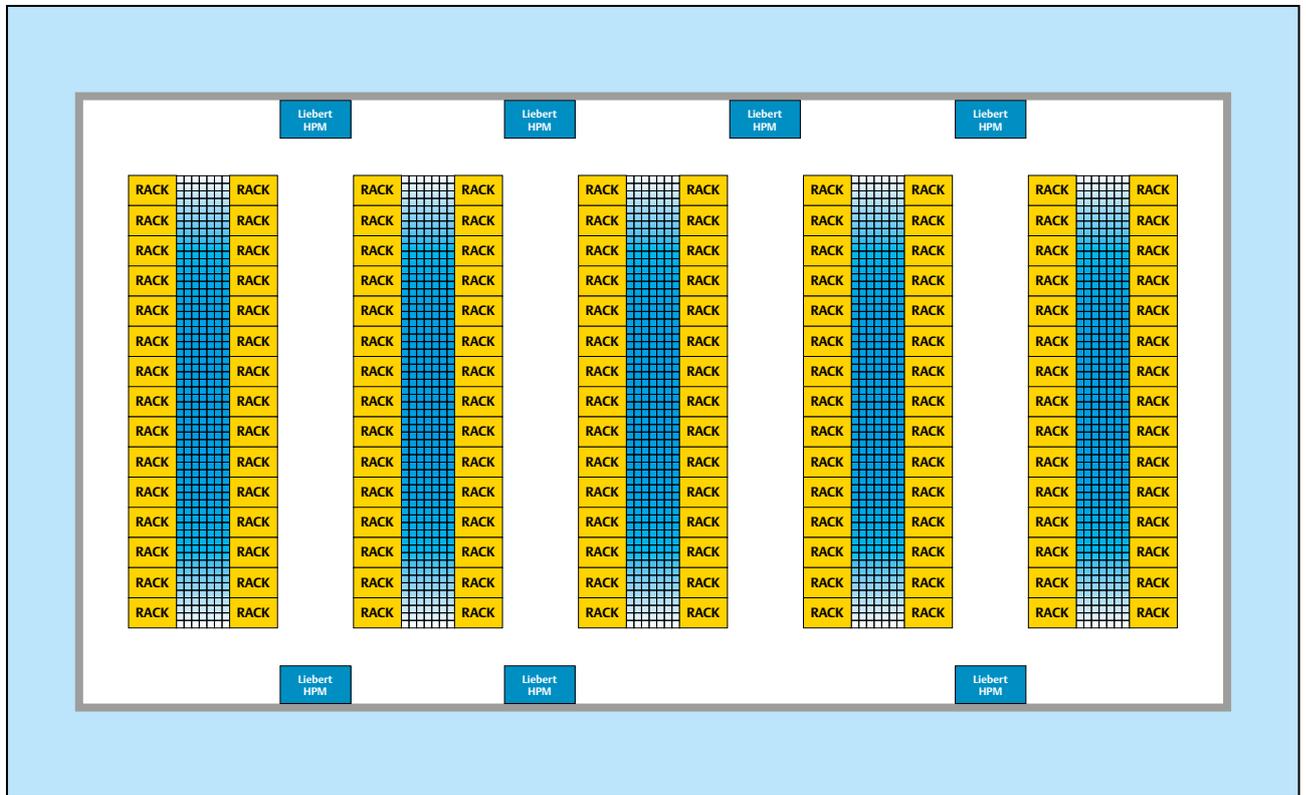
Power input of pumps is not considered

Large Datacenter

- Footprint: >200m²
- Total Heat load >500 kW
- More than 50 Racks
- Recommended solution
 - Liebert HPM CW, Liebert HPM EXTENDED CW

Case Study: Chilled Water System With Perimeter CRAC Units

Traditional Approach

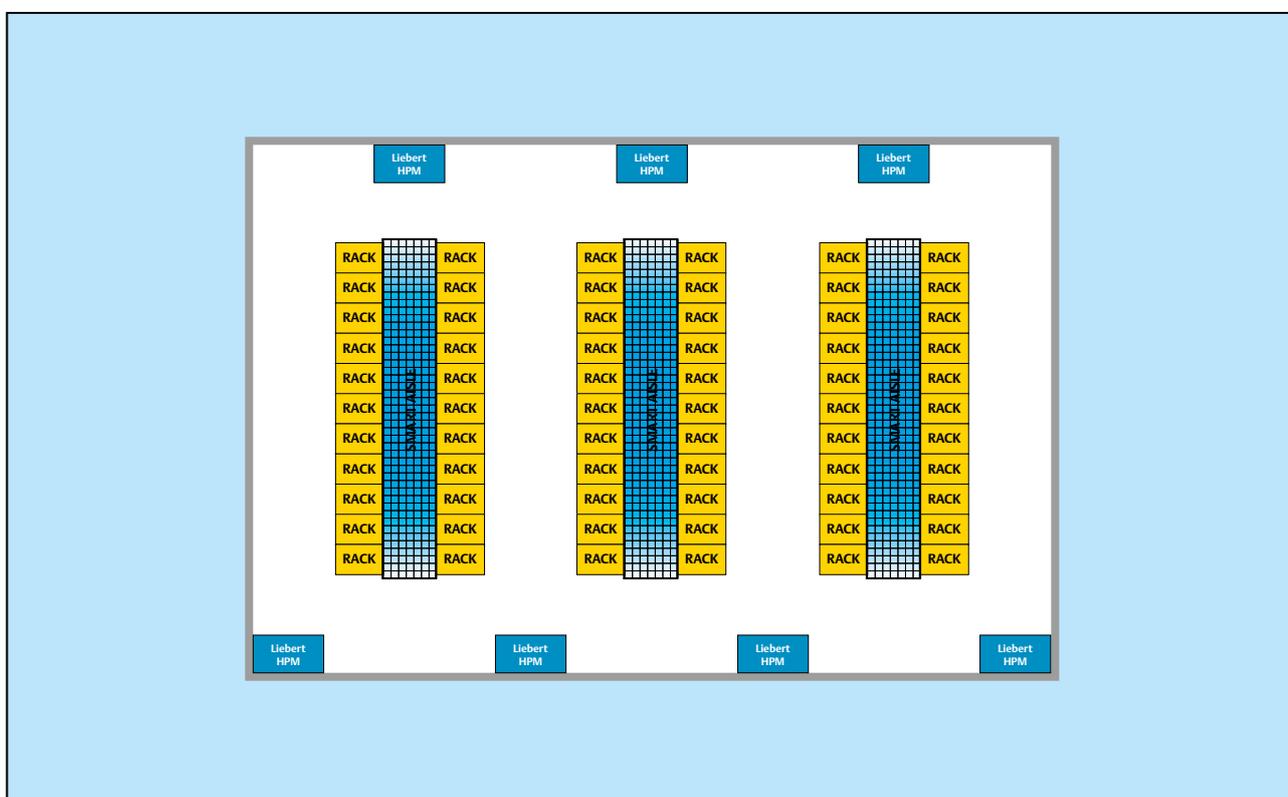


		Traditional Approach	SmartAisle
Datcenter Heatload	(kW)	640	640
Location		Munich, Germany	
Racks Qty	(-)	150	66
Min. Datacenter footprint	(m ²)	332.5	189
Redundancy for CRAC units	(-)	N+1	N+2
CRAC unit type	(-)	L16UC	L16UC
CRAC Qty	(-)	8	7
Freecooling Chiller	(-)	SBS073	SBS073
Fluid 35% Ethylene Glycol	(°C)	10/15	14/20
Heatload per Rack	(kW)	4.27	9.3
Annual energy consumption of the system	(kWh)	1156291	663793

Power input of pumps is not considered



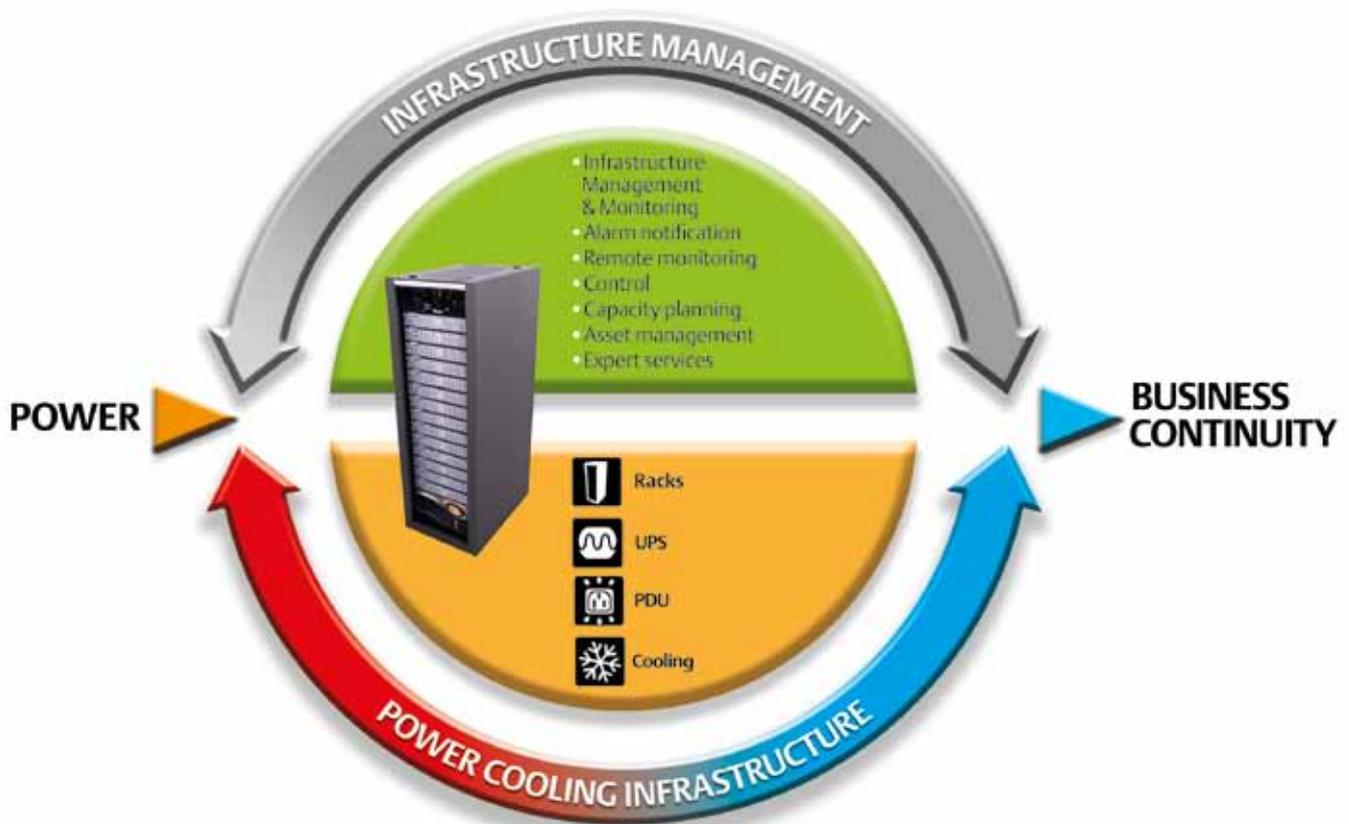
SmartAisle™



SmartAisle™ benefits:

- **Pay Back Period 0 months** (immediate return of investment thanks to saving on investment to racks and CRAC units)
- **Reduced Racks Qty: 56% saving**
- **Reduced footprint: 43.2% saving**
- **Reduced CRAC Qty: 12,5% energy**
- **Increased efficiency: 42,6% energy saving**
- **Minimized hot spot risks for long rows of racks**
- **Higher reliability and redundancy increase in available cooling capacity**

Emerson Network Power Business-Critical Continuity™ Expert



Today's successful businesses depend on adaptable technologies to help them respond quickly to market demands. Your datacenter must be built on a support infrastructure designed to match the power and cooling needs of rapidly changing IT initiatives such as virtualization and consolidation. Each IT change, move or addition will affect the entire support infrastructure so you need products and support that ensure your IT systems will operate reliably in these environments.

Get More on line: www.eu.emersonnetworkpower.com



More than 35,000 organizations in 70 countries depend on our Business - Critical Continuity™ Promise: your IT infrastructure stays up to support your Business!

Ensuring The High Availability Of Mission-Critical Data And Applications.

Emerson Network Power, a business of Emerson (NYSE:EMR), is the global leader in enabling *Business-Critical Continuity™* from grid to chip for telecommunication networks, datacenters, health care and industrial facilities. Emerson Network Power provides innovative 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. All solutions are supported globally by local Emerson Network Power service technicians. Liebert AC power, precision cooling and monitoring products and services from Emerson Network Power deliver Efficiency Without Compromise™ by helping customers optimize their datacenter infrastructure to reduce costs and deliver high availability.

For more information, visit:

www.Liebert.com, www.EmersonNetworkPower.com
or www.Eu.EmersonNetworkPower.com

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To get the list of the nearest in your country, send an e mail to:

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Emerson Network Power™

The global leader in enabling Business-Critical Continuity™

- AC Power
- Embedded Computing
- Outside Plant
- Racks & Integrated Cabinets
- Connectivity
- Embedded Power
- Power Switching & Controls
- Services
- DC Power
- Infrastructure Management & Monitoring
- Precision Cooling
- Surge Protection

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Emerson Network Power Srl- ISO 9001:2008.
Design, manufacturing, assembling and sales of chilled water
mixture and equipment for high precision air conditioning.
Sales of small uninterruptible power supply (UPS Small and Micro)



Emerson Network Power Srl-ISO 14001:2004:
Design, manufacturing, assembling and sales of chilled water
mixture and equipment for high precision air conditioning.
Sales of uninterruptible power supply (UPS Power). Design
of uninterruptible power supply (UPS Power). Sales of small
uninterruptible power supply (UPS Small and Micro). HQ Service
Activities (Spare parts warehouse, Technicians training)

