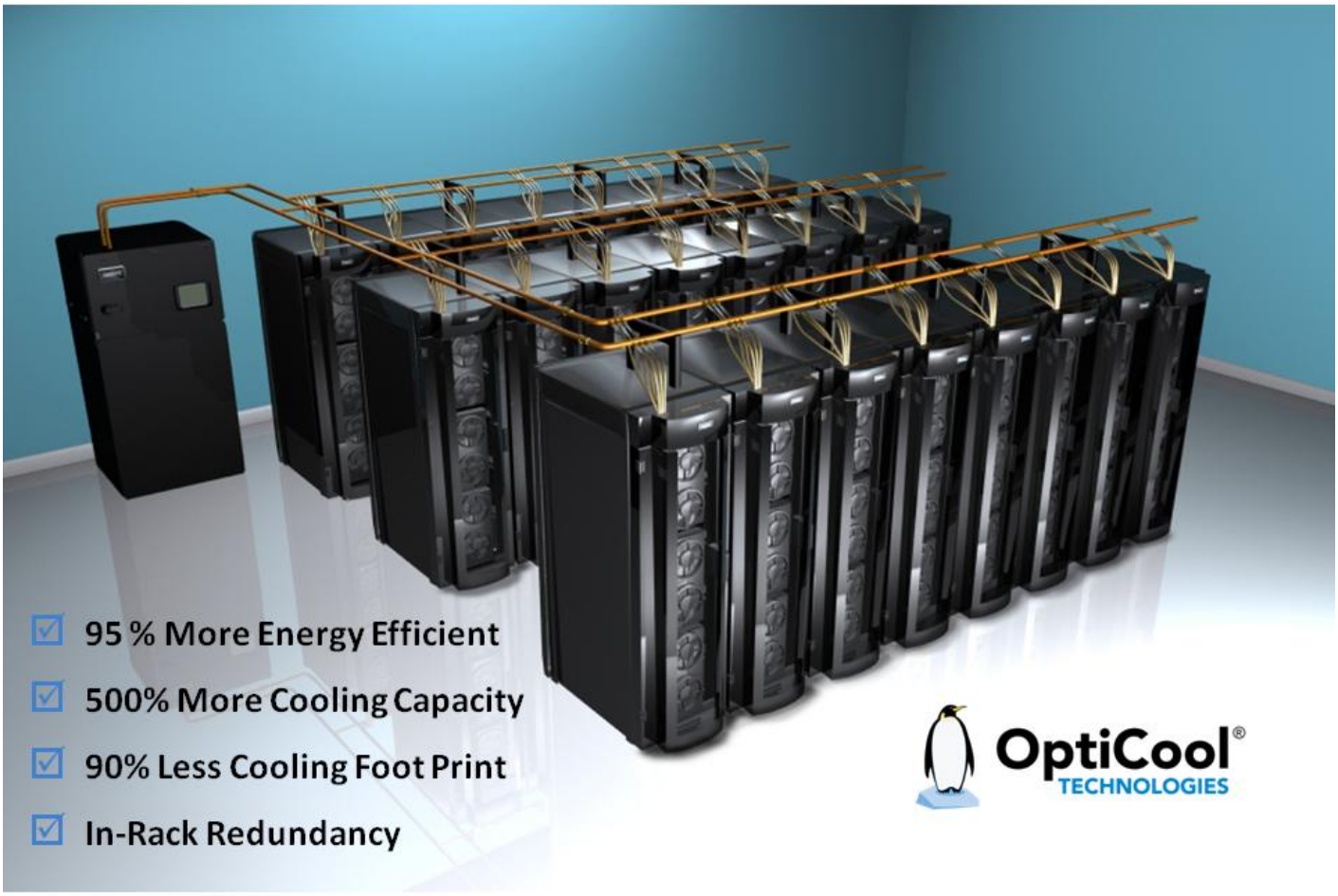
# OptiCool® Data Center Cooling

## Engineered for the Future

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# Introducing the OptiCool® Data Center Cooling Solution

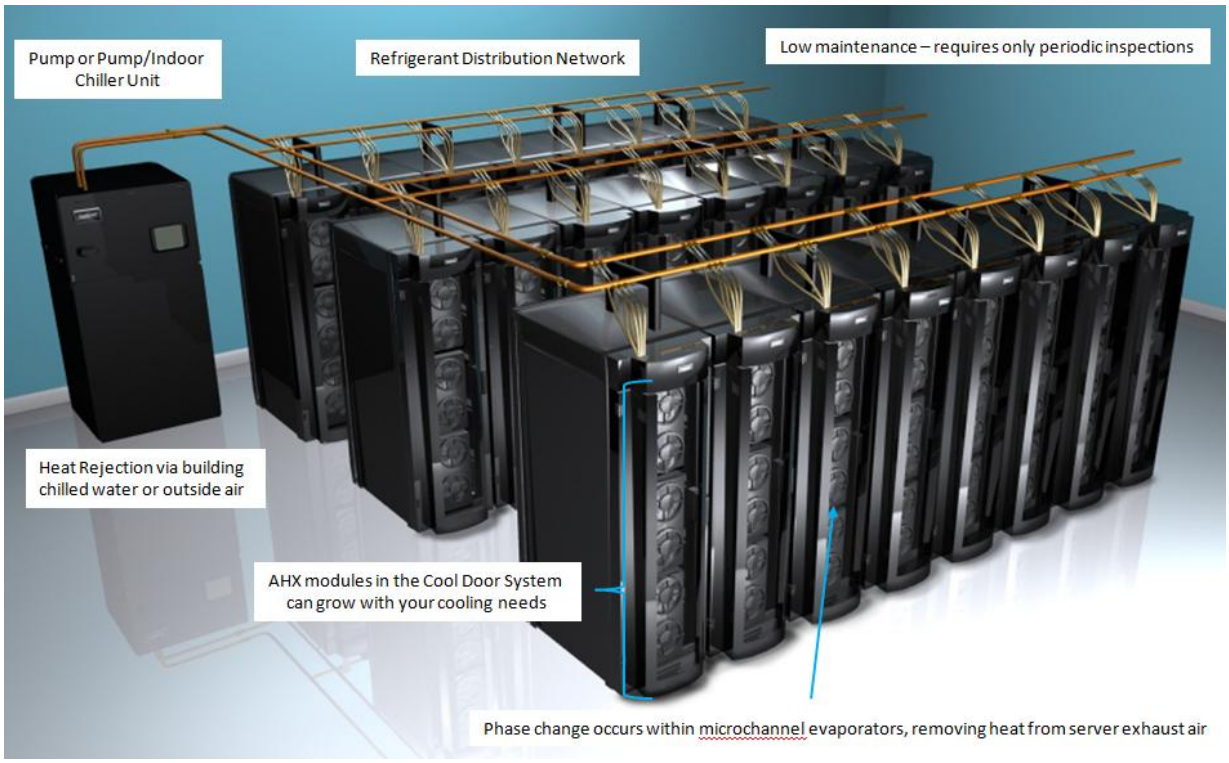
## System Description

The OptiCool® data center cooling solution delivers unprecedented simplicity, performance and energy efficiency.

OptiCool® is designed to actively cool IT computer equipment in data center applications. The system uses a pumped refrigerant in a two phase low-pressure process, instead of ambient air, to transport heat generated by the equipment from each cabinet to the location's heat sink.

OptiCool® has the potential to reduce energy consumption by up to 95% within the data center.

For new or existing data centers, OptiCool® can be a primary cooling solution, or can be integrated with conventional Computer Room Air Conditioners (CRACs) to address extreme cooling needs.




## System Components

***OptiCool® Refrigerant Pump (RPx)***

The pump unit circulates R-134a refrigerant to the Active Heat Extractors (AHXs) located in the Cool Door System (CDS). The pump also includes a chilled-water heat exchanger to remove the heat from the refrigerant (RPW-210). In deployments where building chilled water is not available, a pump/indoor chiller unit can be deployed (RPC-210). This is an indoor chiller unit that provides the same system functionality as the chilled water version pump but contains a refrigerant (R-134a) to refrigerant (R-407c) heat exchanger. Both the pump and pump/chiller units circulate virgin R-134a at low pressure (~55 psi; no compression and therefore no oils are used) in the primary cooling loop and prevent condensation by maintaining the refrigerant temperature above the dew point temperature. There are multiple pump and pump/chiller models available to support environmental conditions.

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***Active Heat Extractor (AHX)***

The AHX units are mounted inside of the Cool Door System (CDS) at the rear of the electronic equipment and function to actively remove the heat from the exhaust air. Each AHX unit consists primarily of a micro-channel evaporator coil and two variable-speed fans for 2N redundancy. The unique design of the Cool Door® System allows for full access to the IT equipment. The AHX can also be removed and installed in the CDS without disruption to service. The fans are designed to draw the hot exhaust air from the electronics through the coil, which causes the pumped refrigerant to undergo a phase change, thereby removing the heat prior to being exhausted into the room.

***Hoses and Refrigerant Distribution Network***

Flexible hoses provide the connections between the AHX units in the Cool Door® System and the refrigerant supply and return lines. The hoses are a 9.5mm (3/8") ID flexible stainless steel ribbed design covered with a protective stainless steel braid and are equipped with self-sealing quick-connect couplers at each end. If electrical isolation between the AHXs and copper plumbing is required there are non-conductive versions of the hoses available. A variety of standard hose lengths are available to support site conditions. The refrigerant supply and return lines are constructed of refrigerant-grade rigid copper pipe. Factory-built manifolds provide the proper interface to the quick-connect hose couplers, reducing on-site installation time.

***Cool Door® System***

Each Cool Door has been designed to support and position up to three AHXs into each cabinet. The Cool Door System is designed to fit directly onto OptiCool® ready cabinets available from multiple manufacturers. For retrofits, there are transition frame adapter kits that attach to various cabinet models and sizes from multiple manufacturers, requiring no cabinet modifications. This allows for installation of the AHXs without any service interruptions. The Cool Door System enables up to 5 pre-selected AHX positions for vertical adjustability, allowing for maximum flexibility of AHX placement within the cabinet.

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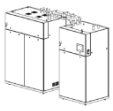
### Pump Unit (RPW-210/RPC-210)

- Height: 2,083 mm (82.0 in)
- Width: 1,016 mm (40.0 in)
- Depth: 914 mm (36.0 in)
- Weight (dry): 386 kg (850 lbs)
- Cooling Capacity (60 Hz model): 15 kW min/210 kW max[2] (RPW-210) or 30 kW min/210 kW max (RPC-210)
- R-134a refrigerant
- Remote Alarming Interfaces: Standard ethernet, optional BACnet IP or Modbus 485
- Input Power: 460V/3 ph/60 Hz
- Full Load Amps: 4.0 A



### Indoor Chiller Pack (RPC-210 w/ ICP-210)

- Height: 2,083 mm (82.0 in)
- Width: 1,473 mm (58.0 in)
- Depth: 914 mm (36.0 in)
- Weight (dry): 850 kg (1,875 lbs)
- Distance between RPC and ICP (max): 1,829 mm (72.0 in)
- R-134a refrigerant (primary cooling loop) and R-407c (secondary cooling loop)
- Remote Alarming Interfaces: Standard Ethernet, optional BACnet IP or Modbus 485
- Input Power: 460V/3 ph/60 Hz
- Full Load Amps: 105.0 A

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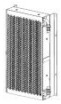

### Active Heat Extractor (AHX)

- Height: 569.0 mm (22.4 in)
- Width: 346.71 mm (13.65 in)
- Depth: 132.58 mm (5.22 in)
- Weight (each, dry): 5.9 kg (13 lbs)
- Cooling Capacity[1]: 1.5 kW min/10 kW max
- Remote Alarming Interface: Optional
- Input Power: 50/60 Hz, 120V-240V AC, or -48V DC
- Nominal Power Consumption: 30 W

### Cool Door System (CDS)

- Height: 42U/44U
- Width: 600.0 mm (23.6 in), 735.0 mm (28.9 in), 800.0 mm (31.5 in)
- Depth: 174.0 mm (6.9 in)
- Weight (Empty): 24” (35 lbs)
- Door Transition Kit Depth: 25.4mm (1 in)

### Refrigerant Distribution Plumbing

- Refrigerant-grade rigid copper pipe
- Supply line: 1 3/8 in OD (extended run)
- Return line: 2 5/8 in OD (extended run)
- Refrigerant supply plumbing equivalent total length limited to 107m (350 ft)

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[1] Maximum cooling capacity is dependent on operating conditions. The AHX will operate at heat loads lower than 1.5 kW; however, phase change efficiency is greatly reduced and the AHX will cool as a single phase (liquid) heat transfer device.

[2] Cooling capacity is based on 7 degree C (45 degree F) chilled water temperature and 530 lpm (120 gpm) chilled water flow rate.