Precision Cooling for
Business-Critical Continuity™

Liebert Economizer Cooling Solutions

Reduce Cooling Costs by up to 50% Without Compromising Reliability

EMERSON™
Network Power

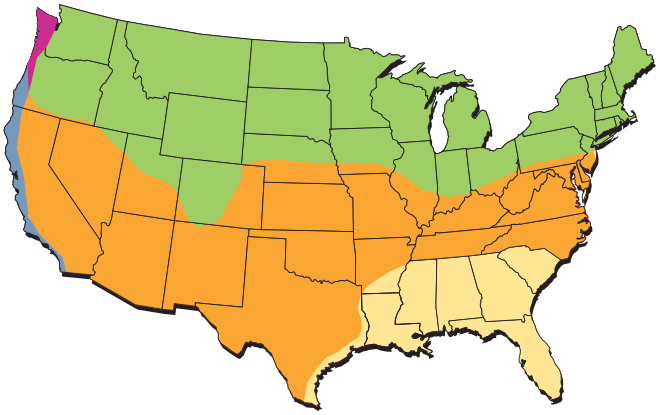
Lower Cooling Energy Consumption by up to 50%

Fluid- and Air-side economizers take advantage of cold outside temperatures to provide "free cooling" cycles that reduce or eliminate the operation of data center precision cooling system compressors and pumps.

Using economizers, you can lower cooling energy usage by up to 50% – depending on the average ambient temperature and humidity of your site.

A Focus on Energy Efficiency

While many IT professionals are considering economizers in preparation for potential code or legislation changes, a move toward improved efficiencies can pay off with rewards of its own – especially in terms of lower operating costs and utility incentives. For example, some utility companies offer rebates for using energy-efficient equipment, quickly increasing your return on investment and overall savings.



Geographic regions of greatest cooling economization opportunity

- Consider Chiller Plant Economizer
- Consider Chiller Plant or GLYCOOL Cooling Economizer
- Consider Chiller Plant or Air Economizer
- Consider Chiller Plant, Air Economizer or GLYCOOL Cooling Economizer

Industry Best Practices

When making the choice to use an economizer solution, it is critical to analyze how changes will impact your entire data center.

Industry thought leader ASHRAE® recommends that IT professionals investigating the use of economizers in their data centers consider the impact of incorrect application, and/or maintenance/operational issues, on the life of protected sensitive equipment:

- High humidity can cause condensation that reduces server life and affects operation
- Low dew point can result in problems such as static electricity
- Gaseous or particulate contaminants can adversely affect sensitive electronics
- Operational reliability, including redundancy, is required to achieve IT initiatives
- Reliable water sources for cooling towers
- Chiller condensate sump heaters for cold climate operation (or other solutions)

Why Emerson Network Power?

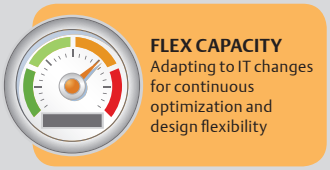
For more than 40 years, Liebert technologies have led the industry in precision cooling for data centers, including economizing solutions such as the free-cooling GLYCOOL system.

Our depth and breadth of experience make us uniquely prepared to serve as trusted advisors to IT professionals. Liebert representatives can help you decide which economization method is the right solution for your application. They will guide you through the complexities of environmental factors affecting your decision making, including temperature ranges, dew point, humidity, and the issue of gaseous and particulate contaminants, as well as maintenance issues that impact all types of econimizers.

It's how we deliver Efficiency Without Compromise™ – providing high availability products with energy-efficient technologies.

Efficiency Without Compromise

Efficiency Without Compromise provides a path to optimize data center infrastructure around design, operating and management efficiencies – while maintaining or improving availability. This is achieved through the proper selection and utilization of cooling, power and monitoring technologies, supported by key services and local expertise.

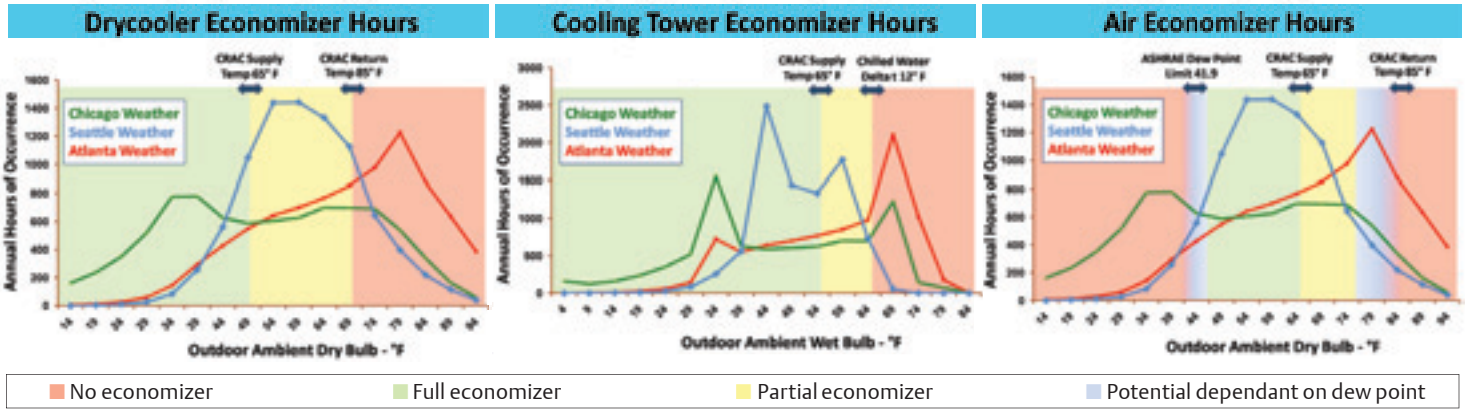


	Atlanta			Chicago			Seattle		
	Fluid Economizer		Liebert CW or DS with Air Economizer	Fluid Economizer		Liebert CW or DS with Air Economizer	Fluid Economizer		Liebert CW or DS with Air Economizer
	Cooling Tower	Dry-cooler		Cooling Tower	Dry-cooler		Cooling Tower	Dry-cooler	
Full Economizer Hours	25%	17%	18%	48%	41%	14%	39%	23%	27%
Partial Economizer Hours	52%	34%	33%	39%	28%	22%	61%	61%	15%
Estimated Total Energy Savings	51%	36%	34%	67%	58%	25%	70%	49%	34%

The effect of ambient conditions in representative cities on economization hours and resultant energy savings, using different economization methods (assumes cold aisle temperature 71°–80° F; CRAC return temperature 85° F). Cooling tower calculations were made with Liebert chilled water-based precision cooling products. Drycooler calculations were based on Liebert precision cooling products equipped with GLYCOOL option. Air economizer calculations based on 41.9° F dew point limitation.

Liebert Precision Cooling Economization

In accordance with ASHRAE's guidance, and in keeping with our position as the industry's power and cooling leader, Emerson Network Power provides effective, efficient economizer solutions. Emerson Network Power offers fluid-side economization solutions and an air-side economizer – and Liebert technologies are well suited to work with economization solutions from third-party providers.



Comparative hours of economizer operations through varying CRAC supply and return temperatures in three cities representing distinct ambient conditions (partial economizer operation = outside ambient used to precool or assist in cooling of data center return air).

Fluid-Side vs. Air-Side Economization Comparison

Fluid-Side

Advantages

- Can be used in any climate cold enough to provide effective hours of economization; Glycol-based systems operate effectively at the widest range of outdoor ambient temperatures
- Wider operating range results in 2x–3x more effective hours than air economizer systems in most climates
- No outside air is introduced to the data center, so the filtration and humidification functions of the CRAC unit operate normally to ensure optimal air quality and relative humidity
- Service requirements and complexities are reduced compared to air-side economizers; less filter changing and maintenance are required
- Compatible with Liebert DS, Liebert CW, Liebert Challenger 3000 and Liebert XD precision cooling systems (downflow and upflow)

Challenges

- Indirect piping and control are more complex
- Higher initial capital costs
- Added water use for cooling tower

Air-Side

Advantages

- Compatible with moderate climates
- More operating hours than fluid-side economizers, if humidification is added
- Can be used on systems that don't use water for heat rejection
- Lower initial capital costs
- Uses less water than fluid-side economizers
- Compatible with Liebert DS and Liebert CW precision cooling products (downflow only)

Challenges

- Ductwork required to get air into IT space
- Narrower range of effective hours of operation if used without humidification
- Dust and pollen sensors are required to minimize filter maintenance; humidity control can be costly and challenging
- Need proven, intelligent controls to ensure proper temperature and humidity
- High-density applications may require more localized cooling
- Mildew minimization actions required

Fluid-Side Cooling Economization Strategy

Fluid-side economizers work in conjunction with a heat rejection loop – consisting of either a cooling tower, evaporative cooler or drycooler – to satisfy cooling requirements.

These systems are incorporated into either a chilled water or glycol-based cooling system. For economizer operation, the fluid used in the cooling system passes through an additional heat exchanger to cool the room air, reducing or eliminating the use of cooling compressors and pumps.

Energy-efficient Liebert technologies are well suited to fluid-side cooling economization.

GLYCOOL Cooling

for Liebert DS™ and Liebert Challenger™ 3000

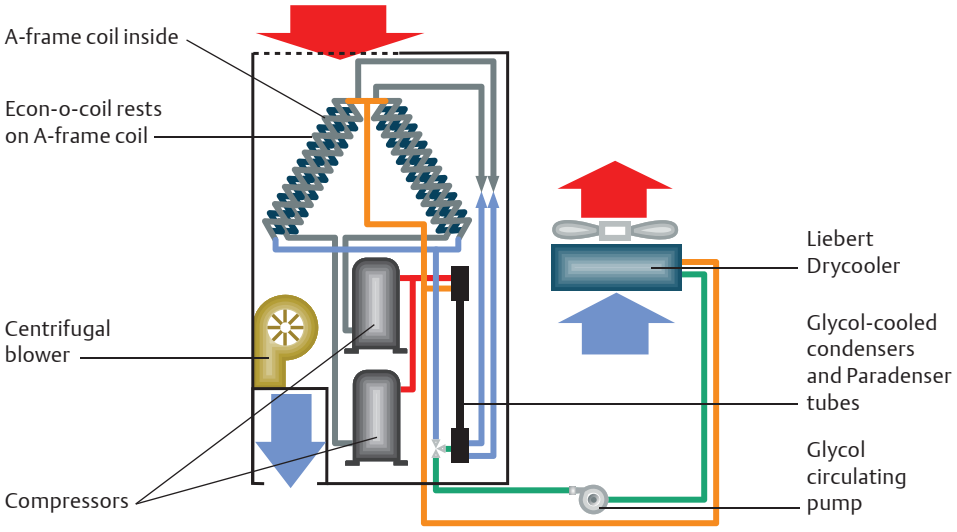
How the Liebert GLYCOOL System Works

The self-contained Liebert GLYCOOL system comprises a compressorized Liebert glycol system with advanced controls, a standard cooling coil, an additional "Econ-o-coil" free cooling coil and a drycooler.

At ambient temperatures above the CRAC return temperature (less the drycooler approach), the system functions as a normal glycol-cooled system. As outdoor temperatures drop, the temperature of the fluid in the heat rejection loop drops also. Once it is cold enough outside, the control opens the modulating valve to the Econ-o-coil circuit. Depending on ambient conditions, the system either reduces or eliminates cooling compressor and pump operation.

Savings

The Liebert GLYCOOL system delivers an average annual energy savings of 20–50%.



Liebert GLYCOOL System

Providing free cooling by using outside air through the Econ-o-coil circuit to maximize cooling efficiencies

Chiller Plant

Partnered with Liebert CW™ and Liebert Challenger 3000

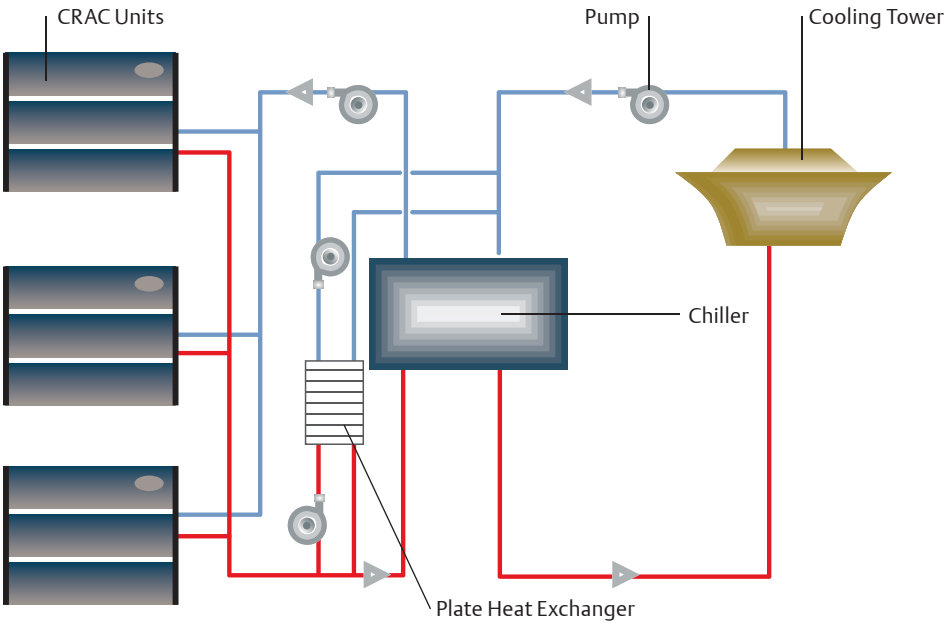
How Chiller Plant Economization Works

The chilled water loop that feeds multiple chilled water-based CRAC units uses cold outdoor temperatures to cool the chilled water loop, effectively reducing pump operation.

Full economization hours are dependent upon the outdoor wet bulb temperature, the approach of the cooling tower and heat exchanger, and the chiller water supply temperature. Partial economization hours are dependent upon the factors listed above, as well as the chilled water return temperature.

Savings

A chiller plant, partnered with Liebert precision cooling technologies, delivers an average annual energy savings of 40–60%.



Economizer System Chiller Plant

Fluid flow during fluid-side cooling economization – taking advantage of environmental conditions to improve cooling efficiencies

Why Liebert Products and Services?

- **Liebert iCOM® Control** – Based on years of data center precision cooling experience, the intelligent Liebert iCOM control dynamically optimizes the operating parameters of fluid-side economizer solutions

Provides advanced control and monitoring, which allows units to work together as a single system to enhance performance and improve efficiency

- **Service** – Industry-leading local service and support network ensures timely maintenance, service and parts availability

- **Industry Leadership** – Liebert advanced technologies can help you cut operating costs, improve efficiencies, reduce energy consumption, ensure reliable performance and maintain optimal conditions within your IT environment
- **Compatibility** – The Liebert GLYCOOL system is available on Liebert DS and Liebert Challenger 3000 (both downflow and upflow)

Liebert CW Chilled Water Based Precision Cooling is designed to handle high heat loads – using an existing building chiller as a chilled water cooling source

Liebert Challenger 3000 provides complete control of temperature, humidity and air filtration

Liebert DS Precision Cooling System provides efficient, precise, reliable control of room temperature, humidity and airflow for operation-critical equipment

Air-Side Cooling Economization Strategy

Air-side economizers use outside air to supplement data center cooling. They utilize a system of sensors, ducts and dampers to control the entry of outside air to help satisfy cooling demands.

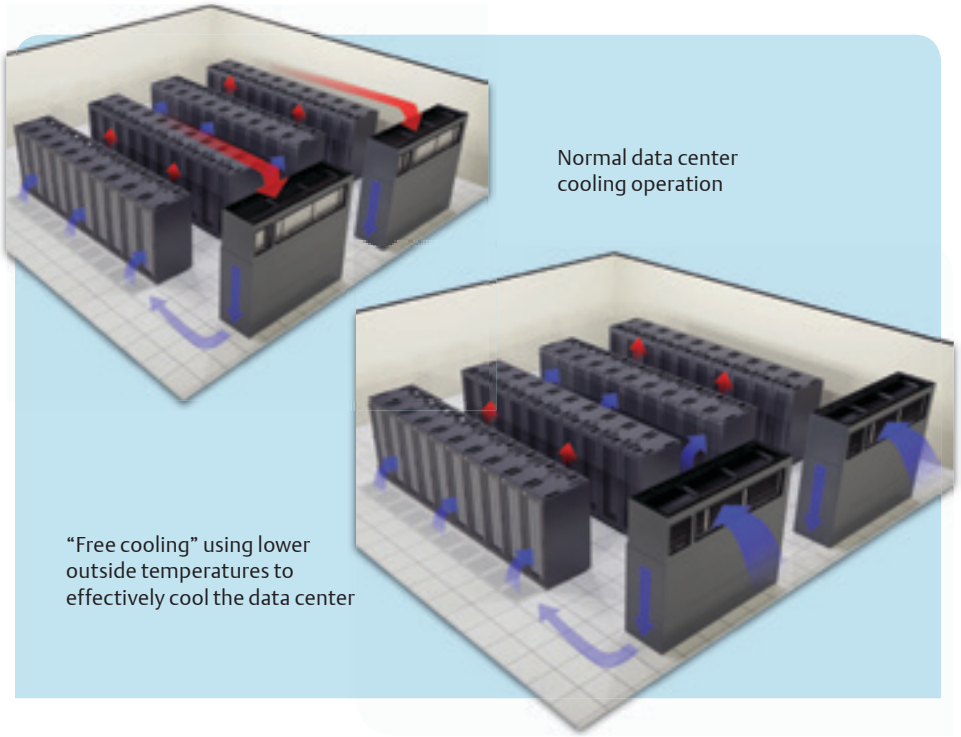
Sensors monitor outside and inside air conditions, and when outside conditions are suitable for cooling, the economizer adjusts the dampers to introduce the outside air, making it the primary cooling source. This "free cooling" reduces or eliminates the need for cooling compressors, resulting in increased efficiencies and significant energy savings.

Full "free cooling" is attained when the outside air is below the entering cold aisle temperature.

Partial benefit is attained when the outside air temperature is 2 degrees Fahrenheit lower than the air temperature returning to the Cooling Room Air Handlers and dew point is less than 59 degrees and above 41.9 degrees Fahrenheit.

Air Economizer System

Liebert Air Economizer System installed on a Liebert CW chilled water-based precision cooling system in downflow configuration – using lower outside temperatures to minimize cooling compressor and pump use.



Maximizing Economization with Liebert iCOM Control

Intelligent Liebert iCOM control is ideally suited for sensing and controlling Liebert economizers – or those supplied by other manufacturers.

Multiple parameters within an IT environment add complexity and can be difficult to monitor and manage, but the Liebert iCOM control simplifies oversight and puts you back in control – with substantial benefits over custom configured controls.

Liebert iCOM control:

- Factory tested and warranted
- Offers multiple levels of monitoring and control – and compatibility with Liebert SiteScan® Web
- Provides consistent, field-proven operation
- Shares a common platform with Liebert Precision Cooling Systems
- Equipped with factory-provided installation, operation and maintenance instructions
- Supported by factory-trained technicians

Liebert iCOM Control System

Liebert Air Economizer System

with Liebert iCOM Control for Liebert DS and Liebert CW

How the Liebert Air Economizer System Works

The Liebert Air Economizer System reduces cooling costs by taking advantage of cool outdoor air to condition indoor spaces, reducing or eliminating compressor operation in Liebert DS units, and eliminating pump operation in Liebert CW, as well as reducing or eliminating the compressor operation of the supporting chiller plant. The Liebert Air Economizer System is equipped with high-efficiency filtration and a sensor network that detects clogged filters – and it communicates with your existing Business Management System.

The Liebert Air Economizer system comprises a plenum with air mixing box; dual enthalpy controls with Liebert iCOM control (temperature/humidity sensors for outdoor air, return air and supply air). The Liebert Air Economizer system must be applied to each CRAC unit.

Three Stages of Cooling

Depending on environmental conditions, the Liebert Air Economizer will adjust to cool your IT environment with:

- 100% outdoor air
- Mixed outdoor air and compressor/pump cooling
- 100% compressor/pump cooling

Savings

The Liebert Air economizer system delivers an average annual energy savings of 30–60%.

Solution Compatibility

	GLYCOOL Cooling	Chiller Plant Economization	Liebert Air Economizer	Liebert iCOM Control
Liebert DS upflow	X			X
Liebert DS downflow	X		X	X
Liebert CW upflow		X		X
Liebert CW downflow		X	X	X
Liebert XD™ Systems		X		X
Liebert Challenger 3000	X	X		X
Liebert Deluxe System/3™ downflow systems retrofitted with Liebert iCOM controls	X		X	X

Why Liebert Products and Services?

- **Liebert iCOM control** – Dynamically optimizes both the precision cooling system and the operating parameters of air-side economizer systems
- **Temperature and humidity sensors** – Our sensors focus on both temperature and humidity, because ignoring the impact of humidity can have a serious short- and long-term impact on your IT equipment and your facility's infrastructure
- **Service** – Industry-leading local service and support network ensures timely maintenance, service and parts availability

- **A long history of success** – Liebert DS and Liebert CW represent the newest generation of the industry's most reliable and popular precision cooling system, the Liebert Deluxe System/3
- **Compatibility** – The Liebert Air Economizer System can be used with the Liebert DS and Liebert CW – as well as the Liebert iCOM Control

Liebert CW Chilled Water Based Precision Cooling is designed to handle high heat loads

Liebert DS Precision Cooling System provides precise, reliable control of room temperature, humidity and airflow

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, data centers, 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, monitoring, 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 data center infrastructure to reduce costs and deliver high availability.

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