



## Bay Area Internet Solutions

Founded in 1995, Bay Area Internet Solutions is one of Silicon Valley's leading facility-based providers of co-location, high-speed Internet access and managed hosting solutions for small, medium and large enterprises worldwide. The company specializes in providing high-availability, scalable and reliable managed IT service solutions tailored to meet each customer's specific applications and requirements.

### Background

Bay Area Internet Solutions (BAIS) is one of the largest managed service providers in Northern California. After several significant service expansions in the early 2000s, the company set out to design and build its second co-location facility in Santa Clara, Calif. A "Green Colo" facility, the data center offers up to 45,000 square feet of raised floor space and is the first Tier IV data center in Silicon Valley to employ the latest in efficient cooling technologies to maximize savings and minimize energy consumption.

### Case Summary

**Location:** Santa Clara, Calif

**Products/Services:**

- Knurr Cold Aisle Containment (CAC) System from Emerson Network Power
- Knurr Racks and Enclosures
- Liebert CW Computer Room Air Conditioning (CRAC) units with Variable Speed EC Plug Fans
- Liebert Precision Power Centers with Expansion Cabinets
- Liebert FDC Power Distribution Cabinets
- Liebert SiteScan Monitoring

**Critical Need:** Build and support a world-class, energy-efficient Tier IV facility that delivers 99.999 percent availability to global customers with 24/7/365 operations.



## Results

- Engineered an efficient power and cooling infrastructure capable of supporting capacities as high as 300 W per square foot.
- Implemented next-generation cooling technologies to increase efficiency up to 30 percent and achieve a low overall power usage efficiency (PUE) rating of 1.4.
- Capitalized on a redundant, N+1 power architecture to ensure 99.999 percent availability.
- Leveraged an on-site monitoring system to enhance service responsiveness and optimize equipment operation.
- Integrated power protection equipment with standard energy-efficient transformers capable of achieving 98.7 percent efficiency.
- Incorporated high efficiency technologies into the cooling infrastructure to save an estimated four million kWh per year, earning a maximum grant allocation from Silicon Valley Power for energy efficiency.



***BAIS estimates that using a hot aisle containment strategy with in-line cooling would have increased building costs by roughly five hundred percent over cold aisle containment.***

## The Situation

By 2005, Bay Area Internet Solutions (BAIS) had become an established player in Silicon Valley's competitive co-location industry. Supported by a single, 24,000-square-foot internet data center (IDC), the company served hundreds of customers from small start-ups to Fortune 500 companies, all looking to BAIS for expertise in providing the best support for their IT requirements.

As the company's global customer base continued to expand – many seeking a comprehensive co-location partner to support their always-on operations – BAIS began planning for the construction of a new co-location facility adjacent to its Santa Clara headquarters in late 2006.

In designing the data center, eliminating unforeseen downtime was the utmost priority, and tolerance for maintenance windows was narrow. “For our customers, downtime is intolerable,” says Tom Wye, president and CEO. “They come to us to have service that doesn't go down, so we needed an electrical system that allows us to operate and to do maintenance without causing downtime to our customers.”

To meet customers' need for high-availability services, the 83,000-square-foot facility with 45,000 square feet of raised floor at full build-out would need a robust power infrastructure with N+1 redundancy to consistently deliver “five nines” (99.999 percent) of availability. It would also need to be modular in design in order to support future growth and technology upgrades without impacting uptime.

“From electrical to mechanical, all the systems within the data center needed to be built in a scalable fashion,” says Wye. “This would allow us to precisely meet our



***A fan wall comprised of more than 200 fans along the building's exterior takes in 200,000 CFM of cool air from the outside, which is filtered as it enters the air plenum corridor.***

customers' current demands, and as things change, upgrade our systems and add additional capacity without affecting systems that are already in place.”

Customer demand also dictated the need to accommodate as many as 45 servers in a single rack – translating to power densities upwards of 300 watts per square foot. Understanding the significant impact heat can have on a facility's reliability, BAIS was faced with the challenge of finding a next-generation cooling solution that would reliably and efficiently maintain optimal operating conditions for its customers' sensitive equipment.

Finally, to ensure the highest levels of responsiveness from its service personnel, BAIS needed to be able to monitor every piece of equipment impacting the facility's operation, from CRAC units to each customer's individual branch circuits.

## The Solution

The BAIS design team recognized that the deployment of high availability, mission-critical IT equipment often translates to marked increases in power and cooling costs.

“Our customers were demanding 100 percent uptime, and our service level agreements mandated 100 percent uptime on power and cooling,” Wye says. “By and large, some of the greatest costs in the data center come down to power utilization, so to preserve our bottom line while fulfilling our obligations to our customers, we needed to use the most efficient products available.”

“We wanted a vendor that could deliver an integrated solution set, and Emerson Network Power was the only company that could deliver an integrated power, cooling and monitoring solution that provided energy efficiency without compromising on availability,” he continued. “We’ve had a long-term relationship with Emerson Network Power in our previous data centers, and in my 14 years of experience in data centers, I’ve always depended on Liebert products for cooling and power distribution.”

After researching a number of power distribution units to support the new data center, Wye and his team determined that the installation of six 300 kVA Liebert PPCs (Power Protection Cabinets) with standard TP-1 transformers that provide up to 98.7 percent efficiency would provide the highest levels of efficiency and reliability. Power in the facility is fed from the Liebert PPCs to 18 Liebert FDC power distribution cabinets.

To house customer hardware, BAIS needed to provide rack enclosures capable of handling up to



***“EC plug fan technology within the CRAC units allows us to automatically throttle up and down based on pressure under the floor, giving us the ability to be between 10 and 30 percent more efficient.”***

***Tom Wye,  
President and CEO, BAIS***

45 high-density servers without sacrificing scalability down the road. The design team selected 47U Knurr racks from Emerson Network Power to provide an ideal balance of flexibility and ruggedness.

“The Knurr racks’ state-of-the-art rails and panels make it much easier for our customers to install additional servers as their capacity needs increase,” says Brian Trang, BAIS’s technical support manager. “The Knurr equipment is also built from very solid metals, ensuring that our customers can install their servers securely and efficiently.” Furthermore, the enclosures’ perforated doors with four-point combination locks allow for up to 83 percent airflow, enabling the racks to be easily cooled without compromising the security of the equipment inside.

During the design phase, BAIS carefully considered both hot aisle and cold aisle containment strategies. In partnership with their Liebert representative, the team determined that Emerson Network Power’s cold aisle containment system, with an airtight Plexiglas corridor and more than 450 CAC-optimized

Knurr rack enclosures, would boost overall cooling efficiency while simultaneously achieving rack densities upwards of 10 kW.

“We’re bringing cold aisle containment into the co-location market,” Wye says. “This is one of the first data centers in Northern California to deliver more than 500 racks of cold aisle containment.”

“What makes cold aisle containment great is it puts the cold air where it needs to be – right in front of the servers,” says Bob Montreuil, director of operations. “By forcing the air directly into the servers through the Knurr enclosures’ perforated doors, as opposed to throughout the entire room, you get more efficiency with the cold air that you generate.”

The implementation of a cold aisle containment strategy enables BAIS to manage optimum temperatures at the inlet of their customers’ IT equipment and allow the data center’s cooling units to work in load-sharing operations – maximizing system-level cooling efficiency without compromising availability. In addition, by ensuring a 100 percent separation of hot and cold air, BAIS is able to recover cooling capacity typically lost as a result of the mixing of hot and cold air, further enhancing cooling efficiency.

To bring cool air into the contained rack rows, BAIS capitalized on energy-efficient Liebert CW CRAC units with variable speed EC plug fan technology, paired with a large economizer uniquely integrated into the building’s design.

Essentially a “box within a box,” the data center floor is surrounded by a sealed air plenum corridor, which functions as an HVAC duct between the facility’s economizers and the data center’s CRAC units. A



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fan wall comprised of more than 200 fans along the building’s exterior takes in 200,000 CFM of cool air from the outside, which is filtered as it enters the corridor. Air from the corridor is used to supplement the air taken in by the Liebert CW units along the data center’s perimeter walls, allowing chillers to throttle to achieve maximum efficiency.

After the air is filtered a second time by the Liebert CW units, cool air is delivered under the data center’s 30-inch raised floor and directly into the cold aisles. The Liebert CW units are equipped with Variable Speed EC Fans which allow the units to adapt their capacity to the IT load in the room, reducing energy consumption 10 to 30 percent. After passing into the cold aisle containment system and through the server racks, hot air is exhausted outside the containment system back to the CRAC units.

To maintain “clean room” air quality standards, BAIS supplemented its redundant filtration system with an integrated building management system capable of shutting down the economizer if it detects tolerances out of the norm, such as smoke.

To tie all of the data center's systems together and gain visibility into their operations, BAIS turned to Emerson Network Power's Liebert SiteScan critical facility monitoring system. Using Liebert SiteScan, BAIS is able to comprehensively monitor the utility feeds coming into the building, UPS feeds, overall chiller usage and cooling tower usage. The system also monitors overall usage of branch circuits and automatically sends out alarms to customers before a circuit pops.

"We looked at several technologies on the market, and Liebert SiteScan gave us the best ability to look at our overall power load," says Wye. "Liebert SiteScan integrates all of our equipment, including third party products, and gives us a graphical look at our overall infrastructure in a schematic with alarm capabilities if something goes out of the normal ranges."

"Using Emerson Network Power's Liebert power and cooling products in tandem with the Liebert SiteScan monitoring system, we can ensure that all of our products are running at optimum intensity, and deliver the greatest level of reliability in our data center," Montreuil says. "The system gives us the ability to monitor hundreds of critical points that we can track in our network operation center, giving us complete control to run our power and cooling systems at optimum speeds—and in our business, that means greater availability and efficiency without compromise."

## The Results

With the data center complete, Wye says he is pleased with the ability of the infrastructure to achieve efficient performance without sacrificing availability.



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President and CEO, BAIS***

"The Liebert products, especially the branch circuit monitoring capabilities and the Liebert FDC, give us real-time data on power utilization that we can pass along to our customers," Wye says. "Our customers go through peaks during their production runs where power will spike based on server load, and the circuit monitoring technology in the data center really gives us the data that our customers are looking for."

On the cooling side, the implementation of a cold aisle containment strategy paired with a unique economizer that supplements the data center's CRAC units has enhanced the data center's hot and cold air separation and enabled BAIS to achieve the most efficient cooling capacity of any data center in Silicon Valley. According to Wye, the design team projected that building a hot aisle containment strategy with in-line cooling would have cost roughly 500 percent more.

"Here in Northern California, we anticipate that we will effectively run the economizer 85 percent of the time," says Wye. "On top of that, the EC plug fan technology within the CRAC units allows us to automatically throttle up and down based on pressure

under the floor, giving us the ability to be between 10 and 30 percent more efficient.”

BAIS estimates that its innovative cooling design comprised of the air economizer system, cold aisle containment and EC plug fan technology could save more than four million kWh in energy consumption each year. The energy savings were not the only financial benefits BAIS experienced from the efficient design — the data center’s cooling efficiencies qualified BAIS for several efficiency grants from Silicon Valley Power, earning them the maximum grant allocation available in a given year.

With integrated power, cooling and monitoring from Emerson Network Power, BAIS is able to confidently achieve the “five nines” of uptime demanded by its customers while also achieving power and cooling efficiencies unmatched in any Silicon Valley data center.

“We took 24 months to design a high-density co-location facility that is very green and economical to run, while also very stable, so that our customers can run their applications with confidence in our infrastructure,” says Wye. “From a facility point of view, we can deliver a product to the market that has a two percent vacancy rate and is designed around best-of-breed products and practices that are simply unmatched in the industry.”

For more information on Liebert technology from Emerson Network Power, visit [www.Liebert.com](http://www.Liebert.com). For more information about Bay Area Internet Solutions, visit [www.Bayarea.net](http://www.Bayarea.net).



***Liebert PPCs with standard TP-1 transformers provide up to 98.7 percent efficiency.***

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