AIRSYS

CASE STUDY

# How The AIRSYS UNICOOL System Saves a Fiber Network Facility $11,700 Annually

# Table of Contents

# Project Summary

The tall tale of vast electricity savings has always been a sales pitch many facility engineers have heard over the years from sales engineers claiming their product has the potential to save them thousands annually. What it really comes down to in most instances are the energy efficient technologies used in HVAC systems. The research and development team at AIRSYS was an early adopter of adding new energy efficient technologies like free cooling and inverter driven compressors into their HVAC units. These two technologies have allowed us to quielty let our systems do the talking and save our clients money in the process. We are proud to share the true tale of vast electricity savings thanks to the data our trusted client shared with us during the process of an HVAC upgrade at their facility located in Laurel, MT. We gathered a year of stable utility data and have projected an approximate **annual savings of $11,700.00** in electricity savings that is directly attributable to the installation of the new AIRSYS HVAC equipment.

One notable engineering feature that dramatically reduced the HVAC energy use on site was largely due in part to free cooling. Free cooling is a method of allowing low external air temperatures to bypass the mechanical cooling stage and exchange its heat with lower outdoor air temperature. This bypass process of free cooling can reduce energy, lower maintenance costs and overall operational costs.

AIRSYS was the first manufacturer to develop a Wall Packaged Unit (WPU) with a variable speed compressor. AIRSYS designed the UNICOOL Unit specifically for computer and equipment environments with the cooling capacity heavily shifted toward sensible heat removal.

Our goal was to develop a WPU that was not only extremely energy efficient, but also made with high quality components. The UNICOOL unit is designed to withstand extreme climate zones and has proven to be reliable due to the quality craftmanship that went into the design of this high-performance unit. The inverter driven scroll compressors that come standard in every UNICOOL system helped reduce electricity usage on site that is noted in the lower Power Usage Effectiveness (PUE).

# Background Information

In the fall of 2018 our AIRSYS Field Services team met a long time client on site to discuss replacing the end of life (EOL) HVAC equipment with AIRSYS UNICOOL systems. The site was primarily being cooled by (2)AAON 15 ton Roof Top Units (RTU) that were ducted into the facility along with (2) ducted Liebert Challenger 5 ton units that sat inside the facility. One of the Challenger units was offline due to a failed compressor and one of the AAON units was in and out of alarm stages with issues involving the refrigeration cycle. With about a 22 Ton IT load in the site the 35 Tons of operational HVAC equipment was not keeping up with the cooling demands on site.

| Existing 15 Tons of HVAC Equipment | Tonnage | Operational Tons |
|---|---|---|
| Two 15 Ton AAON RTU Package Unit (ducted) | 30 Tons | 30 Tons |
| Two 5 Ton Liebert Challenger CRAC units | 10 Tons | 5 Tons |

The large existing space is comprised of IT equipment positioned on the east side of the shelter and the power plant and batteries on the west side of the shelter. The client was planning to install more rows of IT equipment on the west side of the facility, so the heat loads were going to increase with the addition of the new IT equipment. Duct work was used to try and deliver cold air to random warm spots.

*Two AAON RTUs ducted into facility from north side of shelter*

*Satellite image of the Laurel facility*

*Existing AAON RTUs duct work*

*Existing AAON RTUs duct work*

*Existing Liebert Challenger Units (against the wall in dark grey)*

*Extensive duct work throughout the facility*

*Rack systems and IT equipment*

*Rack systems and IT equipment*

# HVAC Upgrade Details

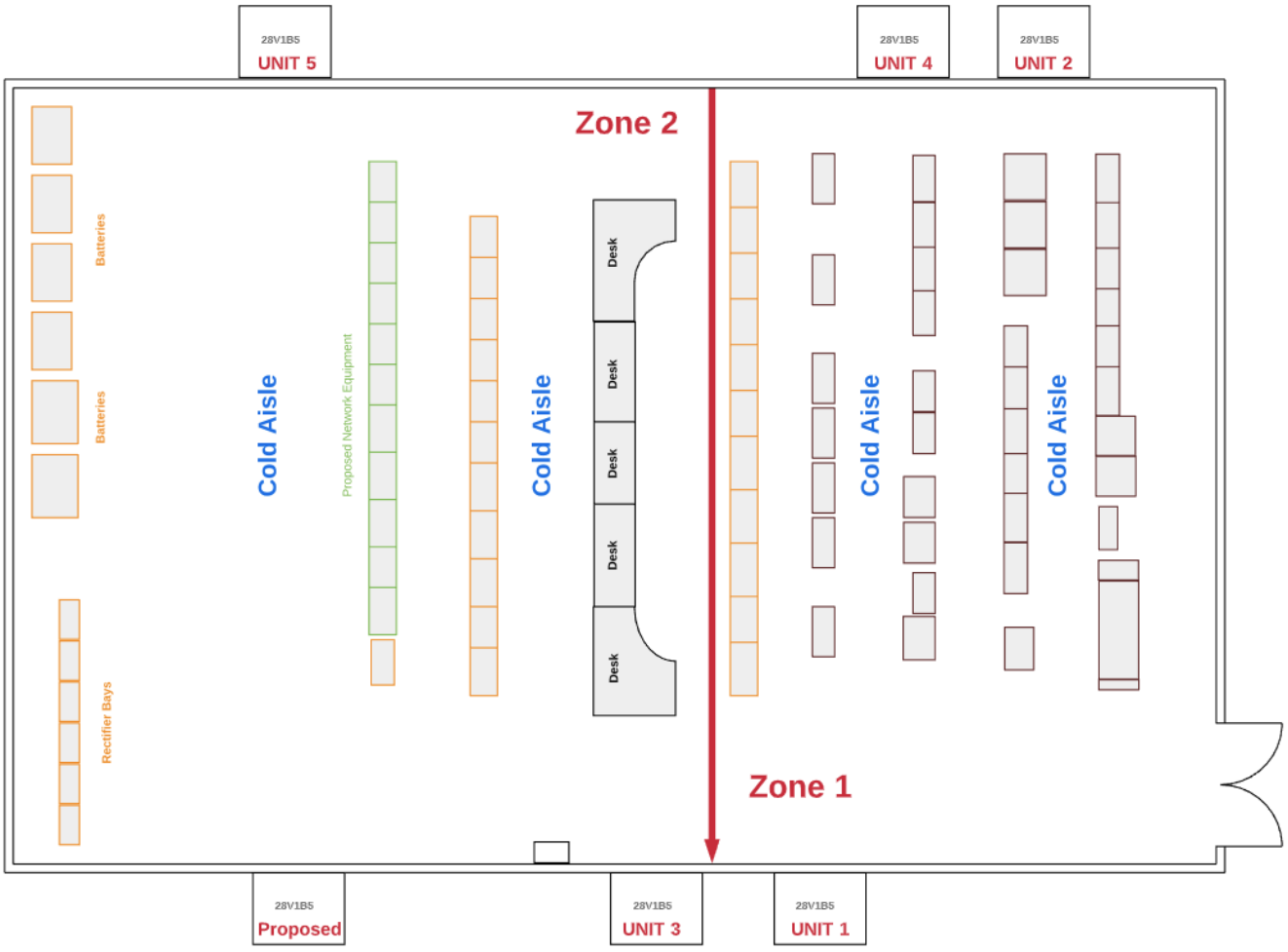
The upgrade had to address the general replacement of EOL HVAC equipment as well as the challenge of air flow to the right places in such a large open space. AIRSYS chose to deploy the newest UNICOOL variable capacity Wall Packaged Units (WPUs) in order to address the air flow challenges and provide plenty of total capacity to ensure a minimum of +1.0 protection for the sites.

The new systems deployed were the following:

- Qty. (5) 28V1B5 // Bottom Supply 5-10 Ton UNICOOL variable capacity WPUs with integrated free cooling (economizers).
- Qty. (1) ASMUC.6 // AIRSYS Multi-Unit controller that can manage 6 (expandable to 16) UNICOOL WPUs with 4 unique control zones.

A total MAX capacity of ~ 50 Tons of cooling across 2 zones. This set the client up with the ability to double the IT load at the facility without requiring any additional HVAC capacity. Provisioned in the plans were a 6th 28V1B5 unit on the west end of the facility to allow for future IT equipment upgrades.

# Mechanical Plan Design



# HVAC Electricity Reduction

In order to capture the HVAC energy consumption and calculate how that electricity consumption has changed before and after the install, we collected utility bills for the site from OCT 2017 through Dec 2019 which include:

- Monthly kWh used
- Number of days in each month
- Average monthly utility rate (the heat load on site may fluctuate month to month. In order to calibrate for this, the load of the site is monitoring remotely.
- DC Plant load (all network equipment is powered through a -48 Volt DC plant)

With these data points we are able to determine average daily energy usage in each month, calibrate for change in load, and calculate the HVAC energy change before and after the completion of install (Dec 2018). Average daily data, change in DC load, as well as YOY change in HVAC energy consumption tabulated below:

## Average kWH/Day

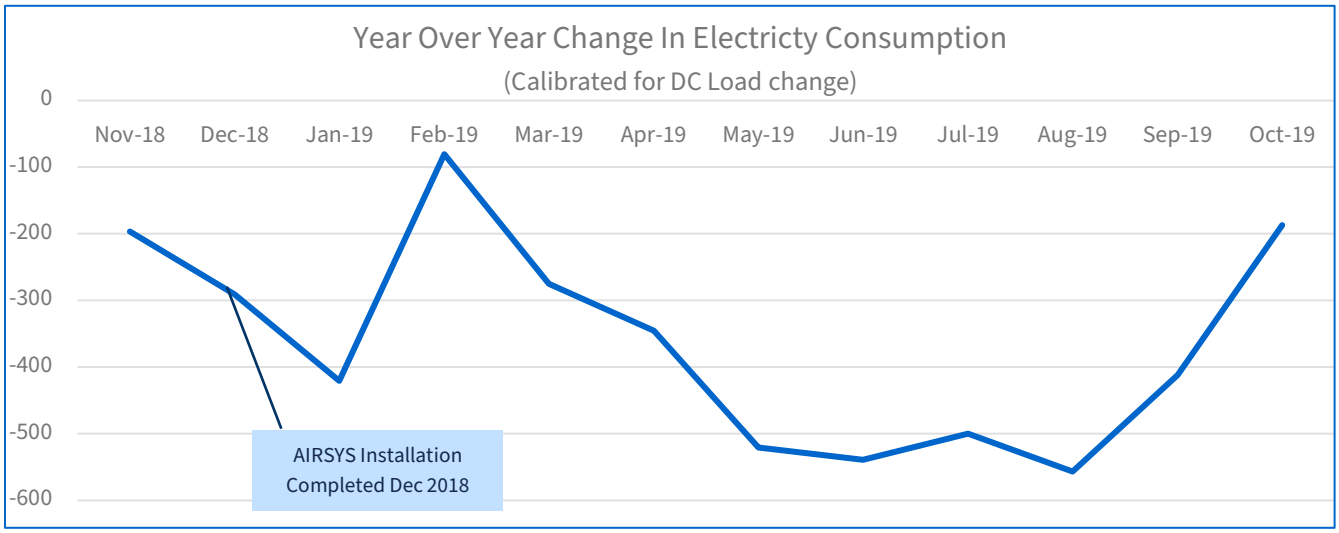
| | Januray | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2017** | - | - | - | - | - | - | - | - | - | 2293 | 2234 | 2163 |
| **2018** | 2048 | 1986 | 1956 | 2119 | 2271 | 2203 | 2640 | 2448 | 2372 | 2179 | 2318 | 2237 |
| **2019** | 1945 | 2447 | 2181 | 2301 | 2304 | 2190 | 2848 | 2584 | 2558 | 2600 | 2595 | 2593 |

## Year Over Year % Change in DC Load

| | Januray | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2018-2017** | - | - | - | - | - | - | - | - | - | -1.0% | 12.1% | 16.3% |
| **2019-2018** | 16.3% | 22.1% | 22.9% | 22.9% | 24.0% | 24.0% | 24.9% | 26.8% | 23.4% | 23.4% | 9.0% | 13.9% |

## Year Over Year Comparison of Average kWH/Day - Calibrated for DC Load Change

| | **Januray** | **February** | **March** | **April** | **May** | **June** | **July** | **August** | **September** | **October** | **November** | **December** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2018-2017** | - | - | - | - | - | - | - | - | - | -92 | -196 | -291 |
| **2019-2018** | -420.6 | -80.5 | -274.8 | -345.2 | -520.8 | -538.7 | -500.0 | -556.6 | -411.6 | -186.8 | 43.7 | -4.6 |

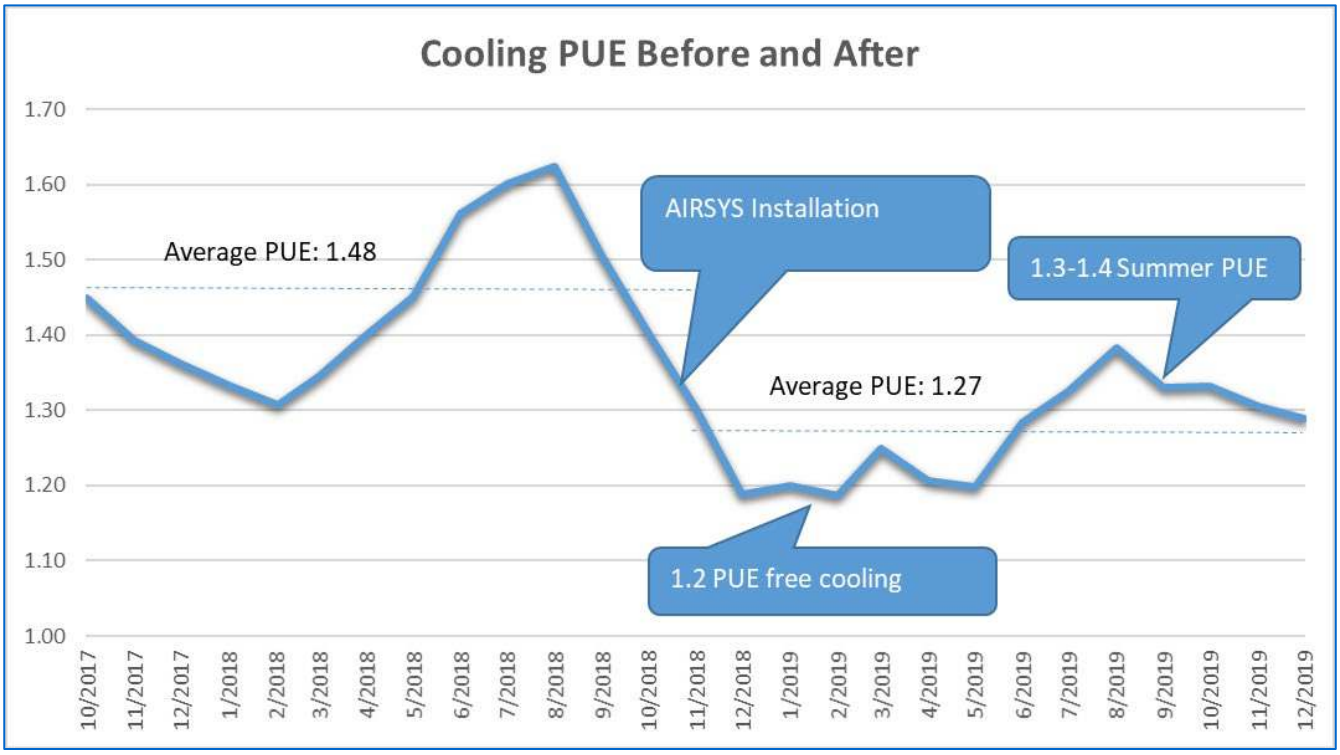



Aggregating 12 months of change in energy consumption

Annual Energy Savings: **24,196 kWh/yr ($11,693)**

# Change in Power Usage Effectiveness (PUE)

Power Usage Effectiveness (PUE) is the ratio between total energy usage of the data center versus the energy usage of the IT equipment. A PUE closer to 1.0 means most of the energy is dedicated for IT equipment, thus representing an overall more efficient data center. Conversely, a PUE much lower than 1.0 means a substantial amount of energy is being consumed to maintain the data center. In general cooling and other environment controls dominate the energy usage other than IT equipment and a reduction in HVAC energy is critical for getting the PUE closer to 1.0. By comparing the site and HVAC energy data before and after the install, we can determine the PUE at this site as seen in the graph below.



# Conclusion

The installation of the five (5) UNICOOL systems has accomplished a number of positive aspects for the client. By replacing the end of life equipment, they have improved reliability and eliminated future maintenance calls for failing equipment. The savings on electricity at the Laurel site will continue to be substantial over time due to the addition of free cooling. Free cooling will hold the site at set temperatures without the need for mechanical cooling during the winter months of December - February and heavily reduce the need for mechanical cooling during the the remaining nine months of the year. Additionally, in the warmer days of June – September the site will also experience a greater amount of Free Cooling hours, further reducing energy consumption during critical cooling summer months. Lastly, by adding tonnage using variable capacity technology, the client can cover the current IT equipment heat load without short cycling and creating a serious risk of damaging the HVAC equipment. This also leaves room for future growth, allowing for the cooling equipment to run efficiently and grow with the site while maintaining +1 redundancy. The team on site at Laurel is extremely satisfied with the new results and the site is now a model for future sites to follow in their vast portfolio of data centers throughout the state. The tall tale finally proved to be true and now our trusted client can safely say the proof this time actually is in the numbers!

*North side of the facility*

*Exterior pad and duct work connections*

*Interior AIRSYS Grilles*

AIRSYS

BALANCE THE ENVIRONMENT.

North America

## AIRSYS (NORTH AMERICA) SALES AND SERVICE CONTACT:


Sales Contact

Email: ASNsales@air-sys.us

Company Main: + 1 (855) 874-5380

Service Contact

Email: ASNsupport@air-sys.us

Company Main: + 1 (855) 874-5380


## AIRSYS GLOBAL SUBSIDIARIES CONTACT:


**AIRSYS REFRIGERATION ENGINEERING TECHNOLOGY (BEIJING) CO., LTD.**
Add: 10th floor, Hongkun Shengtong building, 19, Ping Guo Yuan Xi Xiao Jie,
Shijingshan, Beijing, China 100043
Tel: +86(0)10 68656161

**GU'AN AIRSYS ENVIRONMENT TECHNOLOGY COMPANY LTD.**
Add: 25, Dongfang Street, Gu'an Industry Park, Langfang City, Hebei Province, China
Tel: +86(0)10 68656161

**SHANGHAI AIRSERVE HVAC SYSTEM SERVICE CO., LTD.**
Add: #7-2, No.658, Daduhe Rd., Putuo District, Shanghai, China, 200333
Tel: +86(0)21 62452626 Fax: +86 (0)21 62459622

**AIRSYS AUSTRALIA SALES OFFICE**
Add: PO BOX 1088, Flagstaff Hill, SA, 5159, Australia
Tel: +61 479151080

**AIRSYS BRASIL LTDA.**
Add: Av. Moaci, 395 Conj 35/36 04083-000 – Planalto Paulista SAO PAULO – SP
Tel: +55 (11) 25976817 / +55 (11) 21585560

**AIRSYS DEUTSCHLAND GMBH**
Add: Dahlweg 120, D-48153 Münster Germany
Tel: +49 (0) 1757535054 / 251-97307478

**AIRSYS TURKEY - KLIMA SANAYI VE TICARET A.Ş.**
Add: Barbaros Mah. Evren Cad. Erzurumlular Sk. No:23 Ataşehir / Istanbul Turkey
Tel: +90(216) 4706280 Fax: +90(216) 4706290

**AIRSYS (NORTH AMERICA), LLC**
ICT and Human Comfort Cooling:
Add: 7820 Reidville Rd.
Greer, SC 29651 , USA
Tel: +1 (855) 874 5380
Web: https://airsysnorthamerica.com/

**MEDICAL COOLING:**
Add: 3127 Independence Dr Livermore, CA 94551, USA
Tel: +1 800 7131543
Web: https://advancedcoolingtech.com/

**AIRSYS SINGAPORE PTE. LTD**
Add: 50, Tagore Lane Entrepreneur Centre, #03-04 (F), Singapore 787494
Tel: +65 64991850
Fax: +65 68416301

**AIRSYS (UK) LTD.**
Add: 245 Europa Boulevard, Warrington, UK. WA5 7TN
Tel: +44 (0) 1925 377 272
Call Centre: +44(0)8456099950


www.air-sys.com