



CUSTOMER CASE STUDY

Growing green: UC Davis is using operational data to reach net-zero emissions goals by 2025

University of California, Davis - www.ucdavis.edu
Industry - Facilities

Goals

- Achieve carbon neutrality by 2025
- Improve HVAC scheduling
- Retrofit district steam heating

Challenges

- 1,000 buildings with diverse energy needs
- Self-sustaining budget
- Aging facilities infrastructure

Results

- Expected annual savings of \$150,000 from chilled water optimization and 62% reduction in gas usage from heating system retrofit
- 46% reduction in energy-use intensity since 2009, a cost savings of \$15 million
- Projected savings of \$197M over 60 years from shift to low-temperature hot water heating

Solutions

- AVEVA™ PI System™
- AVEVA™ PI Vision™
- AVEVA™ System Platform

Once an abstract specter, the physical effects of climate change have become commonplace across much of the globe. California has felt these early effects particularly brutally; in the midst of a two decades-long drought, the state's seasonal wildfires continue to shatter records each year. The University of California system, renowned for its scientific, agricultural, and environmental research, found itself at a crossroads.

It could either maintain the status quo or assume a central role in the fight against climate change. It chose the latter and, in 2013, pledged to reduce the carbon footprint of its nine colleges and universities. Acting in conjunction with this initiative, UC Davis, one of the University of California system's premier research institutions, pledged campus-wide carbon neutrality by 2025.

It was a bold vision for the future, but the task of implementing this vision fell to the university's operations and sustainability managers. After all, they would be the ones to turn promises into reality, and the challenge before them was monumental; 1,000 buildings totaling twelve million square feet sprawl across UC Davis's campus. On any given day, 50,000 people pass through UC Davis's storied halls. Due to the age of some of the buildings and systems, the facilities team's first steps were obvious. They retrofitted older buildings' HVAC systems and improved insulation. They installed automatic lighting in classrooms and labs. However, after modernizing the facilities, UC Davis still fell short of its sustainability goals.

“We’re trying things. We’re experimenting. We’re very much open to a pragmatic, experimental, but always optimistic approach toward solving the problems.”

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Camille Kirk
Director of Sustainability, UC Davis

To achieve the college's goal of net-zero carbon emissions by 2025, facilities operators knew they'd have to rely on their experience and creativity, but they'd also need additional help from a real-time operational data platform – a strategy championed by Camille Kirk, UC Davis's Director of Sustainability.

“You can't manage what you don't measure is really true in sustainability,” Kirk said. “We do a lot of sustainability performance assessment, and we also do a lot of data analytics on campus.”

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Historical and real-time data drive real change

UC Davis installed AVEVA PI System in 2006 – a forward-looking investment that began to pay exciting and unexpected dividends in 2013 – as the university charted a path toward carbon neutrality via three key sustainability initiatives.

First, UC Davis would use data to optimize its chilled water system. The university was already using AVEVA System Platform to control nearly all its utilities, from the wells, pumps and chemical controls for water, to its wastewater treatment plant, central heating and cooling, and gas. So, it was able to evaluate and adjust control algorithms in AVEVA System Platform to operate utilities at maximal efficiency.

For example, one newly adjusted algorithm prioritizes chilling water with cooling towers instead of with chillers, which use more electricity. When engineers do have to use water chillers, they use AVEVA PI System to determine how they can run them when electricity prices will be least expensive. To date, the sustainability measure has saved over \$15,000, with an expected annual savings of \$150,000.

“One of the challenges we face in a system like this is data comes from many sources,” Dr. Ahmet Palazoglu, Professor of Chemical Engineering at UC Davis, said. “Being able to integrate and make sure all the data is coming to the same place is important.”



For example, UC Davis has its electric data in a Schneider Electric system, while its water-use data is in AVEVA System Platform. AVEVA PI System integrates data from these two systems to calculate how much chilled water each unit of electricity makes and displays that measurement publicly.

The second energy initiative at UC Davis has been to improve HVAC scheduling and study the campus's energy use patterns. The university's real-time data and AVEVA PI System dashboards make scheduling heating and cooling more efficient, with an innovative way to measure building usage. Facilities operators monitor Wi-Fi traffic to help determine building occupancy. "We've increasingly used this to help us turn down our buildings when they're not occupied," UC Davis Engineering Supervisor, David Trombly, said. "We have scripts that look at the schedule and change our control system to turn off when we don't expect anyone there." With the notifications capability in AVEVA™ PI Server, building managers can receive alerts if there's an unexpected spike in Wi-Fi traffic.

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Designing for the future

The third initiative, named "The Big Shift," is an ongoing project to retrofit the university's old steam heating system. As facilities managers began to weigh their options, the question arose: Would it be more efficient, both in terms of costs and emissions, to repair or replace the system? Data provided the answer; UC Davis used real data collected by AVEVA PI System to inform the design, rather than use theoretical models.

By using the wealth of baseline data stored in AVEVA PI System to run different scenarios, campus engineers determined that switching to a low-temperature hot water system would save the campus money and emissions in the long run. Electricity use will rise, but that energy consumption can be offset with renewable energy sources to maintain carbon neutrality. After the switch, the campus expects a 62% reduction in gas usage and to save an additional 570,394 MMBtu (Metric Million British Thermal Unit).

"The project is going to get us a long way toward the goal," Trombly said. "We're using the AVEVA PI System for improved capacity planning; gathering all this data and creating baselines eventually empowers us to design our systems better." UC Davis estimates it will save \$197 million over the next 60 years as a result of its Big Shift from steam heating to its low-temperature hot water system.

