CUSTOMER CASE STUDY

How the University of Massachusetts uses AVEVA™ PI System™ to supply energy effectively and efficiently

University of Massachusetts - www.umass.edu
Industry - Facilities
Partner - Radix

Challenge

- Improve efficiency and reduce costs at the Combined Heat and Power plant on the UMass campus, a system that has multiple data sources and dozens of configurations, while considering fluctuations in demand, weather, and fuel prices.

Solution

- Radix used PI System to collect and monitor data and develop an advisory system for operators and engineers. This allowed UMass to make efficient and cost–effective decisions while meeting campus demand.

Result

- UMass reduced operation cost by three percent or about $900,000 in savings per year. Production results are also now available outside of the control room as an educational tool for students.

The University of Massachusetts (UMass), located in Amherst, has a population of over 28,000 students, 1,300 faculty, and 5,000 staff. With growing enrollment – a 17% increase over the past 10 years – the university faced pressing business and technical challenges. Since 2004, expansion projects have added $1 billion in new facilities, buildings, and infrastructure to the campus. This has increased the demand for electricity as well as for the data that this electricity demand produces. UMass hired Radix Engineering and Software (Radix) to help improve efficiency and reduce costs. UMass now uses the smart interfaces and robust technology of PI System – an open, operational data infrastructure that empowers enterprises in real time – to realize the full potential of data gathered on campus.

Overcoming challenges by setting goals

The majority of efficiency losses on the UMass campus are due to the support of its buildings' heating, cooling, and electric systems. The university has one Combined Heat and Power (CHP) plant to supply steam and energy to meet campus demands. Eighty-five percent of the energy generated from this plant is distributed throughout the campus through 25 miles of steam piping and the CHP attributes 15% energy loss to steam distribution heat loss and the use of energy to run its plant. Annual steam and power demands vary widely, with higher consumption during cold seasons and lower during hot seasons.

A fast-growing student body led to many new building projects and increasing demand for steam and electricity. Growing enrollment also meant a greater demand for data, but due to cybersecurity concerns, UMass had difficulty to visualizing its data outside of the plant control room. A wider variety of equipment, control systems, and instrumentation on campus with multiple networks needed to communicate with one another. UMass needed a more data-driven approach to optimize operations and decision-making, but before it could change its approach, UMass had to consider various plant configurations, fluctuations in demand, and changes in weather and fuel prices.

UMass hired Radix, a Brazilian-owned engineering and software development company, to help improve efficiency and reduce costs with the following goals in mind: First, the university wanted to deliver better visibility by building a set of dashboards that properly reflected the needs of operations and management teams. It wanted these teams to be able to make seamless decisions based on the real-time presentation of data. It wanted to predict operating conditions that optimized costs and production given dozens of possible plant configurations. In addition, because operators must make decisions based on fuel cost, it needed the system to track fuel cost information in real time. Finally, this project aimed to add value to student education by providing better data visibility, as certain courses and teams (e.g., the carbon mitigation team) required that data be readily available, and it needed to make this data available while also maintaining cybersecurity on campus.

How the PI System made these goals attainable

Radix engineers divided this project into two main phases. The first phase entailed monitoring all current assets. Engineers mapped machines and support equipment in the plant and used this to build a model that provided more visualization for the process. In the second phase, Radix provided real-time, price-data information and made calculations for energy production and steam generation. This information allowed engineers to formulate a plan to optimize the engineering analysis.

To address the challenges of the first phase, Radix implemented PI System to collect, store, and manage data from the plant. After the PI System server was installed as a consolidator for these data sources, Radix used the data to feed optimization and efficiency models, forecasts, and key performance indicators. Radix displayed and accessed the data via AVEVA™ PI Vision, a visualization tool that is used to quickly and securely access all PI System data. The project also made use of Asset Framework (AF) and analytics capabilities for complex calculations and contextualization. The AF is a single repository for asset-centric models, hierarchies, objects, and equipment, which integrates and further analyzes data from multiple sources. PI Vision dashboards were integrated with the AF to provide real-time trend data and analytics to end users.

> "We've standardized the data and reduced operation cost by three percent or approximately $900,000 per year by making real-time decisions on major equipment based on current energy market prices."
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> **Steve Lemay**
> Central Heating Plant Manager

During the second phase, Radix used PI System to perform an energy assessment for the development of an Advisory System, an important tool to help operators keep the plant operating at maximum possible efficiency. Radix also used Thermoflex V27.0 software (Thermal Balance Simulation Software) to simulate scenarios, improve efficiency, and identify opportunities in the plant. This allowed Radix to provide engineers and the management more insights about the plant using engineering analyses, Analytics, and Event Frames. Regarding cybersecurity, Priscilla Gomero, automation engineer at Radix, explained that they chose to use PI System because it "limits direct access to critical systems and allows the user to see this information in a secure way." PI Vision web dashboards allow engineers to easily view the information remotely and share with others outside of a control room setting. This allowed professors to consult information in real time directly from the classroom.

Radix was able to develop custom tools to store real-time price information, compile representative operating configurations of the CHP, simulate the plant under different configurations, and then store models within PI System. The plant supervisors and engineers used this information to make decisions regarding power output, fuel utilization and logistics, equipment runtimes, and root cause analysis for equipment failures or substandard performance. As a result, UMass was able to reduce operation cost by three percent (approximately $900,000 per year) by making real-time decisions about major equipment alignment based on current energy market prices.

"We integrate PI System simulations which help [engineers and operators] suggest the most efficient configuration to run the plant."
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Priscilla Gomero
Automation Engineer at Radix

For more information about **how** Universities **are using** AVEVA PI System, **click here!**