Energy-efficiency concerns remain a top priority for institutional and commercial organizations. Managers are ramping up their efforts to find savings related to heating, ventilation and air conditioning (HVAC) systems, including chillers, boilers, and air-handling components.

Traditional building management systems typically have stand-alone applications with separate monitoring and control stations for HVAC Controls, energy metering and power management, central plant equipment and lighting. While each application is beneficial on its own, the real power lies in managing them as one, intelligent solution.

Customer Profile

In this case study our customer is one of the biggest providers of maintenance services on industrial HVAC systems - the European leader in the design of conditioning systems and solutions, helping more than 1000 customers a year. The Energy Audit worked together with the maintenance services provider on the production site of one of their oldest customers - a pharmaceutical plant in Latina (Italy). In 2012, the Latina plant became part of a global company initiative aiming at energy consumption reduction and sustainability improvement.

Customer needs

Our customer (the HVAC service provider) offers maintenance services, system efficiency services, and performance optimization services. They share the achieved savings with their clients and offer advanced management strategies to further add value. What they were looking for, was a system that could make their diagnostics faster and that could also allow them to identify and validate energy efficiency actions. They knew that HVAC usually accounted for 22% of electricity consumption and estimated that by 2016 51% of savings resulting from energy efficiency action will be related to HVAC systems.

"Now we know our equipment really well. We know also how to maximize its performance and how to reduce our maintenance intervention time."

Antonio Galante, Italian Technical Service Director
Therefore they asked the Energy Audit to do an HVAC pilot project for one of their customers – the pharmaceutical plant in Latina – who spent annually 2m euro on electricity. The project goal was to reduce annual HVAC consumption by 5% and to decrease annual maintenance costs by 3%.

The Energy Audit’s solution

The software solution we designed had the purpose of not only reaching the set goals but also of developing a standard for a future installation. This is why we integrated the main parameters from the SCADA system the pharmaceutical plant already had in place.

Unfortunately the client didn’t have any historical data available, so the first phase of the project was dedicated to monitoring. Once we established our energy monitoring platform, we managed to identify inefficient usage of the HVAC system and to promote improvement actions. At that phase the customer started saving from a consumption point of view. Furthermore, compared analysis between consumption and room temperature let the Energy Audit identify a problem in a temperature sensor. A system error of 2 degrees was increasing the electricity consumption of a cooled area. This small problem alone was causing an overconsumption equivalent to 1000 €/year.

![CUSUM chart](image)

Savings reported after the installation of the HVAC Service Centre

After 3 weeks the monitoring software had collected enough of 15’ data from meters and sensors, that we started modelling the energy consumption of the HVAC system. This approach allowed us to understand and predict the consumption profile of every piece of equipment. Thus, we were able to identify all energy waste and inefficiency and set up a real-time system of automated control on energy consumption.

Results

Once consumption and costs were accurately predicted, the maintenance services company used CUSUM control charts (generated by their own software package) to offer their customer an on-going service of consumption control and instant failure detection. As a result of the Pilot the pharmaceutical plant was able to:

- Identify HVAC system failures on main components, such as terminal boxes, in 5 days instead of 6 months;
- Understand the effects of interventions coming from an energy point of view;
- Identify failures on critical components, such as a water flow pump, allowing for planned maintenance and avoiding motor replacement, for an estimated saving of €3,500;
- Remotely diagnose low-cost components, such as temperature sensors or valves, reducing maintenance costs by 10%;
- Reduce the time necessary for failure diagnostics by 30%;
- Improve maintenance actions and optimize equipment set-up parameters, such as refrigerant flow, bringing in another 3,000 €/year in gains;
- Produce an energy consumption budget for an HVAC system;

Overall, the pharmaceutical plant saved €30,000 in one year (which constitutes 10% of their annual HVAC electricity costs). This convinced the plant facilities manager to extend the monitoring system to their other main sites.

The Energy Audit’s Energy & Efficiency platform also saved the maintenance service company 8% on their total maintenance costs and reduced their mean time to diagnosis by 5%. They also installed the HVAC service centre system to other 5 of their customers, which resulted in significant increases in profit.