



SkySpark

Find What Matters™

Case Study

**Vermont Hospital:
Advanced Analytics as a
Preventative Maintenance Tool**

August 1, 2015

SkyFoundry

www.skyfoundry.com



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Vermont Hospital: HVAC Preventative Maintenance Program Project

Overview

Large scale buildings usually have a preventative maintenance (PM) program of some kind for their HVAC system. The PM usually includes scheduled filter changes, replacement of belts, and other parts and pieces of major equipment, but one item that is commonly left out is calibration of the controls and sensors on the HVAC equipment. The old way of taking care of the controls was “if it hasn’t failed then it still works”, but what most people don’t understand is that sensors and controls can still be functional but not accurate. These non-calibrated devices can result in excess energy consumption that goes unnoticed for months or even years.

SkySpark® can be used to identify when calibrations need to be done and what kind of energy impact it will have if left alone. SkySpark® can also make a HVAC controls PM more cost effective by autonomously identifying when maintenance work needs to be done and reporting the energy savings resulting from various fixes.

Case Study: Vermont Hospital

Location

Building Type – Building type – Large scale hospital (>500,000 ft^2), Vermont US

Issue Description

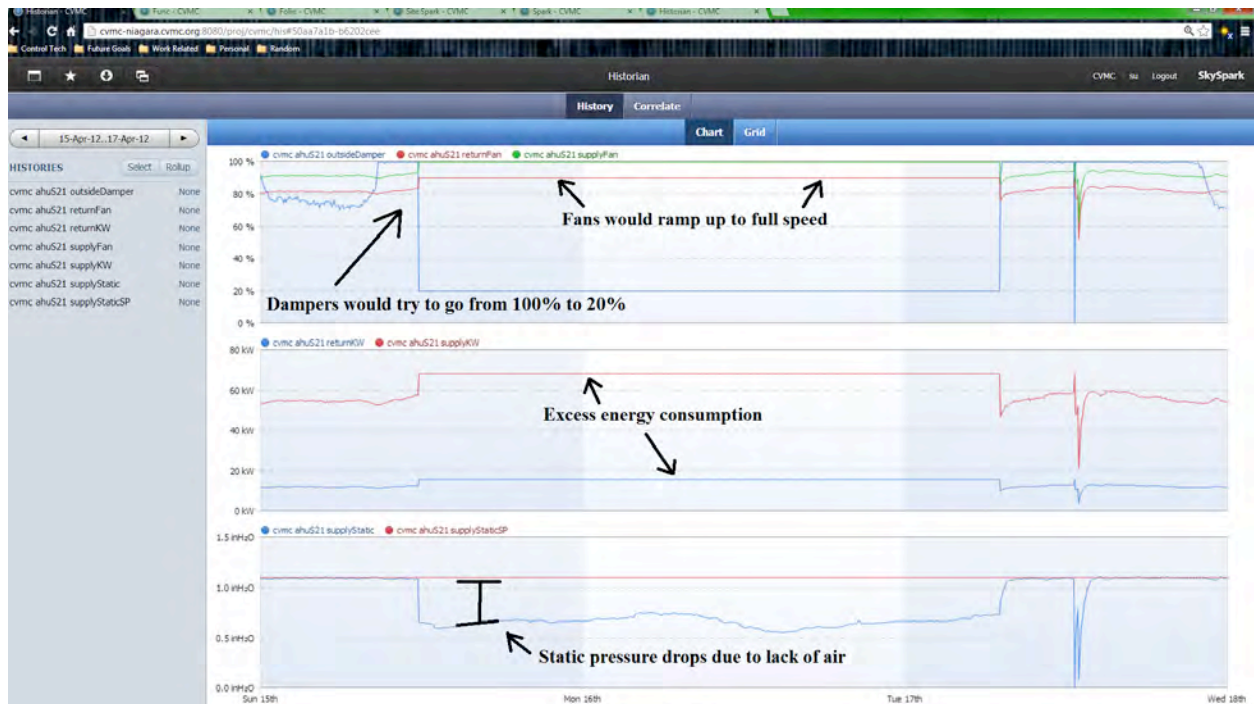
The hospital had a PM program for all the air handling units (AHU) which included frequent filter changes, belt changes, and cleaning of the coils, but there was no program in place for calibrating the controls and sensors for the equipment. The majority of the units didn't even include commissioning of the controls during the original installation. It was also discovered that there were several sensors and control devices that were 20+ years old that have never been calibrated. With the help of SkySpark® there were several issues that were identified and for some of the problems SkySpark® was able to report the costs of the excess energy being used that went unnoticed.

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The Results

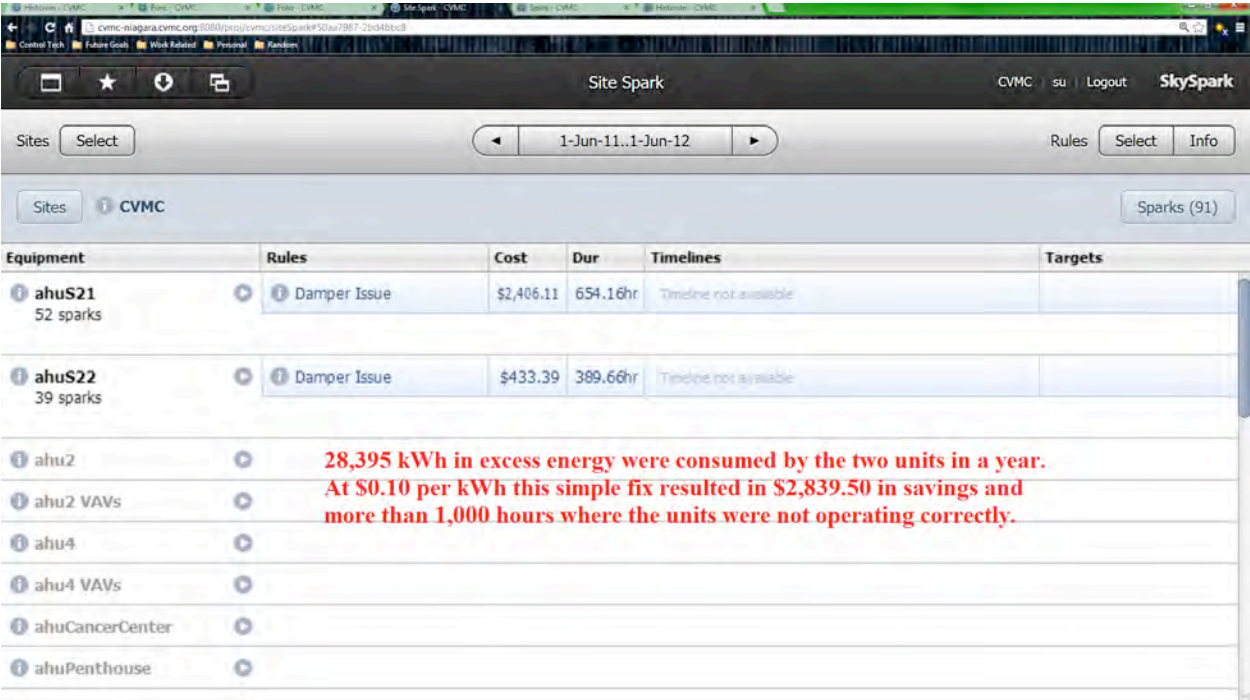
Issue 1: Improper damper actuator linkage

There are two older AHUs in the hospital that were originally controlled pneumatically and in 1996 were converted to direct digital controls (DDC). The return air and outside air dampers were not mechanically linked and each had their own actuators. Over the years the actuators eventually failed and were replaced. Once replaced the facility staff would ensure that the dampers travelled 0-100% as expected but one thing that was overlooked was the fact that the return air and outside air dampers would not travel at the same speed. The economizer control for the unit would modulate the outside air dampers to 100% and the return air dampers to 20%, but once the outside air got too hot the dampers would switch, outside went to 20% and return went to 100%. The outside air dampers would close faster than the return dampers which resulted in so much pressure that the return air actuator would seize and the dampers would remain closed. The supply fan would then have no place to pull air from and the static pressure would drop. This caused the supply fan VFD to ramp up to 100% in an attempt to deliver more air. At this point excess electricity was being used by the fans running at full speed and comfort issues were emerging from the lack of air to the VAVs. Eventually the facility staff would get complaints and they would restart the AHUs, and the overall problem was labeled as “something those AHUs do every now and then”.



Case Study: Vermont Hospital

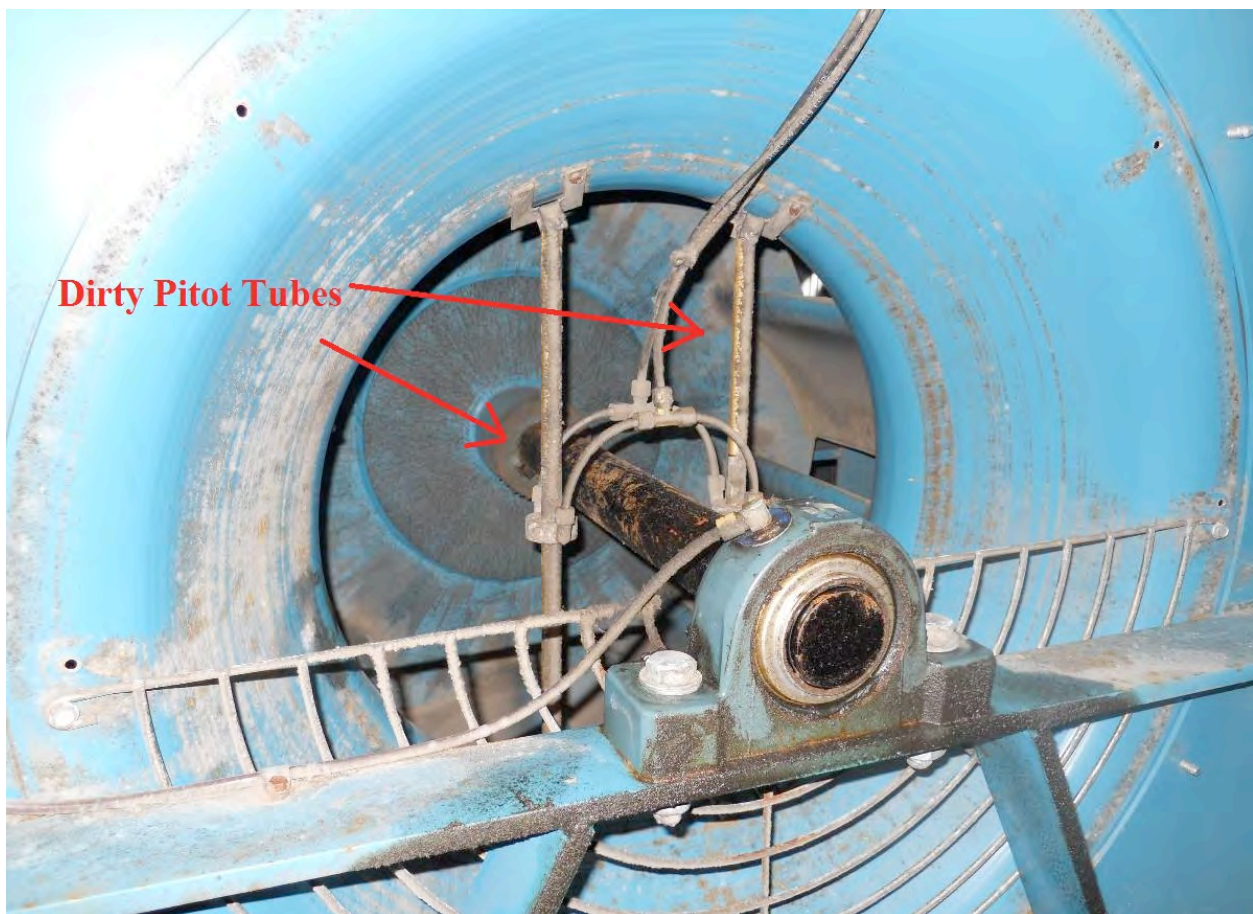
SkySpark® helped to identify when this issue was occurring and the resolution was to adjust the linkage between the actuator and dampers so they travelled at the same speed. SkySpark® was then used to calculate how many times this issue occurred in the past year and how much excess energy was used due to the fans ramping up to full speed instead of normal operation. Now SkySpark® is in place as a monitoring based commissioning system so if this issue occurs again in the future the hospital will be able to respond immediately and avoid excess energy consumption and comfort issues.



Equipment	Rules	Cost	Dur	Timelines	Targets
ahuS21 52 sparks	Damper Issue	\$2,406.11	654.16hr	Timeline not available	
ahuS22 39 sparks	Damper Issue	\$433.39	389.66hr	Timeline not available	
ahu2	28,395 kWh in excess energy were consumed by the two units in a year. At \$0.10 per kWh this simple fix resulted in \$2,839.50 in savings and more than 1,000 hours where the units were not operating correctly.				
ahu2 VAVs					
ahu4					
ahu4 VAVs					
ahuCancerCenter					
ahuPenthouse					

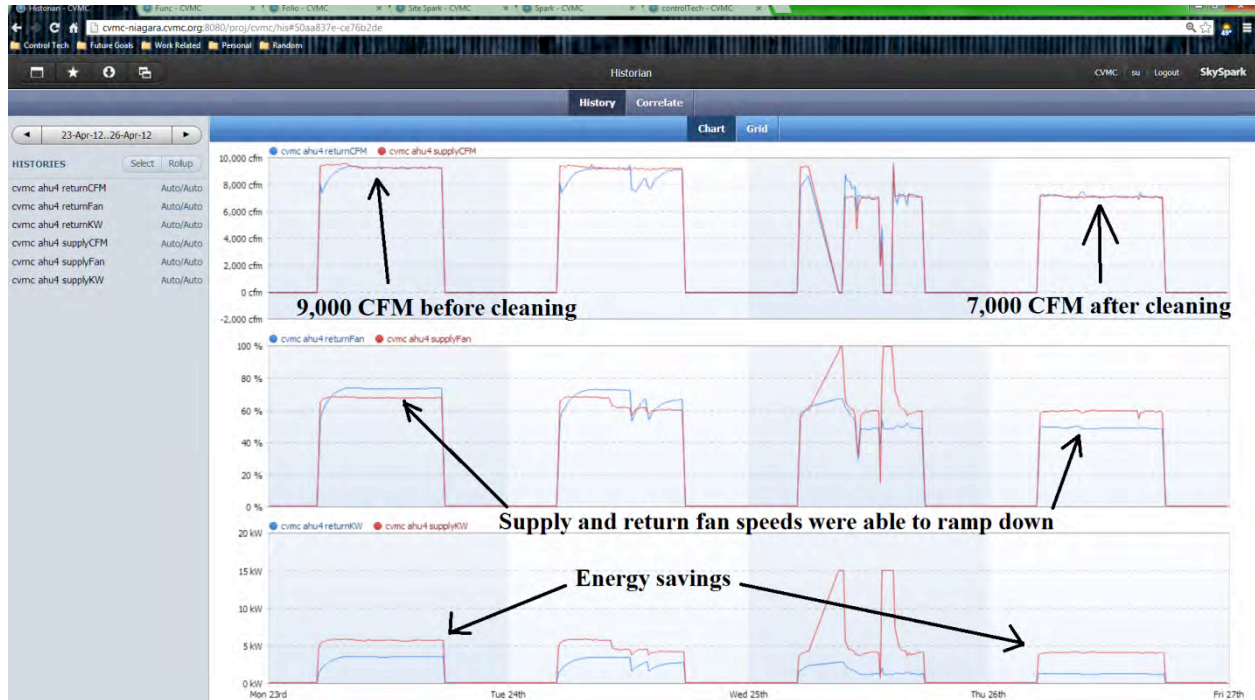
Issue 2: Airflow station maintenance

Airflow stations in AHUs are commonly used to monitor and maintain proper airflow in a building. These devices use pitot tubes and pressure transducers inside the unit to measure air pressures and calculate the flow. These pitot tubes must be kept clean to read accurately and even with frequent filter changes these tubes can become dirty. One AHU at the hospital had this issue on the supply fan where it had never been cleaned and was reading a higher airflow than what it actually was. To maintain proper pressure in the space the return fan VFD would match the airflow of the supply.



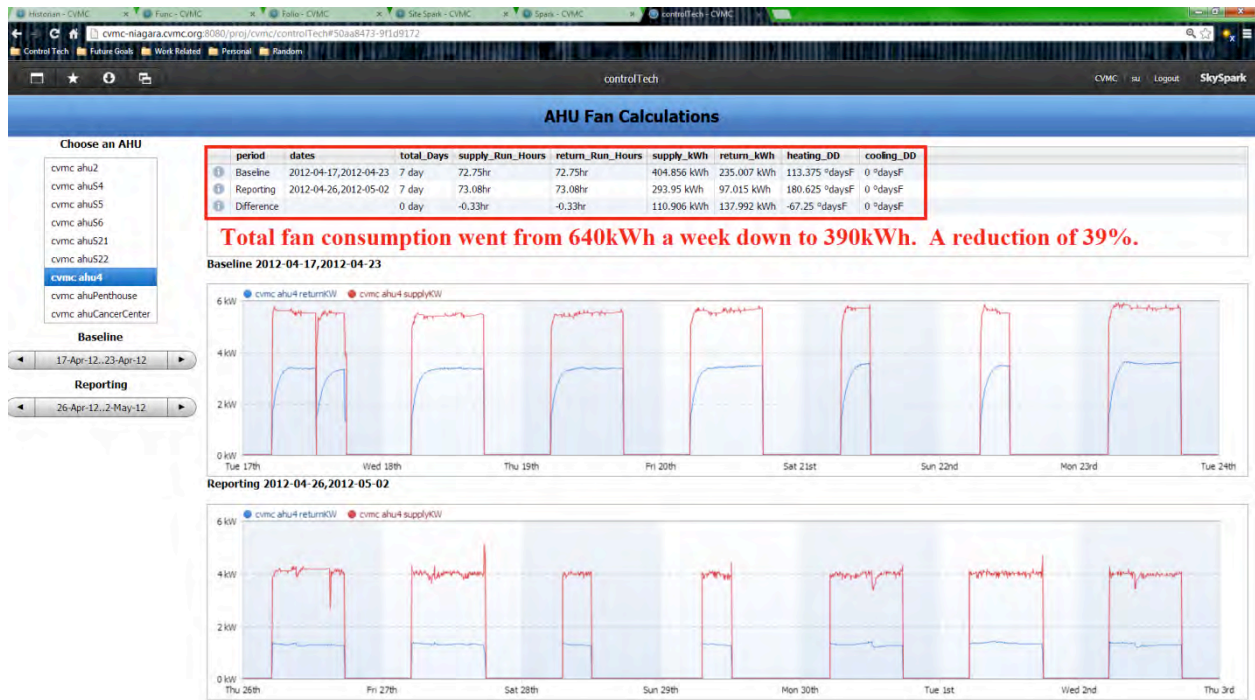
With the dirty pitot tubes reading a higher airflow on the supply side the return fan in turn ran at a higher speed to try and maintain the same return airflow. This resulted in excess fan energy and an unbalanced space with airflow and pressure. Simply cleaning the tubes allowed the airflow station to read a lower accurate airflow and the fan VFDs were able to ramp down which saved energy and produce a better balanced space.

Case Study: Vermont Hospital



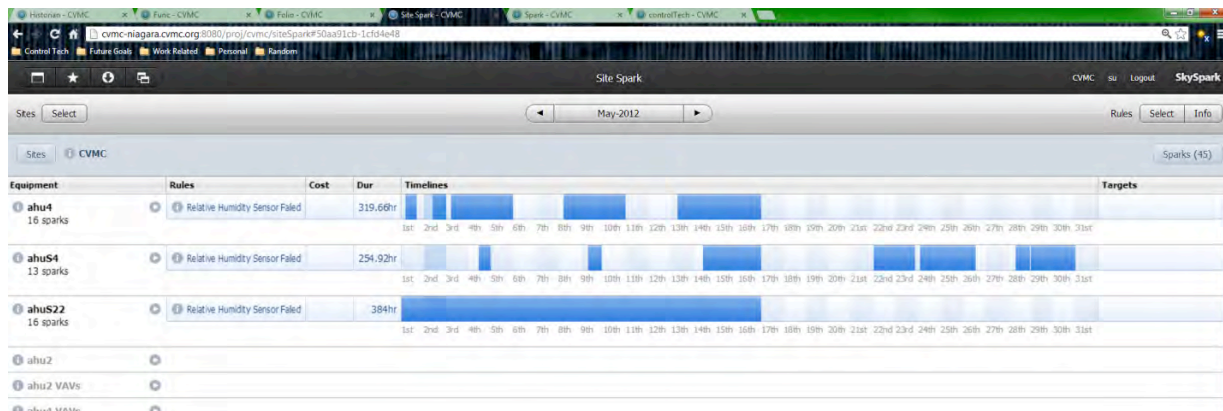
After cleaning the pitot tubes SkySpark® was used to calculate the energy saved. In the first week alone there was a reduction of 250 kWh. Assuming a 52 week hospital year that is 13,000 kWh saved or at \$0.10 a kWh \$1,300 in savings from about 15 minutes of cleaning. SkySpark® can quickly calculate and report savings from simple PM measures that would normally require metering or a measurement and verification process.

Case Study: Vermont Hospital



Issue 3: Failed sensors

Sometimes sensors can fail and get overlooked for extended periods of time. Relative humidity sensors are notorious for having a short life and when they fail it isn't always clear. If the facility staff is lucky the sensor will fail to 100%RH and it will be controlling something that would start acting different than normal and it will be discovered relatively quickly. In most cases though the sensor will slowly fail and drift within 5%-10% of the real %RH. This is much harder to notice and normally would only get discovered through a calibration or PM process. SkySpark® can analyze sensitive sensors like relative humidity sensors and determine when they start to drift out of an acceptable range.



Case Study: Vermont Hospital



Relative humidity sensor was found with a broken probe and hanging in the ductwork. It was still reading values but was not accurate. SkySpark can help notify staff when sensors fail or start to drift out of an acceptable range.

Summary

Project Scope Summary

A preventative maintenance program for the HVAC system in a large facility is an important process that keeps a facility running smoothly and efficiently. The control systems are commonly overlooked for the PM, but failed sensors and controls that go unnoticed can result in poor equipment performance and excess energy use.

Performance Summary

SkySpark® can help make a controls PM more cost effective by analyzing the data and determining when devices fail or are drifting out of range. SkySpark® can also visualize and report what the energy impact is of failed devices different pieces of equipment.

Additional Information

This case study was compiled by Control Technologies Inc. with help from SkyFoundry. If you have any questions or would like additional case studies, please use the contact information below.

www.controltechinc.com

Locations:

Vermont
New Hampshire
New York
Boston
Los Angeles

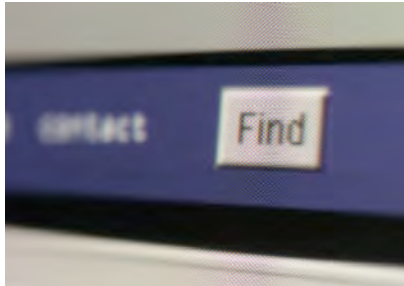


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Case Study: Vermont Hospital

SkySpark® Analytics Software - For the World of Smart Devices



The past decade has seen dramatic advances in automation systems and smart devices. From IP connected systems using a variety of standard protocols, to support for web services, it is now possible to get the data produced by the wide range of devices found in today's smart devices and equipment systems.

Access to this data opens up new opportunities for the creation of value-added services to help businesses reduce energy consumption and operational costs and to identify opportunities to enhance operations through improved control, and replacement or repair of capital equipment.

Access to the data is just the first step in that journey, however. The new challenge is how to manage and derive value from the exploding amount of data available from these smart and connected devices. SkyFoundry's SkySpark® Analytics Software directly addresses this challenge.

The new frontier is to efficiently manage and analyze data to *Find What Matters™*.



About SkyFoundry

SkyFoundry's mission is to provide software solutions for the age of the "Internet of Things".

Areas of focus include:

- Building automation and facility management
- Energy management, utility data analytics
- Remote device and equipment monitoring
- Asset management

SkyFoundry products help customers derive value from their investments in smart systems.

Learn more at: www.skyfoundry.com

Contact us at: info@skyfoundry.com

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