SkyFoundry

Vermont Hospital: Advanced Analytics as a Preventative Maintenance Tool

Case Study
August 2015

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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.

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Location

Building Type – Building type – Large scale hospital (>500,000), 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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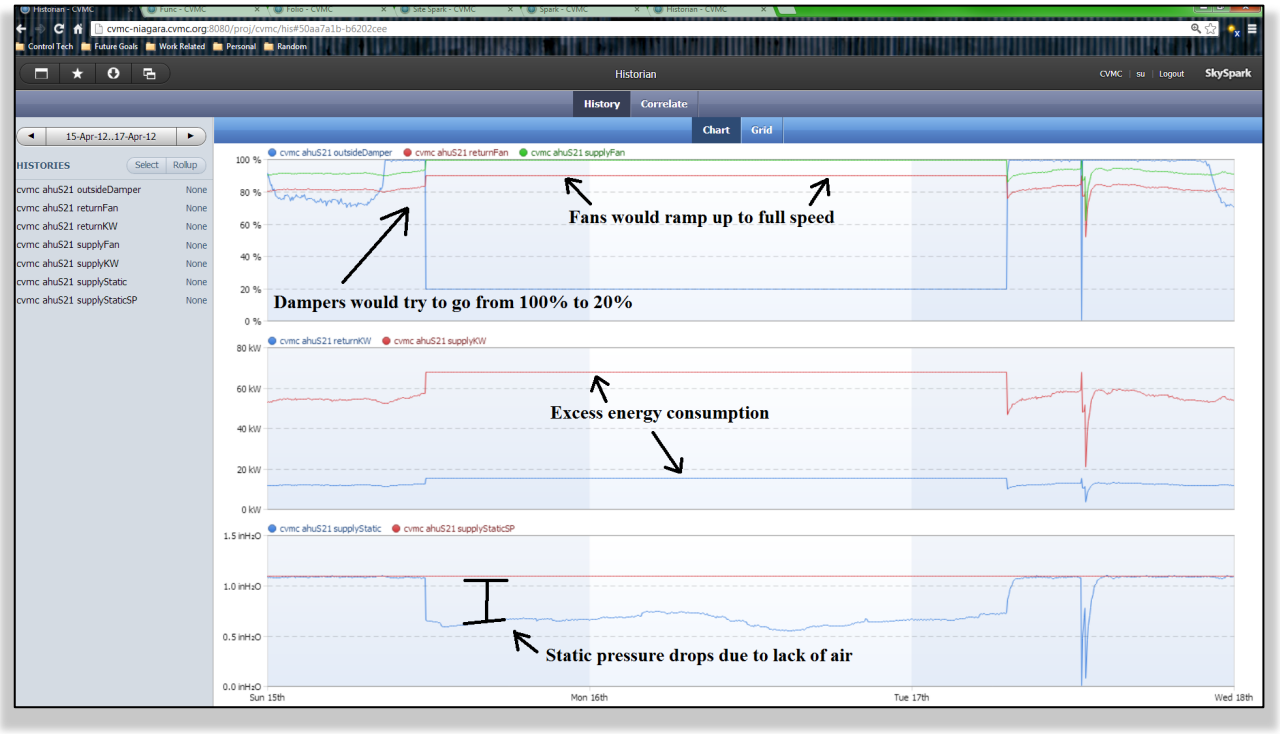
The Results: Issue 1: Improper damper actuator linkage

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".



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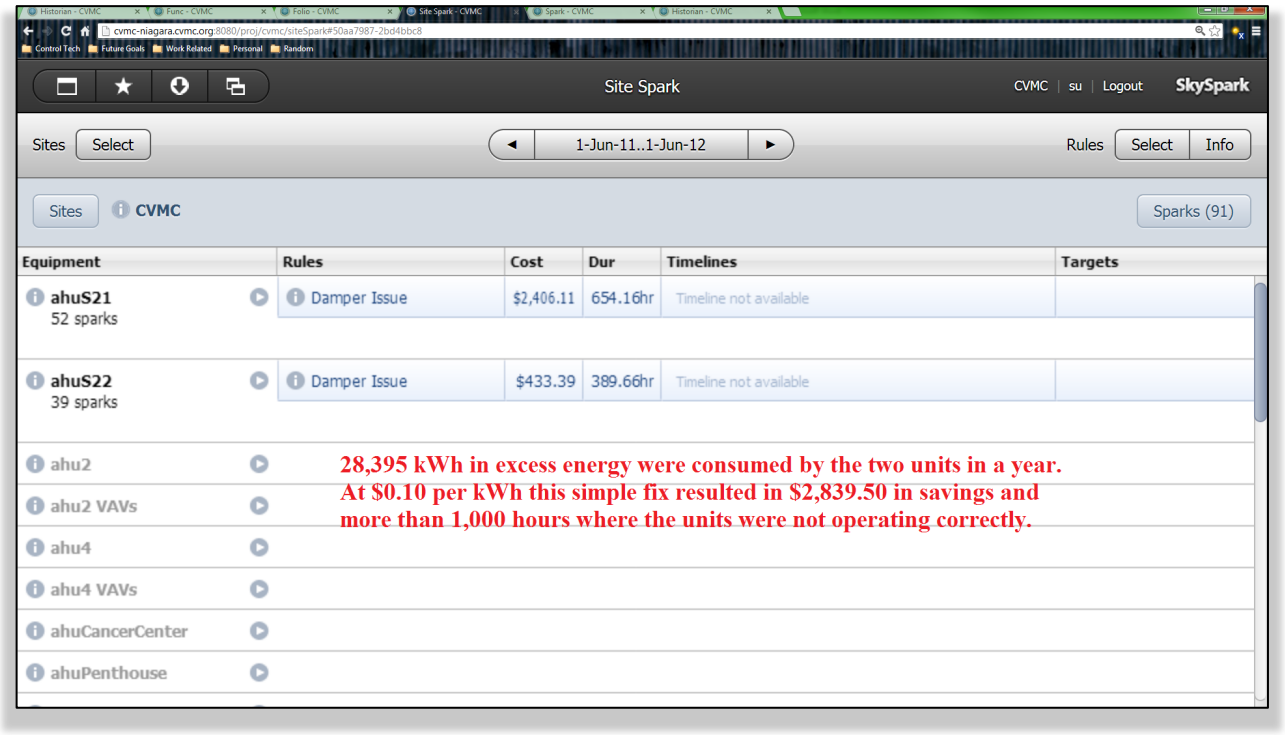
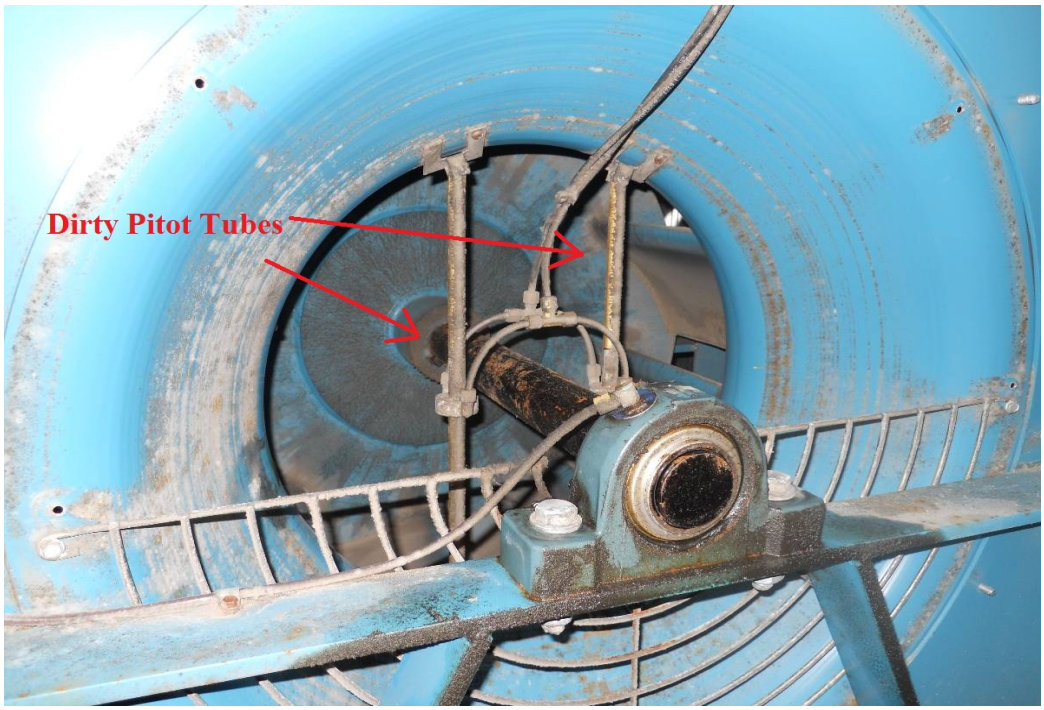
SkySpark® helped to identify when this issue was occurring and the resolution was to adjust the linkage between the actuator and dampers so they travelled at the same speed. SkySpark® was then used to calculate how many times this issue occurred in the past year and how much excess energy was used due 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.



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 then 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.

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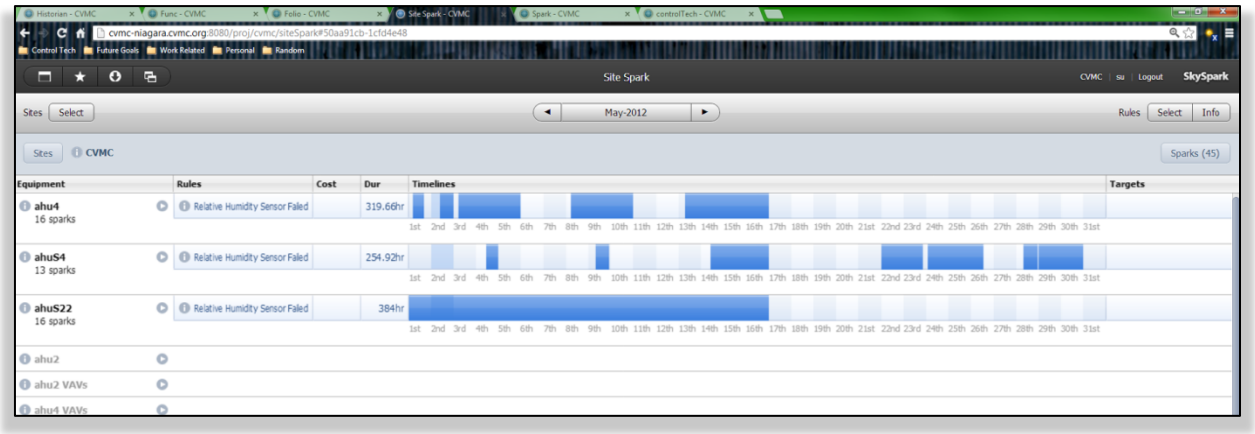
After cleaning the pitot tubes SkySpark® was used to calculate the energy saved. In the first week alone there was a reduction of 250 kWh. Assuming a 52 week hospital year that is 13,000 kWh saved or at $0.10 a kWh $1,300 in savings from about 15 minutes of cleaning. SkySpark® can quickly calculate and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

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.



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.

CONTROL TECHNOLOGIES
DEFINING BUILDING PERFORMANCE

www.controltechinc.com

Locations:

Vermont
New Hampshire
New York
Boston
Los Angeles

SkySpark® – Analytics for a World of Smart Device Data

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 and xml data schemas, it is now possible to get the data produced by the wide range of devices found in today's buildings 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 cost 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 SkySpark 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 "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's software helps customers derive value from their investments in smart systems. Learn more and request a demonstration at www.skyfoundry.com.

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