Information Alchemy – Turning Your Facility and Equipment Data into Money

SkyFoundry

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Information Alchemy – Transforming Data into Value

Alchemy – for the ancients it meant turning lead into gold. For today's building operator it means transforming the energy and operational data from their equipment systems into financial value. That's exactly what SkySpark does – automatically transform energy, equipment and building data into meaningful information that has direct business value.

SkySpark takes the data from your building and energy systems and applies rules and algorithms, combined with your knowledge and experience, to identify operational inefficiencies, equipment faults, and opportunities for savings.

The result – SkySpark finds *and shows you* what matters. There's no need to hunt through graphics, reports, alarms, and histories – SkySpark notifies you when it detects operational issues and brings you to automatically generated views of those issues, which we call "**sparks**". SkySpark delivers true business value from your data – data that you most likely already have access to.

How Do My Systems Really Perform?
And Who is Watching to Make Sure?

When we implement a building automation system, we take our best understanding of the building and equipment systems and write control sequences based on design documents, our past experience and the information available at the time.

Those control sequences do exactly what we "tell" them to do – no more, no less. And while they are often called "feedback loops" the only feedback they respond to is the value of the variable they are attempting to control – the supply air temperature, the room temperature, etc.

Who is watching to verify that what they are doing is right? That the control strategies were well designed? That the assumptions were correct? That sensors haven't degraded? That valves are not stuck resulting in simultaneous heat and cooling? That they are still running as expected and haven't been interfered with or overridden by operators – a common problem.

Buildings are too complex for this to be done solely by humans. There is just too much data, and the equipment systems are too complex. Add to that the fact that almost all buildings are different and the impact of economic decisions that have resulted in fewer people being available with the necessary knowledge of systems, and it's easy to see why buildings rarely operate at maximum efficiency.

The good news is that the keys to addressing this situation are actually at hand. The asset that we have today is data. The information revolution has given us a wealth of data. We have energy consumption data, temperature and equipment status data from our automation systems, asset data like building location, age, size, occupancy conditions, etc. And most of this data is available in some type of electronic form.


Understanding Operational Analytics

So, we have the data… And we know our buildings are not operating as efficiently as they could be… The challenge is to take the information available to us and transform it into actionable intelligence. This is the role of SkySpark's Automated Operational Analytics. SkySpark automatically identifies issues, inefficiencies and faults in the operation of buildings and equipment systems – showing us the way to better equipment and building performance. But what exactly do analytics look like?

Analytics aren't alarms. Analytics aren't reports. Analytics aren't simply graphs of energy use. Analytics are **results** – specific findings of operational issues presented to the user in clear understandable views – views that tell us exactly what the issue is, when it occurred, how long it lasted, the status of all related operating conditions, and even the financial impact of the issue.
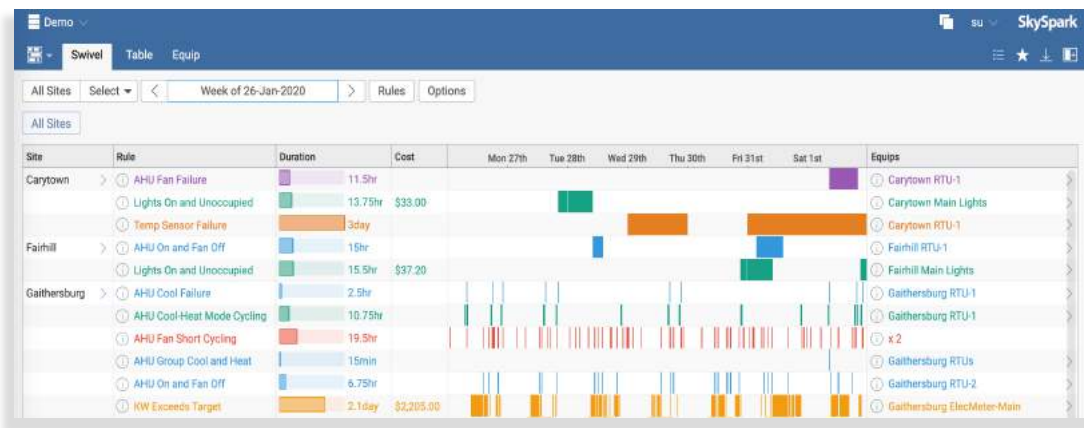
The view above shows us the issues (we call them "sparks") that have been detected across three sites for a specific week, along with the description, duration, cost, a detailed timeline, and the equipment affected. And this entire view is automatically generated by the software. No screen building required. The result is that users can quickly see all of the factors that contribute to the impact of the issues detected.

From there it's a simple matter to click on any individual spark to drill down to all of the details for the site or specific piece of equipment. At the equipment detail level, we see the spark event on a timeline with all of the relevant data – from weather conditions to the status of heating, cooling, damper, fan occupancy, temperatures and setpoints as shown below.
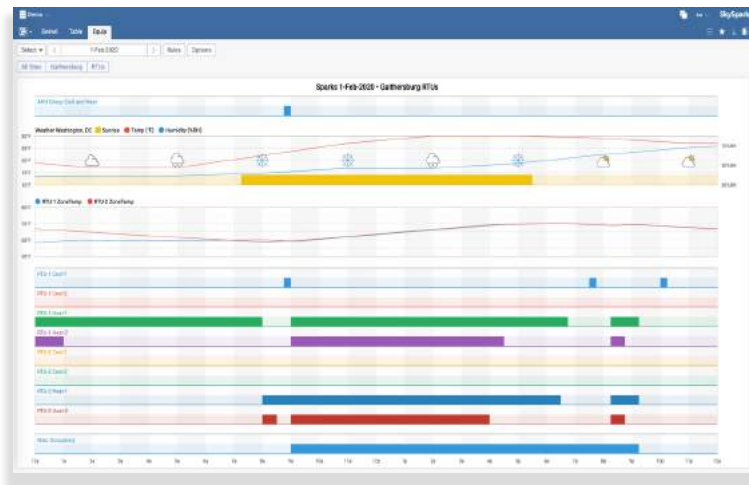
Here again, one of the most important things to note is that these views are automatically generated by SkySpark – views and screens do not have to be assembled or built. SkySpark software is smart enough to generate views to inform operators of the issues that have been detected.

Analytics vs Alarms

Often, when first being introduced to analytics people look to make comparisons with alarms. After all, doesn't an alarm programmed in a control system tell me something is wrong? At a very basic level there is a similarity, but if we look just a little bit deeper, we see that there are fundamental differences between alarms and analytics.

First of all, alarms require that you fully understood what you wanted to look for ahead of time and took the time to program that specific definition into the system. While there are many issues that fit that requirement, like a temperature going outside of a limit, there are many inter-relationships between equipment systems that may not be known at the time the control system was programmed.

Analytics enables you to find patterns and issues you weren't aware of – patterns that you didn't expect or couldn't have imagined, and patterns that evolve over time. Analytics provide results that show how your equipment systems really operate versus how you thought they were operating.

Expressing what you want to find and combining different sources of data are another important difference. Alarms don't typically enable you to implement sophisticated logic that interrelates multiple sources of data.

A typical alarm would evaluate a single item against a limit at a single point in time. While an alarm might tell us our building is above a specific KW limit right now, analytics tells us things like how many hours in the last 6 months we exceeded the electrical demand target. How long were each of those periods were, when they occurred, what pieces of equipment were operating when the demand went above the limit, and how those events were related to the weather or building usage patterns and the cost impact.

Real World Examples of Operational Analytics

The types of issues found vary with building type, system type, building use and the data available. Here are some common examples of issues that SkySpark identifies in actual applications in building systems:

- Simultaneous heating and cooling in a single unit or across groups of units
- Short cycling of equipment
- Lack of diversity control resulting in higher than necessary electrical demand
- Energy Performance Analysis – Deviation of energy intensity (kw/sq ft/degree day) from benchmarks, baselines, or goals, along with time of occurrence, duration and cost
- Predictive Fault Detection – Detecting degradation of cooling or heating performance (i.e., unit runs but does not deliver expected cooling/heating)
- Economizers open while heating or cooling
- Non-functioning sensors (temp, kw, etc.)
- Lights or other loads operating when they shouldn't
- Setpoints overridden and not changing with schedules as expected
- These are just a sampling of common issues that SkySpark finds for building owners. But SkySpark doesn't limit you – SkySpark is fully programmable enabling rules to be defined for any type of application and equipment system.

Understand, Prioritize, and Budget

Knowing the cost impact of issues enables facility managers to set priorities for maintenance budgets and capital spending. SkySpark provides direct calculation of the costs of equipment faults, energy performance deviations, and other operational issues.

Whether it be simple calculations based on average costs per minute or hour, or exact calculations based on multi-structured utility tariff rates, SkySpark will automatically calculate costs by the minute, hour, day, week, month, year, or any time period. And you can set thresholds to generate spark notifications only when costs exceed certain limits. That's the power of operational analytics – to tell you what matters – automatically.
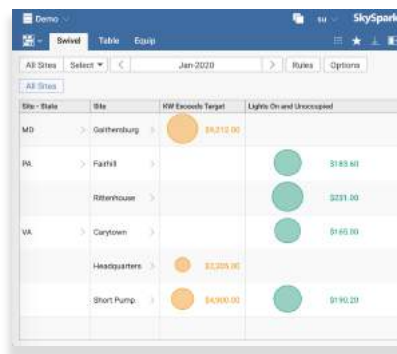

View showing the costs of lighting operating outside of occupancy periods and costs incurred due to demand peaks

Beyond Just Control System Data – Correlate Issues and Energy Consumption with Weather Data, Equipment Operation, Asset Data and Other Factors

Correlation, Normalization, and Prediction. Energy consumption data isn't enough on its own. To fully understand performance, you need to be able to normalize energy consumption for weather data and facility size and other conditions unique to the applications. If it's a fast food chain, the number of meals served or revenue per site is likely a key factor in energy use.

SkySpark enables you to bring all of this information together to provide meaningful analysis and actionable results.
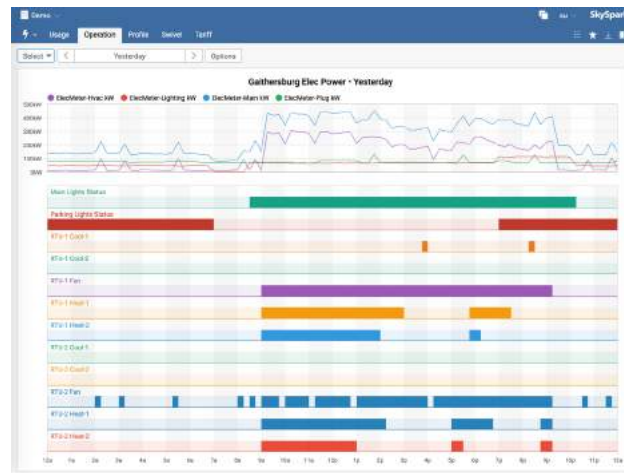
SkySpark's built in weather service provides continually updating weather data, a 3-day forecast (for predictive results) and past weather data going back multiple years. SkySpark brings you the weather data you need to evaluate energy performance. Combine weather forecast data and past performance to predict future conditions using SkySpark's Machine Learning tools.

In the view to the right we see the KW demand **correlated with time of day and the operational status of our equipment systems**. SkySpark shows us **why** our energy performance looks the way it does – Information that's far more useful than a simple graph of energy demand.

Analytics is an Exploratory Process

Findings from one analytic rule often highlight other issues we should look for. SkySpark makes it easy to explore and test new theories. You can add new rules at any time, and when you do, they automatically run back over all your historical data. Attempting to do those types of things in a control system just isn't feasible.

For example, would you be able to justify the cost of reprogramming the alarm logic in 1000 remote sites because you have an idea about a correlation that could be resulting in energy waste and want to test that theory? It is likely you could not justify that expense and the risk associated with modifying programs in all of those operating sites. With SkySpark a rule can quickly perform the analysis across the data from one or all of your facilities and quickly deliver you the results. Test theories, relationships, find correlations and then have SkySpark track the results forever.

Automated Operational Analytics Enables True Monitoring-Based Commissioning (MBCx)

Commissioning is the process of analyzing equipment system performance to identify operational inefficiencies and deviations from optimum performance. The tasks associated with a commissioning effort can be turned into SkySpark rules to automatically monitor results on an ongoing basis detecting occurrence and reoccurrence of the issues that were identified during the commissioning process. The result is continuous, automated monitoring of your systems, providing true Monitoring Based Commissioning.
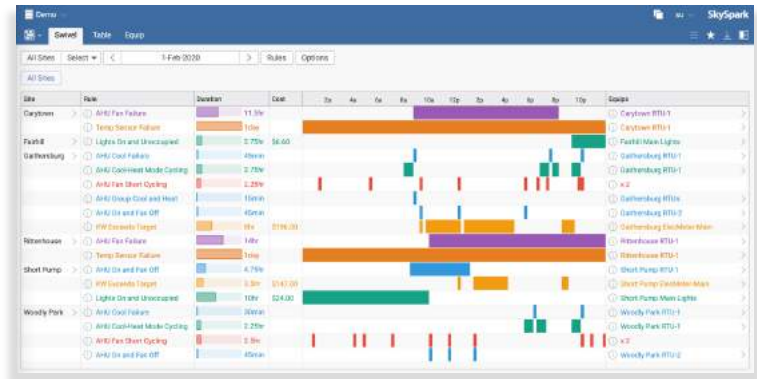
It's Time to Transform Your Operational Data into Money

With the progress made in control systems and smart devices in recent years we have reached the point where we can now take advantage of the wealth of data they contain to automatically monitor and analyze the operations of our facilities and equipment systems.

SkySpark directly identifies operational problems, inefficiencies, equipment faults, and incorrectly performing control sequences. The results are reduced energy use, lower costs, increased comfort, and generation of detailed information needed to prioritize capital and operational budgets and meet regulatory reporting requirements. Analytics enable us to improve overall facility operations, provide greater occupant satisfaction and improve the financial performance of our assets. It's like mining your data for money – *Isn't it time to get started!*
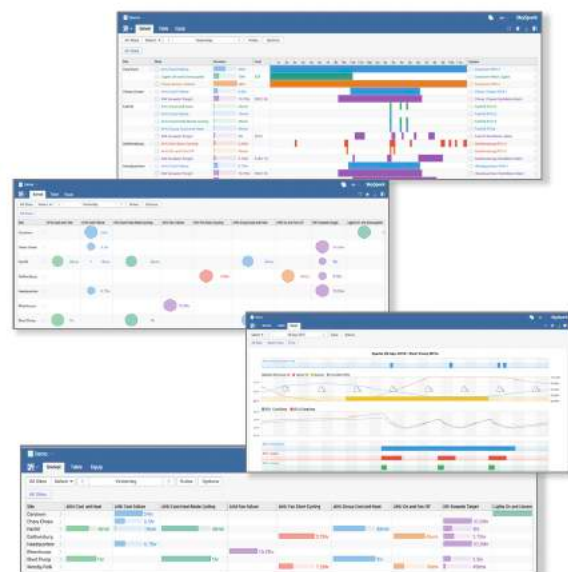
SkySpark – Analytics for a World of Smart Devices

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 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's 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 age of "the Internet of things". Areas of focus include:

- Facility Automation and Management
- Remote device and equipment monitoring
- Energy management, utility data analytics
- Asset management

SkyFoundry products help customers derive value from the data in smart systems. Contact us to learn more.

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