Issue 20 - March 2014

SkyFoundry Insider

SkySpark® - Tools for Visualizing and Understanding Your Data

Often the first step in applying analytics to our equipment systems is to get a sense of our data. As humans we can't easily see relationships by simply looking at huge volumes numbers in rows and tables. Visualization tools are needed to help tap into the unique capabilities of the human brain to make sense of things we see. These tools illuminate patterns, relationships and correlations in our data.

Visualization of our data is essential, but the key to making the visualization step productive is to reduce or eliminate the work needed to get data into a visual format. If it takes too long, or costs too much, operators will never get the opportunity to "see" their data and identify operational issues and opportunities for improvements and cost savings. This is why tools to enable rapid visualization of data is a key area of focus at SkyFoundry.

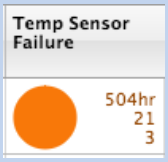
In this issue of the Insider we will look at a range of data visualization tools provided by SkySpark®, and highlight the ways SkySpark lets you share results and views across your organization.

In This Issue

The Energy App

The Equip App

The Historian App



Bubble Charts Sum Up Results

Analytics Shows You How Your Equipment Systems are Really Operating

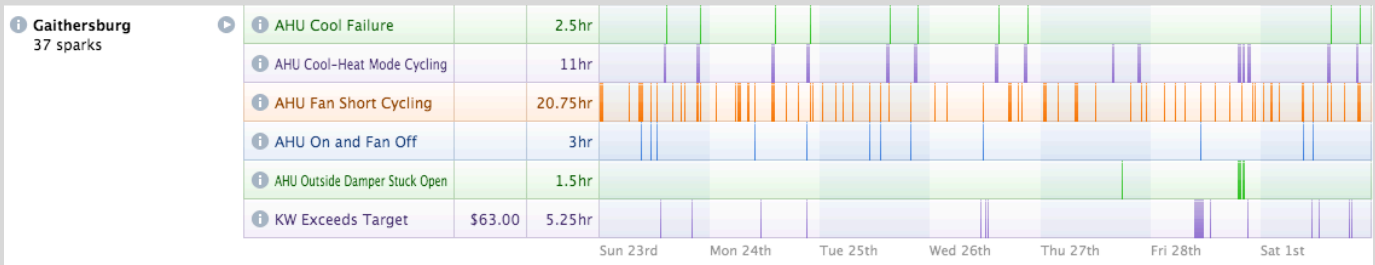
Analytics by its very nature is an exploratory process. Initial findings provide insight into additional relationships and correlations to be explored in our equipment data. SkySpark enables people responsible for managing equipment systems to quickly identify patterns that represent issues, deviations and anomalies by converting data into intuitive, visual presentations.

The key to making the visualization step productive is to reduce or eliminate the work needed to get data into a visual format. If it takes too long, or costs too much, operators will never get the opportunity to "see" their data and identify operational issues and opportunities for improvements and cost savings.

Graphics of equipment systems have been a common tool in automation systems for many years. They achieved widespread adoption because they allowed operators to see "**what is happening now**" in a more visual way than simply looking at tables of numbers flickering on a screen. Conventional equipment graphics are a good tool, but bring with them three important challenges:

- They typically require significant upfront work to draw or assemble the "pictures" of equipment systems.
- They show sensor values and operating status "now" but provide little to no insight into the patterns that have lead up to "now".
- Someone needs to view each of the graphic screens to see what is happening. Think about the significance of that for operators managing thousands of pieces of equipment.

What is needed is a way to directly visualize data as soon as it is brought into the system, whether by batch loading of historical data, or connection to real time data feeds. We want to enable operators to effectively perform analytics as soon as the data arrives, and provide tools that make it easy to look across periods of time from minutes to days, weeks, months and even years.



In this view, Timelines in the SiteSpark App clearly show issues operational issues detected by SkySpark's automated analytics engine

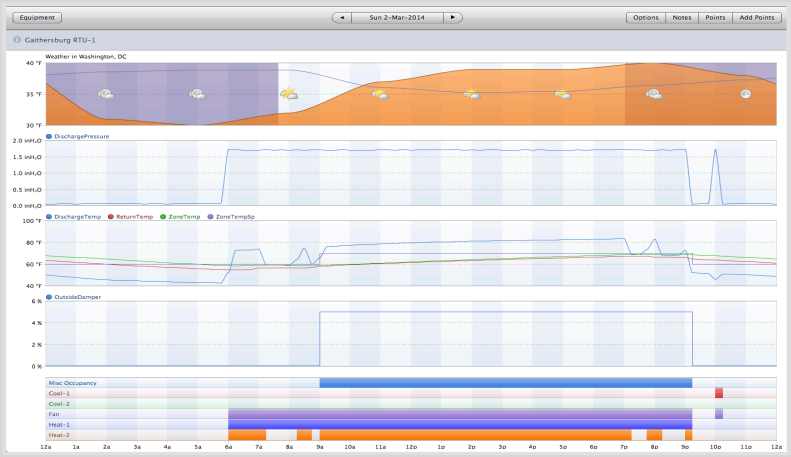
SkySpark provides numerous tools to support this initial step in the analytics process – the visualization of data. In this issue we will explore those tools and provide examples of how they can be used to drive insight into the operation and performance of our systems, and provide insight into analytic rules that will then continuously and automatically analyze new data for patterns as it comes into the system. Lets continue to explore SkySpark tools.

The Equip App

Visualize Data Organized by Equipment System

What if you could quickly view all of the data associated with individual equipment systems without needing to invest the time to create graphic views? What if views were automatically generated just by interpreting the definition of the data items themselves? How much time and money could be saved?

SkySpark's Equipment App automatically assembles data into views based on equipment systems – air handlers, chillers, pumping systems, etc. This allows you to quickly see how equipment systems operate over time frames from "now" to views showing trends over weeks or months.

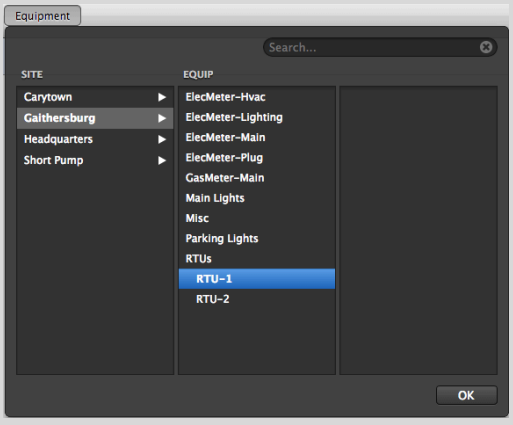


Equipment App view showing operating status of RTU-1 for a single day

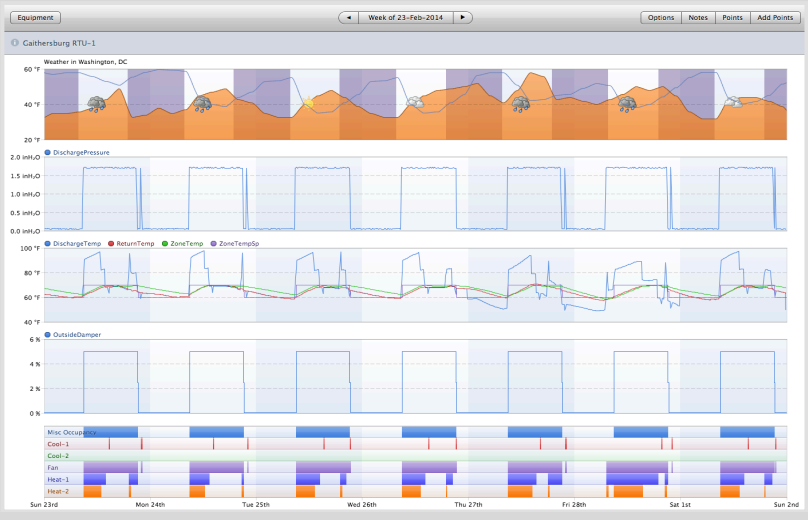
Equipment App views automatically assemble the data associated with a piece of equipment by interpreting tags that define the data items, and allows you view results on a daily, weekly or monthly time period.

These views allow operators to quickly see patterns and exceptions – even before applying automated analytic rules.

This is just one of the ways SkySpark's data visualization apps give operators insight into equipment operation and the types of analytic rules they want to implement.



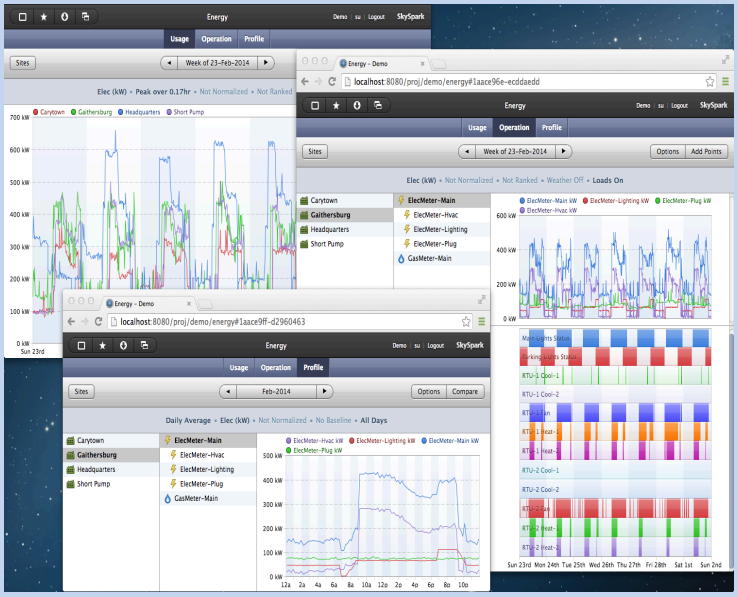
Easily navigate your data by equipment system



Operation of the same equipment shown for a full week. Quickly see operational patterns and any exceptions.

The Energy App

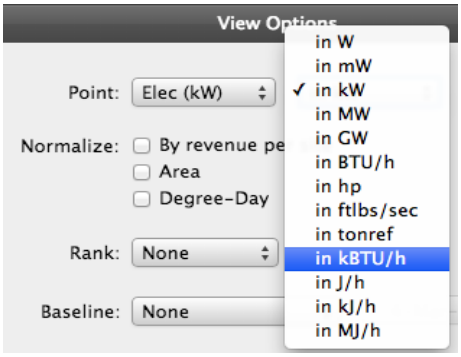
Visualize Energy Data and Quickly Apply a Wide Range of Common Analysis Tools

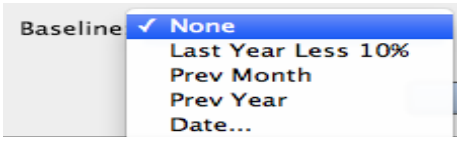


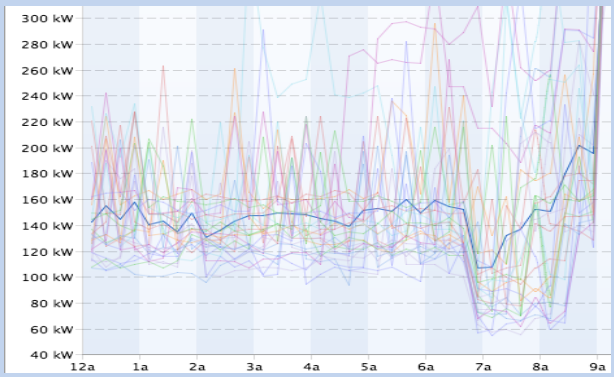
One of the most important types of data is energy consumption and demand. SkySpark's comprehensive Energy App allows you to quickly visualize energy data and apply a wide range of tools to perform energy analytics.

The **Usage Tool** allows you to view energy consumption and demand, compare and rank sites, and normalize energy data using standard and custom normalization factors.

The **Profile Tool** provides Daily Average, Daily Overlay and Load Duration views with a single click. Quickly add baseline analysis for any time period, or create custom calculated baselines that can include weather and other factors. With SkySpark you can implement customized analysis functions.







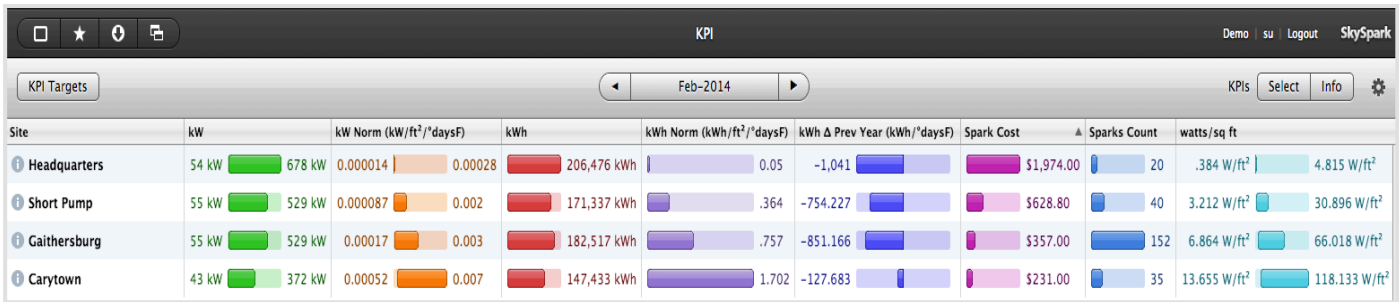
Daily Overlay Profile allows you to quickly see the variability of energy use on a daily basis compared to an average profile

The Operations Tool combines energy and equipment operation data to show you which equipment is driving your energy use profile

The KPI App

See Your Key Performance Indicators across sites and timeframes

What matters to you? How do you track and assess the performance of your equipment systems and facilities? With SkySpark you can create Key Performance Indicators for virtually anything you care about. Once defined, the KPI App lets you quickly assess how you're doing against the metrics that matter to you. Whether energy related, or tracking types of issues on a site by site basis, KPIs provide the tool for quickly understanding where your stand with metrics that matter to you.

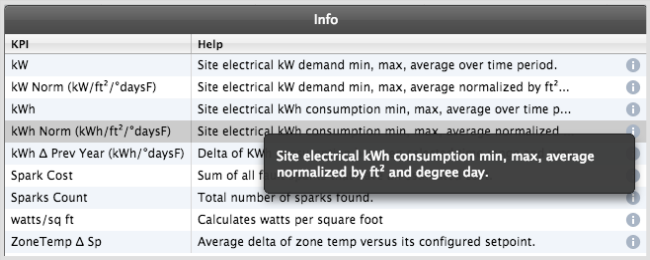


Site	kW	kW Norm (kW/ft²/°daysF)	kWh	kWh Norm (kWh/ft²/°daysF)	kWh Δ Prev Year (kWh/°daysF)	Spark Cost	Sparks Count	watts/sq ft
Headquarters	54 kW 678 kW	0.000014 0.00028	206,476 kWh	0.05	-1,041	$1,974.00	20	.384 W/ft² 4.815 W/ft²
Short Pump	55 kW 529 kW	0.000087 0.002	171,337 kWh	.364	-754.227	$628.80	40	3.212 W/ft² 30.896 W/ft²
Gaithersburg	55 kW 529 kW	0.00017 0.003	182,517 kWh	.757	-851.166	$357.00	152	6.864 W/ft² 66.018 W/ft²
Carytown	43 kW 372 kW	0.00052 0.007	147,433 kWh	1.702	-127.683	$231.00	35	13.655 W/ft² 118.133 W/ft²

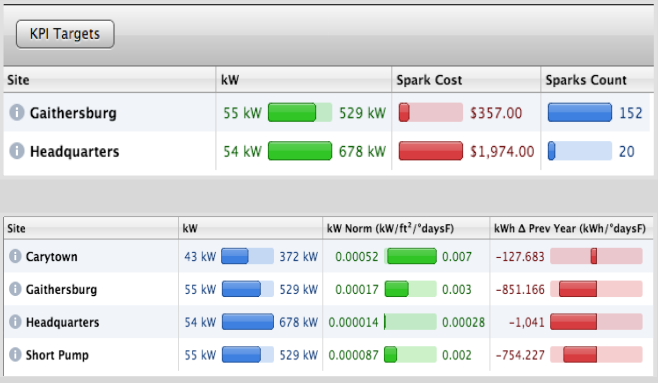
With SkySpark KPI's you can quickly see key performance indicators across multiple sites and periods of time.

With SkySpark, KPI's are fully programmable allowing you to create the performance metrics that are relevant to your facilities and equipment systems.

All KPI views can be saved as favorite Reports and exported in all of SkySpark's supported formats. And, the email digest feature allows SkySpark to send daily summaries of reports including KPIs.



With SkySpark, KPI's are fully programmable – you can create the performance metrics that matter to you (And yes, there are lots of standard KPI's included)



Site	kW	Spark Cost	Sparks Count
Gaithersburg	55 kW 529 kW	$357.00	152
Headquarters	54 kW 678 kW	$1,974.00	20

Site	kW	kW Norm (kW/ft²/°daysF)	kWh Δ Prev Year (kWh/°daysF)
Carytown	43 kW 372 kW	0.00052 0.007	-127.683
Gaithersburg	55 kW 529 kW	0.00017 0.003	-851.166
Headquarters	54 kW 678 kW	0.000014 0.00028	-1,041
Short Pump	55 kW 529 kW	0.000087 0.002	-754.227

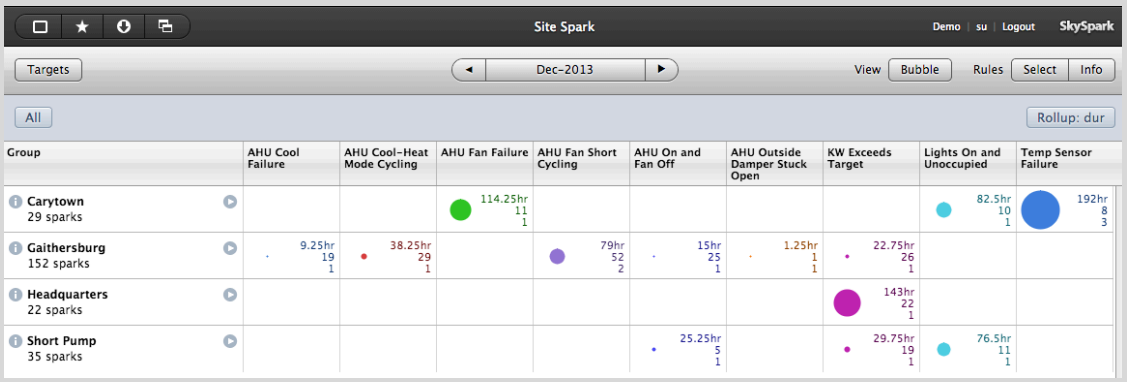
Create KPI Reports that include only selected KPIs and Sites to give operators only the information they need

Management-Level Views Provide Summaries of Issues, Faults, Deviations and Opportunities for Savings

Bubble Charts – show summaries of issues by type, duration, number of occurrences, cost, and virtually any other "rollup" summary relevant of your data.

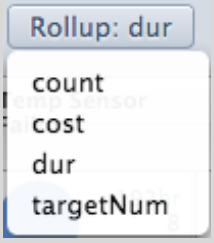
Detailed timelines and graphs are great for technicians and operators that will be investigating and correcting issues. But there are other people in an organization that need information on systems performance.

Management-level users need quick summaries that show the types of issues being detected, how many times they occur, how long they last and of course, how much they cost. Bubble charts provide these high-level summaries and allow "drill down" with a single click.

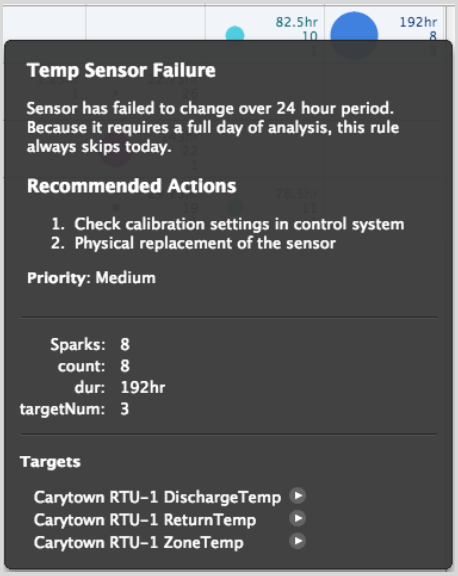


Bubble chart views provide easy to read summaries showing the magnitude of issues based on duration, frequency, equipment type, cost and any other summation value

Bubble chart views can display any summary data including number of events (counts), total duration in the selected time period, cost, or any user defined summation or "rollup".



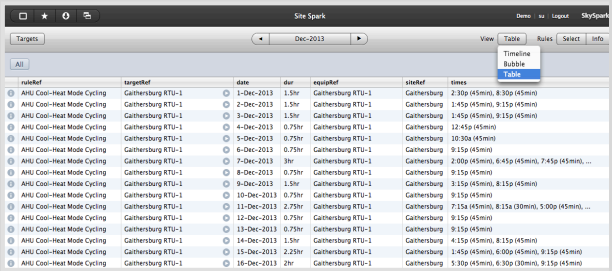
Select from Duration, Counts, Cost or any user defined "rollup"



Click on any "bubble" to get full details

And it's easy to move from a high-level summary to details on any Spark. Just click to get full details including, description, recommended actions, number of events, duration and the specific pieces of equipment that violated the rule.

And when that summary data needs to be shared with other software applications its easy to view as a table and export to CSV or Excel®.



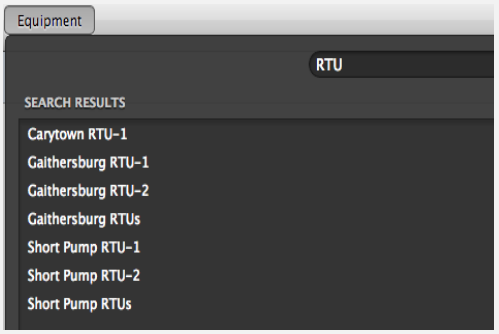
Tabular views can be sorted by column and easily exported to Excel or CSV

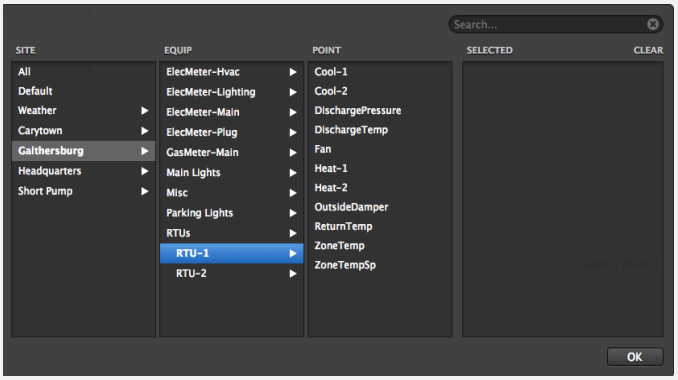
The Historian App

Combine Any Type of Data - Identify Trends and Correlations

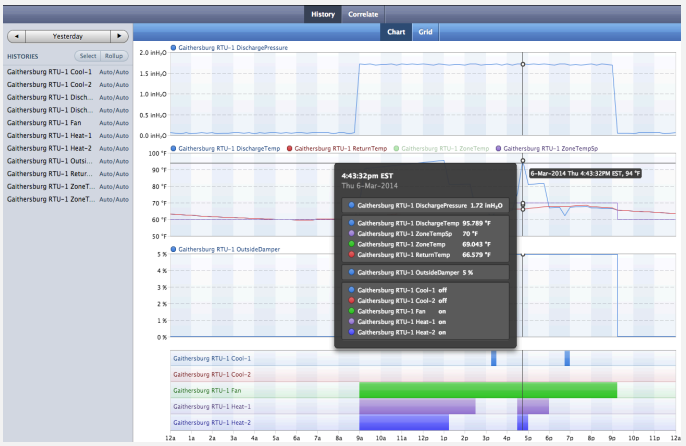
The Historian App lets you combine any type of data across any time frame in charts that show alignment, correlation and trends.

Sometimes you need to combine and explore a range of data. With the Historian App you can choose any data in the system using SkySpark's navigation pickers that support customizable hierarchies and search for fast access to the data that matters to you.



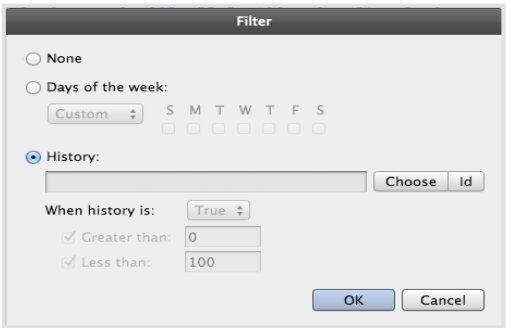


Combine different types of data together. Each unit gets its' own chart, while a pop up tool (see below) bridges the values across all charts so you can compare values at any point in time.



The Correlation Tool allows you to perform linear regression, view associated scatter plots and apply filters.

Correlation analysis tools calculate coefficient of correlation, while showing scatter plot and data series



Filter data based on days of week or other data sets

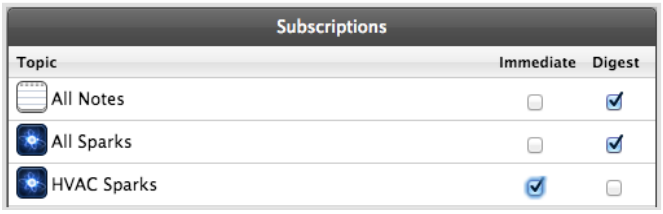
Sharing Results – Its All About Taking Action

Analytic findings provide insight into issues in the operation of our equipment systems but they are just the start of the process. Operators from across the organization are often involved in addressing findings, fixing equipment, and generating savings identified by analytics.

In order to correct deficiencies we often need to share findings with a wide range of people and teams in our organizations. SkySpark excels in its ability to get analytic results to the people that need them, offering an extensive range of capabilities including – export views as a web page, save views as favorite reports, automatically send emails in response to detected issues, and export data in Excel format, XML or CSV.

Automatic Email Notification of Findings

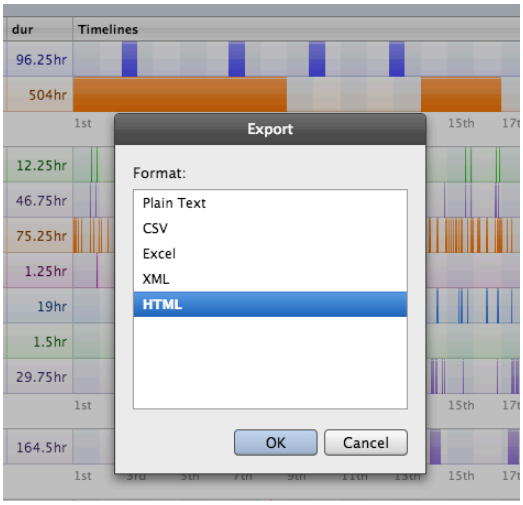
Automatic emails to operators include hyperlinks that take them to the view of the issue. And it's easy to set up detailed subscriptions so operators are only informed of the issues that matter to them and their area of responsibility.

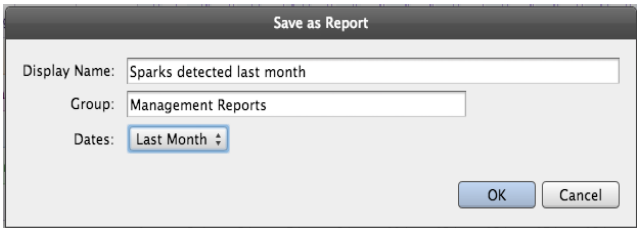


Control subscriptions so operators get the notices that matter to them

Turn any view in to web page with two clicks

Visual representations of operational issues, trends and correlations are simply more powerful than numbers or words. But not all people that need to see results are operators of the software. With SkySpark any view in the system can be exported as a graphical HTML page with just two clicks. From there you can email it to others, or embed it in reports and other documents.





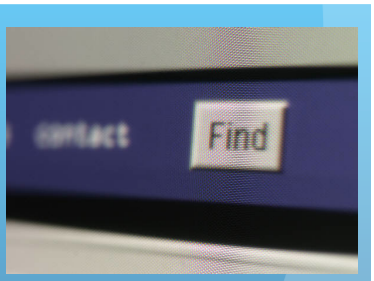
Save any view as a favorite report. Email links on a scheduled basis.

Save views as "Favorite Reports"

Any SkySpark view can be saved as a favorite Report. Operators can the quickly access saved reports in the Report App. This enables reports to be pre-defined to make operators lives easier.

The Report App

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 to support for web services and xml data schemas, it is now possible to get the data produced by the wide range of systems and 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 reduce energy consumption and cost, and to identify opportunities to enhance overall facility operations.

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. *SkySpark directly addresses this challenge.*

The new frontier is to efficiently manage and analyze data to *find what matters.*

Project Haystack to be Focus of Boot Camp Session at IBCon 2014, June 17-19

Project Haystack Supporter

One of the key challenges in utilizing data to drive efficiency improvements is the effort involved in integrating data from a wide range of sources that utilize different formats.

"Recent technology, market and policy drivers (smart meters, energy performance disclosure laws, etc.) are resulting in a rapid increase in the generation of building and energy data... But this data is still hard to access, aggregate, share and utilize because it is housed in many decentralized databases, and in different formats. Stakeholders consistently reported that they spend more time on data formatting and cleaning than they do on conducting analysis. ***The lack of standard data formats, terms and definitions is a significant ongoing barrier to realizing the full utility of empirical information about building energy performance.***" (Building Energy Data Exchange Specification Scoping Report, August 2013, eere.energy.gov)

Project Haystack (www.project-haystack.org) was founded in 2011 specifically to address this challenge and make it easier for software applications to consume, analyze and present building system data. Project Haystack is an open source initiative to develop tagging conventions and taxonomies for building equipment and operational data.

The Haystack community continues to gain momentum with greater awareness, industry recognition and outreach. More and more professionals are joining the effort and implementing the Haystack tagging methodology in their work. Consider joining to contribute your special expertise: www.project-haystack.org

Join us at Realcomm/IBCon:
http://www.realcomm.com/ibcon-2014/

Overview Video Explains Project Haystack in 8 Minutes. Find it here:

http://youtu.be/5C6GwLbYqTw

YouTube