



ALUMINUM FOUNDRY CASE STUDY

Key Findings from a Wireless Monitoring Installation

Application

The presented use case involves a customer operating an aluminum foundry. There are various primary production and support systems requiring electrical energy, including:

- Electric-resistance furnaces
- Sand conveying and molding systems
- Sand processing/reclamation machines
- Heat treatment for finished molded components
- Compressed air
- Cooling water loops
- Dust collection
- Exhaust and makeup air fans

The customer deployed SiteWatch monitoring throughout the facility, capturing equipment energy use for most electrical using processes. The wireless monitoring solution provides multiple value sources to the site, with the customer-identified primary values being:

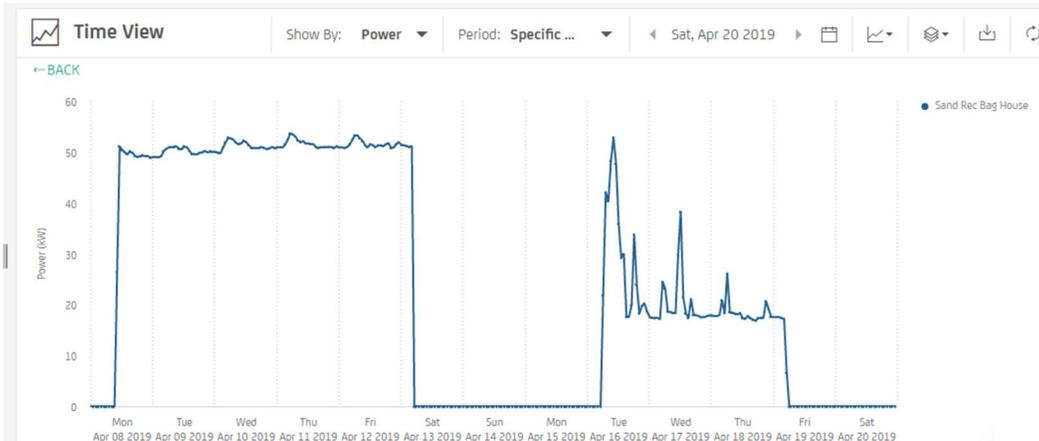
Identifying Wasted Energy – Reviewing equipment operation through Power Radar, the customer can understand when equipment is operating outside its typical schedule or load profile. As a result of monitoring, this customer updated equipment schedules and encouraged operators to turn monitored equipment off at the conclusion of a production cycle.

Early Warning of Equipment Failure - By programming custom alerts pushed in real-time (e.g. over or under amp motors to identify seal leaks, bad bearings, etc.), the customer identified several partial failures and addressed them before total failure could occur during a production cycle.

Improve Process Efficiencies - By understanding site energy used in each process/shift and generating production efficiency rates that can be used as a baseline for improving processes, the customer improved furnace operations and confirmed automated processes are not overridden by inexperienced operators.

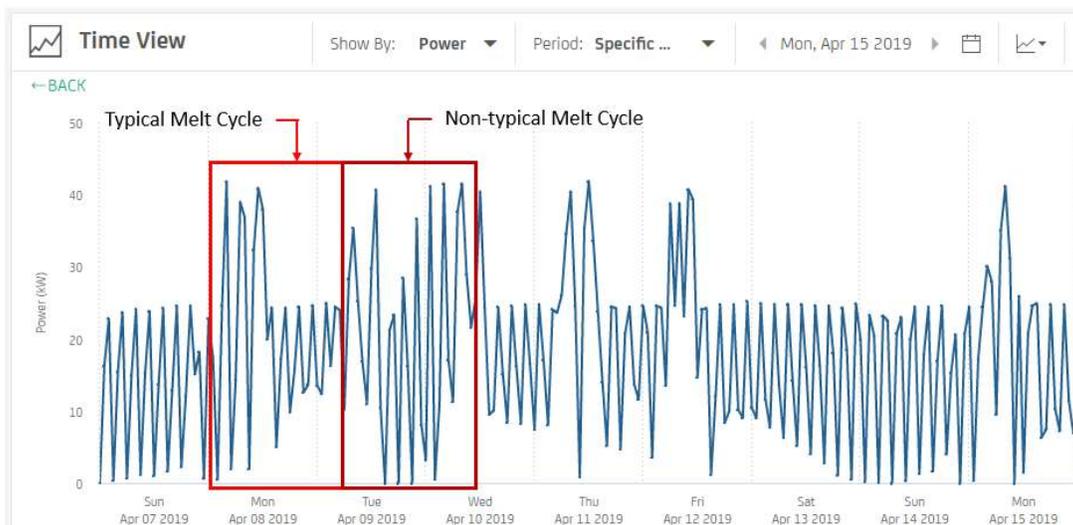
SiteWatch Successes

Motor bearing failure caused motor shaft to break – The customer received an alarm due to a motor running under amps in a part of the plant that is not typically occupied. Maintenance staff were alerted to the situation and upon inspection discovered a broken motor shaft. The issue likely would not have been identified until a production line failure occurred if sensors had not been deployed.



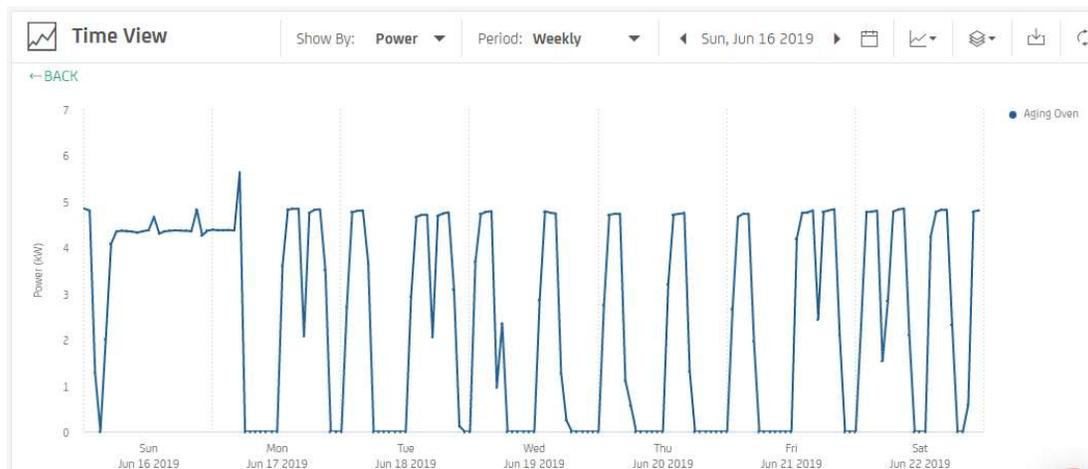
Site Watch Application – The customer set alarms for certain motors in remote areas of the plant to notify plant personnel of over- and under-amp conditions. This alarm range was set after observing the motor running under typical loading conditions for several days.

Automated furnaces can be overridden by operators – Management did not want any manual furnace operations as manually controlled batches were likely to have temperatures exceeding best practice. Increased furnace temperature may appear to help production to an inexperienced operator, but results in diminished quality in final product, as well as increased wear on crucibles used in smelting. Sensors ensure controls are not overridden. If amp swings are detected, operators are required to provide explanation to supervisors. Prior to deployment of sensors, supervisors had no way of knowing whether an operator overrode automated controls. The value to the customer is extended life of smelting equipment, improved product quality, and effective management of operators.



Site Watch Application – Daily and weekly reports showing furnace electricity input over time are used to track periods of excessive use. Time-view plots over 6-hour periods are used to indicate whether a furnace is operating in manual mode. Plant personnel can be notified of improper procedures and corrective action can be taken.

Ensuring heat treatment process occur when plant management is not onsite – The plant has several heat-treating furnaces used to finish cast aluminum parts. Since the heat treatment process takes up to 8 hours between when product can be loaded and removed, and due to size limits of the furnaces, the customer must continuously carry out heat treating to meet customer orders. If heat treatment does not take place in a timely manner, delays in shipping product can occur. Management uses SiteWatch to ensure heat treatment carries through periods when there is little or no oversight of off-hour personnel.



Site Watch Application – Mobile app used to access time-view of heat treatment furnaces, allowing the user to track when a treatment started, and ensuring proper equipment cycling through off hours (nights and weekends).

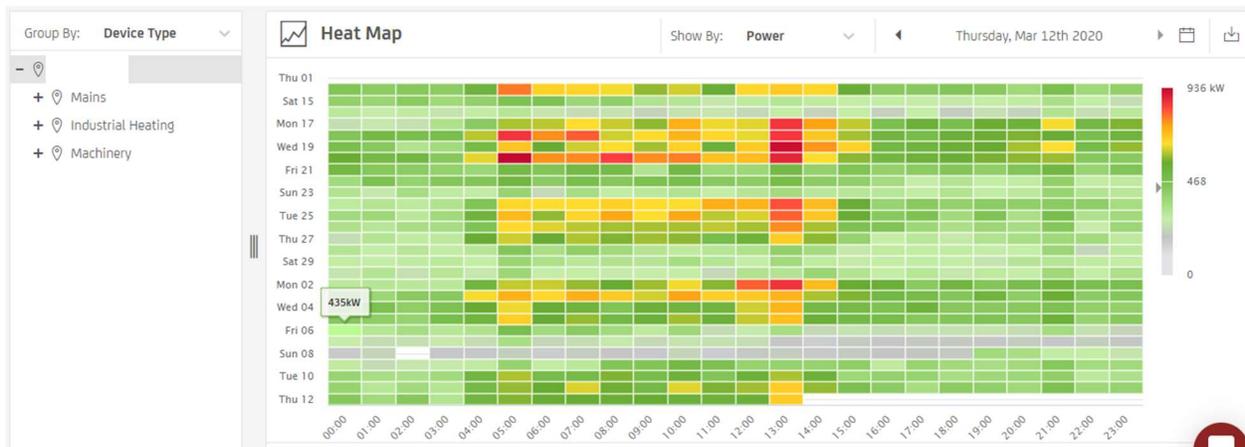
What is the Customer Using from Power Radar?

In addition to regularly viewing real-time and historical data in a readily understandable format, the customer has daily and weekly reporting

Time View - This view allows energy consumption to be viewed over a specific time period down, from annual to 5-minute intervals. Users can select specific equipment, equipment types, production lines, entire sites, or any other combination of sensors to view. Different periods can be overlaid, allowing for quick visual comparison of energy use. Data may be downloaded to .csv or .png format from 1-minute to monthly intervals.



Heat Map – A heat map allows for easily understanding how the selected equipment, zone, panel, or site energy use varies through a 24-hour day, and across multiple days. The visualization allows for easy identification of equipment operating outside normal runtimes and can inform personnel of the cost of energy wasted during non-production or unoccupied periods.



Benchmarking – The benchmarking tool generates a value expressing the relationship between energy use and independent variables available in Power Radar, including cooling/heating degree days, operating hours, building footprint, or another normalization factor (e.g. production).



Energy Flow - This view allows energy use to be visually assigned by equipment type through a detailed graphic representation of how energy is distributed between monitored devices





Daily Energy Reports

Energy Consumption by Category – Shows the daily consumption from the previous day, by classified end use, and compare it to the previous day through figures and a graphical representation. More detailed equipment classifications increase the efficacy of this sub-report.

Energy Consumption by Day – Reviewed daily by the plant manager to understand the fluctuation in total energy consumption from the previous days. Managers knowing plant utilization can immediately determine if daily plant usage, or line usage, aligns with variations in production. Non-aligned changes in daily plant energy use can indicate an issue requires further investigation.

Day-to-Day Energy Consumption – Shows two weeks' worth of total daily consumption, with each day of the week presented side-by-side to easily show differences between the same day of the week. Site personnel use this to identify non-routine energy use outside of typical production days.

Weekly Energy Reports

Weekly Top Electrical Consuming Devices – Shows the 10 highest energy using pieces of equipment.

The customer can use this to understand which equipment is contributing most to overall site usage, thereby focusing attention for potential changes in operations or capital improvements.

Off-Hours Energy Cost for Top10 Devices – Relies on established operating hours to calculate energy cost outside these operating hours. While some equipment is required to stay on, other equipment may not be required. This report alerts the customer to the highest cost equipment contributing to waste.

Daily Peak 15-Minute Interval – Used to track peak demand windows, providing insight to potential transmission and demand tagging for energy procurement. Demand information can also be used to identify equipment that can be staged to avoid higher-than-expected peak demand.

Daily Peak 15-Minute Interval, Top 5 Energy Users – Used to track peak demand use for the top energy using equipment, providing easy to understand guidance on where to focus plant operational changes.

Compressor Lead/Lag – Demonstrates the interaction of air compressors onsite, keying operators into how air compressors are required to run to meet the site's compressed air demand. This information is used to optimize compressed air sequencing, and ensure enough capacity exists for plant needs.

Unbalanced 3-Phase Devices – Used to show onsite electricians if there is a phase imbalance for 3-phase equipment, a situation that can impact operations or indicate equipment failures. The customer cited examples of an imbalances occurring in heating elements for an electrical furnace that would not have been identified by operators, helping extend the life of the crucible and preventing catastrophic failure, as well as reducing wear and overuse of heating elements served by other phases.