![Bentley - Advancing Infrastructure]

Project Summary

Organization:
Danfoss

Solution:
Buildings and Facilities

Location:
Global

Project Objective:

- Lower operational costs through food safety monitoring

- Reduce maintenance and replacement costs

- Reduce overall energy costs (lighting, refrigeration, ovens, and so on).

- Filter alarms to reduce false alarms

Products used:
Amulet

Fast Facts

- Used in nearly 5,000 supermarkets worldwide

- 200,000 refrigeration-related data points across all stores, including compressor pressures, liquid levels, temperatures, energy use, and currents

- 40 million real-time changes daily from readings every five minutes, 24 hours a day

ROI

- Reduced maintenance call outs; false alarms and energy consumption

- Strengthened the bottom line by lowering operation costs

- Identity performance levels across all sites via benchmarking

- Achieve compliance in temperature HACCP

Operational Analytics Helps Lower Maintenance and Energy Costs to Danfoss Customers

Alarm Management Helps Minimize Food Loss and Energy Consumption

Monitoring 5,000 Sites around the World

Danfoss, which specialises in producing refrigeration monitoring equipment, compressors, and controllers for grocery stores, required a solution that would help its customers view their operations at a presentation level, create reports on alarms and performance, and reduce energy costs for around 5,000 sites worldwide.

Backgrounds and Challenges

Refrigeration consumes a major portion of a large grocery store's electricity (up to 30% in some UK stores), with the remainder consumed by HVAC equipment, lighting, and other utilities such as in-house bakeries and restaurants. Add to this the risk of asset failure, which can result in food loss, unplanned asset down time and maintenance call outs — unexpected costs that can quickly escalate.

Retailers now operate in a market where the demand for frozen foods is increasing, causing them to invest in large-scale refrigeration equipment. This has led to tight margins in an increasingly competitive market where assets are expected to perform constantly. Historically, supermarkets have accepted that the cost for high customer volume, regulatory compliance, and increasing energy costs were part of the business model.

Danfoss addressed these business challenges with an operational analytic solution provided by Bentley's Amulet that saves money, categorizes and filters alarms, improves energy efficiency, and gives customers peace of mind.

Solutions

There were many key solutions that enabled Danfoss customers to manage their supermarkets more efficiently and to aid decision making. Central to these is the alarm management system that is in place to monitor food quality and energy efficiency along with a visualization component to bring all of the information to together in one platform.

Visualization and Reporting
The collection, organization, and visualization of operational information were an important factor to Danfoss customers

as it allowed them to present a real-time visualization of performance and current conditions, particularly focusing on generated alarms. Using the operational analytics solution, customers are able to view alarm counts and status, view, and email reports on performance on a daily, weekly, monthly, or annual basis, as well as the facility to create ad-hoc reports as required.

Alarm Management System
An underlying alarm management system means any alarms based on a potential failure or a threat to an asset when a threshold has been reached is raised automatically. The difficulty here is identifying which alarms needed attention and which could be dismissed as a result of defrost cycles, or when refrigerator doors are being accidentally left open. Danfoss uses Bentley's Amulet software to count repeated similar alarms and identify which were real and which were false, and notify the right people, leading to a more proactive approach to maintenance as opposed to reacting after an incident. Eliminating false alarms from the system significantly cuts costs by reducing needless callouts of maintenance engineers. Alarm histories could also be used against the asset, the fault, or the site to highlight patterns, such as determining the reason why a particular alarm was occurring against the same asset consistently across multiple stores.
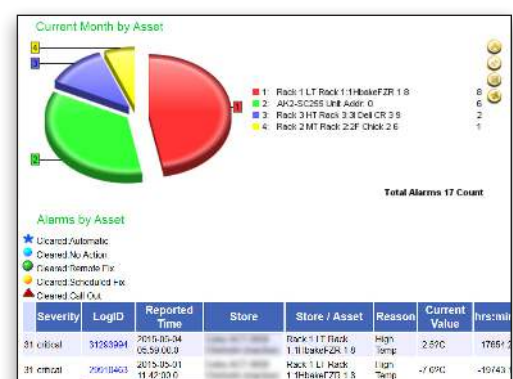
Managing, categorizing, and filtering alarms lead to the identification of false alarms.

HACCP Reporting

Danfoss addresses regulatory food compliance with Hazard Analysis and Critical Control Points (HACCP) reports, a monitoring and reporting system that assures food production and storage facilities are safe. Using Amulet for data collection and visualization, HACCP reports show the average temperature during an hour (from typically four 15-minute intervals) of any asset containing food. These reports are displayed within Amulet's dashboards and allow Danfoss and its customers to spot at a glance any differences in behavior in an asset's temperature by using a color coded boxes to indicate whether an asset is operating above or below its normal level. These reports can display historical data to prove that measures are taken to ensure food safety.

Coupled with the Temperature Quality Index report, which displays the overall performance of an asset in terms of how much of a percentage it is operating within its set points, the reports bring a complete picture of asset performance in near to real-time, where certain events can be predicted and actions taken ahead of time.
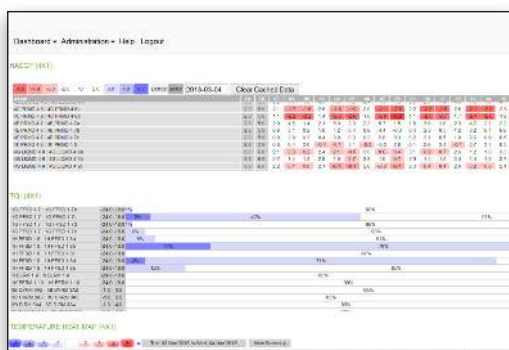
Spot differences in temperature behaviors in a glance.

Load Shedding and Set Point Management

Other functionality within Amulet include the addition of automated load shedding and set point management. Load shedding (or demand response) involves Amulet to help facilitate the automatic switching on/off of certain assets by interfacing directly with the hardware. This is to reduce energy consumption and receive financial incentives from
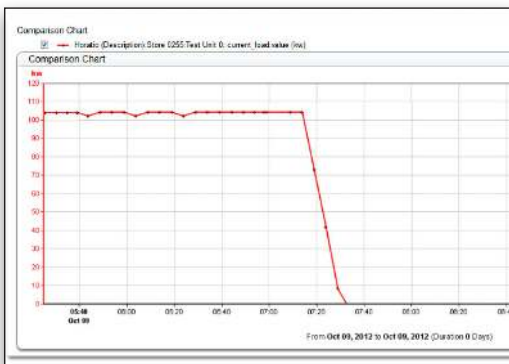
Load shedding reduces energy costs at peak demand.

power companies who need to reduce peak demand. This could include HVAC systems, store, and car park lighting. The previous image shows the energy use before and after a loadshedding phase has been started.

From the Amulet dashboard, levels can be set that will send a signal to certain controllers, such as lighting zones, turning them off over a set period of time. Each level of load shedding can include any number of assets, from a few to all. These measures help reduce energy consumption while the initiative also encourages financial incentives from the energy provider.

Set point management automates corrections in hardware value points to ensure error control regulation of asset temperatures, switch status, and alarm values. This means that Amulet constantly checks values to specific hardware, like a switch or a set point, making sure they are correct. If a change occurs, or is made accidently by a third party, it can be entered into an audit trail and automatically corrected to the original value. This ensures continuity to the operational performance of the store and peace of mind knowing that accidents will be avoided, further reducing callouts and loss of stock. Set points and schedules can also be changed for an entire estate through one job.

Results

Through the use of operational analytics, Danfoss has achieved complete visibility of its whole operation, including energy usage against external parameters like outside/inside temperatures and other factors. By monitoring these patterns for their customers, Danfoss can regulate the environment in which its assets work. For example, refrigerators won't need to work as hard if the temperature or humidity in the store is controlled at an optimum level.

Through Amulet, Danfoss is able to determine that substantial energy savings can be achieved and affect its customers' bottom line. Key operational benefits included:

- Ensure food safety and minimize food loss
- Reduce energy consumption
- Anticipate failure of refrigeration equipment
- Filter, identify, and notify alerts and real service maintenance needs
- Prescriptive load shedding for optimal power reduction
- Prescriptive set point remapping when overriding settings

The Amulet alarm management system allows Danfoss customers to monitor and track their assets and intervene when necessary if one triggers an alarm. With Amulet's variety of specialised alarms such as threshold, percentage, or hold down, raised alarms have been filtered to only notify users of critical alarms, thus reducing false alarms and maintenance call outs.

Using Bentley's Amulet operational analytics software enables Danfoss to increase its customers' ROI by eliminating false alarms, effectively monitoring energy usage, and provides them with levels of visibility that help them monitor performance more accurately and timely.