



Smart Connected Refrigeration Services Improve Uptime and Energy Efficiency

Stellar is an industrial design/build firm focused primarily on the food and beverage market, with a leadership position in industrial refrigeration facilities. Based in Jacksonville, Florida, the firm was seeking an industrial IoT platform that could help the company reduce Total Cost of Ownership for its industrial refrigeration customers.

Challenges

In an industry where assets can remain in the field for decades, change takes time and determination. Leaders at Stellar realized that embracing new technology was key to delivering greater value to its customers. The company created an innovation division to explore alternative solutions. Their first goal was to develop a crisp definition of customer challenges. These included:

- Ensuring Quality and Reliability
- Reducing Operational Costs
- Improving Energy Efficiency
- Managing Compliance
- Improving Workforce Efficiency



We knew that providing customers with insight into the true cost of building ownership would be a game-changer.”

Luke Facemyer, Divisional Vice President, Refrigeration

Charting a Clear Vision

Stellar recognized that providing insight into the true costs of building ownership would be a powerful change agent. "And to do that, we recognized we would need to collect significantly more data," explains Luke Facemyer, Divisional Vice President. "We wanted to expand our service business and help customers move to a more proactive maintenance approach."

The first solutions targeted for the company's digital transformation journey were:

1. NH360 MAP, Stellar Maintenance Advisor and Predictor

Stellar's flagship service solution helps customers improve equipment efficiency and avoid losses due to equipment downtime. This initiative helps transition customers from higher-cost, reactive maintenance methods to prescriptive and ultimately, predictive maintenance approach (see sidebar).

Key goals of the MAP project include:

- **Reduce or eliminate downtime** and protect against spoilage through asset monitoring.
- **Lower total cost of ownership** by transitioning from scheduled maintenance to condition-based maintenance – extending the life of parts without increasing risk.
- **Reduce energy costs** through analysis of the most efficient system parameters.
- **Improve workforce efficiency** by automating data logging, equipment troubleshooting and diagnosis.

2. Process Safety Management (PSM)

Stellar already had a Digital PSM (Process Safety Management) system in place to help customers track and manage compliance with industry regulation of ammonia and other chemicals. However, the solution was highly manual, and paperwork, service calls and training were becoming a time drain. A new PSM application would sport a modern look and feel. It would also integrate with enterprise resource planning (ERP) software to reduce double-work and improve data integrity.

FOUR MAINTENANCE METHODS – WHAT ARE THEY?

Reactive – Equipment is operated until failure. The facility then performs any needed maintenance to repair or replace equipment and likely experiences costly and unplanned loss of production, equipment repairs, expedited parts, and emergency overtime.

Preventative – Components are regularly repaired, serviced, or replaced on a time-schedule based on manufacturer information or staff experience. This method reduces some machine failures, but misses root cause issues and replaces parts that may still have a long life.

Predictive – Equipment is monitored by tapping into existing PLCs and device drivers, or using sensors connected to an analytics engine that alerts maintenance staff when an anomaly is found, which could be a sign of a future issue.

Prescriptive – The analytics engine above harnesses deep-learning algorithms to determine the likely root cause of the future issue and provides recommendations to address the issue before it manifests.

– Courtesy of Stellar

Selecting the Right Technology

To support its digital transformation initiatives, Stellar sought an IoT solution that could be quickly implemented with minimal business impact. Other selection criteria included a superior application design user interface (UI) and user experience (UX), personalized audit navigation, on demand training modules, and drag-and-drop connectivity with ERP and other external software. Robust analytics capabilities and the ability to quickly create and deploy working applications were also key factors in the decision to move forward with ThingWorx and Vuforia.

The simplicity of having multiple capabilities offered by a single vendor was a plus. "When we took a step back and looked at the products that PTC could offer us it was like, okay, we have to do it this way." Explains Jose Cortez, Stellar's Innovation Manager. "It's better to have everything under the same umbrella than to have to deal with multiple vendors."

Stellar selected four solutions from PTC to bring its portfolio to the next level: ThingWorx, Vuforia, KEPServerEX[®] and the PTC Cloud.

- **ThingWorx** simplifies the process of connecting devices and sensors, systems and assets, and can easily scale to accommodate growth and change, delivering increased business value. Onboarding is fast with rapid app development and IoT solutions ready out of the box. Sophisticated analytics are made available to developers via simple, intuitive user interfaces, easy-to-understand information and visualizations.
- **Vuforia** allows Stellar to create onsite training manuals and capture knowledge and expertise from existing employees through augmented reality (AR) and virtual reality (VR). This is particularly impactful for Stellar's aftermarket support, a key differentiator in their service offerings. Sales and marketing efforts are also made more efficient through AR and VR by eliminating the burden of transporting bulky equipment to tradeshow and customer presentations, allowing teams to show real-life scale machines in action.
- Stellar's use of **Kepware**, the leading industrial connectivity solution, helps hold, transfer and analyze real-time operational data from sensors, devices and control systems for further insights and machine improvement.
- **The PTC Cloud** allows Stellar to build its solutions in a cost-effective manner, reducing its in-house IT burden and allowing for quick amp-up of new solutions. Sharing critical information related to product development, operations, manufacturing, support and services securely and reliably from anywhere in the world is a key differentiator in today's marketplace.

A Fast Start

First out of the gate was the Digital Process Safety Management (PSM) solution. It took less than three months to develop the replacement PSM solution, which is now being deployed across the Stellar customer base. Early feedback has been overwhelmingly positive. The new solution enables customers to more easily manage their compliance documentation and enables greater confidence in the event of an audit. With convenient cloud deployment, the solution can also be easily upgraded as regulations evolve.



Better Maintenance through Analytics

The first MAP (Maintenance Advisor and Predictor) pilot was introduced shortly thereafter. The new system brings visibility, efficiency, and cost savings to customers through a system health dashboard.

At the heart of the MAP solution is an analytics engine, powered by ThingWorx Analytics, built from large data-sets specific to each customer installation. To create these data sets, the engine accumulates and analyzes operating data to determine baseline parameters. Once established, the baseline is

continuously monitored and fine-tuned as anomalies are identified. The self-learning Analytics Engine harvests knowledge from each new piece of data to diminish false negatives and positives.

Stellar endeavors to monitor virtually all refrigeration equipment, from decades-old assets to the modern smart, connected units. To achieve this, it utilizes a combination of edge devices ranging from PLCs to wireless sensors that do not require extensive cable or hardware install.



UNDER THE HOOD: HOW STELLAR MAP SOLVES MAINTENANCE ISSUES

Traditional Maintenance Issue	Stellar Solution
Equipment failure occurs, refrigeration and production stops, storage may spoil	Analytics engine detects anomalies and diagnoses future issues before they occur
Upon equipment failure, production must accommodate maintenance	Issue detection provides time to resolve before a future issue occurs
A. Emergency parts must be expedited and costly machine repairs performed. B. Equipment repairs may be delayed due to long-lead-time parts	Diagnosis provides information on root cause of future issue before it arises
Small unseen issues cause larger costly issues	Engine detects anomalies and diagnoses issue before it occurs
Maintenance or technician overtime is required	Issue prediction from anomalies is provided before issue occurs
Parts are preventatively replaced well before the end of their useful life	Issue detection and diagnosis allows parts to be replaced only when they are at the end of their useful life
Energy-use impacts of system changes hidden and hard to quantify	The system dashboard provides real-time system conditions and historical data
Staff uses majority of time collecting and reporting system information	Data is automatically collected and logged
Staff troubleshooting experience and knowledge requires substantial training to pass on or it is lost	Issue diagnosis is performed by the Analytics Engine

— Courtesy of Stellar



The new remote predictive service solution provides Stellar customers with the operational insight needed to monitor fleets of refrigerated assets, reduce energy costs, and deploy assets more efficiently. Early feedback has been highly positive. The initiative has helped Stellar differentiate its offerings and serve as a trusted advisor in their customers' own transformation journeys.

A Commitment to Excellence

By partnering with PTC, Stellar is taking its Industrial Solutions division to the next level of connectivity. Looking to the future, the company anticipates delivering applications that will further target improved uptime, reliability and peace of mind. Pilots are also underway with Vuforia solutions to support sales and marketing, training and knowledge capture. All of which make Stellar's IoT program a flagship milestone in its commitment to delivering excellence in industrial refrigeration.



As the construction and industrial refrigeration industries continue to evolve, it is imperative to have the right technology partner in place to ensure our systems are meeting customer demands. With increasing regulatory requirements and an aging workforce that holds untapped knowledge of system operation, now more than ever, embracing technology such as cloud, IoT and AR is vital."

— Luke Facemyer, Divisional Vice President of Refrigeration.