

Axiom Cloud Case Study

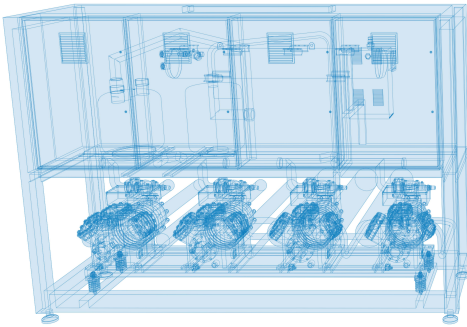
Getting paid to save.

A three month pilot at two Grocery Outlet sites in California's Bay Area demonstrates a better way to manage refrigeration infrastructure, while receiving utility incentives and **creating \$27,000 in projected savings.**

“Without Virtual Technician's early notification of the leak, this store would've experienced unplanned downtime and a big maintenance bill in the coming weeks.”

Frank Davis, Director of Refrigeration Engineering, Energy & Sustainability

Summary



Grocery Outlet, a leading value supermarket chain with over 400 locations in the U.S., piloted Axiom Cloud apps in two Bay Area locations. Several outages were avoided through features including refrigerant leak and compressor floodback detection, leading to \$26,988 in positive financial value during the three month pilot. Now, demand response incentives in California offer the potential to fund the deployments of Axiom Cloud apps at many additional sites across the state.

Challenge

Grocery Outlet, a leading value supermarket chain with over 400 locations in the United States, sought an easier, better way to manage refrigeration assets at their stores. Maintenance events and outages were a challenge for technicians and store operators to manage. In addition, the industry-wide service technician shortage, with 81% of contractors surveyed in 2020 having trouble filling open positions, created a need for more efficient management.

Issues with refrigeration assets take many forms. Most modern commercial refrigeration systems have control systems that send threshold alarms after issues arise. Grocery store operators usually face an avalanche of refrigeration alarms in their inboxes that are difficult to interpret or take action on. In many cases, grocery store operators have to empty malfunctioning display cases, throw away spoiled product, and tell customers that certain products aren't available due to refrigeration problems that could have been avoided. Missing maintenance problems impacts sales and the customer experience, and a single unplanned compressor failure can cost a store \$8,000-\$10,000 in equipment and labor alone!

Refrigerant management is another source of headache across the industry. In addition to causing painful outages if left unchecked, refrigerant leaks are a store's leading source of Scope 1 emissions. Refrigerants like R404a and R507 are highly potent greenhouse gases, and repeat leaks can lead to fines and compliance headaches.

While they are responsible for 80% of a store's service calls, refrigeration systems are also a grocery store's largest and least flexible energy consumer. Refrigeration makes up 60% or more of a building's total energy footprint. With rising energy costs, refrigeration represents an opportunity to reduce expenses and improve profit margins.

Demand response programs, offered by utilities like Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E), provide financial incentives to electric customers to expand and improve building energy management capabilities. In the case of PG&E, an upfront incentive of up to \$200 per kW of flexible capacity is available to customers for installing new equipment that enables automated demand response.

Taken as a whole, managing refrigeration systems provides a daunting set of challenges. With Axiom Cloud's apps, navigating these challenges is now easier than ever before.

Solution



Facilities Analyzer



Virtual Technician



Virtual Battery

PHASE I

Given the significant challenges that come with refrigeration system management, Grocery Outlet greenlit a pilot program for two stores in California's Bay Area. These stores would start with Axiom Cloud's apps for refrigeration visibility and maintenance - Facilities Analyzer™ and Virtual Technician™.

Facilities Analyzer provides a software layer, on top of existing control systems, that predicts refrigeration problems before unplanned cooling outages occur, provides multi-site visibility into store refrigeration operations on any device, and provides useful store analytics to help identify performance trends.

Virtual Technician adds onto the foundation of the Facilities Analyzer app by autonomously solving many common equipment problems, detecting refrigerant leaks without PPM detectors, and reducing energy use with continuous commissioning. Powered by artificial intelligence and machine learning, the app uses a digital model of each store's refrigeration system to predict failures before they lead to case temperature alarms. After detecting an equipment problem, the app either remedies the problem on its own, alerts store personnel to the issue, or sends a highly contextual notification.

For both Facilities Analyzer and Virtual Technician, predictive maintenance notifications include all pertinent information required to fix the problem as quickly and efficiently as possible. By running advanced data validation on any repair, the app ensures the root cause of any issue is completely addressed, and that a "band-aid" fix wasn't applied.

In the span of 90 days, we helped two Grocery Outlet stores avoid significant business disruptions, while providing a new way for them to interact with their refrigeration systems. The total estimated savings we provided was about 15x the cost of our software."

Amrit Robbins, Axiom Cloud CEO

Results

Anomaly Type	Description and Root Cause	Projected Savings
Compressor Cycling	<p>Rack 1 compressors are tripping off when outdoor air temperature (OAT) is greater than 60°F. Compressors reset themselves but trip back off soon after. A heat wave will likely cause a rack outage. Recommissioning of the compressor pressure cut-out setpoint is required. Likely root causes:</p> <ol style="list-style-type: none"> 1. Rack 1 compressors high pressure cut-out setpoint is too low. 2. Rack 1 compressors are faulting due to high internal temperature. 	\$3,237
Compressor Floodback	<p>Liquid refrigerant is overfeeding into Rack 1 suction header resulting in compressor floodback. The source of the floodback has been isolated to Circuit 1-A RIIC. Likely root cause:</p> <ol style="list-style-type: none"> 1. Circuit 1-A RIIC case TXV(s) is staying open after defrost. 	\$4,578
Refrigerant Leak	<p>Rack 1 is likely leaking refrigerant. This results in low rack capacity and cases unable to meet their temperature setpoint. If Rack 1 continues to leak, case outages are likely to occur during high outdoor air temperature conditions.</p>	\$4,790
Rate Plan Change	<p>This store's current electricity rate plan, which is the default for commercial buildings with peak demands < 500kW, is not the ideal rate plan based on the store's load profile. Voluntarily switching to the B-19 rate plan, which has higher demand charges (\$/kW) and lower energy charges (\$/kWh), would reduce the store's monthly electricity bill by ~17%.</p>	\$14,383 per year
Unhealthy Case	<p>Case 4.10 1B WIIC average temperature has drifted substantially relative to other cases in the circuit. Likely root causes:</p> <ol style="list-style-type: none"> 1. Case 4.10 1B WIIC has a discharge air temperature that is consistently higher than the other cases in the circuit due to a heat transfer problem (e.g., dirty evaporator or malfunctioning evaporator fan). 2. Insufficient defrost duration or frequency has allowed Case 4.10 1B WIIC to accumulate ice over time. 3. Damaged door seal has led to increased humidity in Case 4.10 1B WIIC. 	\$931

Results

PHASE I

Between the two sites, a total of five distinct anomalies were detected by Axiom Cloud apps during the three month pilot. These anomalies ranged from a low urgency rate plan change recommendation that was estimated to save over \$14,000 per year, to a high urgency refrigerant leak that required immediate action to avoid a refrigeration outage.

In the first month alone, Axiom Cloud apps detected two medium urgency anomalies related to compressor health, which had a combined estimated value of \$7,815. By the end of the third month, Axiom apps had generated \$26,988 in value by detecting these anomalies, and had gathered enough energy data to suggest a rate plan change that would save significant money at one of the stores.

Performance reports provided to Grocery Outlet at the end of each month summarized the refrigeration anomalies that were detected for each site, as well as the value generated from the resolution of each issue.



Virtual Battery



Virtual Technician



Facilities Analyzer

PHASE II

Demand Response Incentives and the Virtual Battery app

Axiom's Virtual Battery™ app allows refrigeration assets to provide the same value streams as a lithium-ion battery, but without the expensive hardware. By forecasting building power consumption, followed by intelligent pre-cooling and load shedding of frozen refrigerated cases, Virtual Battery eliminates building power spikes and supercharges a store's ability to generate demand response revenue.

Demand Response Tests

Through demand response programs offered by many utilities, customers can earn revenue by reducing their energy consumption after receiving advanced notice. Based on the success with Facilities Analyzer and Virtual Technician at these two stores, Grocery Outlet was excited to use demand response incentives to leverage Axiom Cloud's apps at additional stores throughout California.

At one of the two existing stores, a test demand response event was completed to demonstrate the flexible load that was enabled by Axiom's Virtual Battery app. After pre-cooling and load shedding both the low temperature refrigeration system and HVAC on the day of the test, building and refrigeration data were shared with PG&E's incentive program. Based on the results of the test, PG&E's program administrators gained confidence in Virtual Battery's ability to shed load autonomously at Grocery Outlet stores.

The test event demonstrated that Axiom Cloud could shed 23% of the store's baseline power consumption on average over a 2-hour period! With an incentive of \$200 per kW, in addition to ongoing revenue from participation in the demand response program and reduced energy bills, the financial benefit promises to be significant for this Grocery Outlet store and others.

Conclusion

On behalf of Grocery Outlet, Axiom and a partner have applied for Automated Demand Response (ADR) incentives for many sites throughout California. More than 50 store owners/operators have already signed on, and many more have expressed interest. The next step beyond the two-store pilot is to implement the Axiom apps, with hardware and initial installation paid for by utility incentives, at many Grocery Outlet stores throughout California.

The stores will earn ongoing demand response revenue, experience lower energy bills, reduce refrigeration maintenance emergencies, and have more visibility into their refrigeration systems from any device. All with great financial returns in the first year, and every year thereafter.

Contact Info

Axiom Cloud's mission is to use software and automation to transform how the world's cooling systems are powered, operated, and maintained, in order to generate significant climate and financial impact.

Axiom's team of refrigeration experts, data scientists, energy nerds, and software developers solves retail grocery's biggest energy and maintenance challenges by layering intelligence onto their existing refrigeration systems. Learn more at www.axiomcloud.ai

