Axiom Cloud: Apps for Commercial Refrigeration

Virtual Technician™ Case Study - Compressor Failure Detection

OPPORTUNITY

Unplanned refrigeration system downtime, component failures, overtime repairs, and refrigerant leaks can be a very costly aspect of operating mission critical supermarket refrigeration systems. For example, one compressor failure can cost $8,000 to $10,000 once a rushed replacement compressor and overtime labor are included.

At this site in Northern California, Axiom Cloud's Virtual Technician app identified a compressor that was not responding to commands from the refrigeration system controller. Because the controller only tracks commanded runtime of the compressor, and not actual runtime, the existing alarm strategy did not recognize the compressor failure, which could have led to case demerchandising, lost sales, or food spoilage during the next heat wave.

SOLUTION

Unlike traditional threshold alarms, Virtual Technician's compressor malfunction detection feature predicts the expected compressor power using historical operational and weather data, and then compares these predictions to power measurements in real-time. If the Virtual Technician algorithms indicate that a compressor is operating abnormally or inefficiently, specific sets of remedial actions are triggered or recommended.

In this instance, Virtual Technician was predicting compressor power based on moving averages of commanded runtime and other system parameters during "normal" historical operation. On August 24, a sudden step increase in commanded compressor runtime was not accompanied by a increase in total rack power, as would be expected. Virtual Technician then realized that compressor 2 commanded runtime was permanently at 100%, and the total rack power did not decrease when this command was overridden. Because of this, it was determined that compressor 2 had failed and a technician was sent to the site.

Virtual Technician processes thousands of data streams to identify anomalies, or indications of upcoming system faults, and automatically fixes issues or diagnoses their root cause.

RESULTS

With Virtual Technician, this site's service provider was able to identify a compressor failure that the existing refrigeration controller missed and send a technician to site before any additional damage was done. Because this compressor was repaired in a timely manner, thousands of dollars of repairs and product loss were avoided when the compressor capacity would have been required to keep the food cold during the next heat wave.

Customer type

Retail grocery, 67,000 ft²

Location

Northern California, USA

Apps provided

- [x] Facilities Analyzer
- [x] Virtual Technician
- [ ] Virtual Battery

Feature in this case study

Compressor failure identified, diagnosed, and resolved prior to a critical loss or outage event.

Refrigeration system architecture

Tyler central parallel racks
Micro Thermo Controller
MT: 1705 MBH, 262 HP, 404A
LT: 220 MBH, 74 HP 404A

Estimated benefit of Virtual Technician at this site

$113,000 over 5 years

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HOW VIRTUAL TECHNICIAN PREVENTED AN OUTAGE

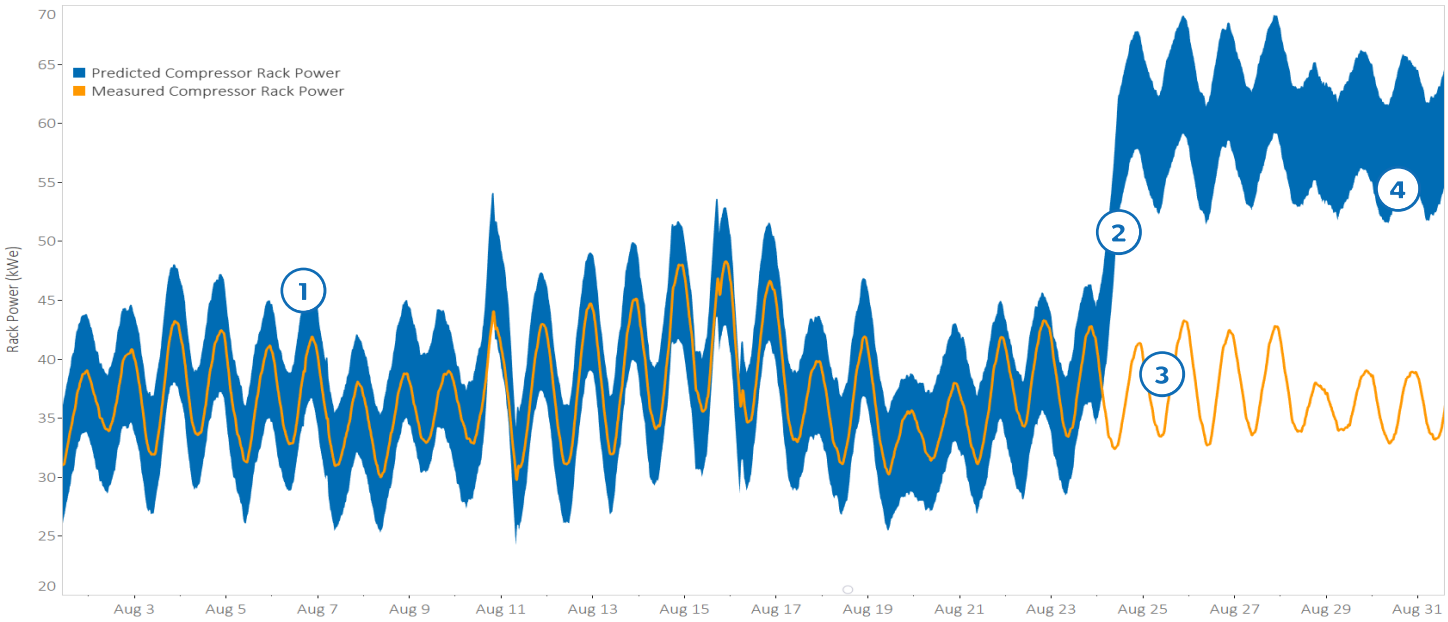
Detected the compressor failure early

Isolated the fault to a specific compressor on the rack

Notified the maintenance provider with specific corrective action

Ensured the proper corrective action was taken

COMPARING PREDICTED TO ACTUAL COMPRESSOR POWER



Normal operation (1)

Prior to 08/24, measured compressor power fell within the values predicted by Virtual Technician, indicating normal operation.

Deviation (2)

Around 02:30 on 08/24, a step increase in commanded compressor runtime caused the predicted power to rise significantly.

Identification (3)

After this step increase in commanded runtime, the measured compressor power did not rise accordingly, indicating that a compressor on the rack had failed.

Diagnosis (4)

By modulating individual compressor runtime values and observing the effect on measured power, Virtual Technician was able to isolate the failure to compressor 2 and subsequently notified a service technician.

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Axiom Cloud's mission is to use software and automation to transform how the world's cooling systems are powered, operated, and maintained. To learn more more about our Facilities Analyzer, Virtual Technician, or Virtual Battery apps, send us an email or visit our website.

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