

# Axiom Cloud: Apps for Commercial Refrigeration

## Virtual Technician™ Case Study - Condenser Override Detection



### OPPORTUNITY

Supermarkets are the most electricity-intensive type of commercial building, and refrigeration systems are often neglected when it comes to lowering store-wide energy costs. Even when manual retrocommissionings are done, there is often no system in place to ensure that these savings are retained through subsequent months of operation.

At this site in Northern California, Virtual Technician identified a system inefficiency caused by a condenser controller override that the existing alarm and monitoring strategy missed. Condenser fans were permanently commanded ON at 100% runtime after a technician visit, causing the store to incur unnecessary energy costs. Considering that razor thin margins at supermarkets are common, recognizing and resolving inefficiencies such as this one can make a large difference to a supermarket's bottom line.

### SOLUTION

Axiom Cloud's Virtual Technician app uses advanced algorithms to monitor refrigeration system setpoints such as condenser temperature delta, suction pressure float, and more. Unlike traditional threshold alarms, Virtual Technician detects abnormal system behavior by predicting specific parameters using historical operational and weather data and comparing these predictions to measurements of the same parameters in real-time. If Virtual Technician's algorithms indicate that the refrigeration system is operating abnormally or inefficiently, specific sets of remedial actions are triggered or recommended.

In this instance, Virtual Technician had been predicting condenser power based on moving averages of outdoor ambient temperature, store heat load, and other parameters. After a visit from a refrigeration technician, the measured fan power greatly increased relative to the predicted power. Because the condenser controller had been manually overridden, Virtual Technician produced a non-critical fault recommending the controller be reset.

### RESULTS

Virtual Technician was able to identify the overridden condenser controller and notify the appropriate parties before significant energy was wasted. While the correction of this fault was not critical to the operation of the store's refrigeration system, it significantly reduced the power consumed by the condenser fans and is expected to save the store greater than \$3,000 in energy costs over the course of a year. See the following page for a more detailed sequence of events.



The on-site gateway connects existing controllers and sensors to Axiom's cloud-based AI engine.

#### Customer type

Retail grocery, 50,000 ft<sup>2</sup>

#### Location

Northern California, USA



#### Apps provided

- Facilities Analyzer
- Virtual Technician
- Virtual Battery

#### Feature in this case study

Continuous Commissioning - ensuring refrigeration system operates as efficiently as possible

#### Refrigeration system architecture

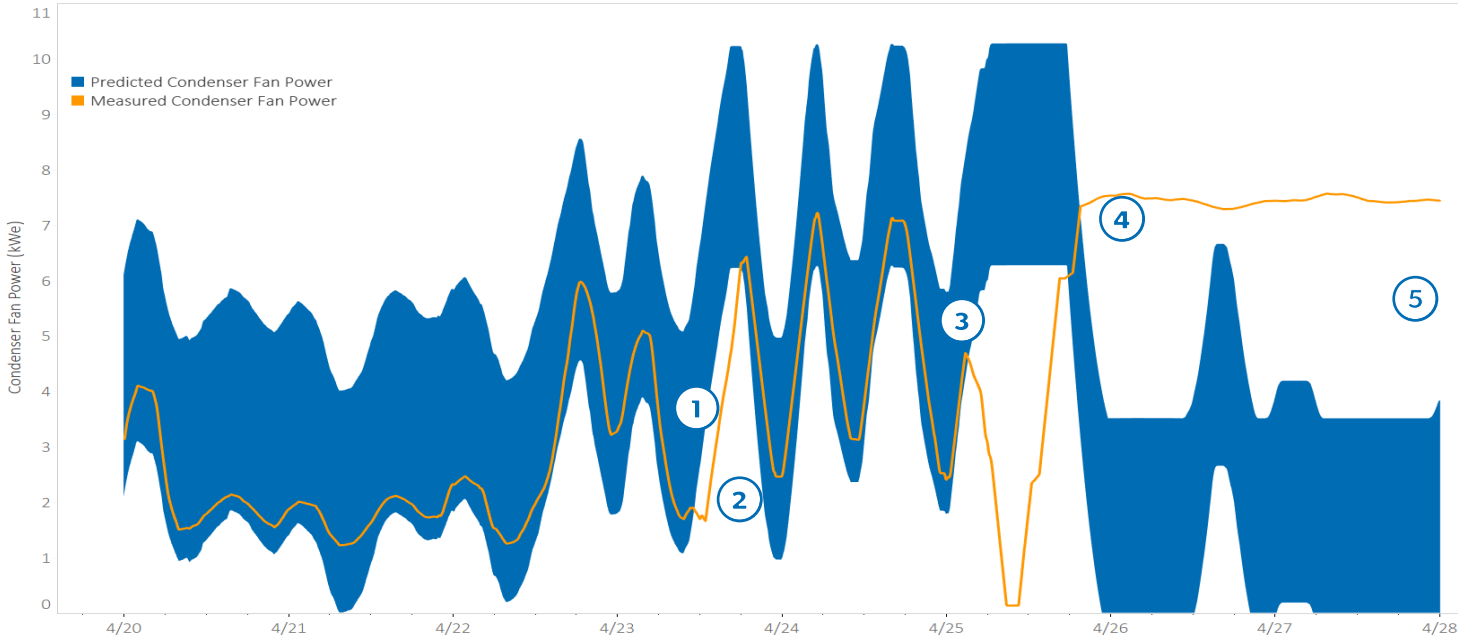
Tyler central parallel racks  
Micro Thermo controller  
MT: 1705 MBH, 262 HP, 404A  
LT: 220 MBH, 74 HP 404A

Estimated benefit of Virtual Technician at this site

\$118,000 over 5 years

# HOW VIRTUAL TECHNICIAN IDENTIFIED THE CONDENSER OVERRIDE

Predicting condenser fan power and comparing it to measured condenser fan power



## Incident

1

Between 9:30 and 10:00 on 04/23, store employees power-washed the underside of the Rack B condenser, causing the condenser fan motors to electrically short and the associated fuses to blow.

## Deviation

2

After arriving on site around noon on 04/23, technicians temporarily bypassed the fuses using wire nuts, allowing the condenser fan motors to be re-enabled until replacement fuses could be obtained.

## Identification

3

At 01:45 on 04/25, the condenser fans failed again. While the fans were repaired, service technicians replaced the previously blown fuses and overrode the condenser controller, causing the fans to be permanently ON at 100% runtime.

## Diagnosis

4

Once the controller was overridden, the measured condenser fan power significantly increased relative to Virtual Technician's predicted value, signifying that the system wasn't operating as efficiently as possible.<sup>1</sup>

## Remedy

5

Virtual Technician notified the service provider of this non-critical fault, and the controller was set back to normal operation the next time a technician was on site (not shown on graph).

<sup>1</sup> The predicted fan power decreases after the Td controller is overridden because the predicted fan power is partially based on the runtime commanded by the controller. When the fans are permanently ON, the condenser Td is readily maintained, causing the controller to command less runtime, thereby decreasing the predicted fan power.

## WHAT VIRTUAL TECHNICIAN DID

- ✓ Detected the condenser fan failure early
- ✓ Notified the maintenance provider with specific corrective action
- ✓ Diagnosed controller override after condenser was repaired
- ✓ Ensured the proper corrective action was taken

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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 about our Facilities Analyzer, Virtual Technician, or Virtual Battery apps, send us an email or visit our website.



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