



**CaseStudy:**

**Taco Bell**  
Union, Missouri



**Summary -**

**Equipment on Site:**

4' x 7' x 8' Freezer

**Equipment Applied**

(1) KE2 Evaporator Efficiency controller

**Results**

- Reduced energy consumption by 51%
- Reduced kWh by 6,520.54
- Reduced energy expense by \$652.06 (based on .10/kWh)
- reduced defrost cycles by 86%
- more stable temperature
- eliminated icing issues

From September through November 2013, a study was conducted on the walk-in freezer at the Taco Bell located in Union MO. The study's purpose was to compare energy consumption and temperature control of the freezer using two scenarios. In the first, the system was operating with standard mechanical controls, including a thermostat, defrost timer and defrost termination device. In the second, the system was controlled using a KE2 Evaporator Efficiency (KE2 Evap) controller in place of the mechanical controls.

At the start of the test, the KE2 Evaporator Efficiency controller was installed to provide monitoring of the room and evaporator coil temperatures, while the mechanical controls were still providing the actual system control. The target temperature for the walk-in freezer was 0°F. The freezer was monitored, and data on the energy consumption of the compressor, evaporator fans and defrost heaters was gathered.

After gathering the data from the mechanically controlled system, the system was switched to the KE2 Evap controller, and the same data points were monitored. Then, the pre and post retrofit results were annualized, to develop a comparison of the energy consumption.

Data Points Monitored	Type of Control	
	Mechanical	KE2 Evap
Median Air Temp	-5.0°F	0.8°F
Compressor On	40.8%	23.3%
Fans On	96.0%	34.0%
Heaters On	3.6%	0.7%

**Annualized Energy Study Results - Taco Bell , Union MO**

	Mechanical Control			
	Compressor	Fans	Heaters	Total
Runtime Hours/Year	3,572	8,449	311	
kWh /Year	8,230.98	4,055.41	448.18	12,734.56 kWh
Energy Expense/Year*	\$823.10	\$405.54	\$44.82	\$1,273.46

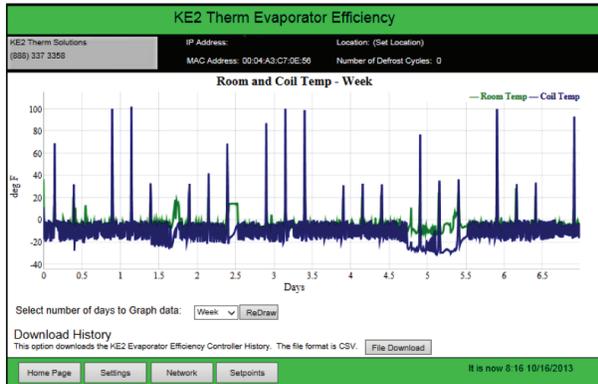
	KE2 Evaporator Efficiency Control			
	Compressor	Fans	Heaters	Total
Runtime Hours/Year	2,037	2,979	62	
kWh /Year	4,694.06	1,430.05	89.92	6,214.03 kWh
Energy Expense/Year*	\$469.41	\$143.00	\$8.99	\$621.40

**Using the KE2 Evap Provides the Following Savings**

	Compressor	Fans	Heaters	Total
Reduction Runtime Hours/Year	1,535	5,470	249	
Reduction kWh/ Year	3536.92	2625.36	358.26	<b>6,520.54</b>
Reduction Energy Expense/ Year	353.69	262.54	35.83	<b>\$652.06</b>

\* Based on \$0.10/kWh

## Mechanical controls



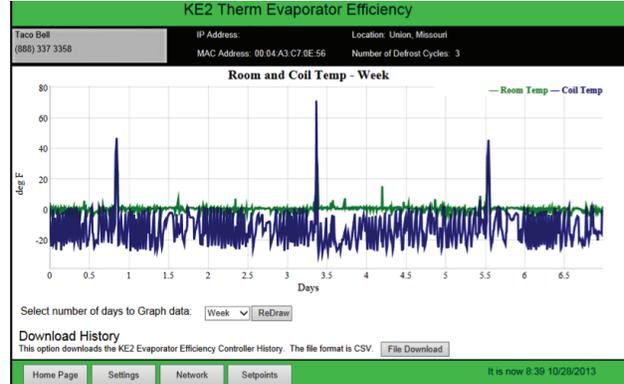
21 defrosts in 7 days. Room Temp (green line) shows more spikes, and for longer durations. Coil Temp (blue line) reaches 100+°F on numerous occasions.

### Conclusion

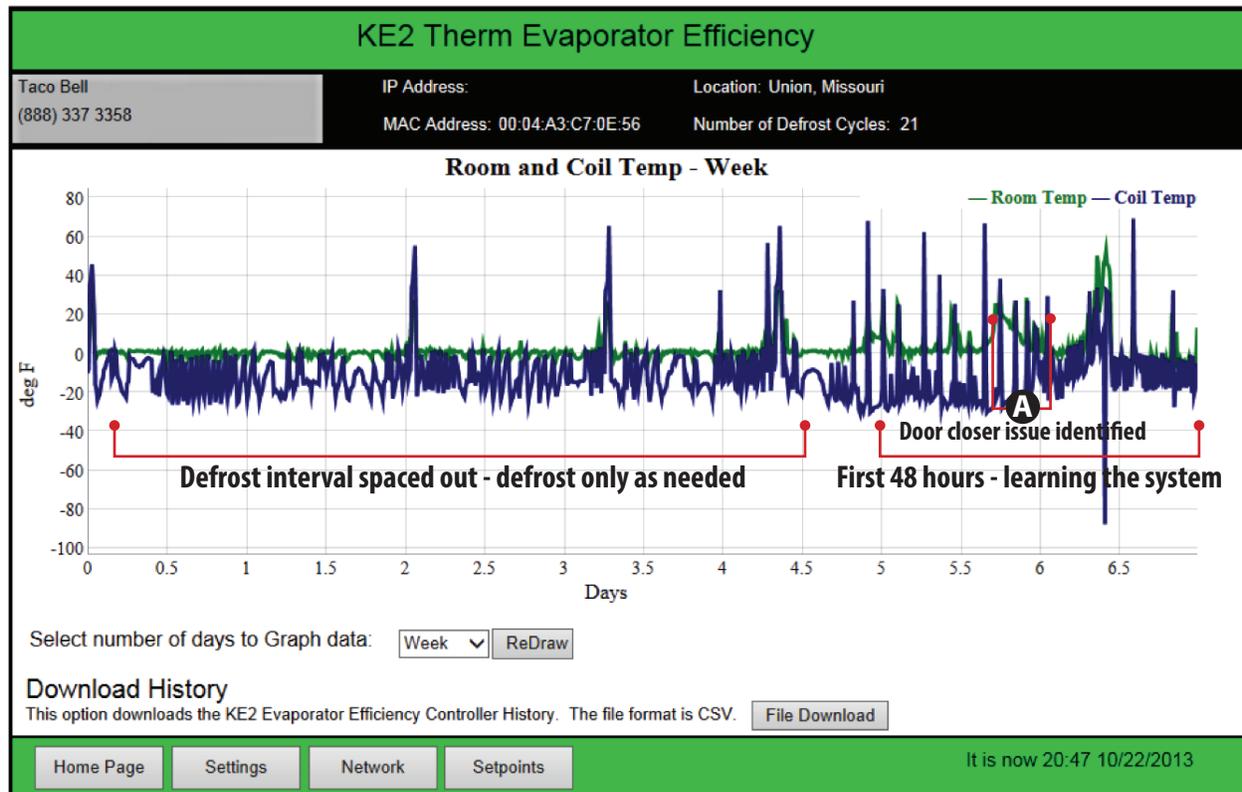
In addition to documented energy savings of 51%, this location has also realized the benefits of troubleshooting via the communications capabilities of the KE2 Evap controller. Shortly after installation, review of operation on the Home page and Graphs page identified an anomaly where the freezer temp was increasing slightly while in refrigeration mode. This observation was quickly diagnosed as an intermittent issue resulting from the improper functioning of the door closer, see **A** below. This was quickly rectified. Undetected, this issue would have led to increased run time of the refrigeration equipment, and possibly resulted in a freeze up of the evaporator coil.

A further benefit of the KE2 Evap was the elimination of ice buildup on the freezer on walls and ceiling.

## KE2 Evaporator Efficiency



3 defrosts in 7 days. More stable Room Temp (green line), and Coil Temp (blue line) does not exceed 65°F



As seen by viewing the chart from right to left, at the onset the defrosts are more frequent. Over the course of the first 48 hours, the KE2 Evap is “learning” the system conditions. At point **A** the trouble with the door closer is identified. The controller then begins adapting to these conditions, and as we see later in the week, the defrosts are spaced further apart, and initiated only as needed.