

20% of the World's Energy is Consumed by Refrigeration

What is the CycleGuard+ (formerly EndoCube) and how does it Work?

CycleGuard+ fits over the thermostat sensor on commercial refrigeration units which reacts to the product temperature, not the air temperature. CycleGuard+ is the *only* Patented Microcrystalline wax that creates an air barrier around a thermostat probe which mimics food and encases the thermostat sensor preventing fluctuating air temperatures from controlling the refrigeration unit. NSF, under protocol 235, has proven CycleGuard+ to mimic food and beverage properties.

CycleGuard+ is the first patented product to change the way we approach refrigeration temperature control. Current practice uses volatile air temperature to trigger refrigeration demand. Product temperature is not as volatile as air, and product has built up thermal inertia stored within. CycleGuard+ mirrors product temperature and uses this for the thermostat to signal refrigeration demand. The CycleGuard+ turns the unit on and off as the product temperature demands, reducing compressor starts. Air temp no longer causes so many random start/stops. Longer on/off cycles naturally leads to longer equipment life with energy savings as well.



NSF International under Protocol 235



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After extensive testing of the EndoCube (CycleGuard+), Fazoli's made the decision to install EndoCubes in over 130 company restaurants. The test demonstrated reduced kWh usage in our walk in coolers, freezer and savings energy and money. Also, there was a significant reduction in compressor starts. We would recommend the EndoCube (CycleGuard+) to any company that uses refrigeration to store and sell food products.

Vito Vascassenno

Director of Construction/Equipment

Current CycleGuard+ Users Include:

- Mastro's Steakhouse Chicago
- American Blue Ribbon Holdings
- Holiday Inn Club Vacations
- Embassy Suites
- Aloft
- Crown Plaza
- The Westin



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Dan Furner
Vice President Operations
Universal Master Products- Americas LLC
428 E. 6400 S.
Suite 202
Salt Lake City, UT 84107

RE: EndoCube

Dear Dan:

After extensive testing of the EndoCube testing in our Louisville market, Fazoli's made the decision to install EndoCubes in over 130 company restaurants, plus additional franchisee locations. The test demonstrated reduced kWh usage in our walk in coolers, freezers and saving energy and money. Also, there was significant reduction in compressor starts.

We made the decision to self-install the EndoCubes through our local refrigeration service companies. This proved to be the correct course of action, as our local management could work more efficiently with service technicians.

We would recommend the EndoCube to any company that uses refrigeration to store and sell food products. If they want to reduce kWh usage, save money, and lengthen life of refrigeration systems, EndoCubes should be installed on their equipment.

With Regards

Vito Vascassenno
Director of
Construction and
Equipment
Services

Sonic Drive In #2585
 3655 N Mt. Juliet Rd
 Mt. Juliet, TN 37122
 EndoCube Test Trial

Summary

Commercial Green Solutions LLC, an Authorized EndoCube dealer, collaborating with Sonic Drive in, completed EndoCube pilot tests to assess the energy conservation and equipment mechanical use reduction of fitting an EndoCube to the refrigeration equipment of a commercial walk-in cooler and freezer. The EndoCube consists of a proprietary microcrystalline wax contained in a small box, when installed over the thermostatic bulb of a cooling unit will dictate the compressor cycles to occur based on temperature changes of the food and beverage product as opposed to the fluctuating air temperature.

The following analysis consists of two week of compressor start/stop data points, in both a walk-in cooler and freezer box to create a baseline for equipment performance.

The two weeks of testing monitored the same set of data points after the EndoCube was installed. Due to ramp up and not full days on either side of testing, we narrowed the data points to 12 full days.

The Cooler date Comparisons are February 10 through February 21 vs. February 24 through March 6, 2016.

The Cooler showed an average compressor start reduction of 66% once the EndoCube was installed.

Pre EndoCube Dates	2/10/2016	2/11/2016	2/12/2016	2/13/2016	2/14/2016	2/15/2016	2/16/2016	2/17/2016	2/18/2016	2/19/2016	2/20/2016	2/21/2016	
Post EndoCube Dates	2/24/2016	2/25/2016	2/26/2016	2/27/2016	2/28/2016	2/29/2016	3/1/2016	3/2/2016	3/3/2016	3/4/2016	3/5/2016	3/6/2016	12 Day Total
Compressor Starts Pre	79	81	73	68	74	71	73	77	74	73	72	77	892
Compressor Starts Post	25	26	24	24	27	26	25	24	26	25	27	27	306
Start Variance	54	55	49	44	47	45	48	53	48	48	45	50	586
Reduction %	68%	68%	67%	65%	64%	63%	66%	69%	65%	66%	63%	65%	66%

The Freezer date Comparisons are February 10 through February 21 vs. March 29 through April 29, 2016.

The Freezer showed an average compressor start reduction of 54% once the EndoCube was installed.

Pre EndoCube Dates	2/10/2016	2/11/2016	2/12/2016	2/13/2016	2/14/2016	2/15/2016	2/16/2016	2/17/2016	2/18/2016	2/19/2016	2/20/2016	2/21/2016	
Post EndoCube Dates	3/29/2016	3/30/2016	3/31/2016	4/1/2016	4/2/2016	4/3/2016	4/4/2016	4/5/2016	4/6/2016	4/7/2016	4/8/2016	4/9/2016	12 Day Total
Compressor Starts Pre	74	137	128	72	74	207	228	219	94	79	59	52	1,423
Compressor Starts Post	27	27	89	136	130	22	49	38	80	22	18	20	658
Start Variance	47	110	39	-64	-56	185	179	181	14	57	41	32	765
Reduction %	64%	80%	30%	-89%	-76%	89%	79%	83%	15%	72%	69%	62%	54%

Energy conservation is a small bonus benefit to the EndoCube value. However, the reduction in start time creates a significant advantage for the life of the compressor itself, as wear and tear decreases exponentially. Combined with the energy cost savings, the decreased maintenance issues (which include labor and loss of product – both costly) would lead to very quick ROI along with the added benefits of maintaining quality of product due to lack of compressor down time.

Mastro's Steakhouse
 520 N Dearborn St.
 Chicago, IL 60654
 EndoCube Test Trial 10/13/2015 - 10/27/2015

Summary

Commercial Green Solutions LLC, an Authorized EndoCube dealer, in collaboration with Mastro's Steakhouse Chicago, completed EndoCube pilot tests to assess the energy conservation and equipment mechanical use reduction of fitting an EndoCube to the refrigeration equipment of a commercial walk-in cooler and freezer. The EndoCube consists of a proprietary microcrystalline wax contained in a small box, when installed over the thermostatic bulb of a cooling unit will dictate the compressor cycles to occur based on temperature changes of the food and beverage product as opposed to the fluctuating air temperature.

The following analysis consists of one week of temperature/ dew point/ humidity data points, collected at 2 minute intervals inside a standard walk-in cooler and freezer box at Mastro's Steakhouse in order to create a baseline for equipment performance.

The second week of testing monitored the same set of data points after the EndoCube was installed.

The data has been compiled and evaluated from midnight to 11:59pm October 14 – October 19, with October 20 from midnight to 11:20am. The second date range from midnight to 11:59pm October 21 – October 26, with October 27 from midnight to 11:20am.

The Freezer showed an average compressor start reduction of 71%.

Pre EndoCube Dates	10/14/2015	10/15/2015	10/16/2015	10/17/2015	10/18/2015	10/19/2015	10/20/2015	
Post EndoCube Dates	10/21/2015	10/22/2015	10/23/2015	10/24/2015	10/25/2015	10/26/2015	10/27/2015	6.5 Day Total
Compressor Starts Pre	63	54	54	53	51	57	27	359
Compressor Starts Post	15	16	17	15	17	17	8	105
Start Variance	48	38	37	38	34	40	19	254
Reduction %	76%	70%	69%	72%	67%	70%	70%	71%

The Cooler showed an average compressor start reduction of 58%.

Pre EndoCube Dates	10/14/2015	10/15/2015	10/16/2015	10/17/2015	10/18/2015	10/19/2015	10/20/2015	
Post EndoCube Dates	10/21/2015	10/22/2015	10/23/2015	10/24/2015	10/25/2015	10/26/2015	10/27/2015	6.5 Day Total
Compressor Starts Pre	47	43	47	48	48	47	22	302
Compressor Starts Post	14	19	23	20	22	21	8	127
Start Variance	33	24	24	28	26	26	14	175
Reduction %	70%	56%	51%	58%	54%	55%	64%	58%

Energy conservation is a beneficial component to the EndoCube benefits. However, the reduction in start time creates a significant advantage for the life of the compressor itself, as wear and tear decreases exponentially. Combined with the energy cost savings, the decreased maintenance issues (which include labor and loss of product – both costly) would lead to very quick ROI along with the added benefits of maintaining quality of product due to lack of compressor down time.

EndoCube Installation Guide

Step One

Ensure the thermostat bulb is a digital probe thermostat. Take a reading from the gauge on the outside of the cooler/freezer that gives you a reading of the air temperature inside the unit. Record this temperature when reading and the time/date that it was taken. Note: Most exterior temperature gauges are connected to a thermostatic bulb that is usually positioned on the wall as you walk into the unit. This is not the thermostatic bulb that needs to be inserted into the EndoCube.

Step Two

Take a baseline FOOD temperature with a separate thermostat (ask about CGS's ColdStik, a sister product to EndoCube). This step is very important. Your goal, once EndoCube is installed, is to make sure the unit is running at the desire pre-EndoCube temperature. If this step is missed, the opportunity to maximize energy savings and the protection of your food product is possibly compromised. You'll want to leave that thermostat in the cooler/freezer for the first couple weeks the EndoCube is installed to ensure baseline temperature is maintained. It is advisable to install the ColdStik or separate thermostat the day before installing the EndoCube. The Safety Range for food in a cooler is between 36° F - 41° F (follow [FDA Guidelines](#) for Freezers).

Step Three

Remove the Cap of the EndoCube by twisting it in an Anti-Clockwise direction. The EndoCube Cap is made up of three parts.



REMOVING THE CAP

Each piece of the Cap slides separately over the thermostatic bulb and is then reassembled back to its original form.

the FIRST piece to slide over the thermostatic bulb is the RING



the SECOND piece to slide over the bulb is the PLATE



The **THIRD**, is the **TUBE**, that breaks into 2 parts

The **TUBE** is assembled above the thermostatic bulb on the copper wire and pushed through the **PLATE**. Once the **TUBE** is pushed through the **PLATE**, slide the **RING** over the **TUBE** and the **CAP** will now be assembled and ready to receive the body of the **EndoCube**.



Step Four

On the top of the **EndoCube** where the **Cap** was, insert a wooden dowel or screwdriver into the wax to make a hold big enough to accommodate the size of the **Probe**. It is important that the hole made is slightly **SMALLER** than the size of the probe, to ensure a snug fit where the probe is completely enveloped by the wax.

Step Five

Insert the thermostatic probe into the body of the **EndoCube** and slide the **Cap** back into position turning in a **Clockwise** direction to secure it in place.



Step Six

Secure the **EndoCube** to its final position in the unit by using a self-tapping screw through the pilot hole provided at the bottom of the **EndoCube**. As a general rule it is best to mount the **EndoCube** towards the back of the condenser unit, where the air is warmest as depicted in the photo, however this is not always possible and the **EndoCube** may be mounted anywhere in the cooler/freezer and still function properly.

Step Seven

The thermostat set points should be increased if the food temperature on the second thermostat is lower than 36° F (follow FDA guidelines for temperatures for Freezers). By increasing the set point, less energy is required to maintain the correct food temperature.

