



**Doin' the
green thing...**



**business that's
economical and
ecological.**



Learn more at ke2therm.com



Who we are - KE2 Personnel

At KE2 Therm Solutions we embrace the belief that great employees make great companies. We are passionate about innovative design, quality products, and having the integrity to stand behind the products we create.

Leadership

[Link to Profiles](#)

Marketing/Sales/ Training

[Link to Profiles](#)

Operations

[Link to Profiles](#)

Engineering

[Link to Profiles](#)

Mission Statement

KE2 Therm Solutions seeks to save energy, preserve the environment and improve profitability for our customers by delivering energy saving electronic solutions to the Heating, Ventilating, Air Conditioning and Refrigeration (HVAC&R) industry.

We will be recognized for having high quality, technologically advanced products that are easy to use, and for providing superior technical applications support before and after the sale.



Advanced Energy Savings and Control for Refrigeration Systems



Simple Superheat Board



OEM branded



KE2 Evaporator Efficiency

Electronic Refrigeration Controller

- **What does it do?**

Controls

- Saves energy
- Improves product shelf life/product integrity

Communicates/Remote Monitoring

- Provides remote monitoring
- Sends alarm notices
- Use as system diagnostic tool

Eliminates

- Discrete components



KE2 Evaporator Efficiency

What does it do? Eliminates.



Defrost Time Clock

Eliminating the traditional defrost time clock saves component cost and installation. And, when using the KE2 Evap the system enters defrost only when needed -- reducing energy costs, and room temperature fluctuations that shorten product shelf life.

Room Thermostat

The KE2 Evap closely monitors and controls room temperature so separate thermostat cost and installation are eliminated.

Defrost Termination Device

Eliminate the defrost termination device ("Klixon") too and save on the related expenses. The KE2 Evap uses a unique algorithm to sense defrost necessity and duration. A "Klixon" can't do that.



KE2 Evaporator Efficiency

Electronic Refrigeration Controller

1. True demand defrost initiated by monitoring loss of evaporator efficiency
 2. Efficient system operation utilizing latent energy of coil / frost
 3. Efficient defrost heater management and termination
- Optional Electronic Expansion Valve control
 - Communications

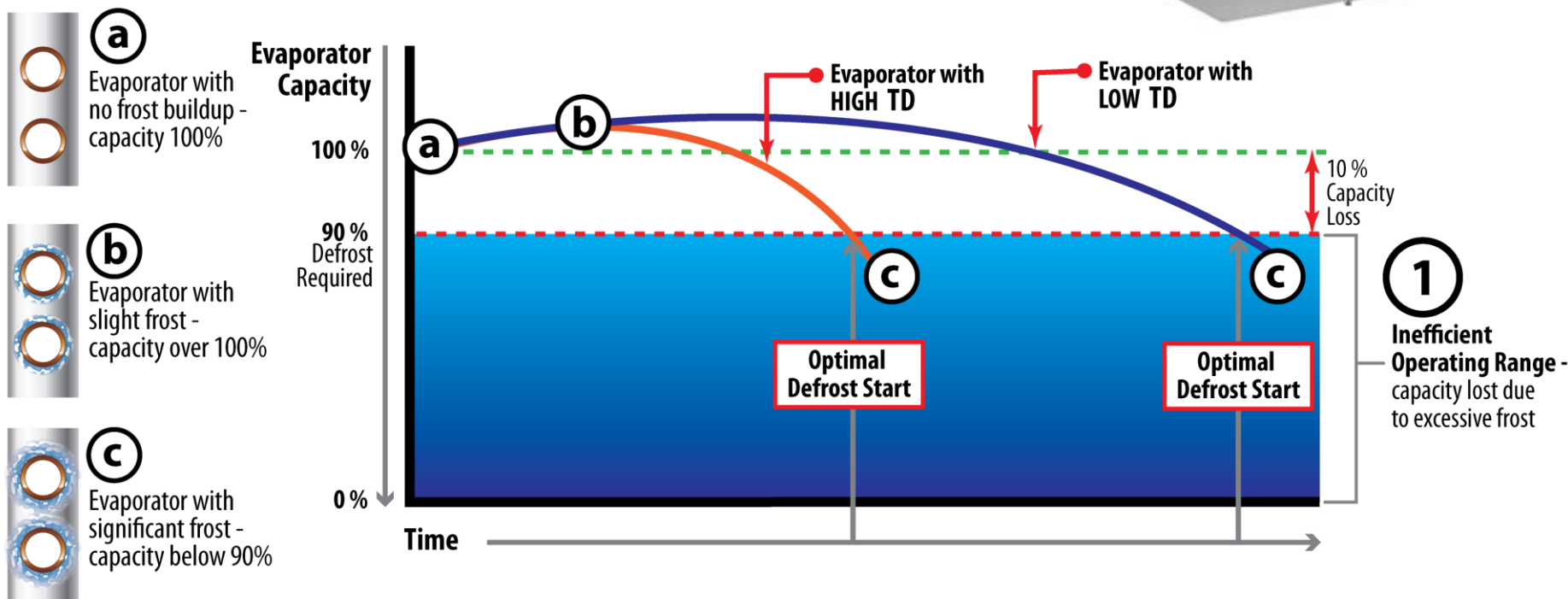


Part # 20178

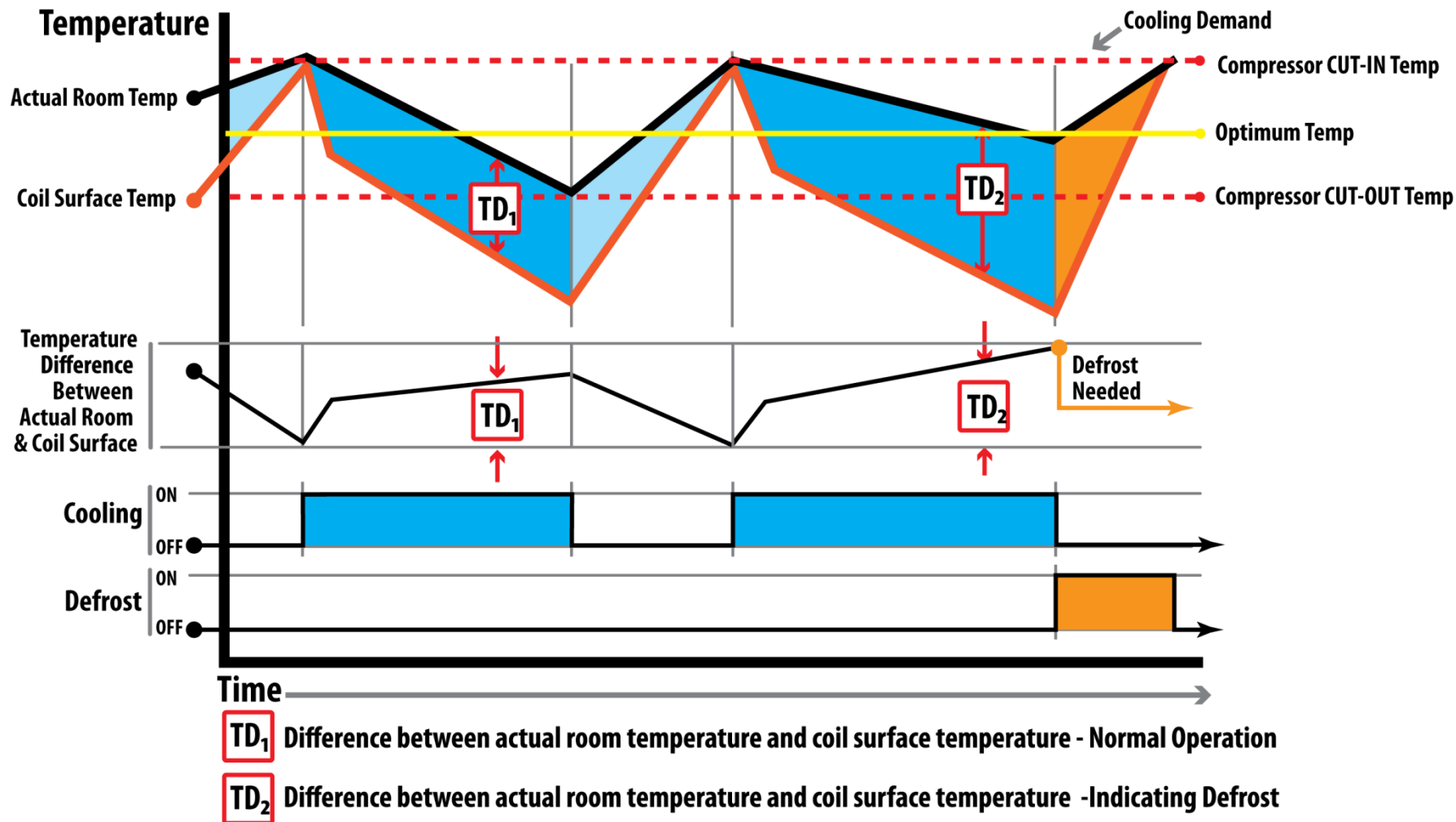
**Please take some time to review
Companion Literature B.1.1, T.1.1 & N.1.1**

Understanding Evaporator Performance

① Evaporator capacity decreases with accumulation of frost



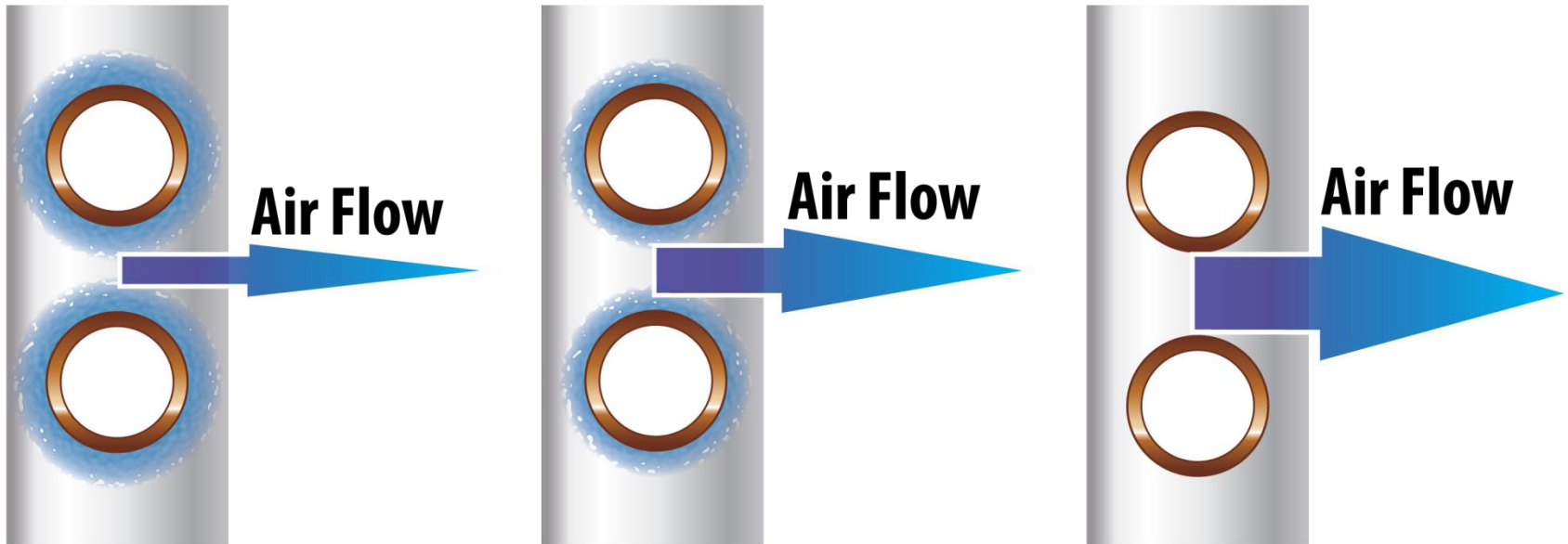
1. Change in TD indicates need for defrost



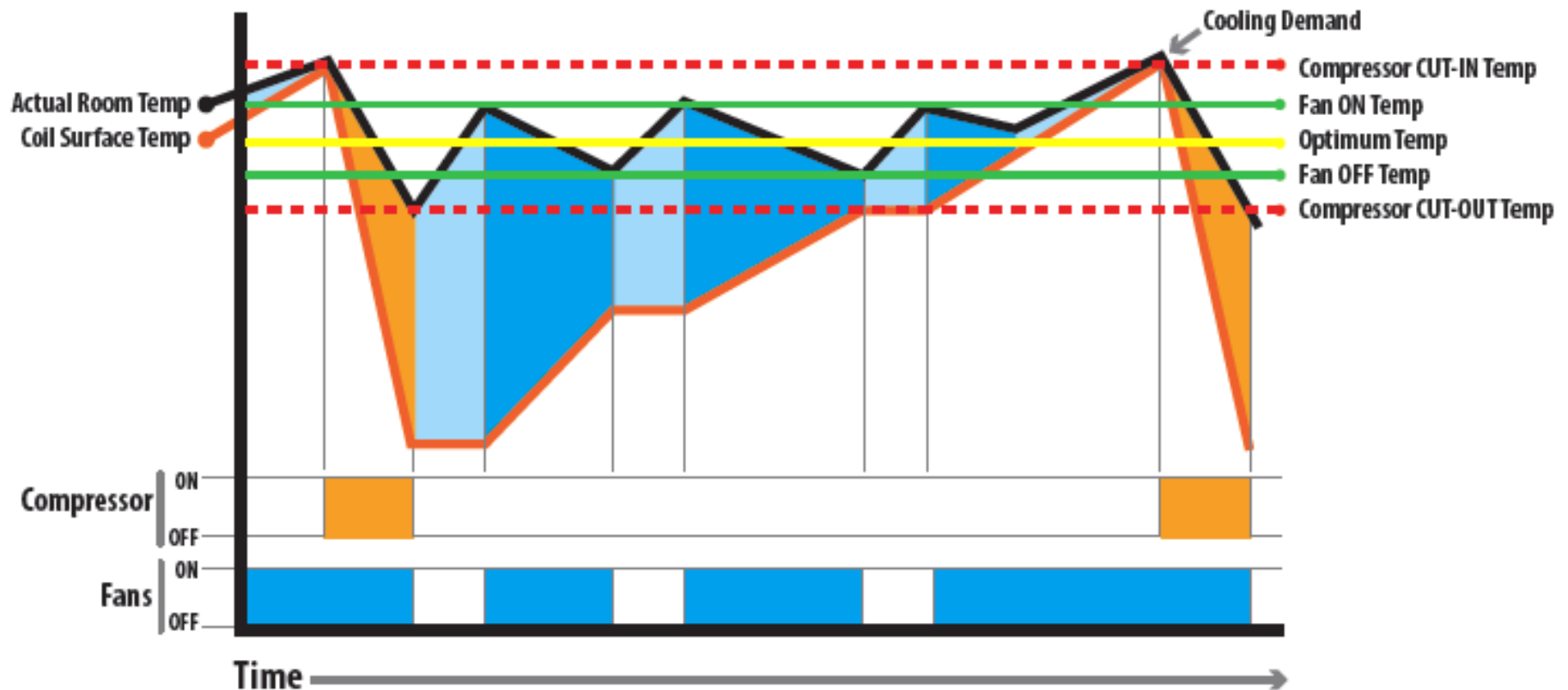
“Free cooling” – Latent energy recovery

- **Proper fan control during operation provides “free cooling” by sublimating frost to chill room**

~ 1200 BTUs per Pound



2. Optimum temperature control and energy efficiency

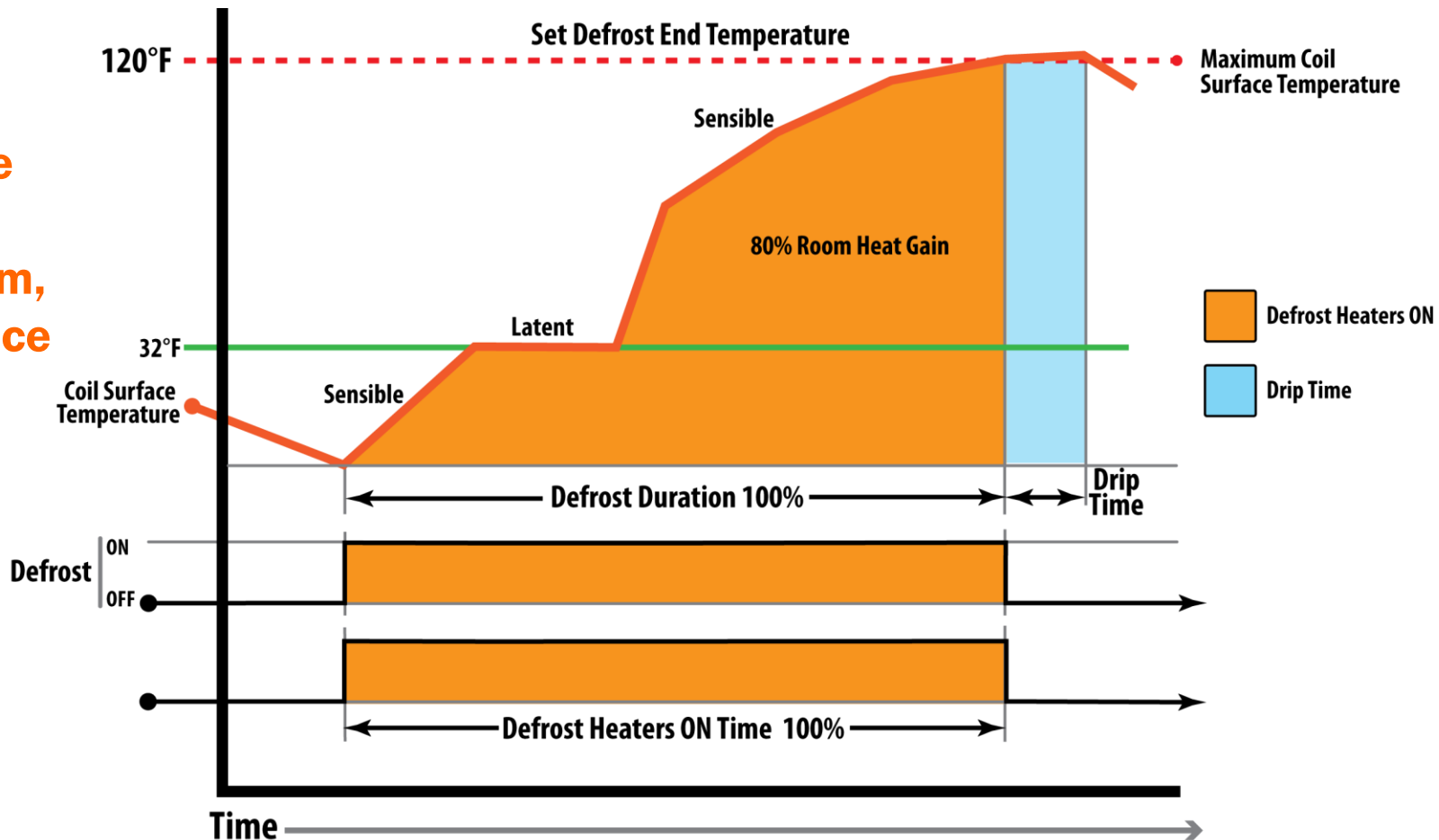


Latent energy recovery through evaporator fan cycling, compressor stays off

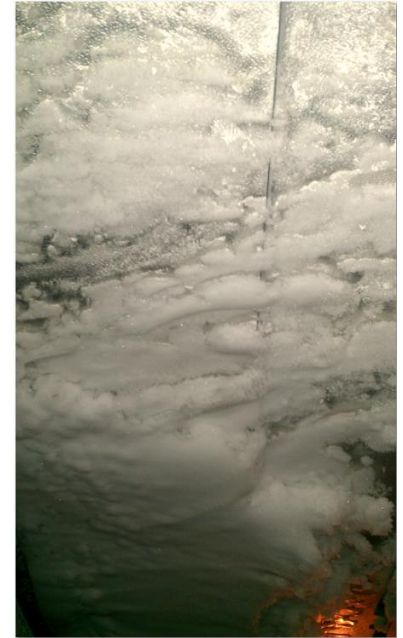
Electric defrost based on time

80% additional room heat gain (radiation + convection) due to high heater temperature

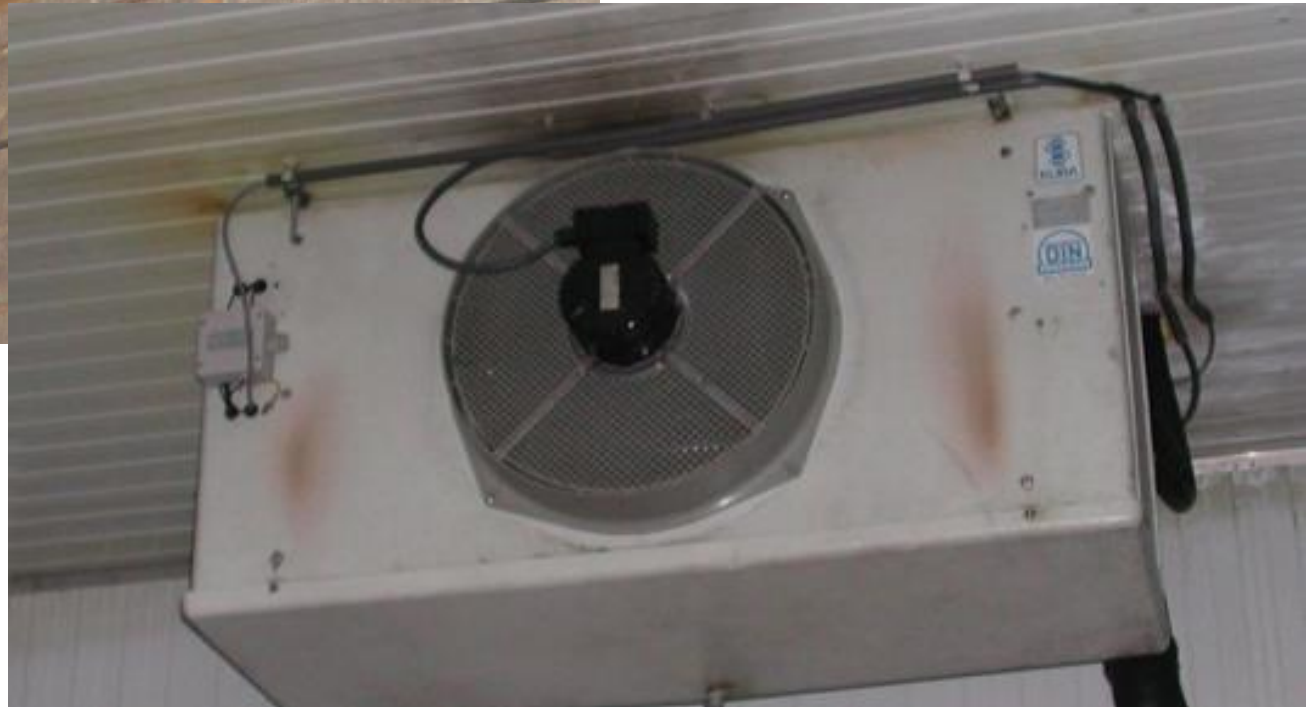
High coil temperature drives “fog” into the room, can create ice build up problems



Consequences of fogging



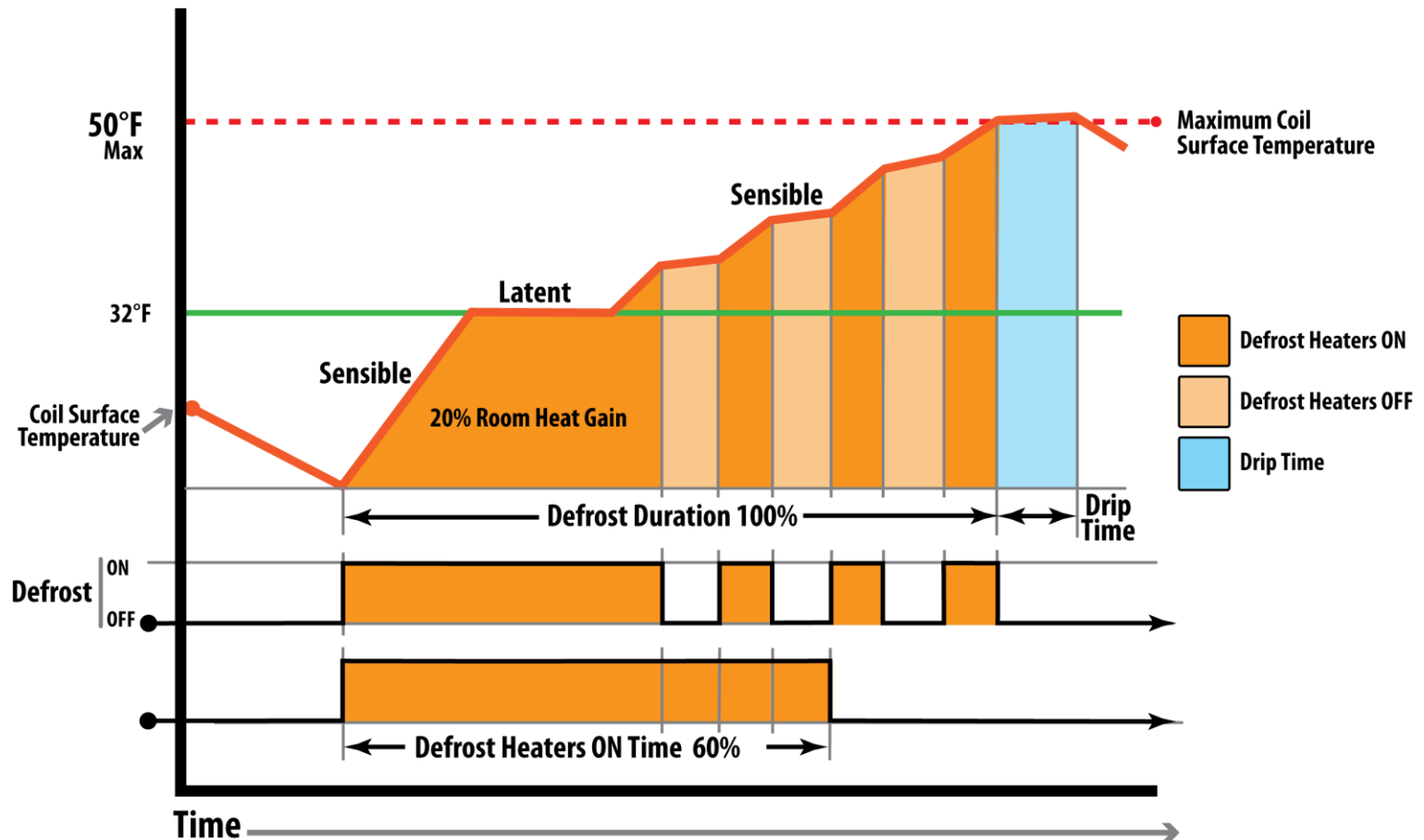
Consequences of excessive heat from trying to eliminate ice build up



3. KE2 Evap pulses defrost heaters

Only 20% additional heat gain (radiation + convection) due to heater temperature

Ensures lower coil temperature, less energy usage, decreased product heating



KE2 Evaporator Efficiency

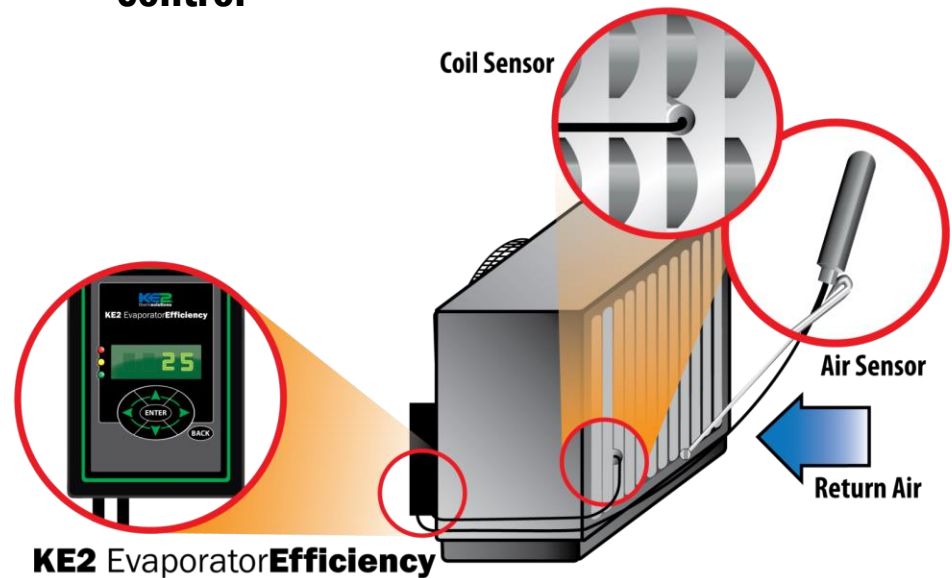
Ease of set up and Installation

Three parameters to set with

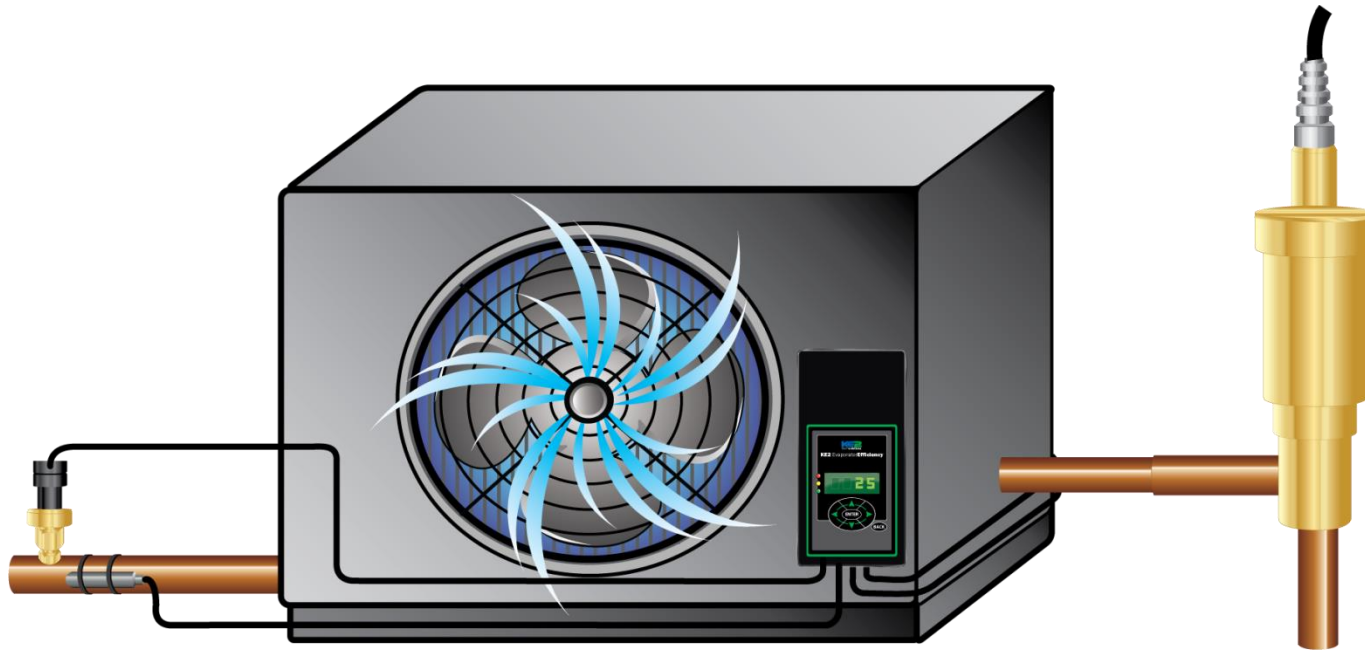


1. Select desired room set point
2. Select defrost mode
 - Electric
 - Hot Gas
 - Air
3. Select expansion device
 - Mechanical TEV
 - Electric expansion valve

KE2 Evap – only requires two inexpensive temperature sensors for precise room temperature control

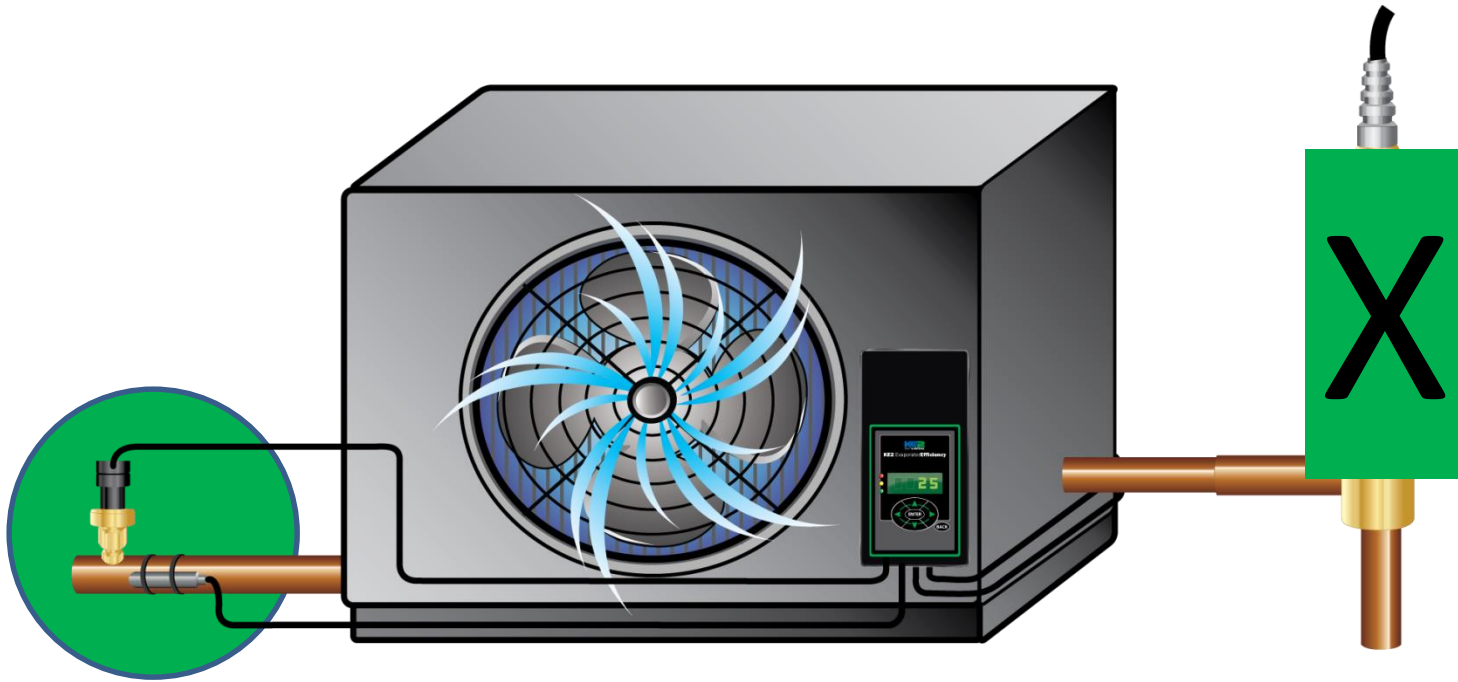


Optional EEV control possible with pressure transducer and suction temperature sensor



System Diagnostics Made Easy

Real time superheat monitoring



Can remotely view Superheat if Mechanical Valves are utilized!


Case Studies at ke2therm.com

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[ROI - Evap Efficiency](#)
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KE2 Therm Solutions, Inc. · 209 Lange Drive · Washington, MO 63090 · 636.266.0140 · fax 888.366.6769

CaseStudy:
Flower and Gift World




"The flowers are lasting so much longer, at least 7 days, probably 7-12 days longer. It's a tremendous difference, before we were spending our weekends checking the cooler. Now, we receive e-mail alerts so our weekends are our own"

Martha Gail Windham, Owner
Flower and Gift World of Samson

[Download](#)

CaseStudy:
Mc Donald's, Cudahy WI




"Holy cow! It was starting to look like Antarctica in there with the ice building on the ceiling. I can't believe the ice is gone....The product quality is also better..."

Dawn Bayer, Assistant Manager
McDonald's, Cudahy WI

[Download](#)

CaseStudy:
Mc Donalds, Vancouver



"The KE2 controller reduces M&R by eliminating the service calls for de-icing the coils. I also like the fact that it is very visible..."

Joe Guzzo, Owner
McDonald's, South Vancouver BC

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CaseStudy:
Mama Lucia's Pizza

[Download](#)

CaseStudy:
School District of Washington

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CaseStudy:
Mc Donald's Godfrey, IL

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CaseStudy:
Circle of Concern Food Pantry

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Williams Brothers Meat Market

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CaseStudy:
Dierberg's Supermarket

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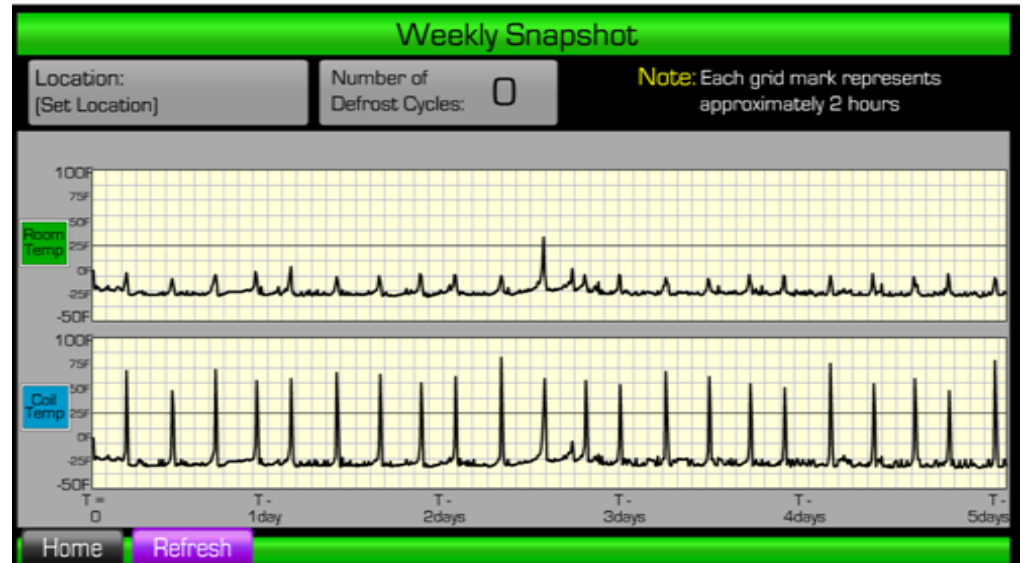
Before and After Comparison – Cudahay, WI



Before - McDonalds Graphs

Standard mechanical control system operation

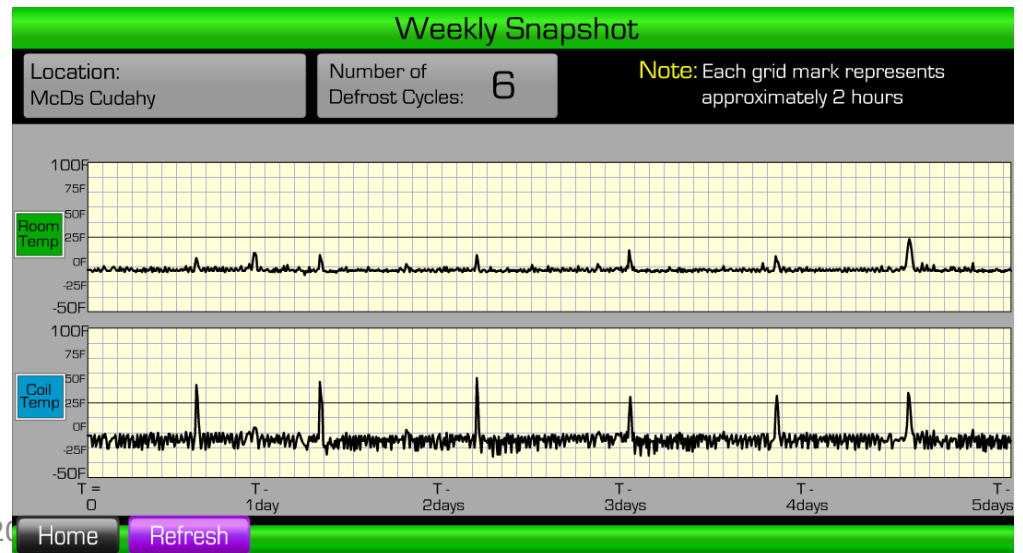
- Fluctuating room temp
- High Defrost termination temp
- 4 defrosts / day



After - McDonalds Graphs

Standard mechanical control system operation replaced with KE2 Evap control for last 2 days

- More stable room temp
- Lower Defrost termination temp
- dramatic reduction in # of defrosts



McDonalds Cudahy WI

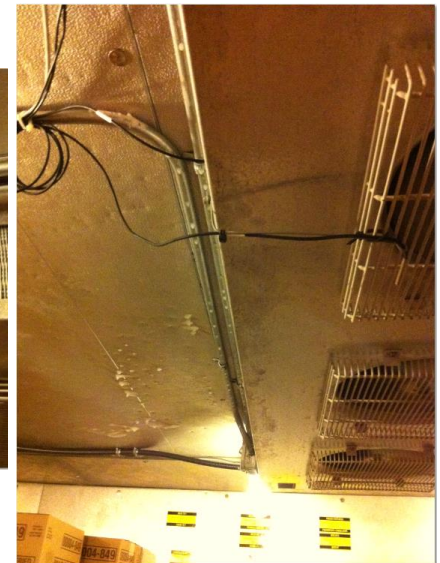
Reduction of Ice build up on freezer ceiling



Before



After



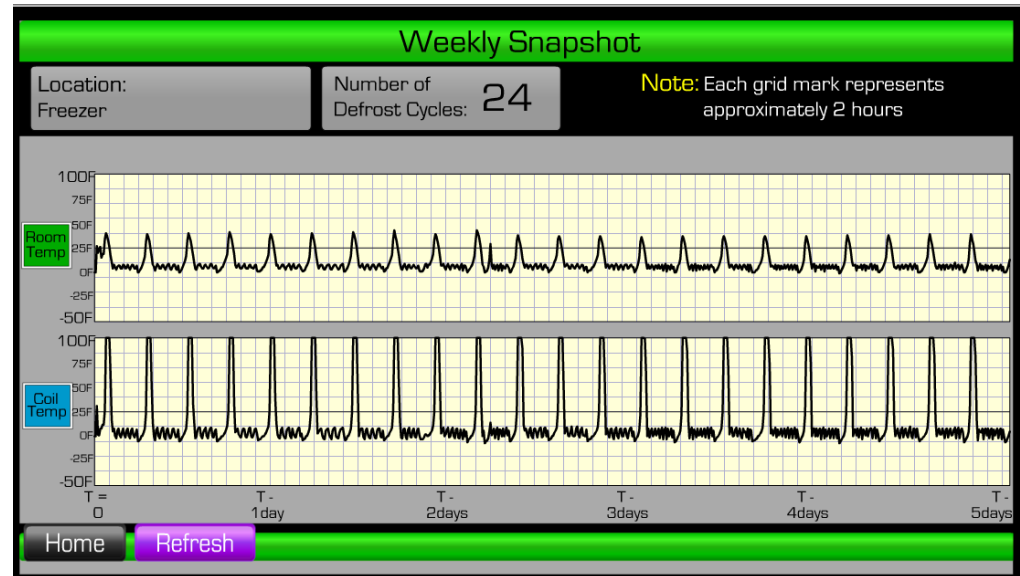


Before and After Comparison - Phoenix, Arizona

Before - McDonalds Graphs

Standard mechanical control system operation

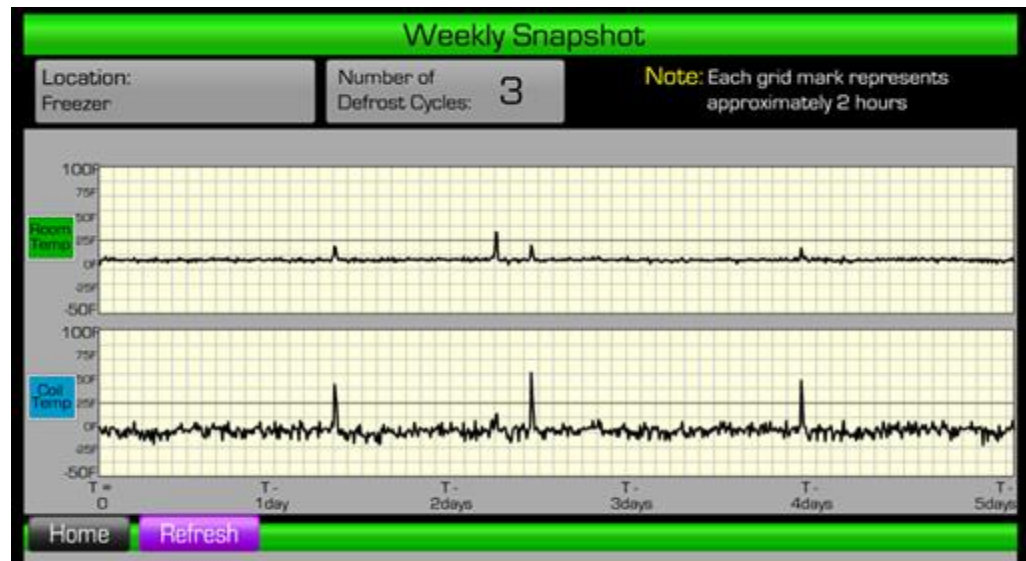
- Fluctuating room temp
- High Defrost termination temp
- 4 defrosts / day



After - McDonalds Graphs

Standard mechanical control system operation replaced with KE2 Evap control

- More stable room temp
- Lower Defrost termination temp
- dramatic reduction in # of defrosts



Before and After Comparison - Washington, Missouri



Before - Applebees Graphs

Standard mechanical control
system operation

- Fluctuating room temp
- High Defrost termination temp
- 4 defrosts / day

After - Applebees Graphs

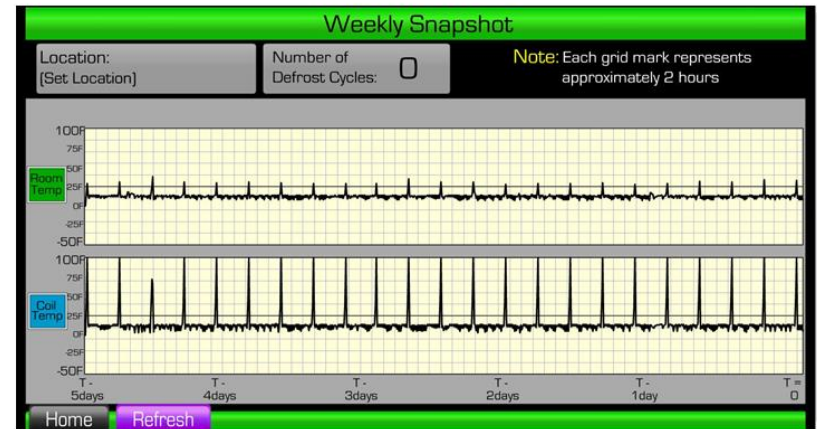
Standard mechanical control
system operation replaced with
KE2 Evap control

- More stable room temp
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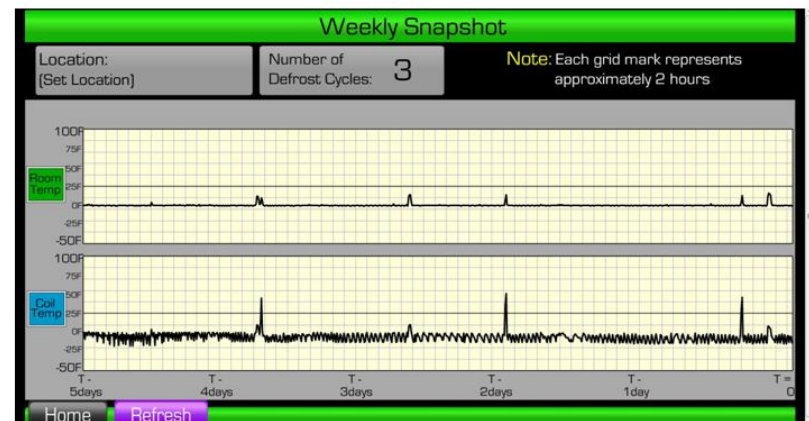
Case Study: Jan 4, 2012

New Cond. Unit Controlled by mechanical time clock / thermostat



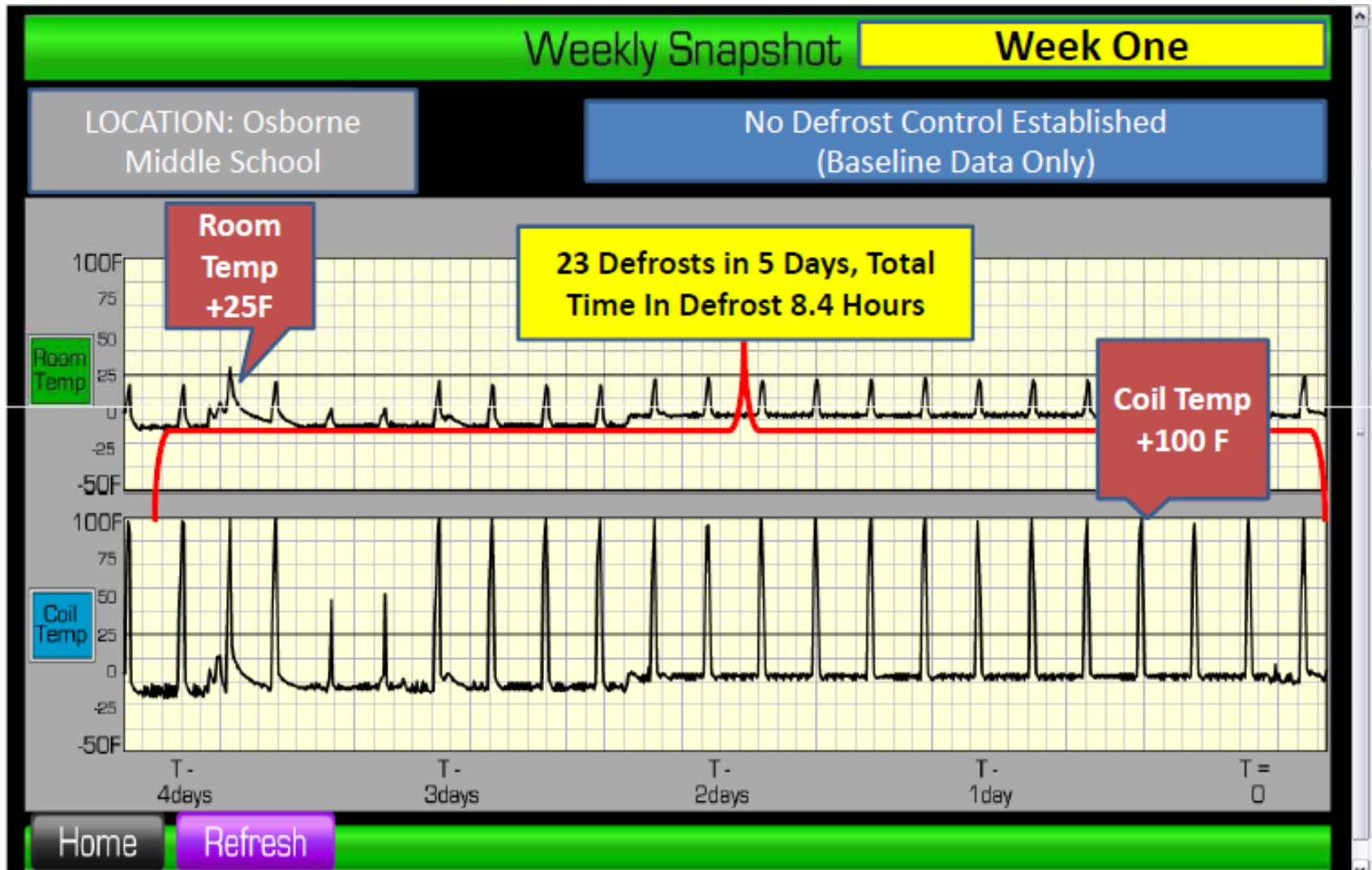
Case Study: Feb 13, 2012

System Controlled by KE2 Evaporator Efficiency



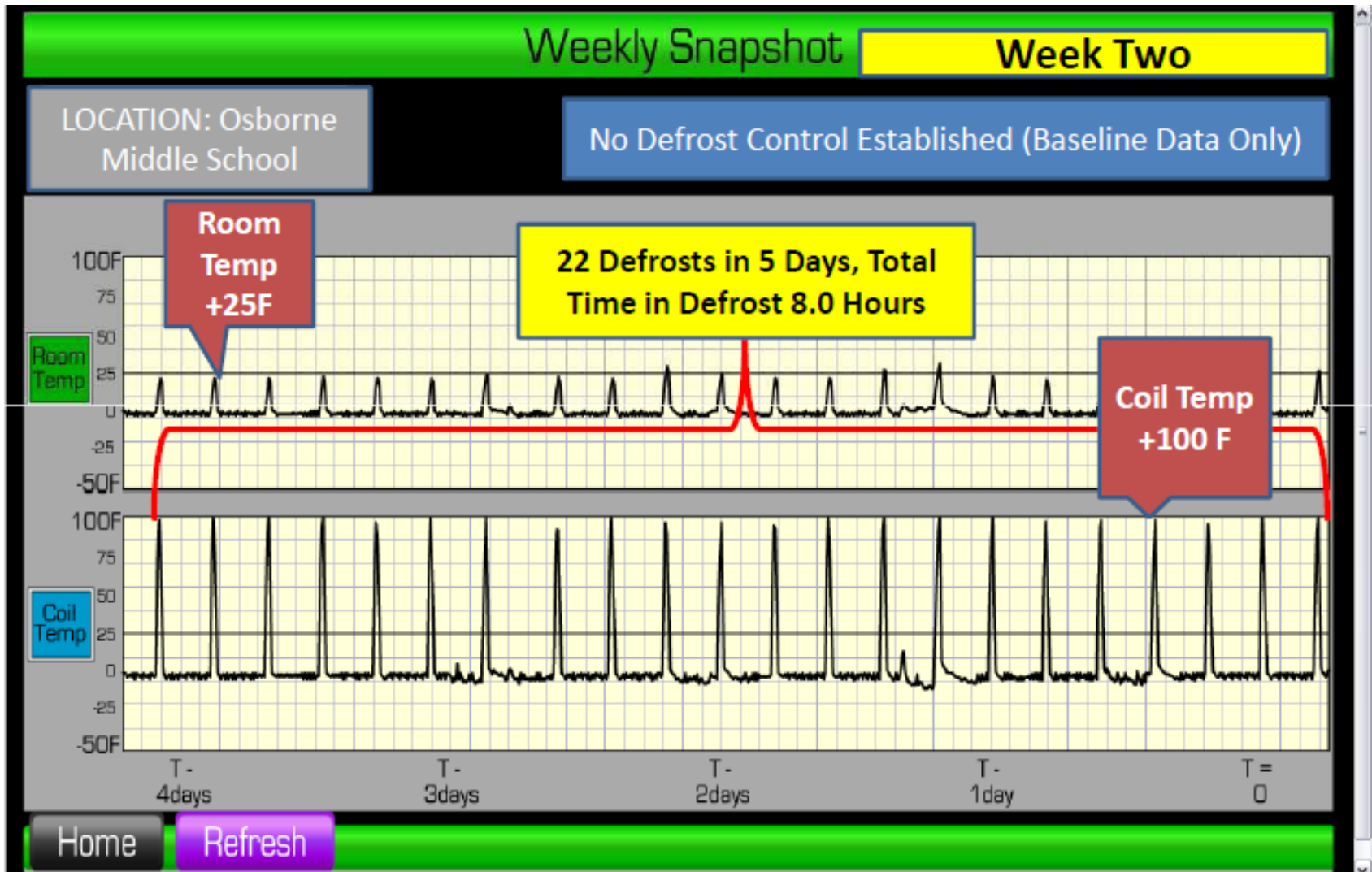
Case Study

System Controlled by mechanical time clock / thermostat



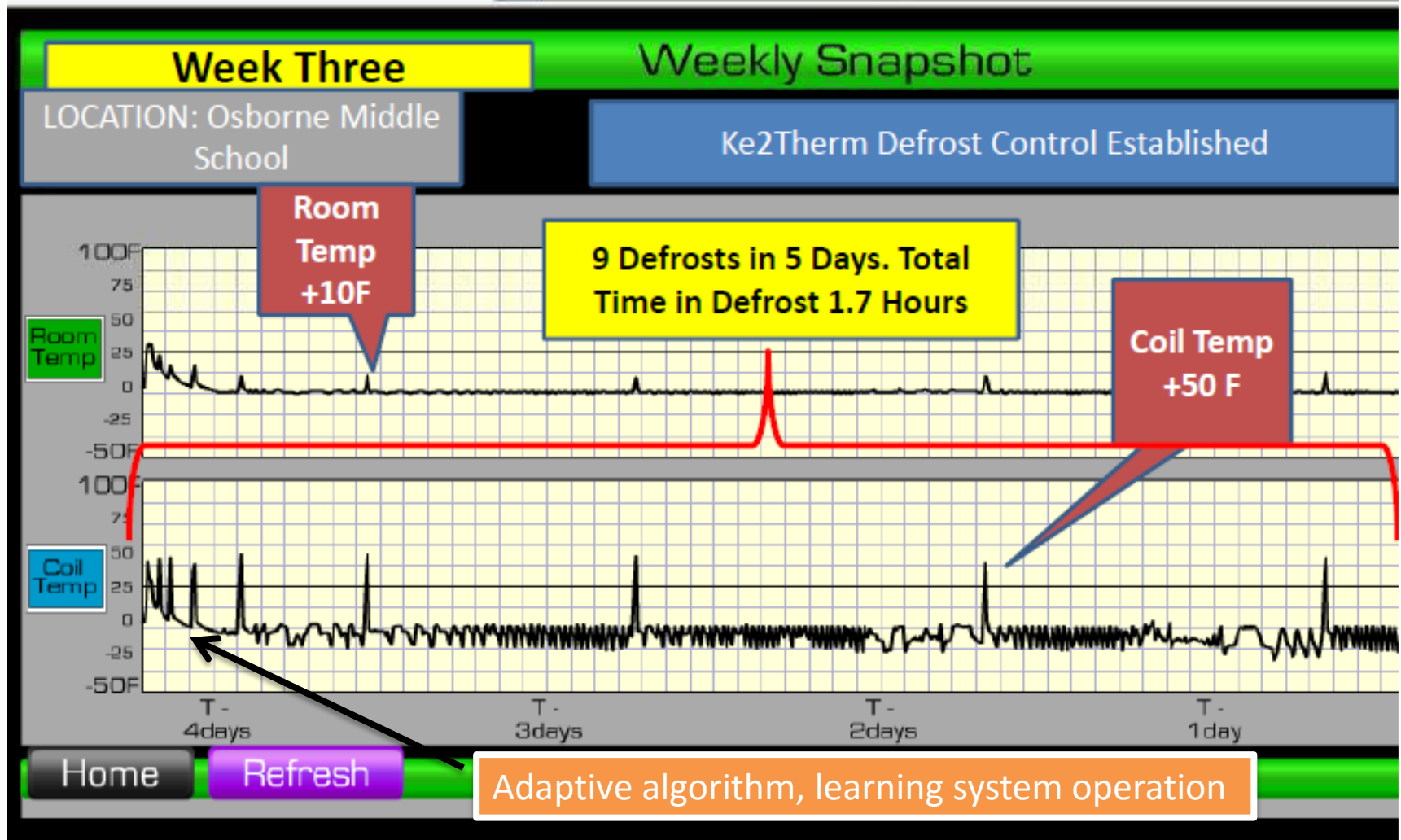
Case Study

System Controlled by mechanical time clock / thermostat



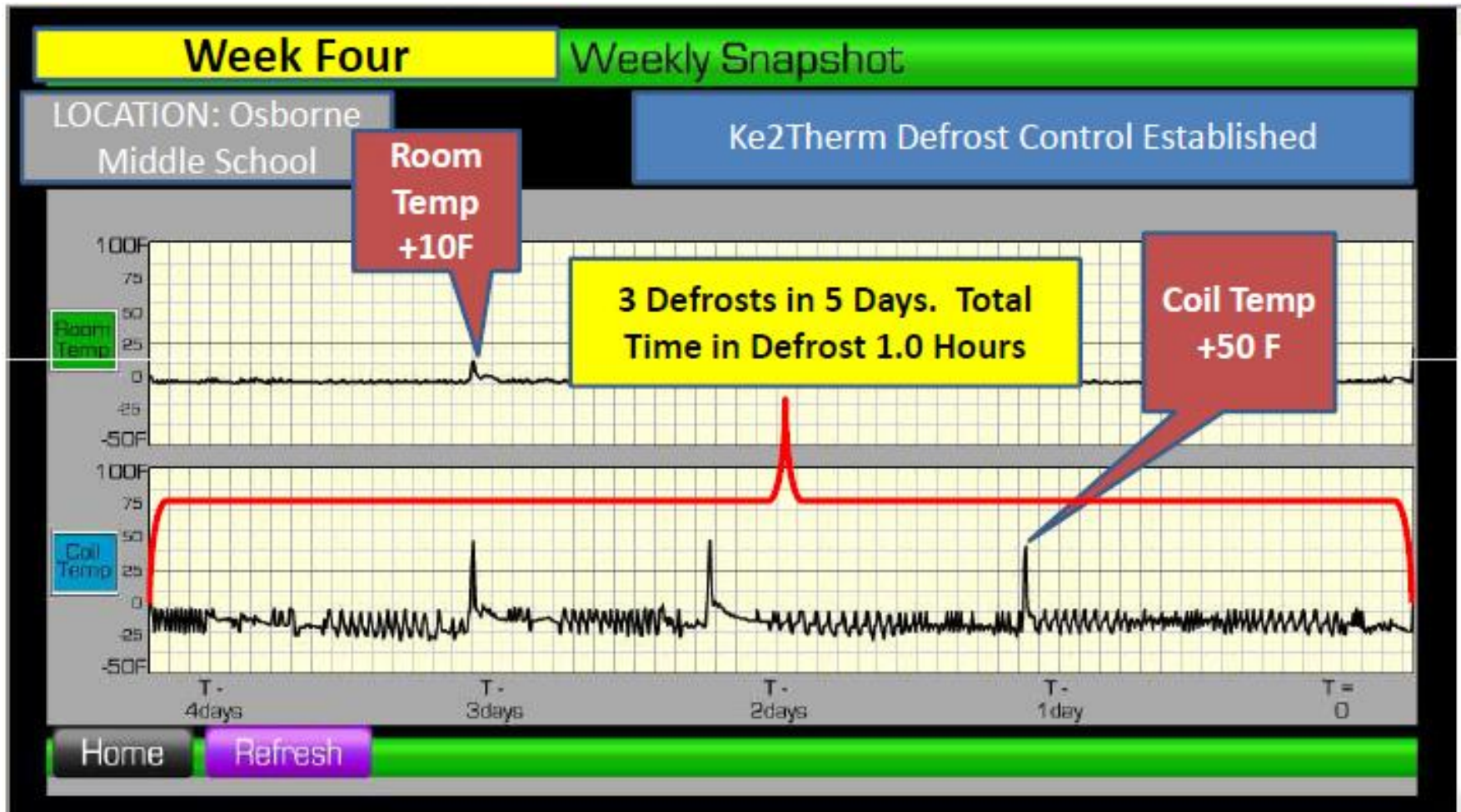
Case Study

System Controlled by KE2 Evaporator Efficiency



Case Study

System Controlled by KE2 Evaporator Efficiency



Case Study: May 26, 2011

System Controlled by KE2 Evaporator Efficiency



Summary calculation				
	Compressor	Fans	Heaters	Total Savings
Annual hours	8,760.00	8,760.00	8,760.00	
Current run hours	5,220.04	7,786.67	628.22	
Current watts consumed	3672	1008	1992	
Current kWh	19,168.00	7,848.96	1,251.42	28,268.38
KE2 run hours	4,605.19	5,756.48	99.00	
KE2 watts consumed	3672	1008	1992	
KE2 kWh	16,910.25	5,802.54	197.20	22,909.99
Run time reduction	-11.8%	-26.1%	-84.2%	
Current	2,108.48	863.39	137.66	3,109.52
KE2 Therm	1,860.13	638.28	21.69	2,520.10
Savings	248.35	225.11	115.96	589.42
				19.0%







0.10



036339

Sugar Free





Precise Refrigeration System Control

Controls



KE2 Evaporator Efficiency



Communicates

KE2 Master View on:

Tablet



Smart Phone



PC



KE2 Router



KE2 Data Logging



KE2 Bootloader

Benefits to Communication

- High speed access to information
- Remotely view and adjust controller set-points on site or remotely
 - Simplify system setup
 - Review system performance from outside refrigerated space
 - Change set points remotely
 - Increase efficiency of service calls
- Communicate information between controllers
 - Coordinate defrosts with multiple controllers
 - Share sensor data between controllers
- Receive email / text message alerts to computer or cell phone
- Push software updates direct to the controller

What does it do?

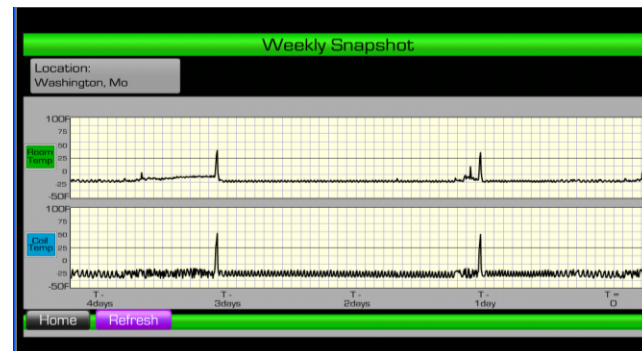
Avoid / Improve Service Calls



Provides local or remote monitoring – trouble shooting
-check/adjust system on site
or
wherever there's internet service

“I can see more information on one page and know what is going on in the system in a matter of seconds. It would take me 20 minutes inside the box to get the same information”

Andy Fincutter- Service Technician A to Z
Refrigeration
Burlington, WI



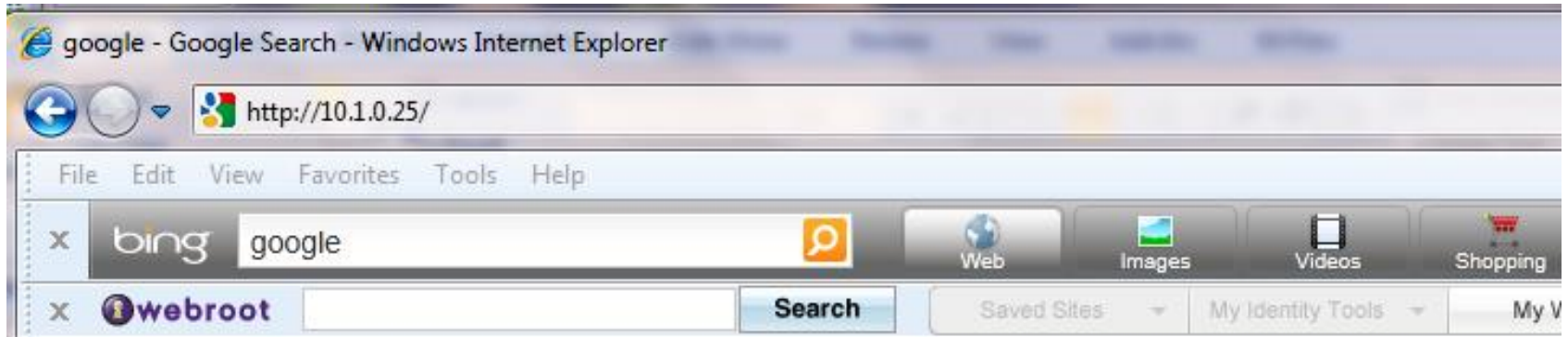
Install a single KE2 Therm Controller on a LAN (local area network)

1. Connect Ethernet cable to the KE2 Therm controller and to an open port on the Customer Network
2. Power up KE2 Therm controller



Verify the KE2 Therm Controller is on the lan

- Type the IP address listed on the controller into the address field (i.e. 10.10.50.10)



KE2 Masterview

Remote Display / Service Tool

View System Performance





KE2 Masterview

Remote Display / Service Tool

Receive Email / Text alerts

Settings

Dairy walk in room

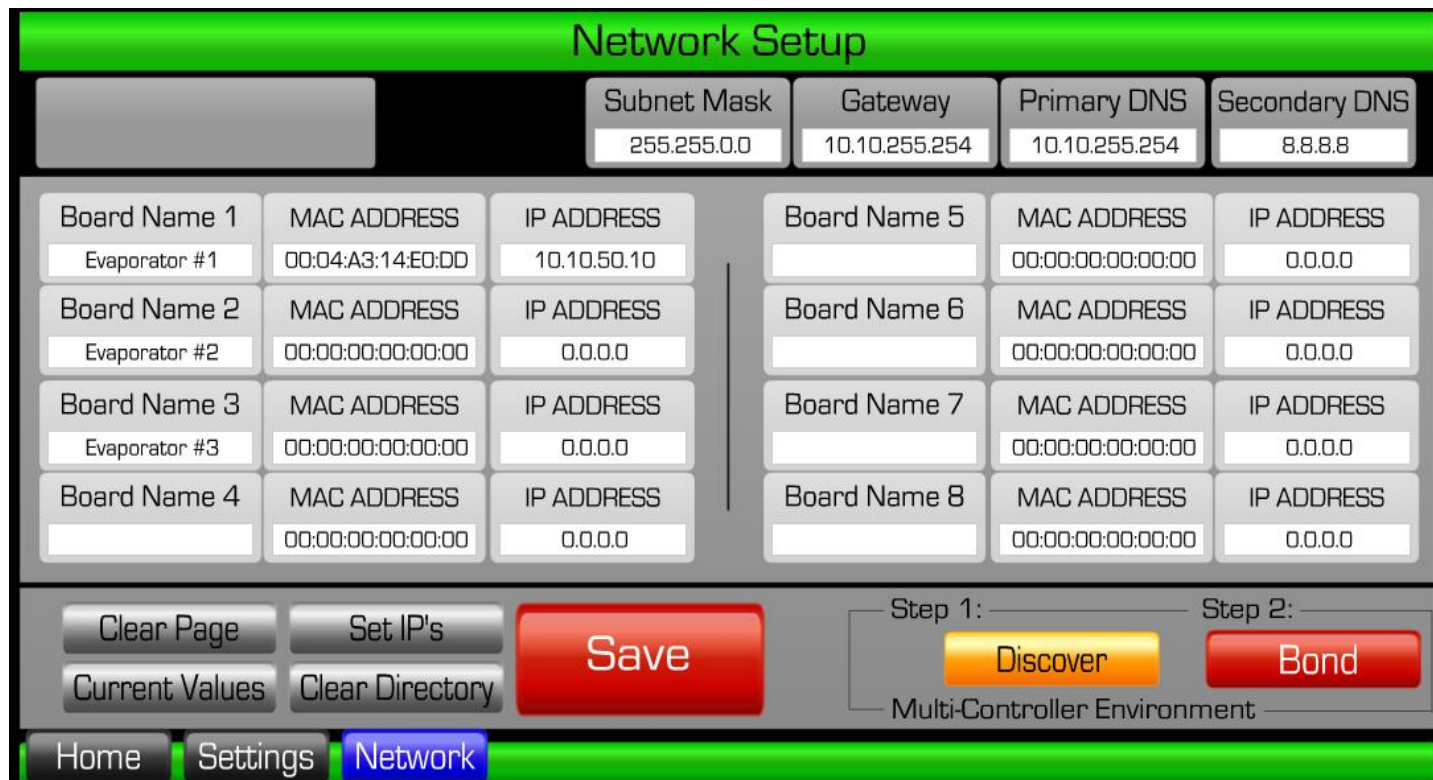
Email Server	smtp.gmail.com	Business Name	KE2 Therm Solutions	Firmware	Flash
User Name	testuser@gmail.com	Phone Number	(888) 337 3358	v02.01.20	
Password	*****	Location	Dairy walk in room	Controller	Reset
Email Address for Alerts	myusername@ke2therm.com	Time Server - NTP		Test Email	Submit
Email Subject	Alert for Controller 1			Clear Logs	
				Clear Alarms	

[Home](#) [Settings](#) [Network](#) [Save](#) [Lock PW](#)

KE2 Masterview

Remote Display / Service Tool

Ease of set up and advanced communication between controllers



The screenshot shows the 'Network Setup' interface. At the top, a green header bar contains the title 'Network Setup'. Below this, there are input fields for 'Subnet Mask' (255.255.0.0), 'Gateway' (10.10.255.254), 'Primary DNS' (10.10.255.254), and 'Secondary DNS' (8.8.8.8). The main area is divided into two columns of board configuration. The left column has four rows for 'Board Name 1' through 'Board Name 4', each with fields for 'MAC ADDRESS' and 'IP ADDRESS'. The right column has four rows for 'Board Name 5' through 'Board Name 8', also with 'MAC ADDRESS' and 'IP ADDRESS' fields. At the bottom, there are buttons for 'Clear Page', 'Set IP's', 'Current Values', 'Clear Directory', and a large red 'Save' button. To the right of these are 'Step 1: Discover' and 'Step 2: Bond' buttons, with a 'Multi-Controller Environment' label below them. A green footer bar contains 'Home', 'Settings', and 'Network' tabs, with 'Network' currently selected.

Network Setup					
		Subnet Mask	Gateway	Primary DNS	Secondary DNS
		255.255.0.0	10.10.255.254	10.10.255.254	8.8.8.8
Board Name 1	MAC ADDRESS	IP ADDRESS	Board Name 5	MAC ADDRESS	IP ADDRESS
Evaporator #1	00:04:A3:14:E0:DD	10.10.50.10		00:00:00:00:00:00	0.0.0.0
Board Name 2	MAC ADDRESS	IP ADDRESS	Board Name 6	MAC ADDRESS	IP ADDRESS
Evaporator #2	00:00:00:00:00:00	0.0.0.0		00:00:00:00:00:00	0.0.0.0
Board Name 3	MAC ADDRESS	IP ADDRESS	Board Name 7	MAC ADDRESS	IP ADDRESS
Evaporator #3	00:00:00:00:00:00	0.0.0.0		00:00:00:00:00:00	0.0.0.0
Board Name 4	MAC ADDRESS	IP ADDRESS	Board Name 8	MAC ADDRESS	IP ADDRESS
	00:00:00:00:00:00	0.0.0.0		00:00:00:00:00:00	0.0.0.0
Clear Page Set IP's Save			Step 1: Discover Step 2: Bond		
Current Values Clear Directory			Multi-Controller Environment		
Home Settings Network					



KE2 Masterview

Remote Display / Service Tool

Change / Update System Setpoints

Setpoints Page 1

Location:
Dairy walk in room

Room Temp -10.0 F	HI Temp Alrm Offset 10.0 F	HI Temp Alrm Delay 60	Lo Temp Alrm Offset 4.0 F	Lo Temp Alrm Delay 10
Air Temp Diff 1.0 F	Temp Units ↓ Fahrenheit	Motor Type ↓ Bipolar	Valve Type ↓ Mechanical	Refrigerant ↓ R-404A
Motor Steps Full Stroke 	Motor Step Rate 	Superheat 	Max Operating Press 	Min Comp Runtime 2
Min Comp Offtime 5	Defrost Mode ↓ Demand	Defrost per Day 	First Defrost Delay 	Defrost Type ↓ Electric
Defrost Fan State ↓ Off	Defrost Term Temp 50.0 F	Max Defrost Time 30	Drain Time 2	Defrost Heater ↓ Pulse

Home

Settings

Network

Restore

Save

Page 1

Page 2



KE2 Masterview

Remote Display / Service Tool

Change / Update System Setpoints

Setpoints Page 2

Location:
Dairy walk in room

Refrig Fan Mode ↓ Fan Cycle	Fan Delay Temp 20.0 F	Max Fan Delay Time 2	Multi Evap Mode ↓ Independent	Multi Evap Temp Ctrl ↓ Average Air
Dig In1 Type ↓ Door Switch	Dig In1 Active State ↓ Short	Dig In2 Type ↓ Off	Dig In2 Active State ↓ Short	Temp 4 Type ↓ Off
Dig In3 Type ↓ Off	Dig In3 Active State ↓ Short	Room Temp #2 -50.0 F	RTC Hour 00	RTC Min 33
Cal. Air Sensor 0.0 F	Cal. Coil Sensor 0.0 F	Cal. Press Sensor 0.0	Cal. Suc Temp Sensor 0.0 F	Cal. Aux Temp Sensor 0.0 F
Proportional 	Integral 	Derivative 	Off Next Mode	Runtime Defrost ↓

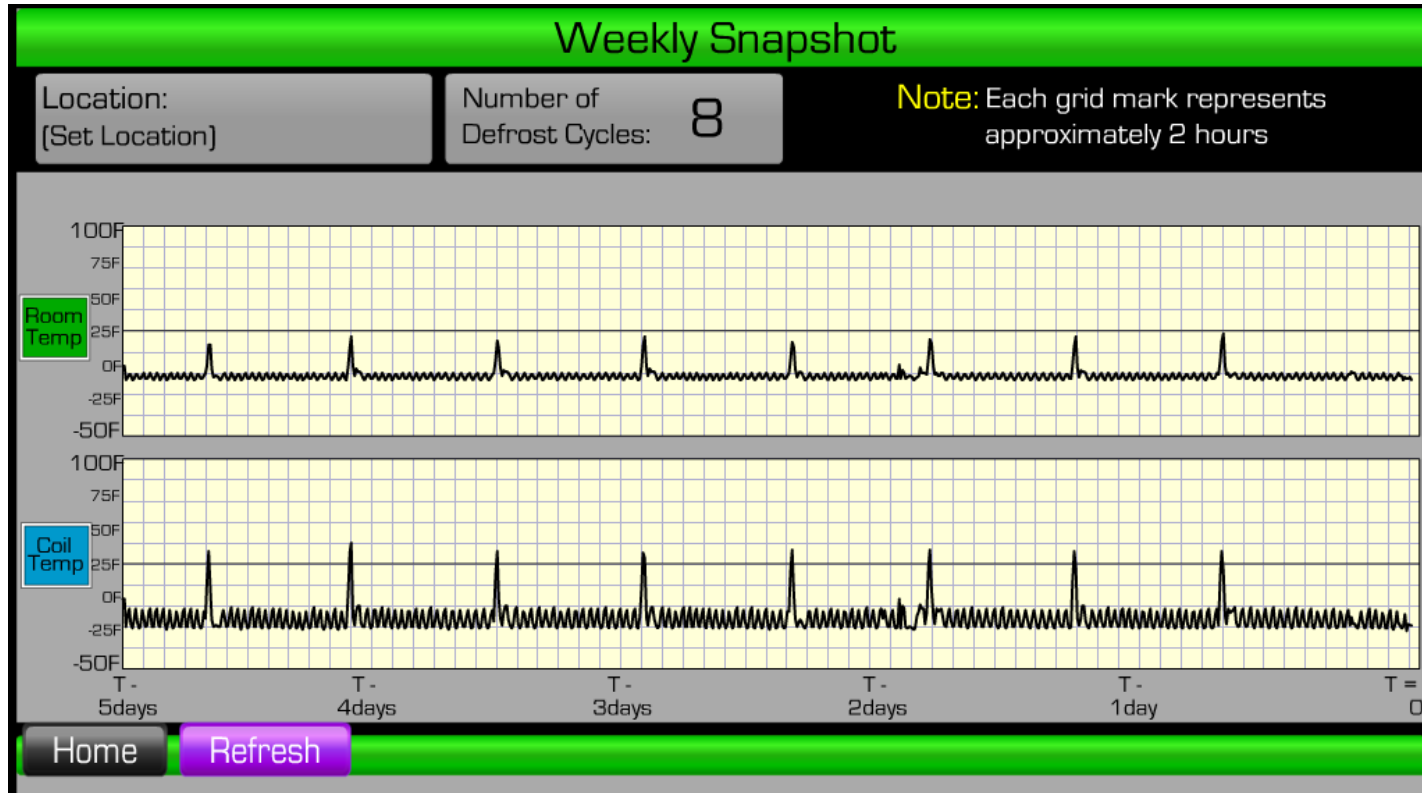
[Home](#) [Settings](#) [Network](#) [Restore](#) [Save](#) [Page 1](#) [Page 2](#)



KE2 Masterview

Remote Display / Service Tool

Display system temperature summary graph





Energy Saving + Communications Solution for Refrigeration Systems

- ✓ Energy Savings
- ✓ Remote Monitoring
- ✓ Alarm Capability
- ✓ Data Logging Capability



KE2 Adaptive - Complete Kit



- A** (1) KE2 Adaptive Control controller
- B** (1) high voltage safety shield
- C** (1) 3-pack of colored 15' temperature sensors
- D** (6) 90° spade connectors
- E** (2) straight spade connectors

- F** (5) self-tapping screws
- G** (2) 1/2" plastic knockout plug
- H** (1) air sensor mount
- I** (3) course thread screws
- J** (1) KE2 Terminal Board*

(1) Warranty card (not shown)

KE2 Adaptive Control

Benefits Overview

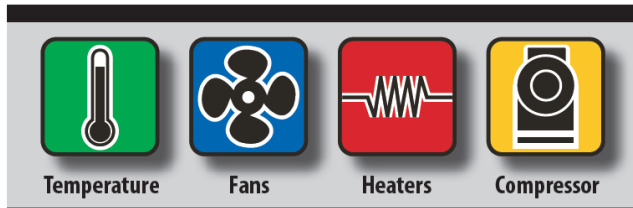


Applications - Freezers & Coolers



- ✓ Combines multiple refrigeration control functions in one device to reduce complexity and wiring
- ✓ Adaptive control ensures continuous energy efficiency savings
- ✓ Precise temperature control protects products for longer shelf life
- ✓ Regulates the amount of defrost heat to reduce steaming
- ✓ Prolonged equipment life

Controls:



KE2 Adaptive Control

Features

- Four digit display
 - Precise Room temp display (1/10th of °F or C)
 - Alarm status
 - Indicates System Mode status
 - Indicates Power failure (PF) if Custom Defrost Schedule is utilized)
 - System Variables review
- Efficient evaporator fan management (Title 24 compliant)
- Keypad lockout option
- Dual voltage selector 120/208-240v
- Audible alarm buzzer

KE2 Adaptive Eliminates...



Defrost Time Clock

Eliminating the traditional defrost time clock saves component cost and installation. And, when using the KE2 Adaptive the system enters defrost only when needed -- reducing energy costs, and room temperature fluctuations that shorten product shelf life.

Room Thermostat

The KE2 Adaptive closely monitors and controls room temperature so separate thermostat cost and installation are eliminated.

Defrost Termination / Fan Delay devices

Eliminate the defrost termination device ("Klixon") too and save on the related expenses. The KE2 Adaptive uses a unique algorithm to sense defrost necessity and duration. A "Klixon" can't do that.



KE2 Fan Control

Packaged Savings Solution





KE2 Fan Control

- Plug 'n play packaged solution for variable speed control of multi-fan condensers
- Over 50% energy savings
- Available in 4, 6, 8 & 10 fan packages
- Split condenser versions
- Factory programmed, wired and tested



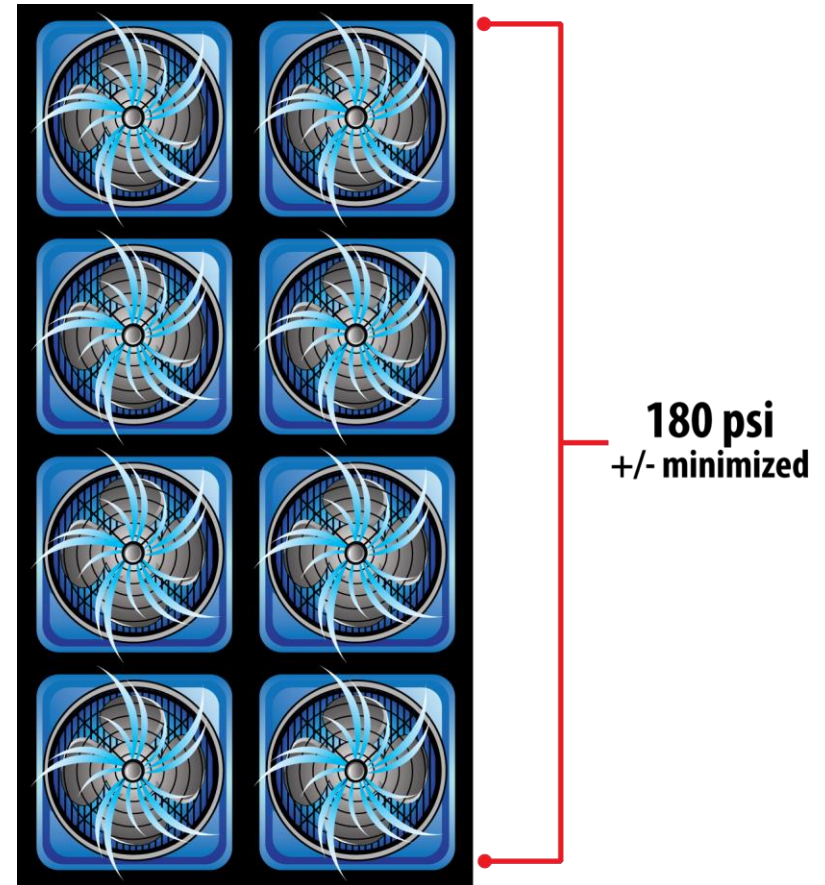
Why condenser fan control?

Number of Fans	8		Non-VFD KW-hr used	68,818	KW-hr
Hp of fan motors	1	hp	VFD KW-hr used	29,781	KW-hr
Fans unloaded at a time	2		% Savings	56.72	%
Installed Cost Estimate	7,500		\$ Saved annually	\$4.684	\$
Utility Rebates	\$0		Estimated Payback	1.6	Yrs
Price of Energy by Province	\$0.12	Ontario	KE2 Fan P/N Suggested	20318	
Motor Voltage	575	volts			
Individual Motor FLA	1.7	1.7	Default Value		

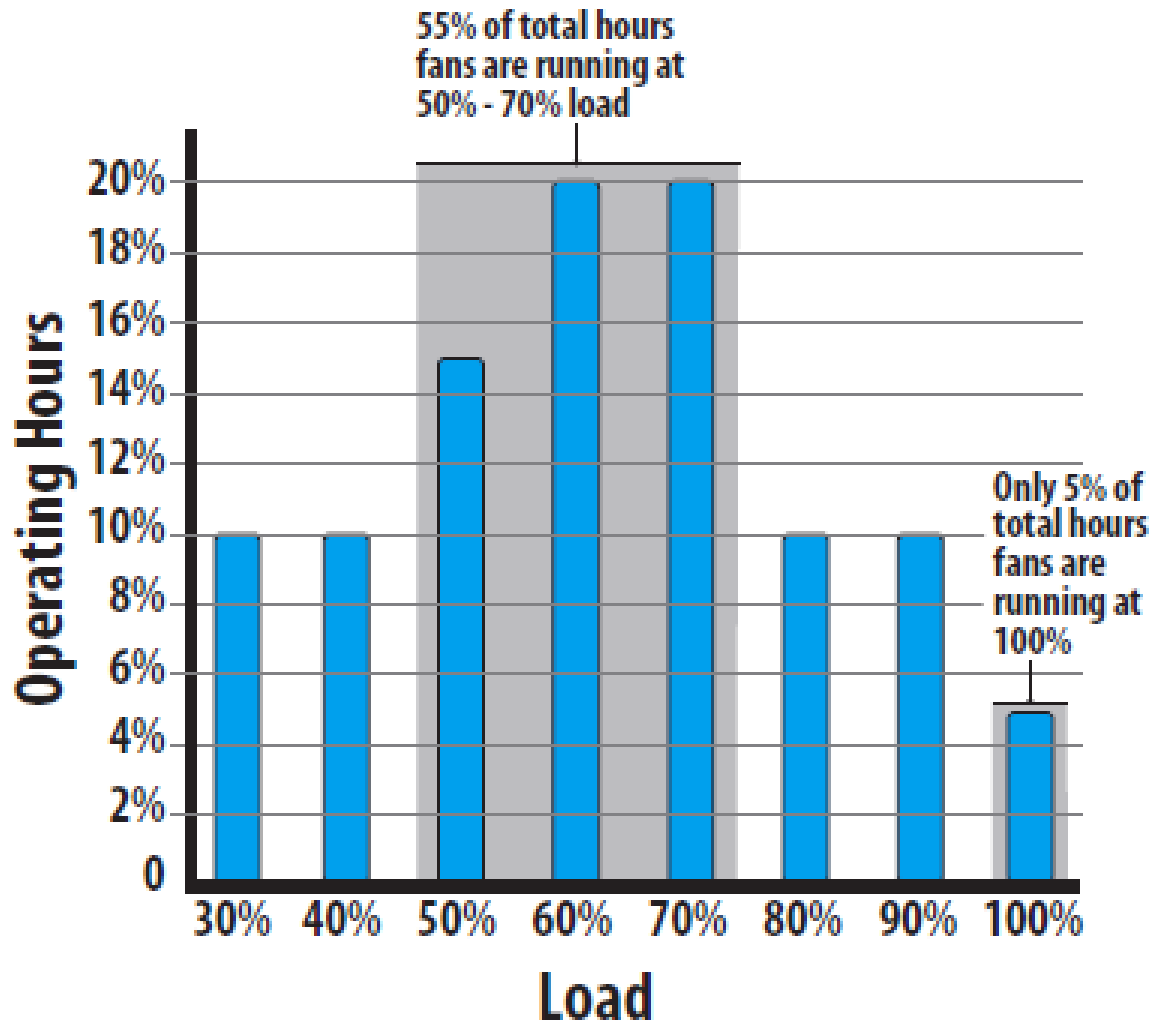
Head Pressure Control

Variable fan control (VFS, VFD, VSD):

- **Very stable head pressure control**
- **More energy efficient than fan cycling (less vibration)**
- **Increases motor life**



Most of the time full fan speed is not required

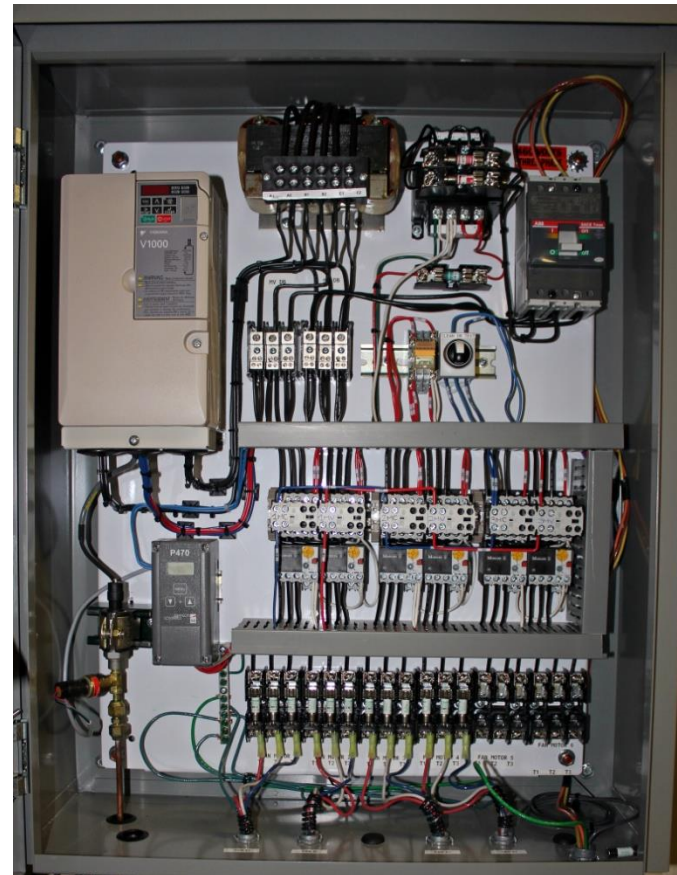


Ease of Installation

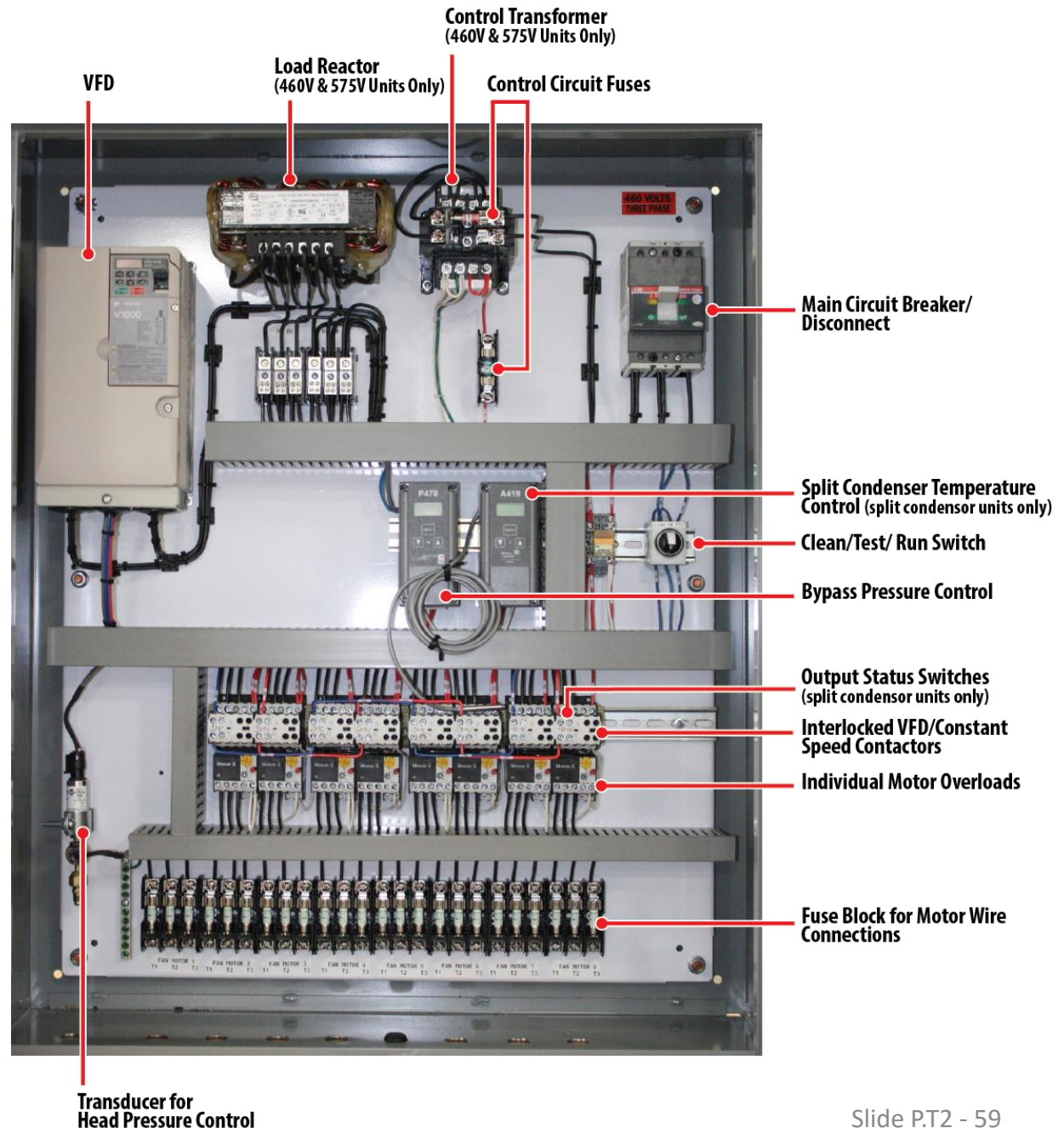
Before KE2 Therm



After KE2 Therm



Neatly Arranged and Wired



Installation on new



**or existing
condensers**





Jun-11

Summary of Data from Supermarket Installation

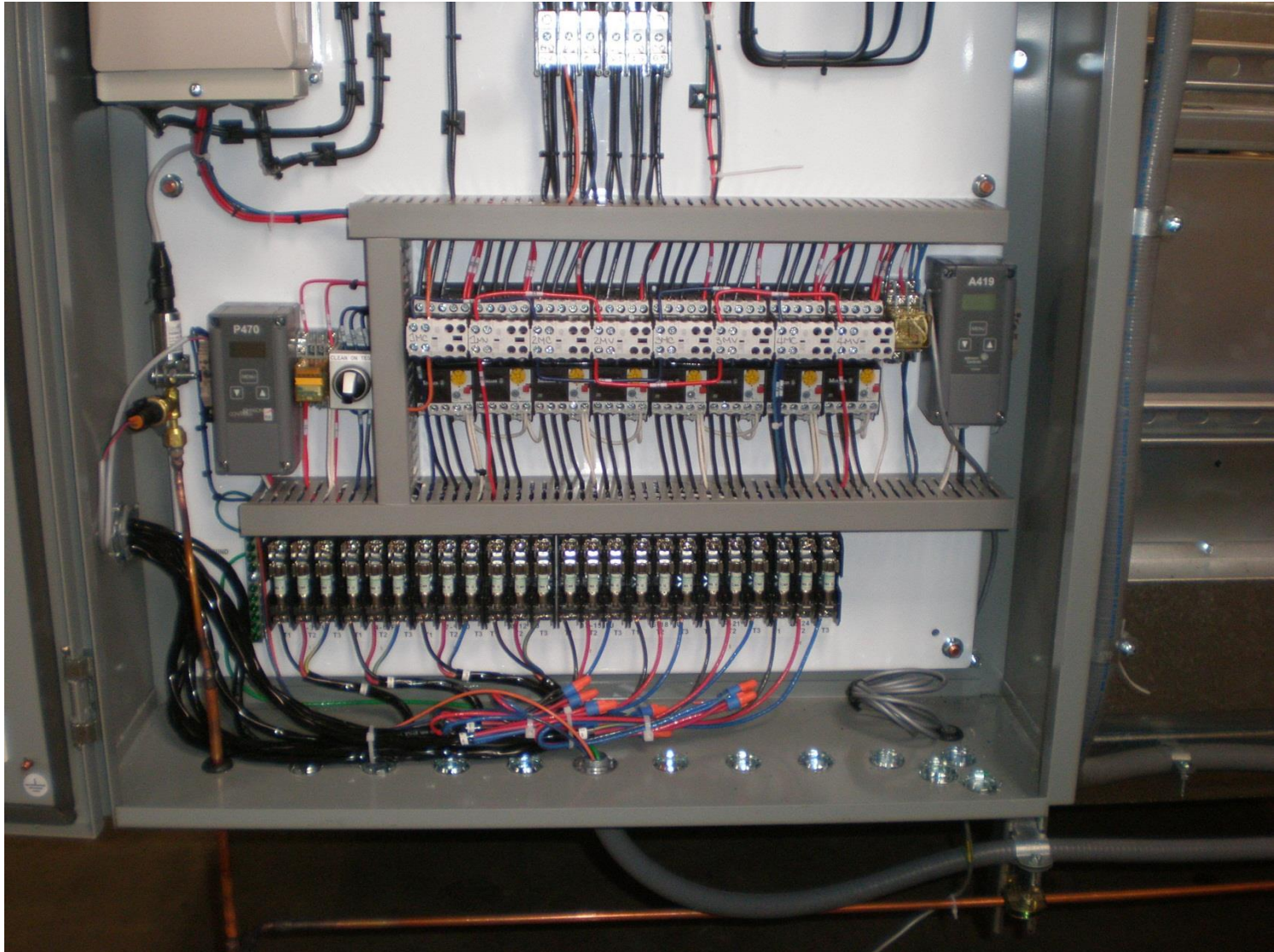
	8 Fan	6 Fan	8 Fan	4 Fan	
Model	20326	20324	20326	20161	Total
KE2 Fan Calculator estimates					
Constant Speed predicted run cost \$	\$4,487	\$3,636	\$4,487	\$2,553	\$15,164
VFD predicted run cost \$	\$1,942	\$1,456	\$1,942	\$971	\$6,311
VFD predicted savings	\$2,545	\$2,180	\$2,545	\$1,582	\$8,853
Payback	2.2	2.3	2.2	2.5	2.3
KE2 Fan Control ROI Calculator					
Constant Speed predicted year kWh	56,092	45,454	56,092	31,914	189,552
VFD predicted year kWh	24,274	18,206	24,274	12,137	78,891
% savings	57%	60%	57%	62%	58%
Data gathered from VFD's at Dierbergs					
Actual VFD run from daily kWh provided from data (annualized)	32,644	14,142	23,270	17,401	87,457
% savings	42%	69%	59%	45%	54%

Based on \$0.08 / kWh

Wiring the motors



Completed wires and pressure line





Nov-11

Summary of Data from Woodsmill Installation

	6 Fan	6 Fan	6 Fan	4 Fan	
Model	20337	20337	20337	20228	Total
KE2 Fan Calculator estimates					
Constant Speed predicted run cost \$	\$4,569	\$4,569	\$4,569	\$3,225	\$16,931
VFD predicted run cost \$	\$1,843	\$1,843	\$1,843	\$1,226	\$6,754
VFD predicted savings	\$2,726	\$2,726	\$2,726	\$1,998	\$10,177
Payback	2.1	2.1	2.1	2.7	2.2
KE2 Fan Control ROI Calculator					
Constant Speed predicted year kWh	65,271	65,271	65,271	46,065	241,878
VFD predicted year kWh	26,323	26,323	26,323	17,518	96,487
% savings	59.7%	59.7%	59.7%	62.0%	60.1%
Data gathered from VFD's at Schnucks					
Actual VFD run from daily kWh provided from data (annualized)	12,432	16,065	11,345	12,305	52,146
% savings	81.0%	75.4%	82.6%	73.3%	78.4%

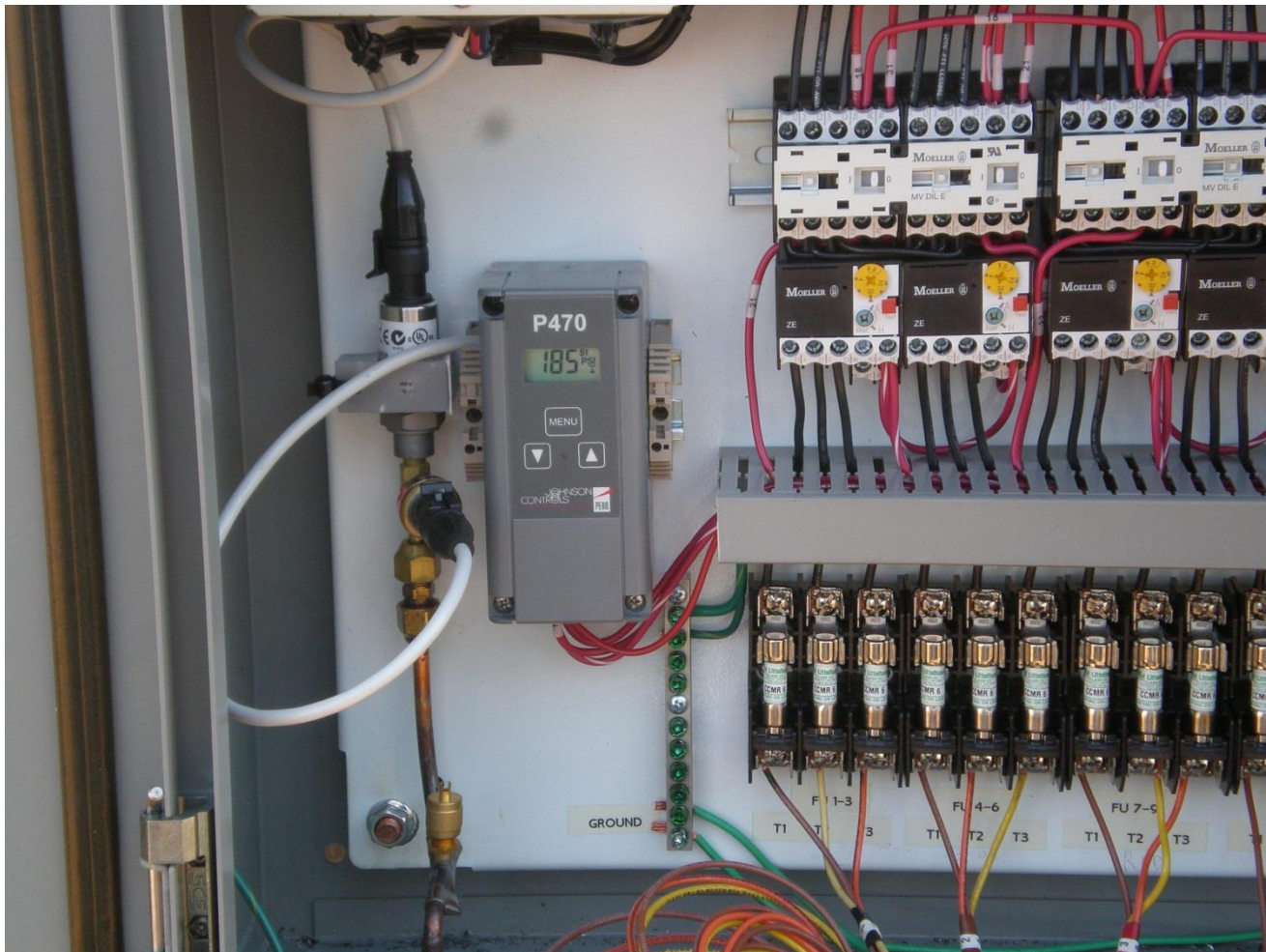
Based on \$0.08/ kWh

Mounting on Existing condensers

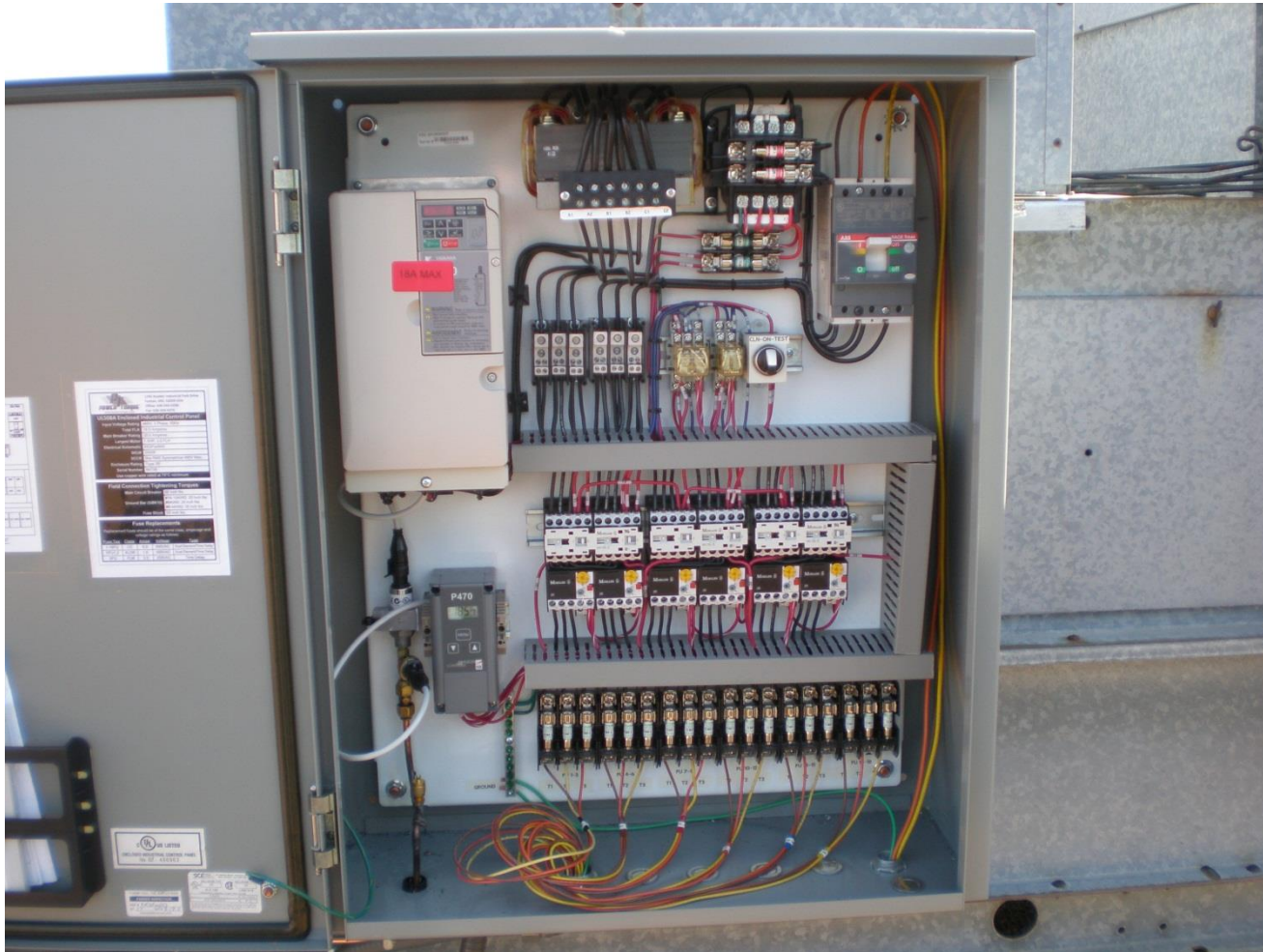


Only 4 hours to install 4 units!

Connect the wires and pressure line



Installation Complete



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Easy enough for one guy to install...

