THE CASE FOR CASE CONTROLLERS – YET AGAIN!

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AGENDA

- CASE CONTROLLER BACKGROUND
- WHY CASE-CONTROLLERS NOW ?
- FRESH & EASY BACKGROUND
- BENEFITS OF CASE-CONTROLLERS
- FRESH & EASY CASE STUDY
- CONCLUSIONS

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CASE CONTROLLER BACKGROUND

- Was first introduced in 1986 by many US vendors.
- Never picked up in US due to many challenges:
  - Energy was lower priority
  - Cost of case controllers was high
  - Case controller technology was new and had many problems
  - Electronic valves were not reliable
  - Not enough trained technician available
- However, Europe has 95% of stores with case controller working reliably today.

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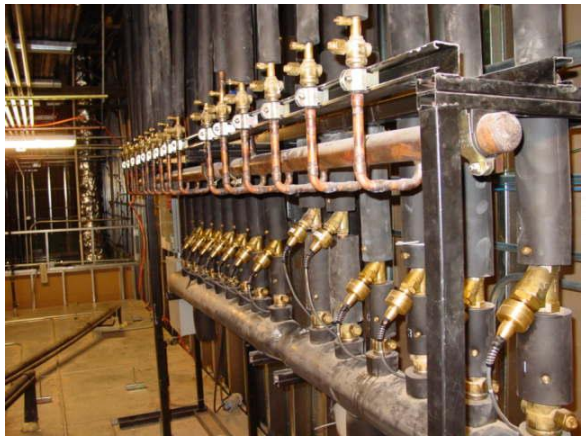
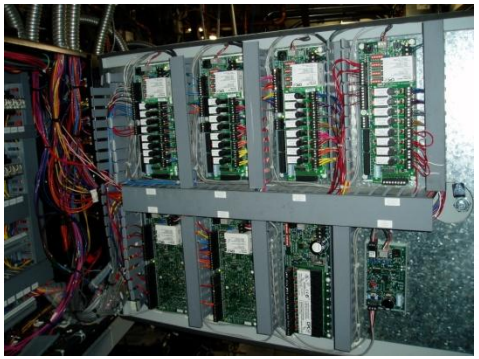
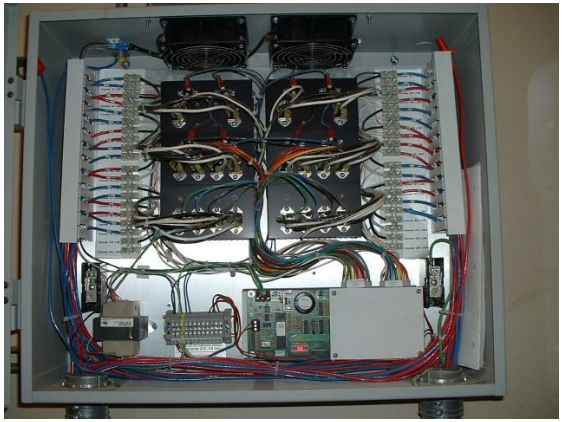
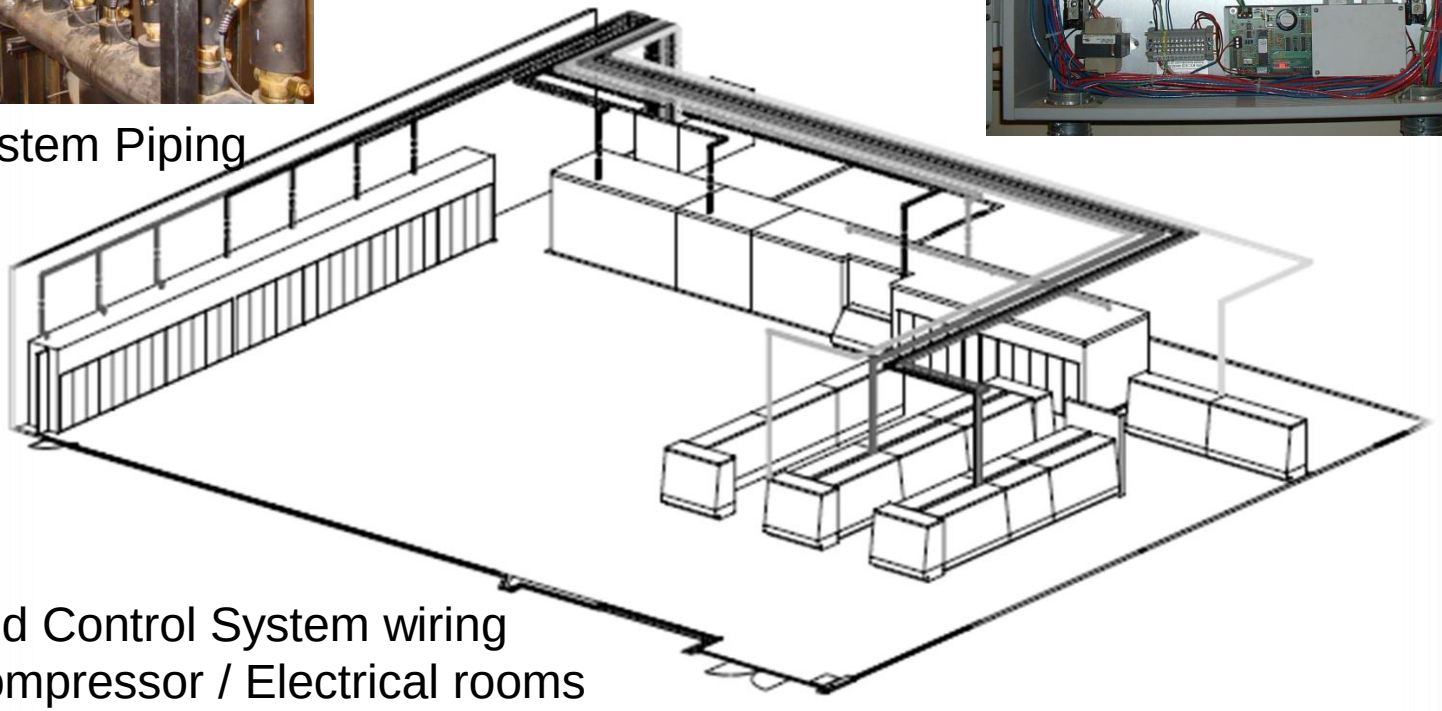
TRADITIONAL CONTROL



Individual System Piping







Electrical and Control System wiring
routed to Compressor / Electrical rooms

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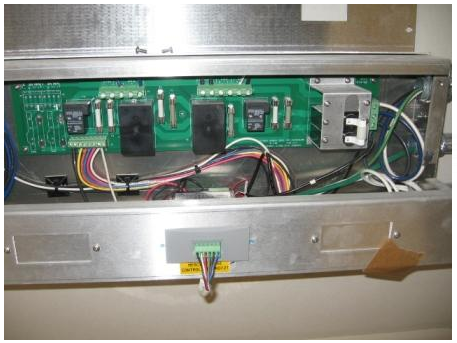
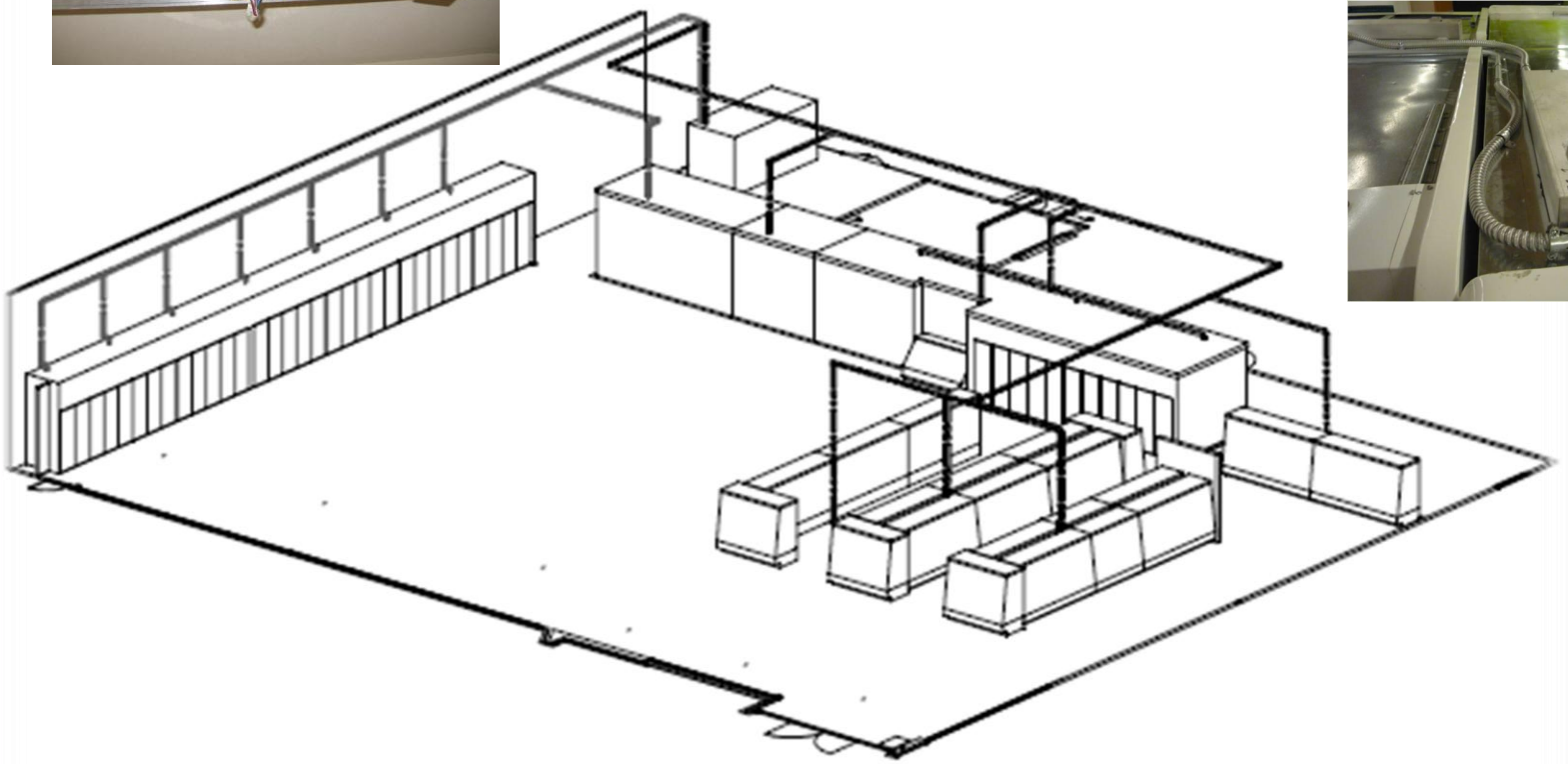
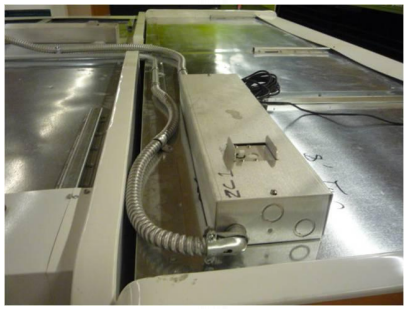
WHAT IS CASE CONTROL?



- Distributed electrical and control systems.
- Loop Refrigeration Piping





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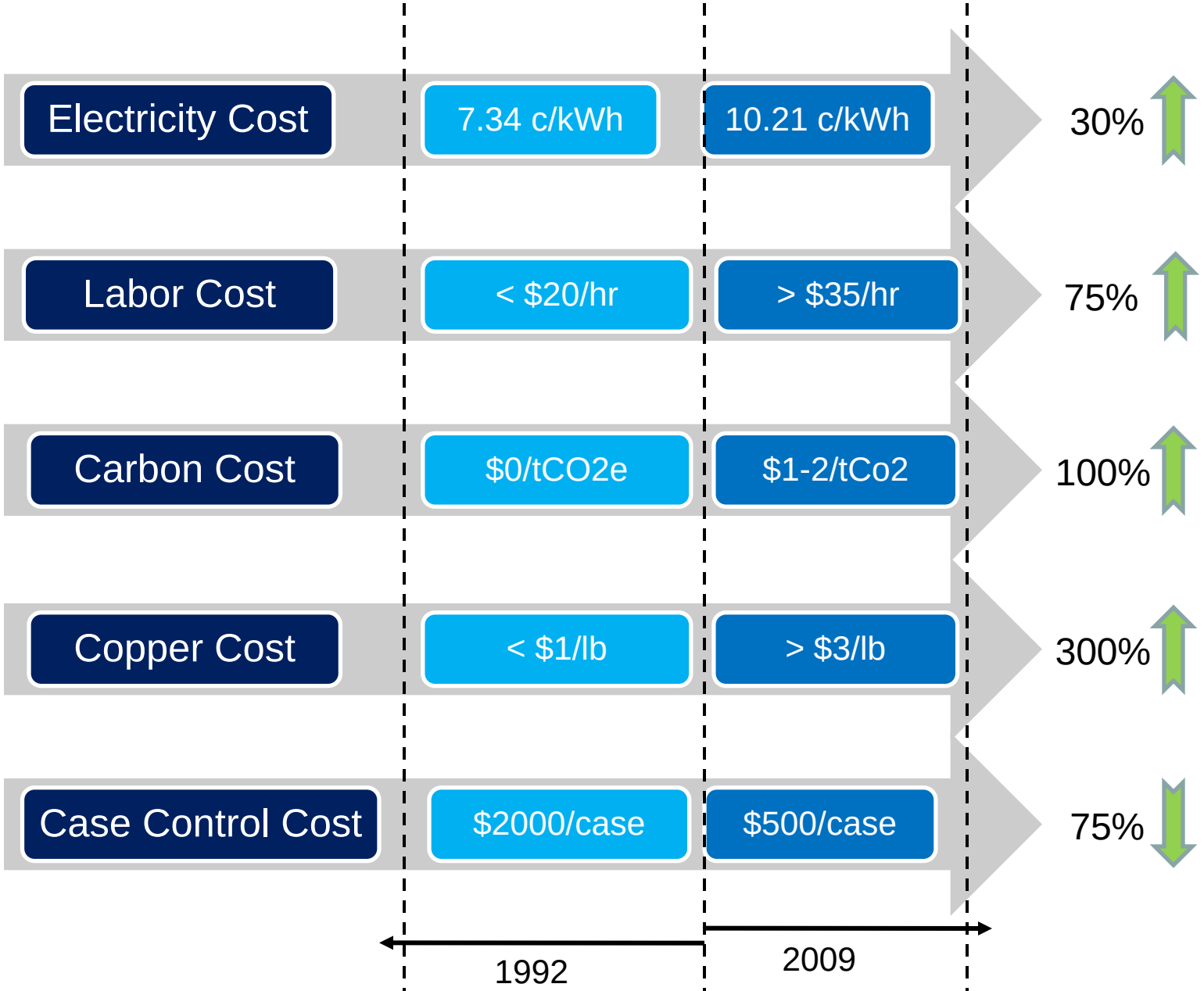
WHY CASE-CONTROLLERS NOW?



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FRESH & EASY BACKGROUND

- 168 stores in California, Arizona and Nevada.
- First store opened November 2007.
- 1400 square foot prototype store.
- All stores successfully using Case-Control technology

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Typical Store

14,000 SQFT


Case Control Module – Multi-deck cases


“Lowboy” Frozen Food


“Lowboy” Case Control Module

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WHY F&E SELECTED CASE CONTROLLER?

- Our goal was to build the most energy efficient prototype store in the country.

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BENEFITS OF “CASE-CONTROLLERS”

- Low Installation Cost
- Lower Energy Consumption
- Lower On-going Maintenance
- Improved Food Quality/Safety
- Environmental Benefits

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BENEFITS – INSTALLATION COST

- Electro-Mechanical Infrastructure Savings:
  - Less Copper Pipes
  - Less Piping Insulations
  - Less 120/208V electrical cables
  - Fewer electrical panels
  - Less temperature sensor cables
  - Less refrigerant charge

- Startup/Commissioning Savings:
  - Less joints/pipe soldering
  - Less electrical cables to run
  - Less temperature sensors to run
  - No TXV to tune

STARTING A CASE-CONTROL STORE CAN TAKE HALF THE TIME COMPARED TO CIRCUIT CONTROL

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BENEFITS – ENERGY COST

- Lower Condensing Pressure
  - Condensing Pressure can be lowered to 60F as compared to typical 90F
  - Every 1 psig saves roughly 0.5% compressor power

- Tighter Superheat Control throughout the life
  - Typically TXV gets off-tuned after 1-2 years
  - Compressors needs to run at lower suction to meet temperature for inefficient TXV operations

- No pressure drops at EPR

- Use of Product probe can let suction float higher.

- Auto Night-Blind Detection

- Suction Pressure Float based on Valve%

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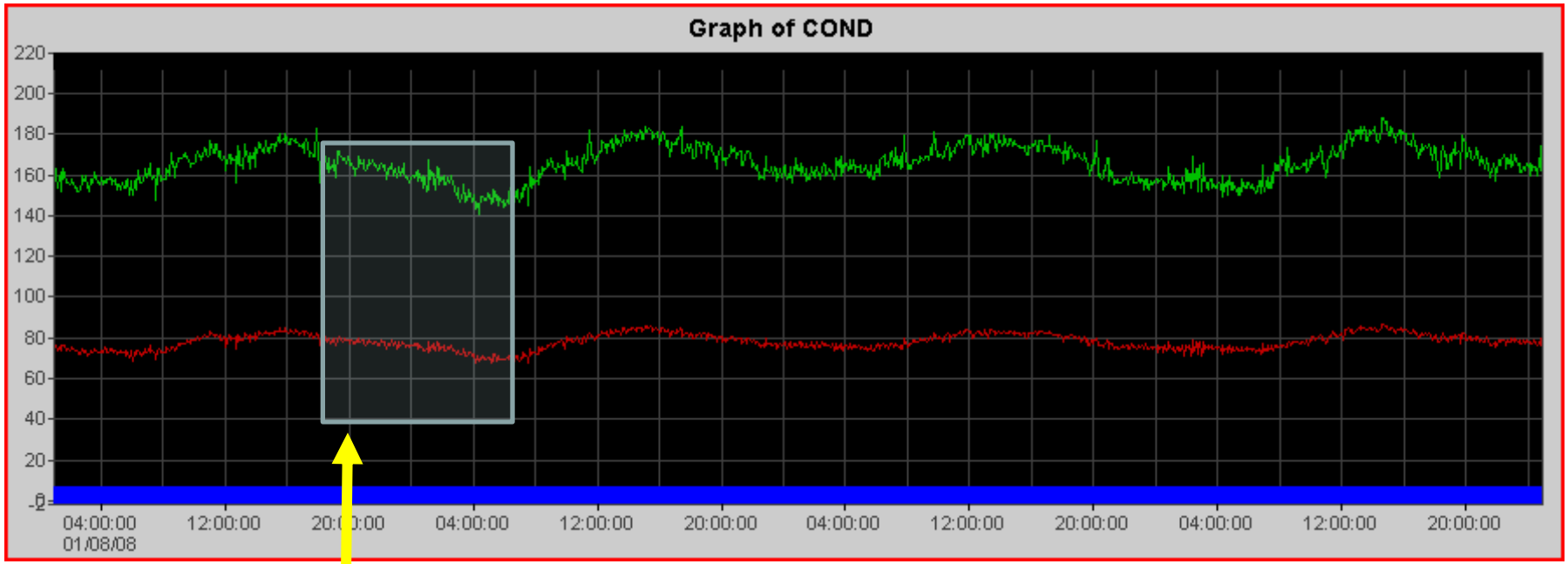
CONDENSER TEMP/PRESSURE FLOAT



Compressor Discharge Pressure
Floated Down to 65 F

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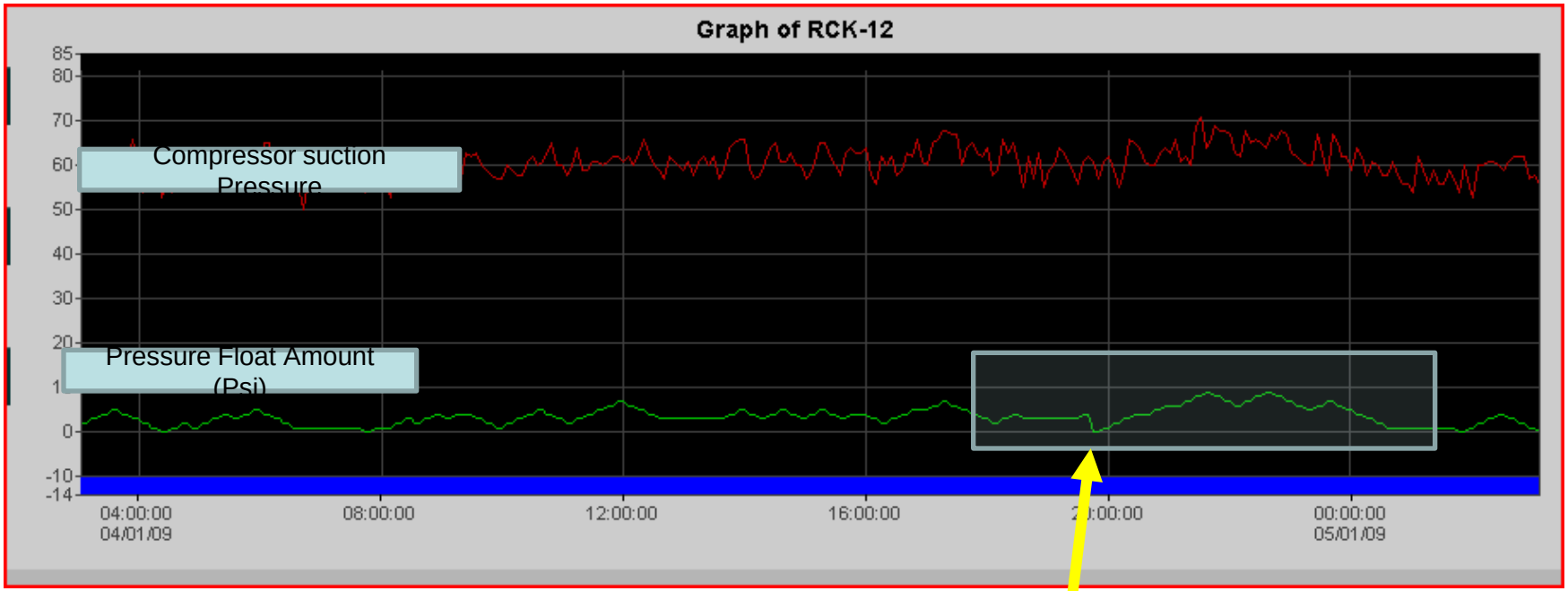
SUCTION PRESSURE FLOAT USING VALVE%



Compressor Suction pressure is floated up by almost 10 psi at night

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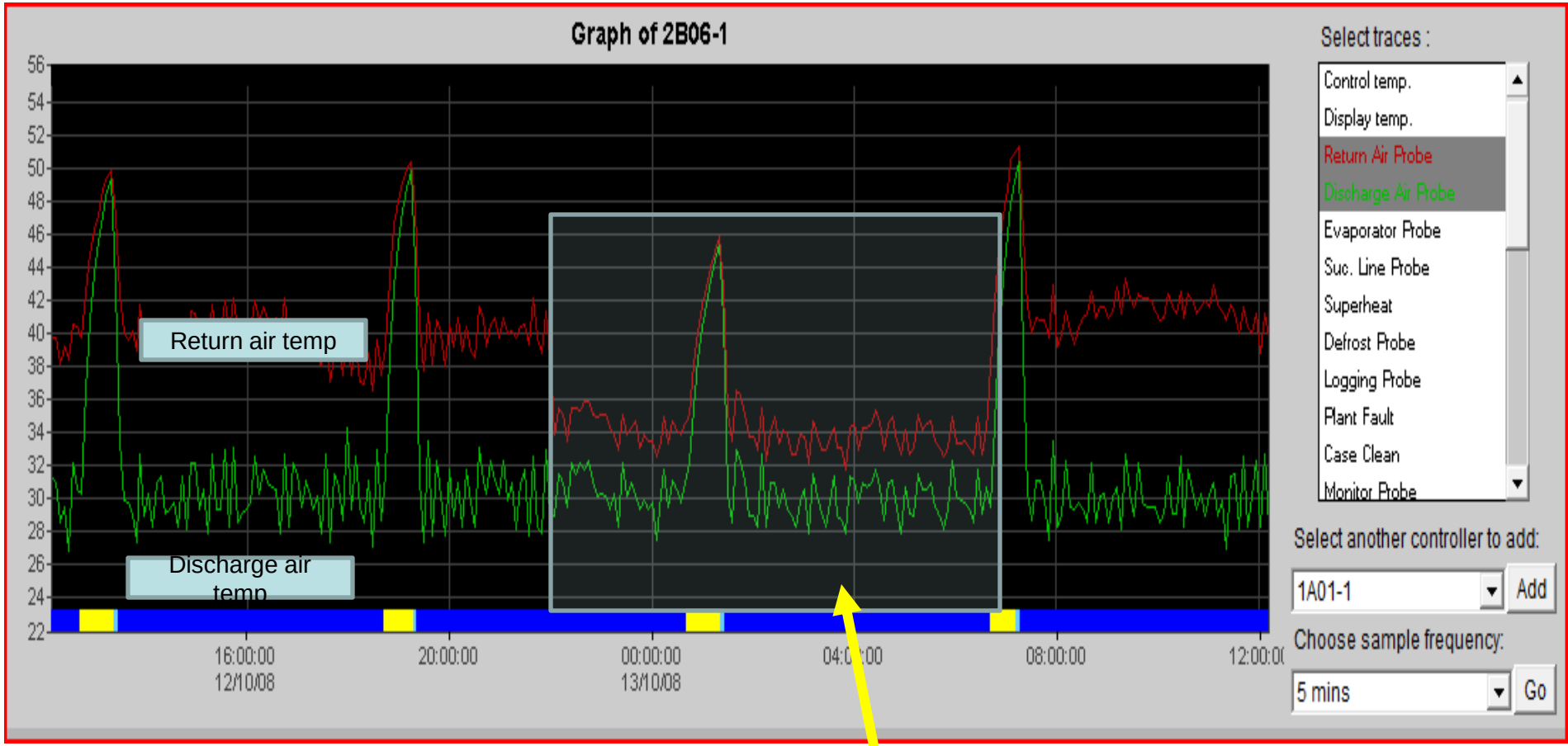
EXAMPLE OF “NIGHT BLINDS USED”



Blinds used (temp comes closer)

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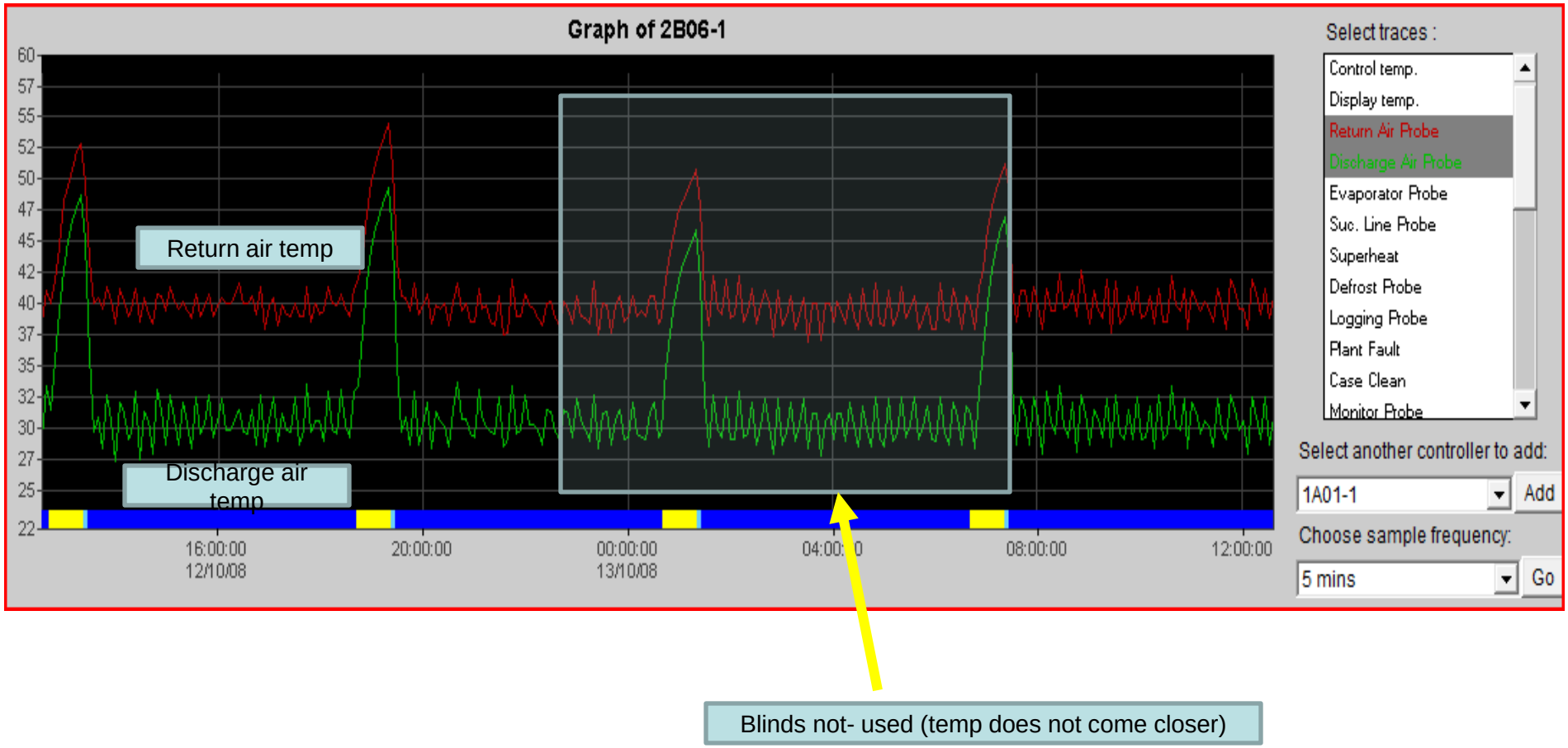
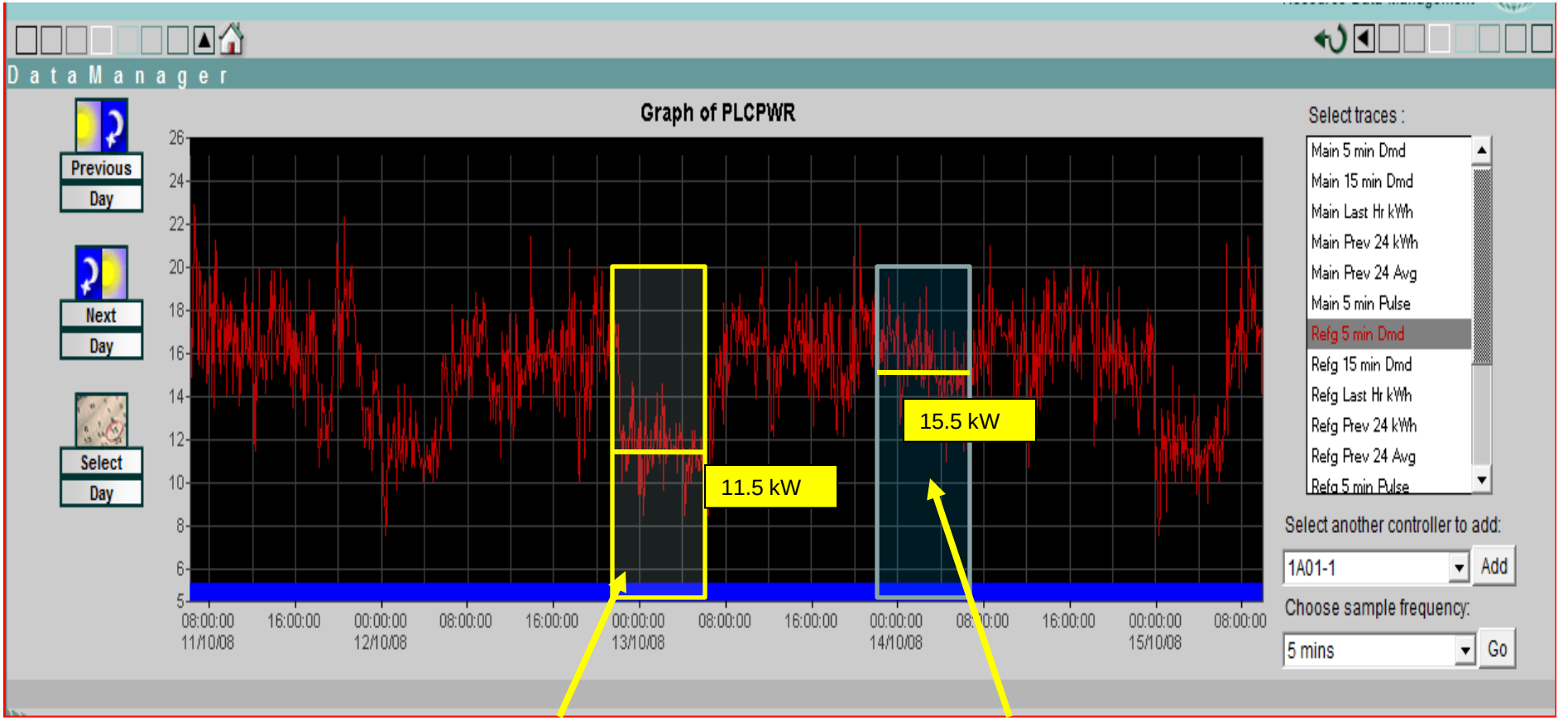
EXAMPLE OF “NIGHT BLINDS NOT-USED”



Blinds not- used (temp does not come closer)

ENERGY IMPACT OF NOT USING BLINDS



Blinds Used

Blinds Not-Used

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BENEFITS – IMPROVED ON-GOING MAINTENANCE COST

- No periodic tuning of expansion valves required.
- Four temperature sensors (coil in-out, discharge-return) per case gives improved visibility and remote diagnostics.
- If temperature control failure detected in a case (due to power fail or defrost problem), the case fans can be shut-off to give maintenance engineer valuable 2-3 hrs extra time and not harm the food products
- Enable EEV shut-off during evaporative condenser maintenance reducing flood back upon re-start.
- Changes to case operating temperature due to merchandising needs, can be done remotely versus generating a service call.
- Case lighting control time of day schedules can easily be adjusted on a per case, or per line-up basis, to accommodate special merchandising needs.
- Use evaporator sensor to detect coil “iced” conditions, without pulling product and deck pans to diagnose.

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BENEFITS – IMPROVED FOOD QUALITY/SAFETY

- Tighter temperature control
- Case temperature displayed digitally creates better awareness
- Product temperature probe tracks product temperature
- If temperature control failure detected in a case (due to fan or defrost problem), the case can be shut to not warm the products and possibly save the product.

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BENEFITS – LOW ENVIRONMENT IMPACT

- Loop piping and hence lower refrigerant charge
- Lower scope 1 & 2 carbon foot-print (due to lower energy consumption and refrigerant leak)
- Less copper piping/cable material and hence lower scope 3 carbon-foot-print.

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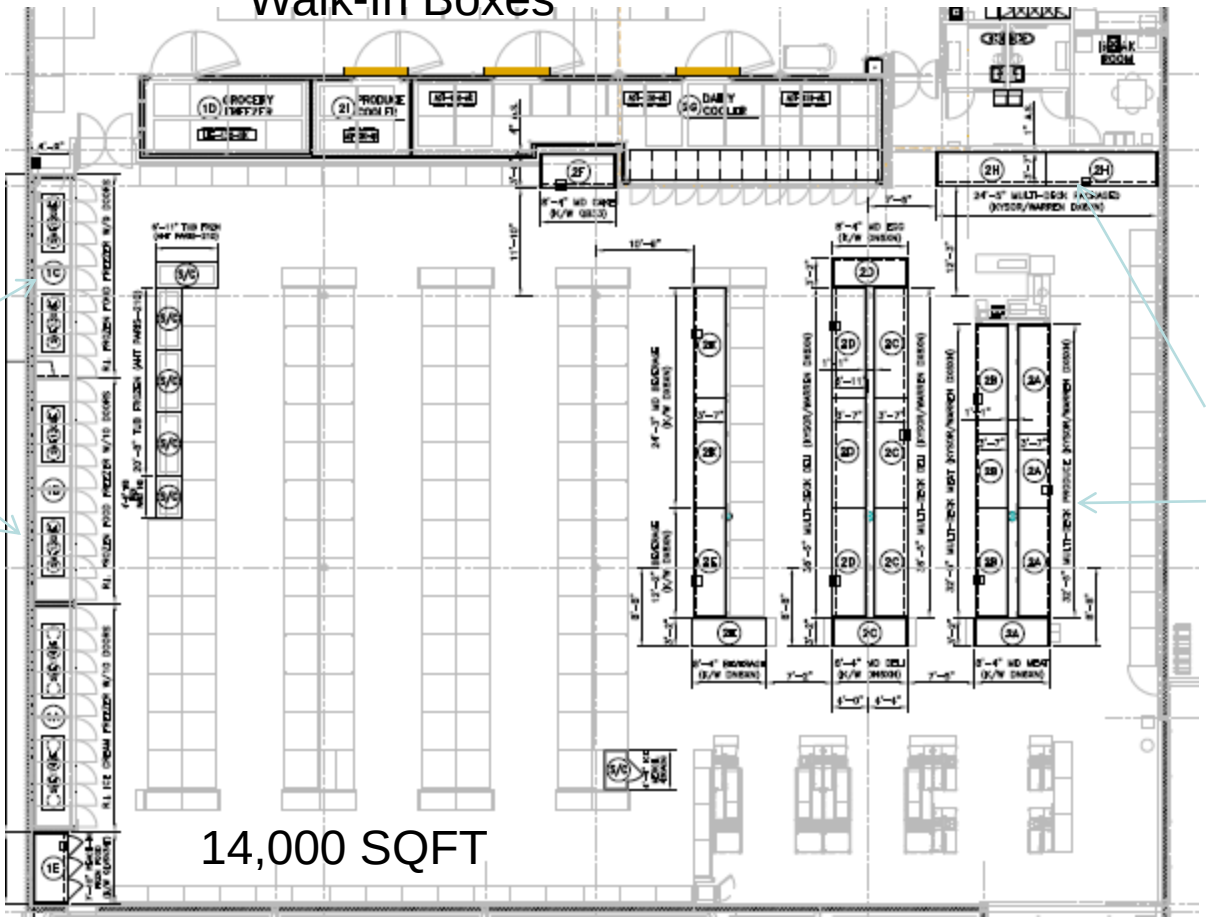
TYPICAL FRESH & EASY STORE FORMAT

Walk-In Boxes



Reach-in Frozen Food & Ice Cream (29 Doors)

Medium Temp Multi-deck Cases (22 Cases)

14,000 SQFT

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FACTORY INSTALLED - BENEFITS

- Standard installation of sensors & electronics.
- Improved quality control.
- Easy change management and training
- OEM much more experienced with case electronics.

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REAL BENEFITS SEEN

- 26% lower high-voltage wiring.
- 83% lower low-voltage wiring.
- 10% refrigerant leak rate.
- Improved remote diagnostics.
- Limited product loss in last 4 years

WHAT DO CASE CONTROLLERS REALLY COST – EQUIPMENT COSTS

Item	System	Deduct	Add
	Change from Case case control to conventional control		
1	Walk-in box control panels - RDM / Defrost / Sensors / EEV's	$ (4,983.00)	
2	Lowboy control panels - RDM / Defrost / Sensors / EEV's	$ (4,473.00)	
3	Defrost panel, fan contactors, defrost contactors, controls		$4,412.00
4	Ship Loose Ball Valves, and EPR Valves		$3,334.00
5	Evaporator Coils - Add Standard TXV		$627.00
6	Rack Controller / IO boards (departure from RDM)	-	$1,021.00
	Refrigerated Cases		
7	Case controller / power module / display / sensors / hubs	$ (5,440.00)	
8	Temp Sensor / Line-up, Digital Thermometers		$1,200.00
9	Remove Electronic Valve add TXV	$ (1,200.00)	
	Totals	$ (16,096.00)	$ 10,594.00

TOTAL UPFRONT COST OF CASE CONTROL EQUIPMENT = $5,502.00

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WHAT DO CASE CONTROLLERS REALLY COST – INSTALLATION COSTS

Conventional System Wiring

Reach-in Frozen Food					
Load	Volts	Amps	Wire Size	Conductors	Wire to
DEFROST HEATERS*	208	15.7	12	2	RDP Contactors
EVAP FANS	208	1.2	14	2	RDP Contactors
DOOR LIGHTS	120	1.44	14	2	PW Contactor
DOOR HEATERS*	120	3.18	14	2	Anti-sweat panel
Grocery Freezer					
Load	Volts	Amps	Wire Size	Conductors	Wire to
DEFROST HEATERS*	208	15.7	12	2	RDP Contactors
EVAP FANS	208	2.08	14	2	RDP Contactors
40Ft Line-up Multi-deck cases					
Load	Volts	Amps	Wire Size	Conductors	Wire to
CASE FANS	120	1.2	14	2	Breaker Panel
CASE LIGHTS	120	4.5	14	2	Breaker / Contactor

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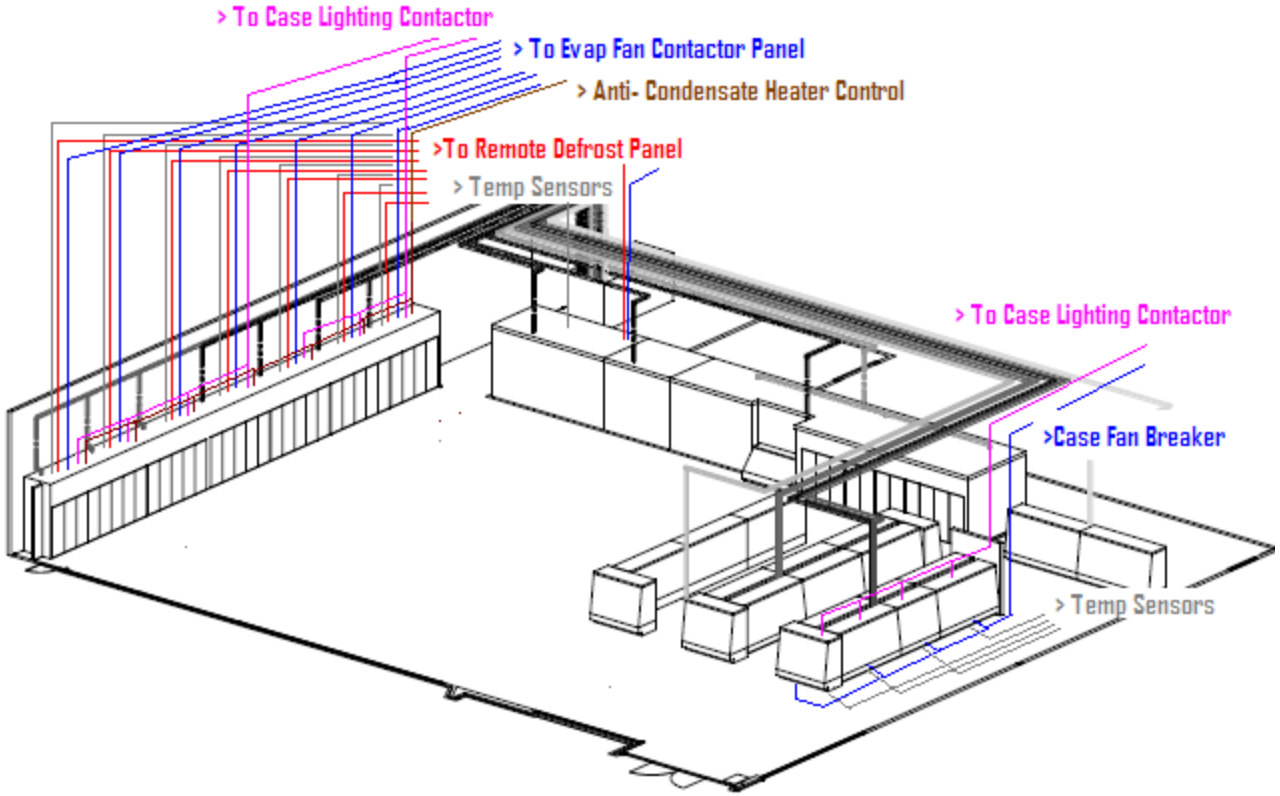
WHAT DO CASE CONTROLLERS REALLY COST – INSTALLATION COSTS

Traditional System Wiring



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WHAT DO CASE CONTROLLERS REALLY COST – INSTALLATION COSTS

Case Control System Wiring

Reach-in Frozen Food					
Load	Volts	Amps	Wire Size	Conductors	Wire to
DEF/FANS/LIGHTS/ASW	208	21.4	10	2	Breaker Panel
Grocery Freezer					
Load	Volts	Amps	Wire Size	Conductors	Wire to
DEF/FANS	208	17.8	12	2	Breaker Panel
40Ft Line-up Multi-deck cases					
Load	Volts	Amps	Wire Size	Conductors	Wire to
CASE FANS / LIGHTS	120	6.3	12	2	Breaker Panel

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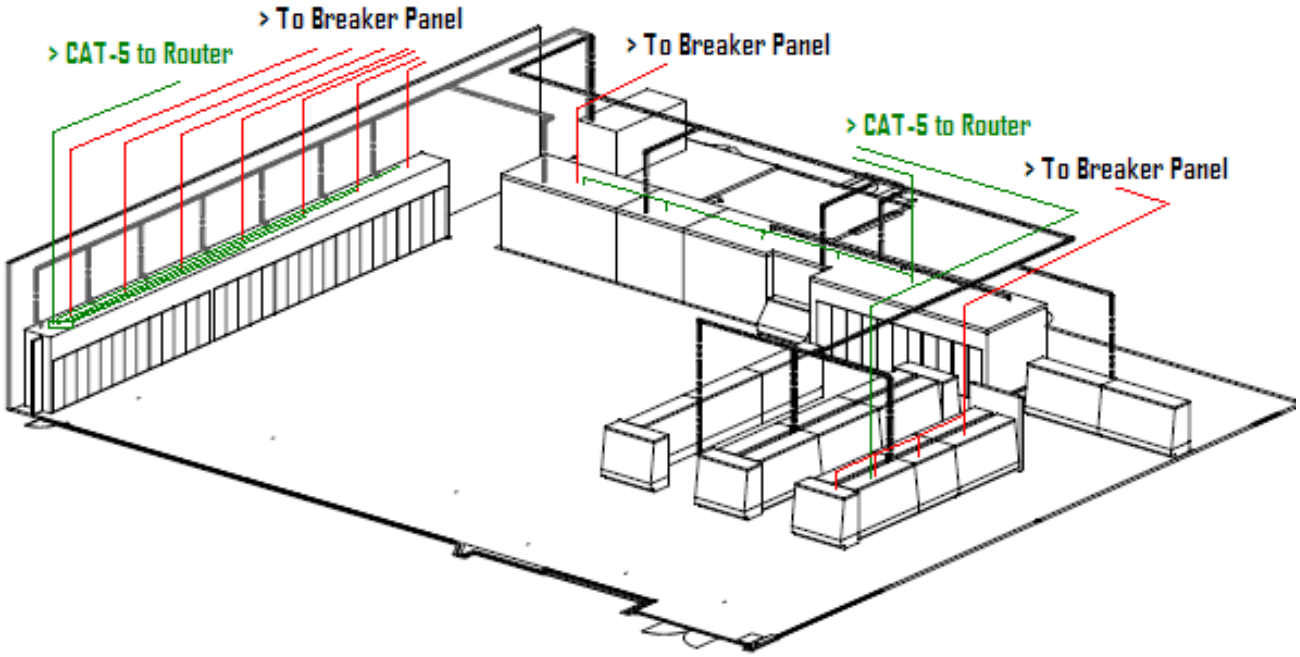
WHAT DO CASE CONTROLLERS REALLY COST – INSTALLATION COSTS

Case Control System Wiring



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WHAT DO CASE CONTROLLERS REALLY COST – INSTALLATION COSTS

- Conventional System Electrical Conductors:
  - Low Temp #12 wire = 10 conductors
  - Low Temp #14 wire = 26 conductors
  - Medium Temp cases #14 wires = 14 conductors
  - Medium Temp walk-ins # 12 = 2 conductors
  - Medium Temp walk-ins # 14 = 6 conductors
  - Supply air sensors (1 per case) = 22 Shielded cables
  - Supply Air Sensors Low Temp = 8 Shielded Cables
  - Total Conductors = 58
  - Total Cables = 30
- Case Control System Conductors:
  - Low temp #8 = 6 conductors
  - Low temp #10 = 12 conductors
  - Medium Temp Cases #12 = 18 conductors
  - Walk-in Boxes #12 = 7 conductors
  - CAT 5 communications = 5 homeruns
  - Total Conductors = 43
  - Total cables (CAT 5) = 5

26% Less High Voltage wiring

83% Less Low voltage wiring

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CONCLUSIONS

- Lower first cost
- Shorter start up time
- Improved case operation
- Lower energy costs

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