

Energy & Store
Development Conference

2016
E+Sd



THE VOICE OF FOOD RETAIL 

Energy & Store
Development Conference

2016
E+SD

***Total Cost of Ownership: Mechanical vs.
Electronic Expansion Valves/Case Controllers***

Peter Dee

Danfoss Sales & Services Director - NAM

Outline

- History of case controllers
 - When and where introduced
- Market penetration estimates
 - Europe
 - US
 - Other regions?
- Experiences with case controllers
 - Benefits and issues experienced with customers
 - How does one evaluate possible payback and ROI for retrofits?
- Most compelling types of applications
 - Which applications?
 - What makes them compelling?



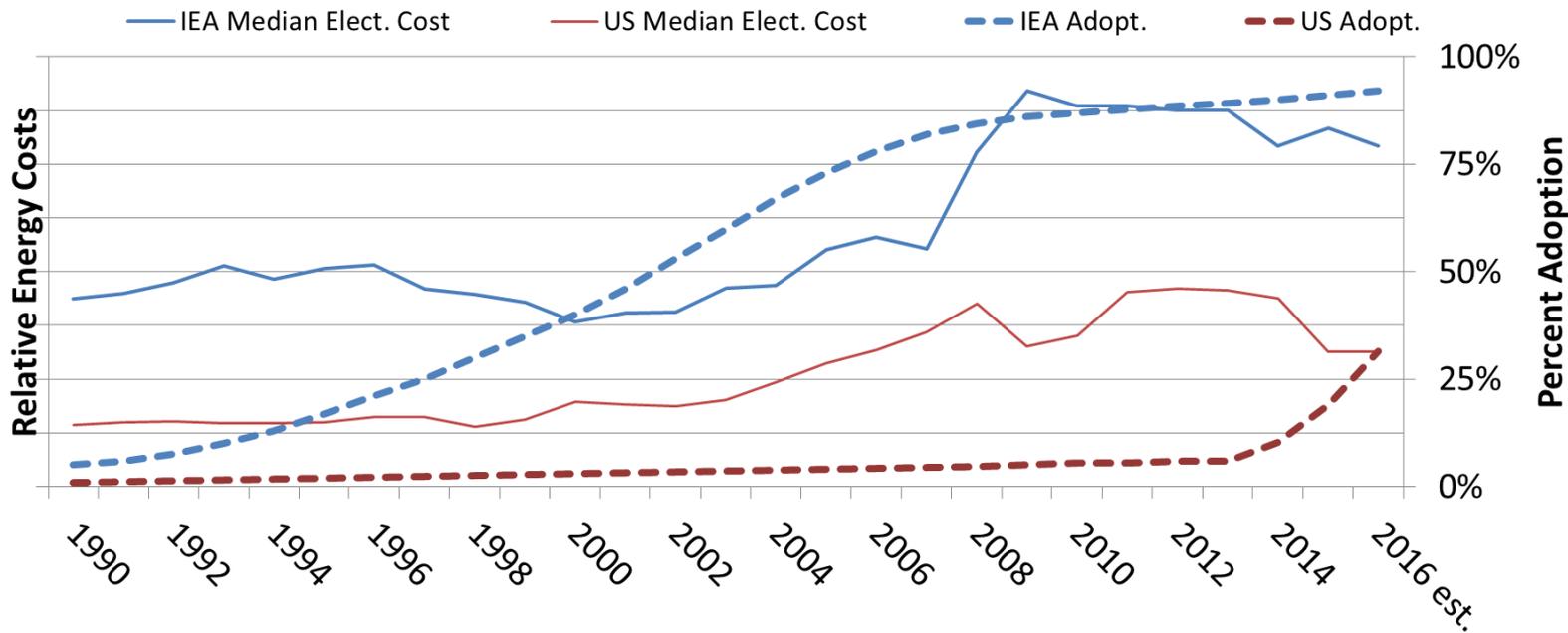
Case Controls

Historically, supermarkets relied on a **single central control device** to monitor and manage multiple refrigerated units in a store.

The introduction of case controllers changed this approach, first in Europe and later — in the early 1990s — in the United States, as **energy prices climbed** and the food industry became better acquainted with the **proven technology**.

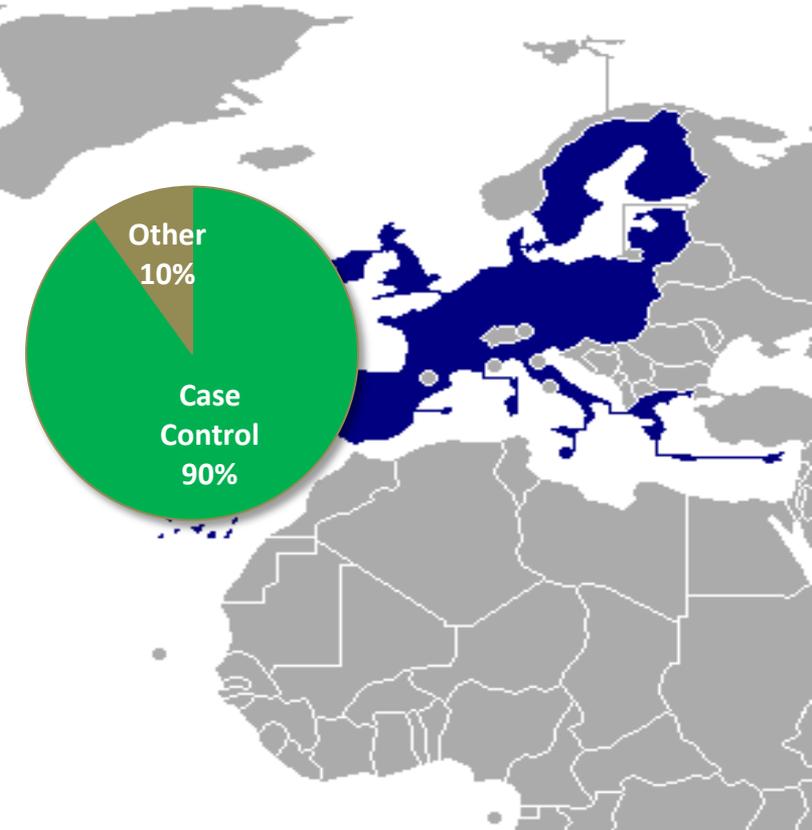
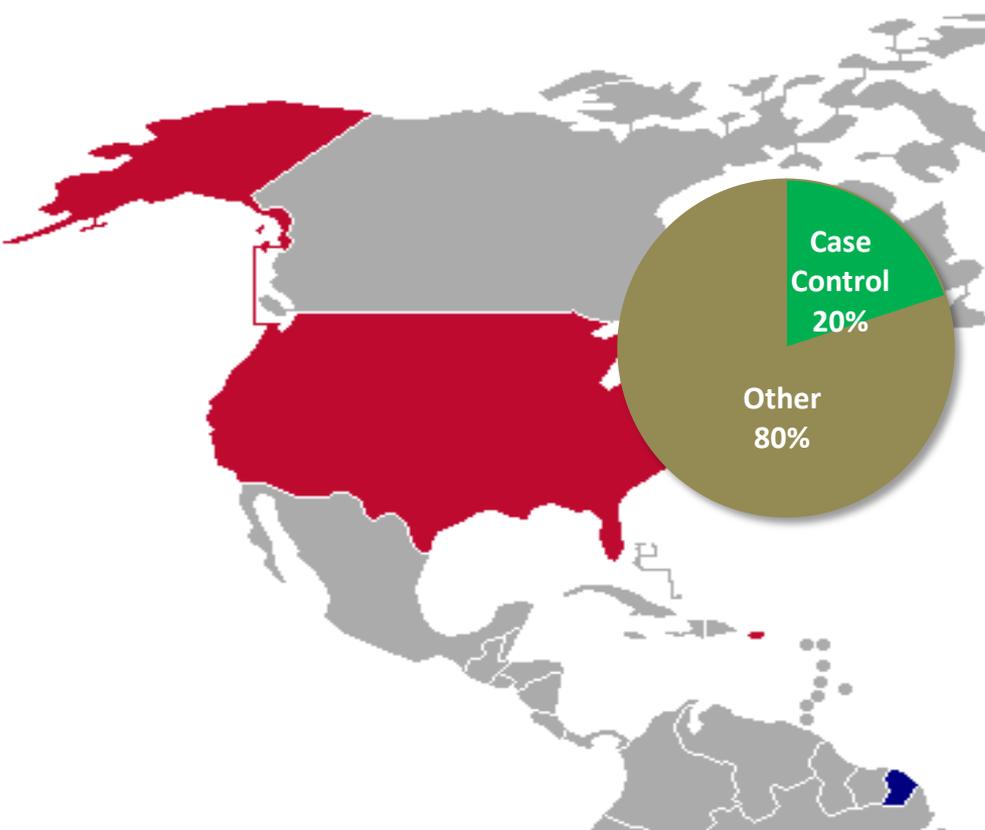


Energy Cost and Case Controller Adoption US and Europe



Market Penetration Estimates

- Europe – Early adopters of case controls, with **90%** of the market using case controls, and has benefited from **energy savings**, reduced **carbon emissions** and increased **food safety** and **quality**.
- US – Slow adopters of case controls; estimated **20%** of the market using case controls; however, this is increasing as food retail end-users benefit from case controllers.



Challenges of Case Controls (US)

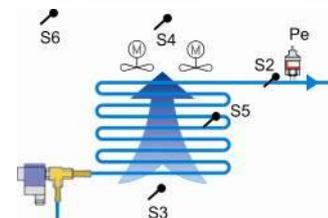
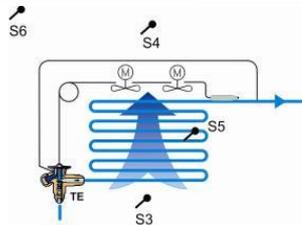


- Application experience
 - Contractor
 - Designing Engineer
- Industry adoption of new technology
- First cost barriers

Advantages of Case Controls

-  Stand-alone control function
-  Seasonal TXV changes not required
-  Reduced product loss
-  Reduced installation costs
-  Energy savings
-  Reduced carbon emissions
-  Gateway to CO₂
- 

Case Controller Comparative First Cost



65,000 square ft., 72 Case, 8 Cold Rooms							
Conventional TXV/EPR Control				Case Controller			
	Units	Cost/unit	Extend		Units	Cost/unit	Extend
TXV	80	\$ 42.79	\$ 3,423.40	EEV	80	\$ 102.44	\$ 8,195.09
Solenoid Valve	80	\$ 37.83	\$ 3,026.47	Pressure Sensor	80	\$ 112.24	\$ 8,979.28
				Temperature Sensor	80	\$ 28.55	\$ 2,283.75
				Case Controller	80	\$ 367.53	\$ 29,402.77
				Wiring/Cables	80	\$ 21.23	\$ 1,698.10
				Add'l Labor	20	\$ 75.00	\$ 1,500.00
				Programming	24	\$ 150.00	\$ 3,600.00
Total			\$ 6,449.87	Total			\$ 55,658.99
First Cost Difference							\$49,209.13

[Note: These cost are representative and will vary based on control strategy, specific equipment and components selected.]

Installation Cost EPR Control vs. Case Control

65,000ft² Store 280-HP Refrigeration System

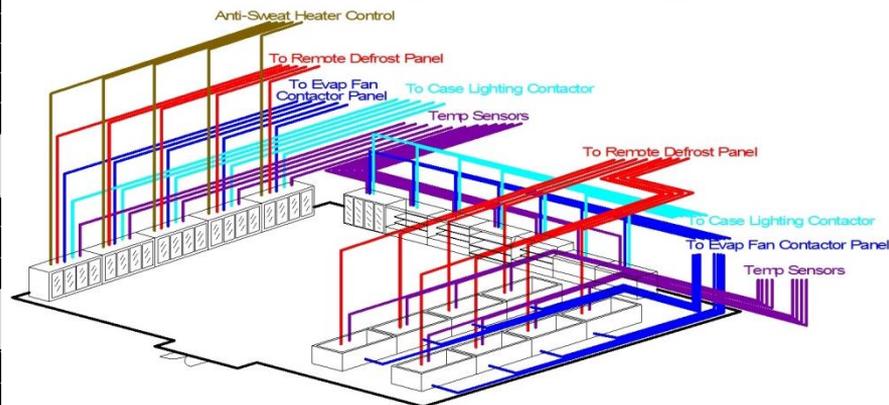
Case Controller vs Conventional Control Comparison							
65,000 square ft, 280 HP Refrigeration Systems							
Conventional-Circuit with EPR Control				Case Controller			
	Units	Cost/Unit	Extend		Units	Cost/Unit	Extend
Labor-Hours				Labor-Hours			
Cable-Rough	380	\$ 125.00	\$47,500.00	Cable-Rough	150	\$ 125.00	\$18,750.00
Cable-termination	500	\$ 50.00	\$25,000.00	Cable-termination	150	\$ 50.00	\$7,500.00
Hardware Install	80	\$ 125.00	\$10,000.00	Hardware Install	30	\$ 125.00	\$3,750.00
Power Wiring-Control	40	\$ 125.00	\$5,000.00	Power Wiring-Control	40	\$ 125.00	\$5,000.00
Power Wiring-Anti-Sweat	80	\$ 125.00	\$10,000.00	Power Wiring-Antisweat	40	\$ 125.00	\$5,000.00
Power Wiring-Lighting	80	\$ 125.00	\$10,000.00	Power Wiring-Lighting	40	\$ 125.00	\$5,000.00
Power Wiring-Defrost	80	\$ 125.00	\$10,000.00	Power Wiring-Defrost	80	\$ 125.00	\$10,000.00
Sub-Total			\$117,500.00	Sub-Total			\$55,000.00
Materials/Misc.			\$0.00	Materials/Misc.			\$0.00
Cable	40,000	\$ 0.50	\$20,000.00	Cable	10,000	\$ 0.50	\$5,000.00
Hardware	500	\$ 6.00	\$3,000.00	Hardware	200	\$ 6.00	\$1,200.00
Scissor Lifts	4	\$ 500.00	\$2,000.00	Scissor Lifts	2	\$ 500.00	\$1,000.00
Power Wiring	10,000	\$ 2.00	\$20,000.00	Power Wiring	8,000	\$ 2.00	\$16,000.00
Sub-Total			\$45,000.00	Sub-Total			\$23,200.00

Estimated Savings = **\$21,800.00**

Conventional Wiring System

Frozen Food					
Load	Volts	Amps	Wire size	Conductors	Connect To
Evap Fans	208	1.2	12	2	RDP Contactors
Defrost Heaters	208	15.7	14	2	RDP Contactors
Door Lights	120	1.44	14	2	PW Contactors
Door Heaters	120	3.18	14	2	Anti-Sweat Panel
Grocery Freezer					
Load	Volts	Amps	Wire size	Conductors	Connect To
Evap Fans	208	2.08	12	2	RDP Cotactors
Defrost Heaters	208	15.7	14	2	RDP Cotactors
Multi Deck (40ft Line Up)					
Load	Volts	Amps	Wire size	Conductors	Connect To
Case Fans	120	1.2	14	2	Breaker Panel
Case Lights	120	4.5	14	2	Breaker- Contactor

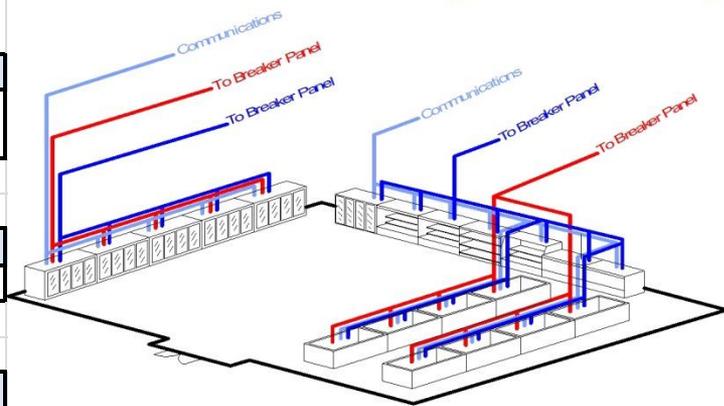
Traditional System Wiring



Case Control Wiring System

Frozen Food					
Load	Volts	Amps	Wire size	Conductors	Connect To
Defrost/Evap Fans/Lights/Anti Sweat	208	21.4	10	2	Breaker Panel
Grocery Freezer					
Load	Volts	Amps	Wire size	Conductors	Connect To
Evap Fans/Defrost Heaters	208	17.8	12	2	Breaker Panel
Multi Deck (40ft Line Up)					
Load	Volts	Amps	Wire size	Conductors	Connect To
Case Fans/Lights	120	6.3	12	2	Breaker Panel

Case Control System Wiring



The Case for Case Controllers

\$10/day

Cost of energy of an average display case. (@ \$0.098/kwh)

At least **7.5%**

Energy saved with case controllers.

\$18,000/yr.

Saved in an average store of 65 cases. (\$50/day)

\$900,000

Additional merchandise sales required annually to match the return.

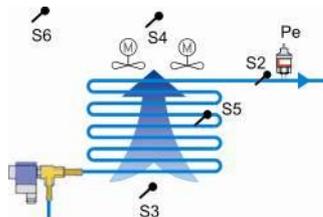


Case Controller Comparative Case Study

65,000 square ft., 72 Case, 8 Cold Rooms		
	First Year	3 Years
First Cost	\$49,209	\$49,209
Install Cost	(\$21,800)	(\$21,800)
Operating Cost	(\$17,640)	(\$52,920)
Total Cost of Ownership	\$9,769	(\$25,511)

**Estimated Savings \$25K over 3 yrs.
Payback Period of First Cost ~1.5 years**

Case Controller Retrofit view



65,000 square ft., 72 Case, 8 Cold Rooms			
Case Controller			
	Units	Cost/unit	Extend
EEV	80	\$ 132.49	\$ 10,599.50
Pressure Sensor	80	\$ 91.48	\$ 7,318.12
Temperature Sensor	80	\$ 19.97	\$ 1,597.56
Case Controller	80	\$ 302.44	\$ 24,195.30
Wiring/Cables	80	\$ 18.13	\$ 1,450.01
Programming	24	\$ 150.00	\$ 3,600.00
Total			\$ 48,760.49

[Note: These cost are representative and will vary based on control strategy, specific equipment and components selected.]

Installation Cost Retrofit Case

65,000ft² Store 280-HP Refrigeration System

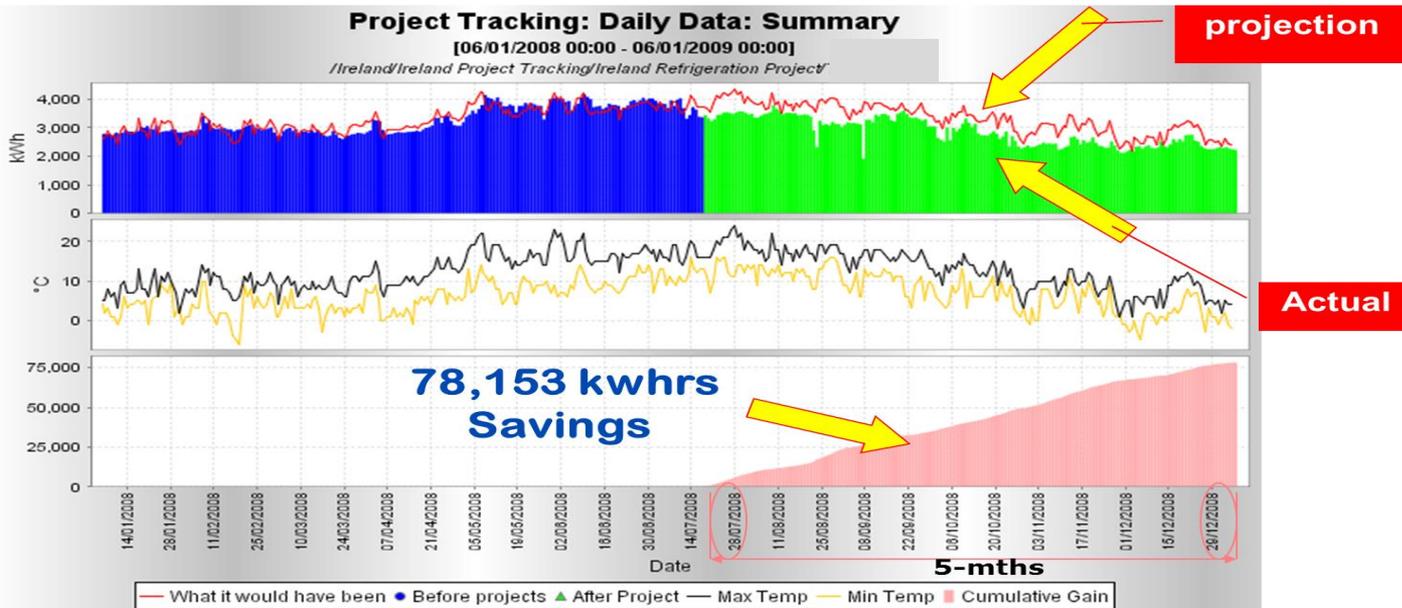
65,000 square ft., 72 Case, 8 Cold Rooms			
Case Controller			
	Units	Cost/unit	Extend
Labor-Hours			
Cable-Rough	75	\$ 125.00	\$ 9,375.00
Cable termination	75	\$ 50.00	\$ 3,750.00
Hardware install	80	\$ 125.00	\$ 10,000.00
Power Wiring - Control	40	\$ 125.00	\$ 5,000.00
Sub-Total			\$ 28,125.00
Materials/Misc.			
Unload/load Cases	80	\$ 25.00	\$ 2,000.00
Cable	5,000	\$ 0.50	\$ 2,500.00
Hardware	200	\$ 6.00	\$ 1,200.00
Scissor Lift	2	\$ 500.00	\$ 1,000.00
Sub-Total			\$ 6,700.00
Total			\$ 34,825.00

Retrofit Project



- No. of refrigerated cases/cold rooms:
 - 24 low temperature cases
 - 48 medium temperature cases
 - 8 cold rooms
- Removed existing controllers
- Installed new electronic expansion controllers
- Set up all controllers for energy savings

Retrofit Energy Results



Comments	kWh Reduction
kWh savings in 5 months	75,000
Estimated kWh savings in 1 month	15,000
Estimated kWh savings annually	180,000
January 2016 Commercial Average Price of Electricity (per kWh)	\$ 0.098
Estimated Annual Electricity Expense Reduction	17,640

Case Controller Retrofit Case Study

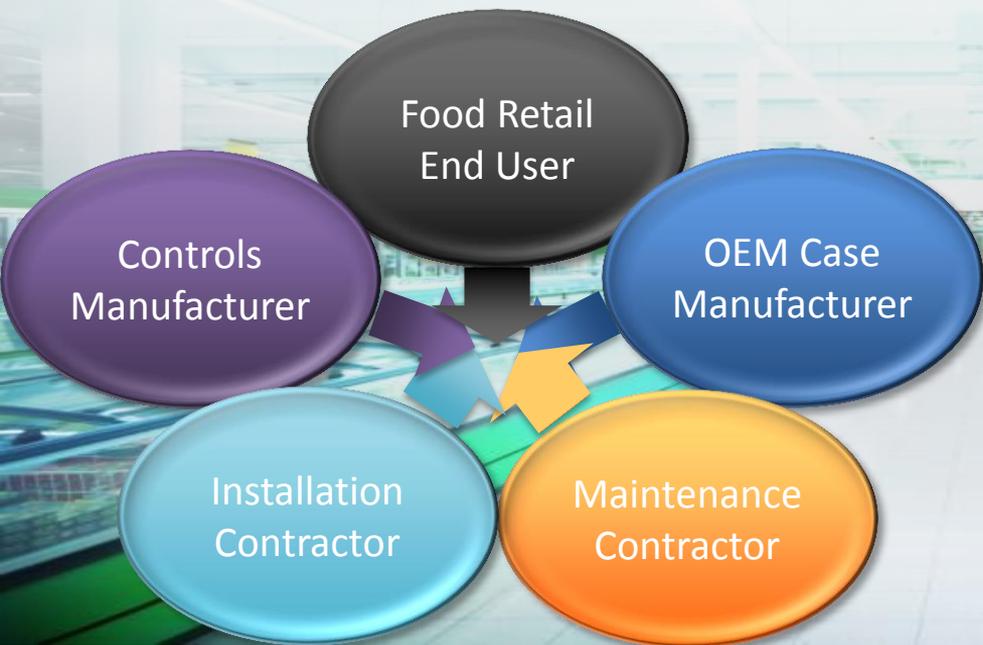
65,000 square ft., 72 Case, 8 Cold Rooms		
	First Year	5 Years
First Cost	\$48,760	\$48,760
Install Cost	\$34,825	\$34,825
Operating Cost	(\$17,640)	(\$88,200)
Total Cost of Ownership	\$65,945	(\$4,615)

**Estimated Savings \$4.5K over 5 yrs.
Payback Period of First Cost <4.8 years**

Case Controllers – Additional Considerations

- Reduced Service Cost
 - No need to adjust superheats
 - Fail-safe operation
- Ability to monitor performance
 - Remote troubleshooting
 - Set point security
 - Benchmarking performance
 - Alarm monitoring and response
- Food Safety
 - Temperature monitoring
 - Fault notification

Case Controls to be Successful.



Early **collaboration**
with all stakeholders is
critical to success.

Thank you