THE MADISON ENERGY GROUP ENERGY EFFICIENCY SOLUTIONS

Case Study:







Proof of Concept Protocol

<u>Purpose</u>: Demonstrate product performance on specified equipment at multiple pre-determined locations.

Measure Baseline Data:

- I. Identify equipment
- I. Ensure unit is operating properly (normal duty cycle, no visible ice, reaches set point)
- III. Ensure thermostat is accessible and compatible
- IV. Ensure compressor motor is accessible for data logger connection
- V. Record unit information: Type, Mfg, Model #

Compressor Power Source:

- I. At the compressor
 - i. Single phase (hot lead)
 - ii. 3 Phase (1 of 3 hot leads)
- II. Locate power rating (amperage/voltage) on compressor nameplate
- III. Record on datasheet; Phase, Volts and Amps
- IV. Record pilot start date/time on datasheet

Record Baseline Data:

- I. Install Dent TOU CT Logger or EKM Omni-meter V.3
- II. Record Baseline Data 7 days
- III. Validate baseline data

Measure Performance Data:

- I. Install Madison technology
- II. Record install start date/time
- III. Record Performance Data 7 days
- IV. Validate Performance Data
- V. Record pilot ending date/time
- VI. Analyze results



EnerG² reduces energy consumption and compressor cycles in walk-in coolers and freezers by providing a more accurate means of temperature measurement through a specialized gel compound that simulates the food product temperature instead of the air temperature which fluctuates with more volatility. It retrofits to the existing thermostat air probe and requires no additional maintenance.



Guaranteed to Reduce Energy Costs 15 – 30%
Reduces Compressor Cycles by 40 – 60%
Prevents Wear and Tear
Extends Life of Equipment
12 Month ROI
Green Restaurant Association Endorsed
Reduced CO2 Emissions – Go Green!
Lifetime Warranty



EnerG² is a device that was developed by The Madison Energy Group and contains a non-toxic, food safe gel compound that has similar thermal properties to that of food and beverage. It is therefore, not subject to the same wider and more volatile standard of deviation in temperature that air is. The technology of EnerG² is based on the fact that food and beverage products contain significantly differently thermal properties than air. This means that their temperatures rise and fall at different rates and at different intervals. This causes inefficiency in operation because typical measurement is of the environment (air) and not the actual food and beverage product. Air, having very little density, fluctuates with more volatility thereby causing the coolers to engage in cooling cycles unnecessarily, while EnerG² simulates the stable temperature curve of food product and allows the cooler to operate only when it needs to.

When applied, EnerG² easily retrofits over the external air probe in commercial coolers and freezers and converts the temperature measurement from the ambient air temperature to that of food and beverage temperature. We are now measuring the *intended target of measurement* of food and beverage temperature instead of the immediate environment surrounding the thermostat. This creates an inherently more efficient scenario and results in an average energy reduction of 15-30%. EnerG² is also effective at reducing carbon emissions by several thousand pounds annually. It also increases food safety by maintaining more stable temperature ranges and reduces maintenance costs on equipment by minimizing unnecessary compressor cycles.

HMS Engineering Ltd.

Phillip Stewart

Engineering Consultant

Background and Qualifications for Energy Analysis

Mr. Stewart joined the US Military in 1982 and became a marine engineer involved with mechanical, electrical and structural engineering. After completing his military tour in 1990, he was recruited by Walt Disney World as a Control Specialist and Engineer. During that period Mr. Stewart became extremely interested in energy management systems. After opening Pleasure Island, MGM Studios, Disney Vacation Club, he realized that it was time for new growth in my life and joined Florida's largest Service Company BGSI. Mr. Stewart became certified as a Master Engineer for Refrigeration and Food Equipment.

After years of international endeavours Mr. Stewart entered semi-retirement where he established his consulting company, HMS Engineering Ltd. in 2007.

As a Chief Engineer, Renewable Energy Consultant and Food Equipment expert, he continues to educate and assist many large companies on ways to reduce their energy consumption and increase their bottom line profits. Companies he has supported over the years include Sandals, Couples Resorts, Montego Bay Convention Centre, KFC, Wendy's, Burger King, Moes, Margaritaville, and many others.

The attached Baseline/Performance Test Report was prepared by Mr. Stewart and all findings are based on analysis of the raw data logger information collected onsite and provided to him.

I certify that neither I nor my company (HMS Ltd.) ever receive any compensation which correlates in any manner whatsoever to test report results and that the referenced report findings are accurate and unbiased.

Phillip Stewart

Chief Engineer
HMS Engineering Ltd.
Referenced Report No. DD83018

Dated 8/30/2018

HMS Engineering

Client: The Madison Ener 5 Hargett St., 4 Raleigh, North C	th Floor	Report Print Date: Report No.: DD830	30-Aug-18	
Facility / Location: Dunkin	n Donuts			
Room/Equip. Tested: Walk-	in Cooler			
	Calculation	on Basis		
	0.0	DT3 0.0		
Compressor Motor: HP:	0.3 Volts: 230	RLA: 8.0	Phase: 3	3
Power Consumption:	2.84 kW Electri	icity Rate: \$0.17	per kWh	
	Operating	g Basis		
	(Without EnerG ²)	With EnerG ²	Change	% Change
Projected Run Hours / Yr: Projected Cycles / Yr:	7,388 3,261	6,032 2,114	-1,356 -1,147	-18.4% -35.2%
Trojected Cycles / II.	3,201	2,117	1,117	33.20
Ene	ergy Use & Cost :	Savings per Month		
	(Without EnerG ²)	With EnerG ²	Change	% Change
Operating Hours / Month:	616	503	-113	-18.4%
KWh / Month: Energy Cost / Month	1,748 \$297	1,428 \$243	-321 -\$55	-18.4% -18.4%
Energy code / Honen	4231	¥2.13	700	10.10
Me	chanical Cost Sa	avings per Month		
		_		
	(Without EnerG ²)	With EnerG ²	Change	% Change
Cycles / Month: Compressor Maintenance Cost/	272	176	<u>–96</u>	-35.2%
Month:	\$42	\$27	-\$15	-35.2%
Combine	ed Energy and Med	chanical Cost Sav	ings	
Energy & Mechanical Cost /	(Without EnerG ²)	With EnerG ²	Change	% Change
Month:	\$339	\$270	-\$69	-20.4%
<pre>Energy & Mechanical Cost / Year:</pre>	\$4,067	\$3,236	-\$830.54	-20.4%
Energ ² Return on Investment Months		8.65		

Longest Off-Time:

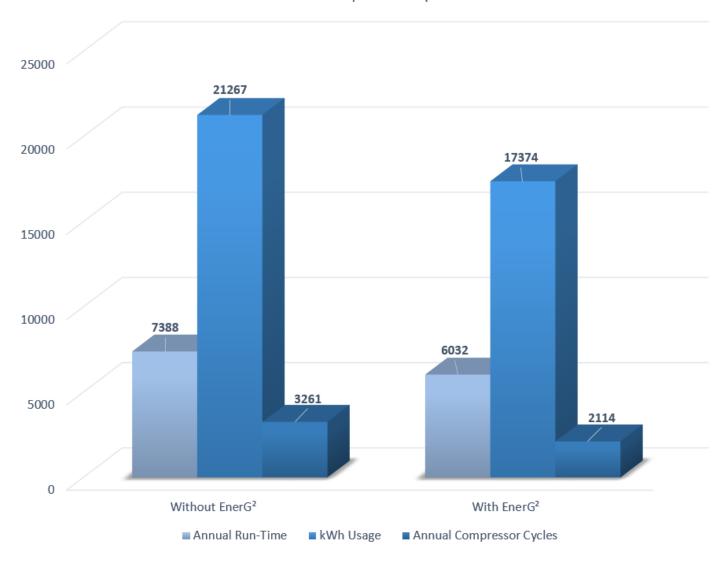
Shortest Off-Time:

1.87 hrs

<0.01 hrs



CT15080034 Data Graph Series | Dunkin Donuts





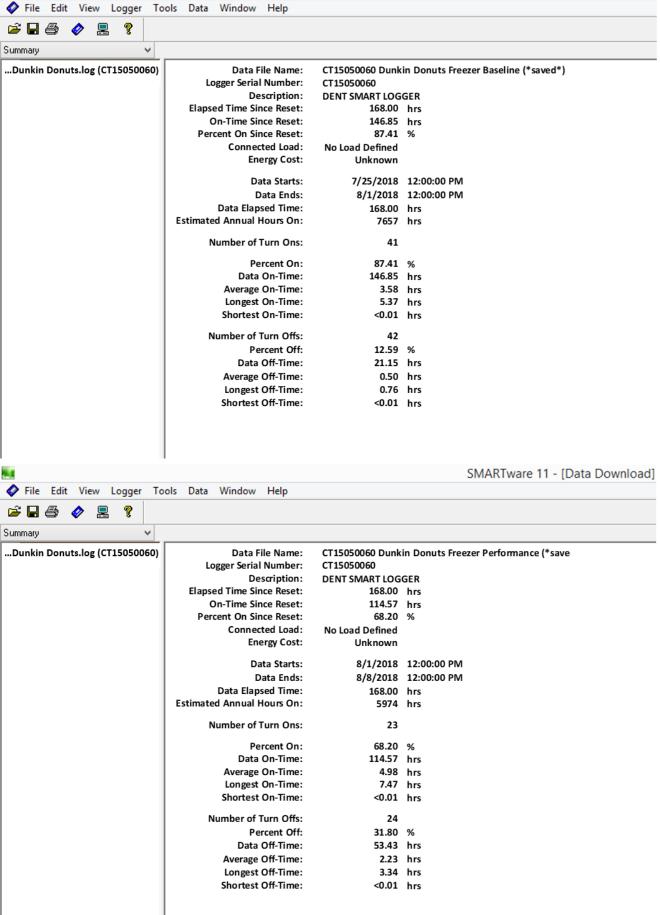
Serial Number: CT15080034

Description: DENT SMART LOGGER On-Time Since Reset: 257.37 hrs Off-Time Since Reset: 78.63 hrs

Date	TOU/Day (hrs)
Wednesday, July 25, 2018	11.33
Thursday, July 26, 2018	19.89
Friday, July 27, 2018	20.97
Saturday, July 28, 2018	18.82
Sunday, July 29, 2018	19.56
Monday, July 30, 2018	21.49
Tuesday, July 31, 2018	19.86
Wednesday, August 1, 2018	19.54
Thursday, August 2, 2018	16.80
Friday, August 3, 2018	16.51
Saturday, August 4, 2018	15.39
Sunday, August 5, 2018	14.99
Monday, August 6, 2018	16.81
Tuesday, August 7, 2018	16.90
Wednesday, August 8, 2018	8.51

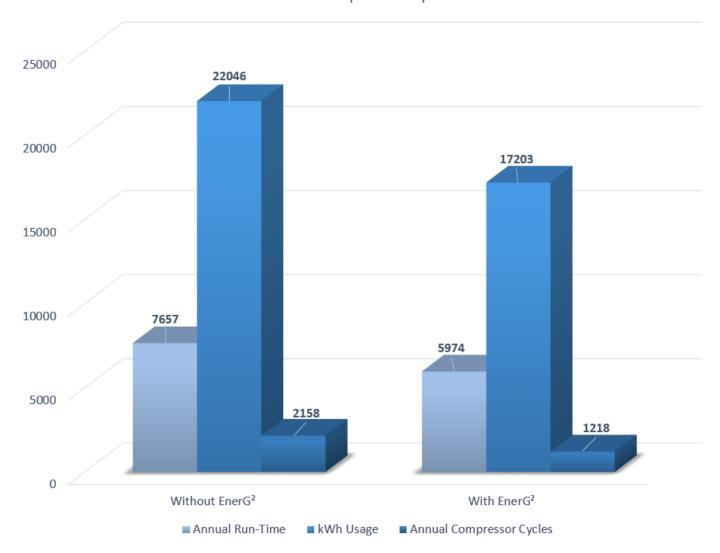
HMS Engineering

Client: The Madison Energy Group 5 Hargett St., 4th Floor Raleigh, North Carolina 27601	Report Print Date: 30-Aug-18 Report No.: DD83018
Facility / Location: Dunkin Donuts	
Room/Equip. Tested: Walk-in Freezer	
Calcul	ation Basis
Compressor Motor: HP: 0.3 Volts:	230 RLA: 12.0 Phase: 3
Power Consumption: 2.84 kW Eld	ectricity Rate: \$0.17 per kWh
Opera	ting Basis
Projected Run Hours / Yr: 7,657 Projected Cycles / Yr: 2,158	* Change
Energy Use & Co	st Savings per Month
Operating Hours / Month: KWh / Month: Energy Cost / Month (Without Energy 638 1,812 \$308	With Energ ² Change % Change 498 1,414 -398 -22.0% \$240 -\$68
Mechanical Cos	t Savings per Month
Cycles / Month: Compressor Maintenance Cost/ Month: (Without Energ? 180 \$42	** Change
Combined Energy and	Mechanical Cost Savings
Energy & Mechanical Cost / Month: (Without Energy \$ 350	2) With EnerG ² Change % Change \$ 264 -\$86 -24.6%
Energy & Mechanical Cost / Year: \$4,197	\$3,166 -\$1,030.35 -24.6%
${\sf Ener}{\sf G}^{\sf Z}$ Return on Investment Months	6.98





CT15050060 Data Graph Series | Dunkin Donuts





Serial Number: CT15050060

Description: DENT SMART LOGGER On-Time Since Reset: 261.42 hrs Off-Time Since Reset: 74.58 hrs

Date	TOU/Day (hrs)
Wednesday, July 25, 2018	11.48
Thursday, July 26, 2018	21.20
Friday, July 27, 2018	22.11
Saturday, July 28, 2018	19.91
Sunday, July 29, 2018	19.87
Monday, July 30, 2018	21.63
Tuesday, July 31, 2018	20.85
Wednesday, August 1, 2018	19.60
Thursday, August 2, 2018	15.42
Friday, August 3, 2018	16.23
Saturday, August 4, 2018	15.17
Sunday, August 5, 2018	14.69
Monday, August 6, 2018	16.69
Tuesday, August 7, 2018	17.45
Wednesday, August 8, 2018	9.12



IntelliHVAC reduces energy consumption in HVAC units through efficient fan control and compressor cycling. The combination of these two technologies optimizes performance by allowing the fans, which use 8 to 15 times less energy than the compressors to capture latent energy that would otherwise be lost. It is retrofitted at the 24 volt terminal and requires no additional maintenance.



Guaranteed to Reduce Energy Costs 10 – 30%
Reduces Compressor Cycles by 20%
Prevents Wear and Tear
Extends Life of Equipment
12 - 18 Month ROI
Reduced CO2 Emissions – Go Green!
Lifetime Warranty



IntelliHVAC is a dual microprocessor technology that easily retrofits to any existing central air HVAC system. It contains both a *post-purge* and *compressor cycle functions* that work together to create a significantly more efficient environment within the system. The inefficiency and therefore *opportunity* is that there is still latent cold energy on the coil or heat energy in the exchanger and this energy is wasted as it dissipates within the system. IntelliHVAC captures this excess energy through its *post-purge function*. This process is known as latent recovery and has been verified by numerous utility companies.

When the HVAC system reaches set point, IntelliHVAC will extend and optimize the fan run-time based on the previous compressor cycle to ensure that the latent hot or cold energy has been captured and that all of that air is circulated all the way through the duct system so that it is not wasted. IntelliHVAC continues to monitor the system and adjust the post purge cycle based on its proven algorithm.

IntelliHVAC also has a *compressor cycle function* that increases the overall energy savings cycling the compressor off for 5 minutes for every 25 minutes of continuous run-time. This allows the fan, which uses 8 to 15 less energy than the compressor to capture the latent energy from the coil or heat exchanger. IntelliHVAC will run the fan for the equivalent amount of time that the compressor is off to ensure that air continues to circulate and there are no negative effects to the indoor air temperature quality.

Tower Engineering Craig Andes Owner / HVAC Engineer

J. Craig Andes, MBA

With close to 40 years of experience, Mr. Andes has been an industry veteran since 1977 and has a keen eye toward efficiency for his customers. Mr. Andes has owned and operated numerous businesses including several mechanical companies, an insulating company, has built numerous structures, and has directed large service-oriented companies. Mr. Andes has also been hired as a consultant by several companies to assist them in their growth and process management.

Currently Mr. Andes owns and operates Tower Engineering in the Raleigh, NC metro market.

After earning his MBA at Union University in Jackson, TN, Mr. Andes is able to merge the real-world practical side of HVAC with financial feasibility and ROI making for good commonsense guidance.

With regard to Madison Energy Group, Mr. Andes serves as an independent, 3rd party consultant and assists the company specifically with the IntelliHVAC technology. Mr. Andes has help Madison Energy consult with companies such as McDonalds, Dominos, Darden Restaurants, CBL Properties, and others in helping them to understand the mechanics of their systems as well as the benefits of the IntelliHVAC technology. Mr. Andes also manages the analysis of data from pilot programs and reporting on behalf of Madison.

The attached reporting is hereby approved and certified by Mr. Andes as accurate in its entirety. Mr. Andes is not compensated in any manner that is based on test results.

J. Craig Andes

Tower Engineering

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Owner / HVAC Engineer

Date: 8/31/2018



Craig Andes HVAC Engineering Contractor

On Behalf of: The Madison Energy Group
For Client: Dunkin Donuts

Location: Dunkin Donuts

Report Date: 8/31/2018

Kwh Rate: 0.17

					Baseline			Performance
		Start Date	Install Date	Time	kWh Consumed	End Date	Time	kWh Consumed
Area:	RTU 1	7/25/2018	8/1/2018	12:00PM	1,088.2	8/8/2018	12:00 PM	837.4
Meter #	15561							
				kWh/Month	4,663.71		kWh/Month	3,588.86
				kWh/Yr	56,741.86		kWh/Yr	43,664.43

 RTU 1 Summary

 kWh Diff./Period
 250.8

 kWh Diff./Yr
 13,077.43

 % Change
 23%

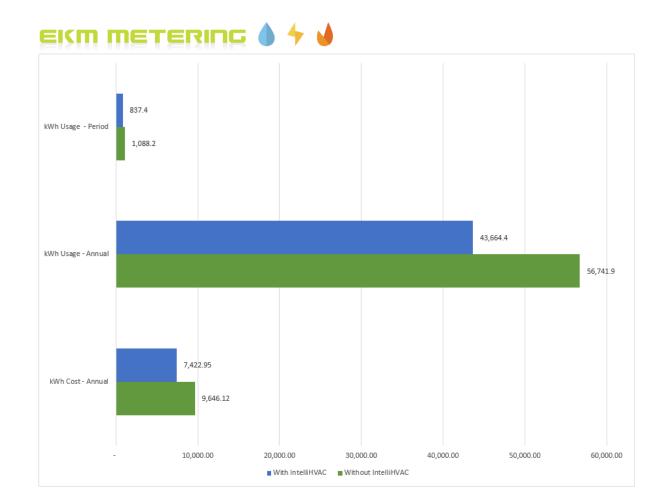
 Savings/Yr
 \$ 2,223.16

Location: Dunkin Donuts

				Baseline			Performance
	Start Date	Install Date	Time	kWh Consumed	End Date	Time	kWh Consumed
RTU 2	7/25/2018	8/1/2018	12:00PM	1,214.9	8/8/2018	12:00PM	908.6
15576							
			kWh/Month	5,206.71		kWh/Month	3,894.00
			kWh/Year	63,348.36		kWh/Year	47,377.00
	_	RTU 2 7/25/2018	RTU 2 7/25/2018 8/1/2018 15576	RTU 2 7/25/2018 8/1/2018 12:00PM	Start Date Install Date Time kWh Consumed RTU 2 7/25/2018 8/1/2018 12:00PM 1,214.9 15576 kWh/Month 5,206.71	Start Date Install Date Time kWh Consumed End Date RTU 2 7/25/2018 8/1/2018 12:00PM 1,214.9 8/8/2018 15576 kWh/Month 5,206.71	Start Date Install Date Time kWh Consumed End Date Time RTU 2 7/25/2018 8/1/2018 12:00PM 1,214.9 8/8/2018 12:00PM 15576 kWh/Month 5,206.71 kWh/Month

RTU 2	Summa	ry
kWh Diff./Period		306.30
kWh Diff./Yr		15,971.36
% Change		25%
Savings/Yr	\$	2,715.13

P	roject Sun	nmary	
Total kWh/Yr Reduced		29,048.79	
Average Annual Savings	\$	2,469.15	
Normalized for Season	\$	1,514.41	
Projected ROI		7.92	Months

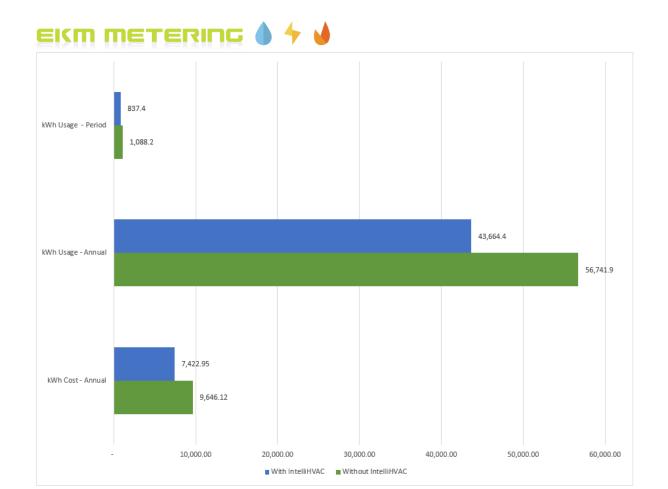




EKM-OmniMeter v.3
Dunkin Donuts RTU 1 LogFile

Total kWh Usage for Period: 1925.6

Date	Kilowatt Hour	Avg. Voltage	Avg. Amps	Avg. Watts	Avg. Cosî, (Power Factor)
7/25/2018	71.5	121.9	25.2	1898	LO.85
7/26/2018	148.8	121.7	25.4	2540	LO.86
7/27/2018	169.2	123.2	26.2	2524	LO.86
7/28/2018	143.7	123.2	24.8	2542	LO.86
7/29/2018	170	123.0	24.6	2574	LO.87
7/30/2018	150.5	122.3	24.6	2576	LO.88
7/31/2018	156.6	122.3	26.0	2524	LO.89
8/1/2018	155.7	123.4	25.2	2498	LO.86
8/2/2018	117.3	123.7	25.6	2464	LO.86
8/3/2018	122.6	121.9	24.0	2448	LO.85
8/4/2018	135.1	120.1	25.4	2456	LO.87
8/5/2018	109	121.0	25.6	2486	LO.87
8/6/2018	116	121.2	24.4	2494	LO.86
8/7/2018	107.8	121.9	24.4	2486	LO.87
8/8/2018	51.7	122.9	24.4	2488	LO.86





EKM-OmniMeter v.3

Dunkin Donuts RTU 2 LogFile

Total kWh Usage for Period: 2123.4

Date	Kilowatt Hour	Avg. Voltage	Avg. Amps	Avg. Watts	Avg. Cosî,	(Power Factor)
7/25/2018	73.4	120.4	25.2	2674	LO.87	
7/26/2018	170.5	120.4	25.4	2674	LO.87	
7/27/2018	187.9	121.6	25.2	2682	LO.87	
7/28/2018	158.6	120.4	25.2	2686	LO.87	
7/29/2018	182.9	120.6	25.2	2688	LO.87	
7/30/2018	177.7	120.2	25.2	2692	LO.86	
7/31/2018	182	121.4	25.2	2702	LO.86	
8/1/2018	163.7	121.4	24.6	2698	LO.86	
8/2/2018	139.4	121.8	24.6	2718	LO.86	
8/3/2018	121.9	122.2	24.8	2718	LO.86	
8/4/2018	142.7	122.2	24.2	2714	LO.86	
8/5/2018	130.3	122.7	25.6	2732	LO.86	
8/6/2018	120.2	122.2	25.8	2734	LO.86	
8/7/2018	114.4	122.2	26.4	2730	LO.87	
8/8/2018	57.8	122.2	26.4	2732	LO.86	

Proof of Concept Performance Summary

Program Duration - 7/25/2018 - 8/8/2018

Cumulative Return on Investment/Months

EnerG ² Summary				
Annual Savings - Cooler	\$	830.54		
Annual Savings - Freezer	\$	1,030.35		
Average Annual Savings per Unit	\$	930.45		
Projected Annual Savings for		120	units	\$ 111,653.40
Projected Savings Over 10 Years				\$ 1,116,534.00
Return on Investment			7.73	Months
IntelliHVAC Summary				
Annual Savings - RTU 1	\$	2,223.16		
Annual Savings - RTU 2		2,715.13		
Average Annual Savings per Unit	\$	2,469.15		
Annual Savings Normalized for Season	\$	1,514.41		
Projected Annual Savings for		90	units	\$ 136,296.90
Projected Savings Over 10 Years				\$ 1,362,969.00
Return on Investment			7.92	Months
Overall Summary of Perform	anc	e		
Annual Per Store Energy Savings	\$	4,132.51		
Combined Monthly Energy Savings	\$	20,662.53		
Combined Annual Energy Savings	\$	247,950.30		
Combined Energy Savings Over 10 Years -	\$ 2	2,479,503.00		

8.37







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