ECM Motors Manufactured By Regal Beloit

Products and Applications- What's an ECM?

- ECM 2.3 series
- ECM 142 Arktic
- ECM 58mm Arktic
- ECM 59 Arktic
- SSC2 Arktic 51

GEXPRO – Regal Beloit's distribution arm for all ECM motor products

GEXPRO-solutions for our customers

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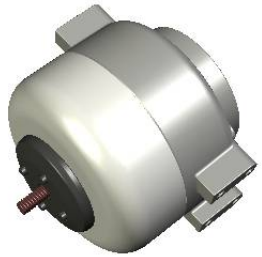
ECM Commercial Refrigeration

ARKTIC™ 142

ARKTIC™ 58

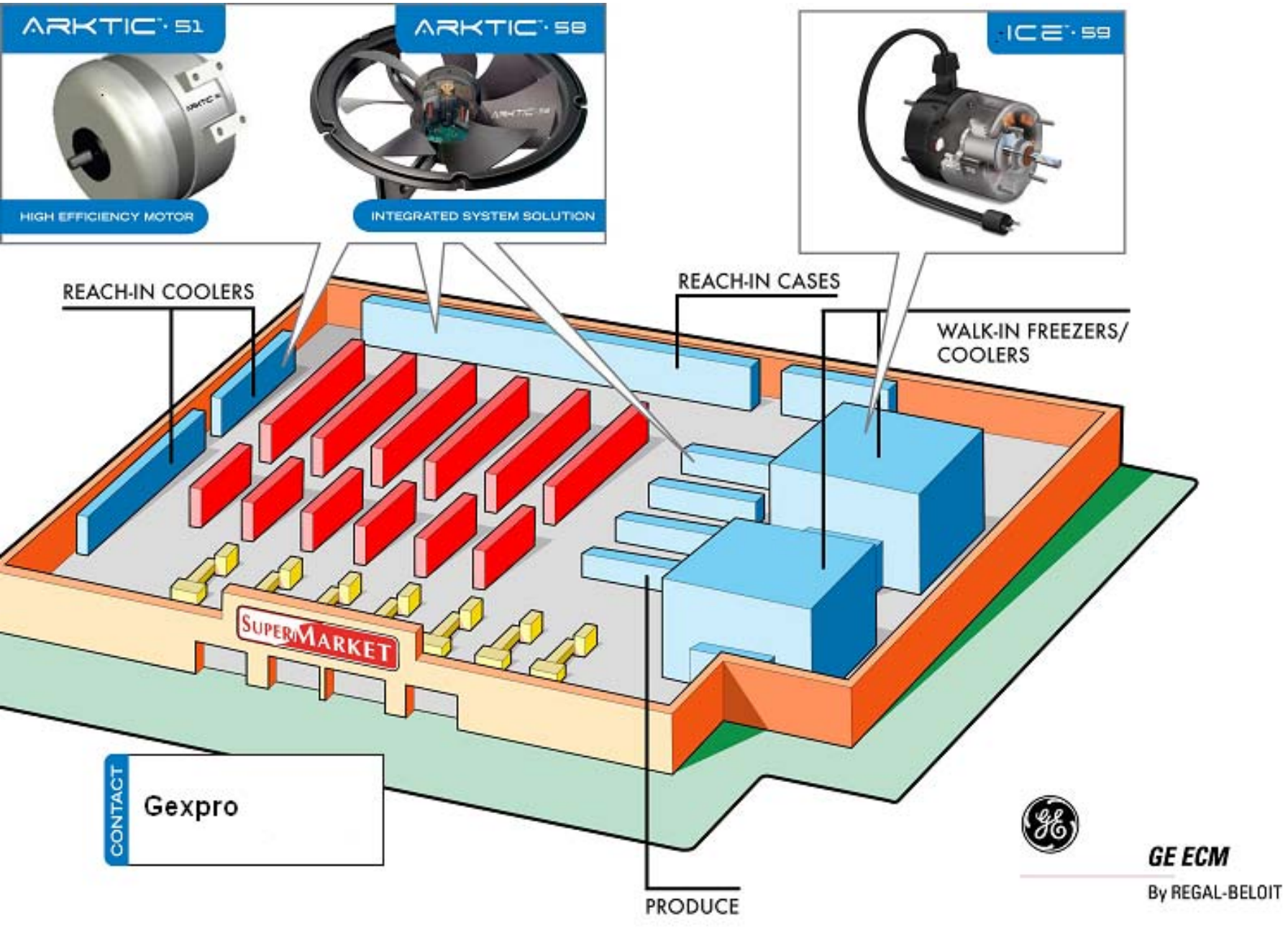
ARKTIC™ 59

ICE™ 59



ARKTIC™ 51

Commercial Refrigeration Market



What's an ECM?

The highest efficiency motor there is! … essentially a DC Motor

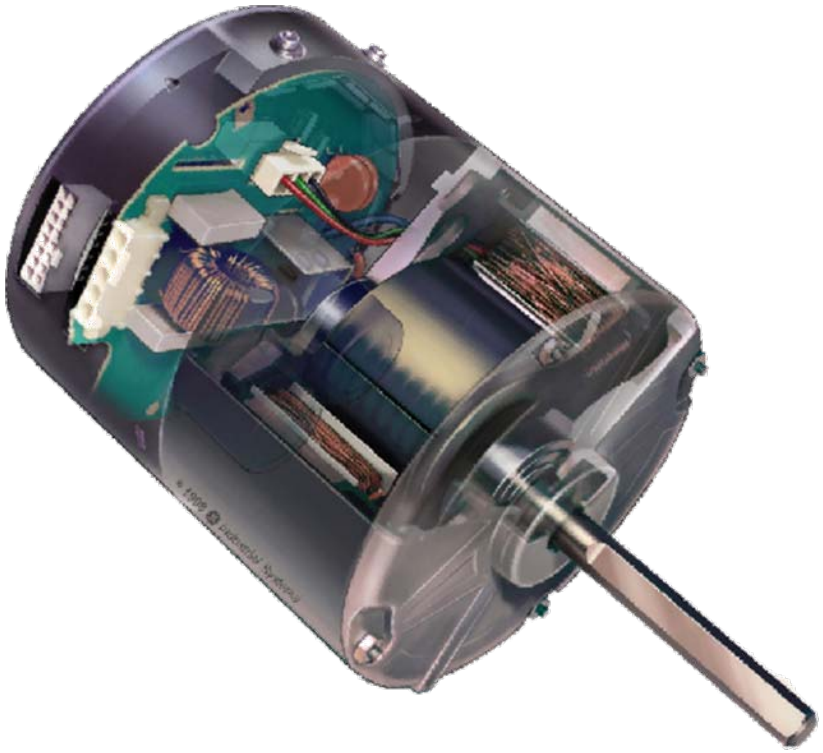
- Without mechanical Brushes and Commutator—motor is electronically commutated

- Permanent Magnet Rotor

- Rotor losses are nearly zero

- Motor has 3 windings and is powered from a single AC source

- The "Electronic Inverter"
  - Speed and torque controlled



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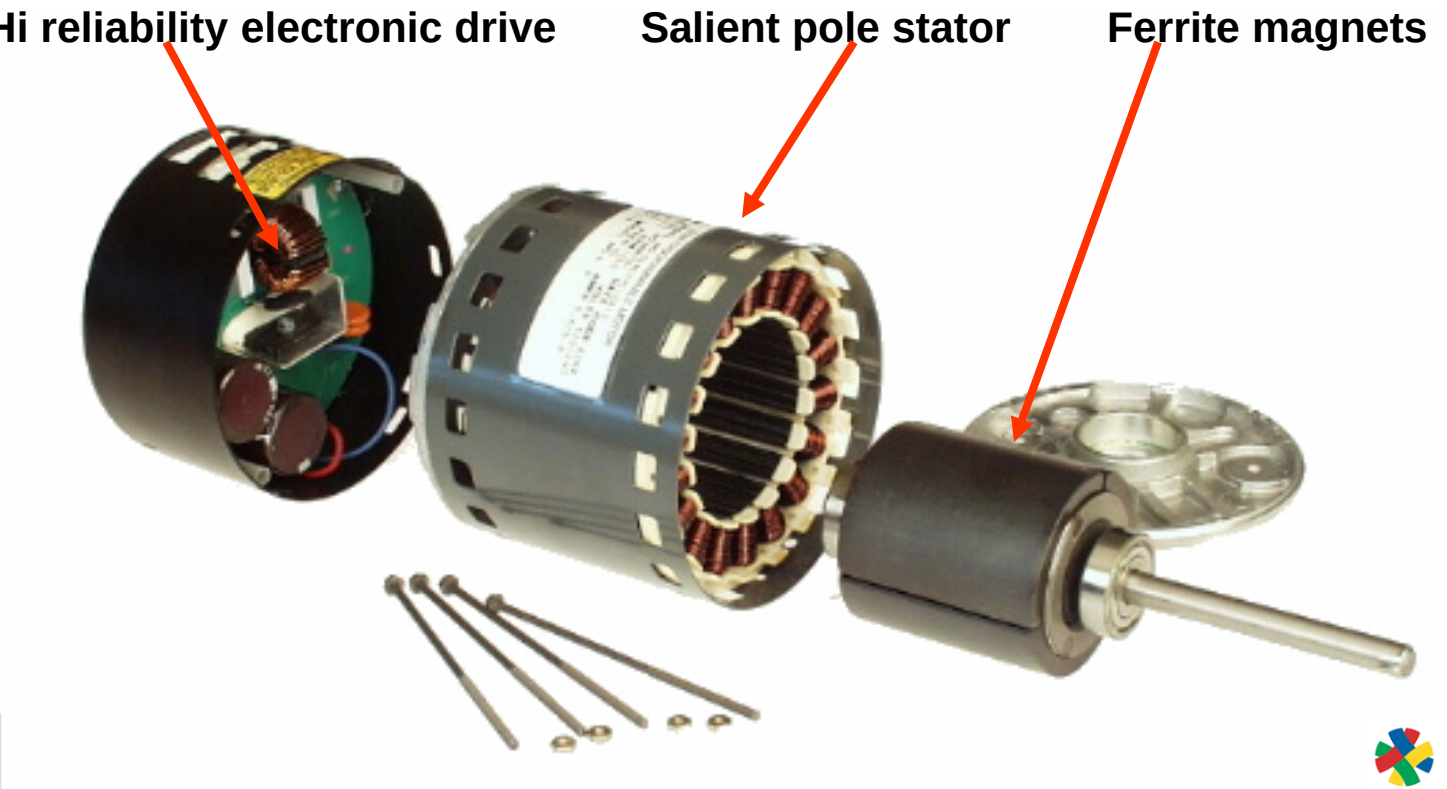
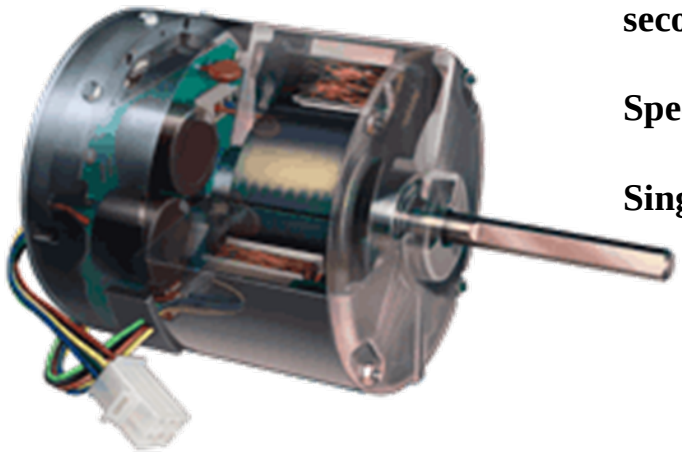
The ECM Motor

- Simple construction minimizes the cost of the technology and takes advantage of the efficiency of DC motors



ECM Product family

ARKTIC 142



1/5hp, 1/3 hp, 1/2hp & 3/4hp

120 & 240 VAC

200 RPM-1200 RPM
second winding option to 1750 RPM

Speed or Torque controlled

Single or multiple pre-set speed outputs

walk-in freezer/cooler evaporator fans, condenser fans, blowers

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ECM Product family

ARKTIC™ 58

Product	Specs	Applications
	Integrated fan and motor assembly **115V/230V** **900 to 1900 RPM** **5-32 Watt Motor output** **50 - 350 CFM (.1”sp)** **IP44 construction**	**Vending equipment** **walk in coolers** **refrigeration display cases** **medical equipment** **ice machines** **small ventilators**

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58 mm ECM Fan Motor

The Most Efficient & Versatile Fan /Motor System
5-38 Watt Air Moving Applications (Evaporator Motors)

Ultra High Efficiency- Up to 300% Greater Efficiency Versus Shaded Pole Systems

Programmable Constant Speed

Moisture Resistant

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ECM Product family

ARKTIC 59 ICE 59

ARKTIC 59 EVAPORATOR MOTOR

Designed for Walk-In Cooler/Freezer App

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ARKTIC 59 EVAPORATOR MOTOR

Form/fit – direct replacement for all 3.3” motors in CR evaporators
- Front Mount / Back Mount / Belly Band Mount

High Efficiency
- ECM Technology
- 70% at 1550 RPM

Increased reliability
- Fully Encapsulated Electronics

Enhanced programming module
- Two Speed Program Available
- Factory /Field Speed Programming to meet coil requirements

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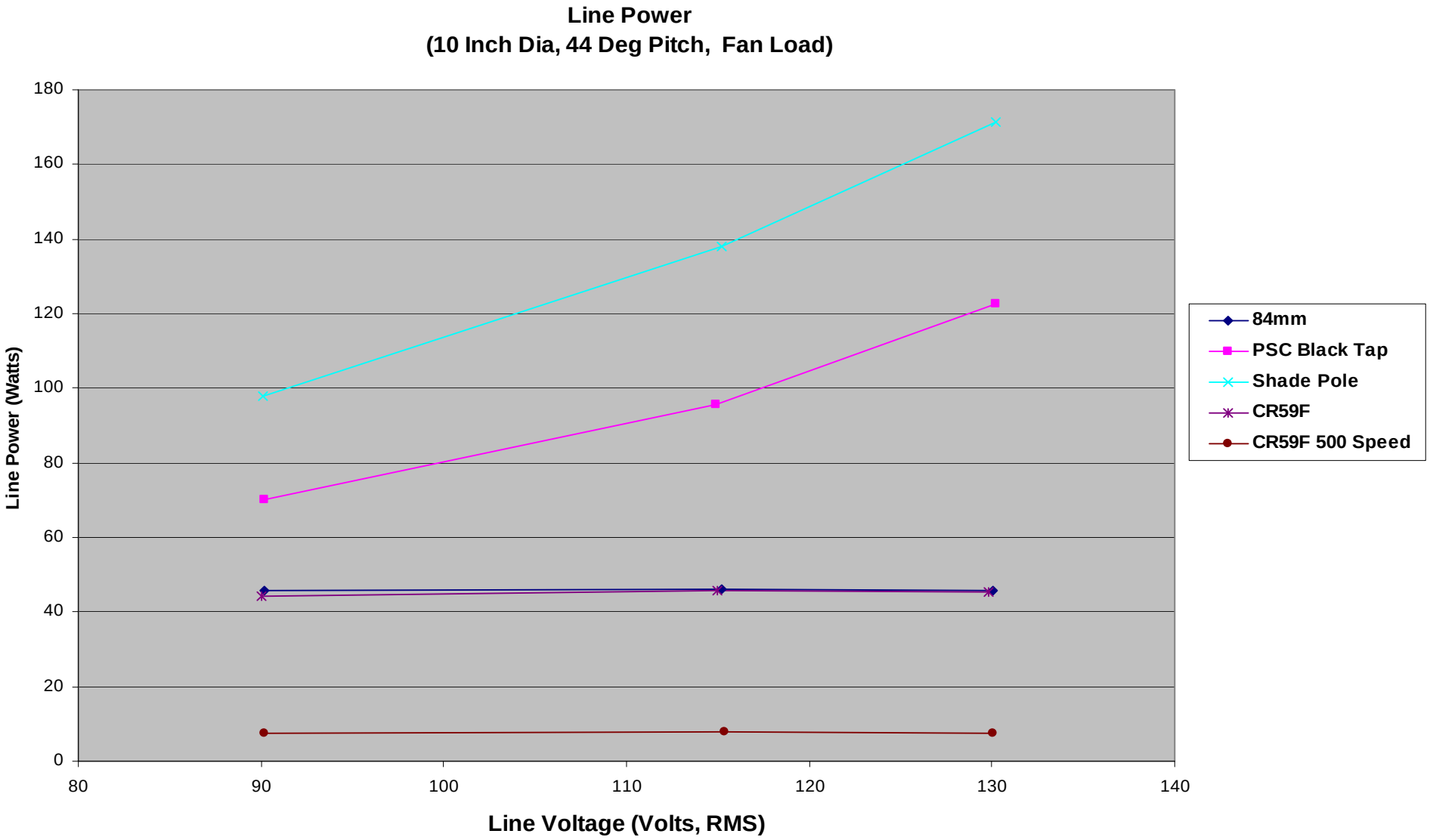

Motor to Motor Watt Comparison Ice/Arktic ECM Versus Shaped Pole & PSC

Motor Size	Motor Description	Input Watts	Annual Motor Watt Usage Continuous Operation	Annual Motor Energy Usage at $0.12 Energy Rate
1/20 HP	Shaded Pole 115V 1550 RPM	137.95	1,208,442	$ 145.01
1/15HP	Permanent Split Capacitor 115V 1575 RPM	95.55	837,018	$ 100.44
1/20HP	Permanent Split Capacitor 115V 1575 RPM	78.25	685,470	$ 82.26
ICE/ARTIC 1/5 HP	Ice/Arktic ECM Motor 115V Operating at 1550 RI	45.81	401,296	$ 48.16
ICE/ARTIC 1/5 HP	Ice/Arktic ECM Motor 115V Operating 50% at 1550RPM and 50% at 500RPM Reduced Speed	26.81	234,856	$ 28.18

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Total System Savings Generated by Reducing Motor Input Watts

The reduction of heat generated by the motors will provide a significant refrigeration system savings. Based on our past metered results the (contribution savings) will average:

Medium Temperature Walk-In Coolers = Motor Watts Saved X 1.5 = Total System Savings

Low Temperature Walk-In Freezers = Motor Watts Saved X 1.8 = Total System Savings

Annual Total System Savings

Retrofit 1/20HP SP with Ice/Arktic 59- Medium Temp Applications =	**$96.85 X 1.5 =**	**$145.28 Savings**
Retrofit 1/20HP SP with Ice 59/Arktic- Low Temp Applications =	**$96.85 X 1.8 =**	**$174.33 Savings**
Retrofit 1/15 PSC with ICE/Arktic 59- Medium Temp Applications =	**$52.28 X 1.5 =**	**$78.42 Savings**
Retrofit 1/15 PSC with Ice 59/Arktic- Low Temp Applications =	**$52.28 x 1.8 =**	**$94.10 Savings**

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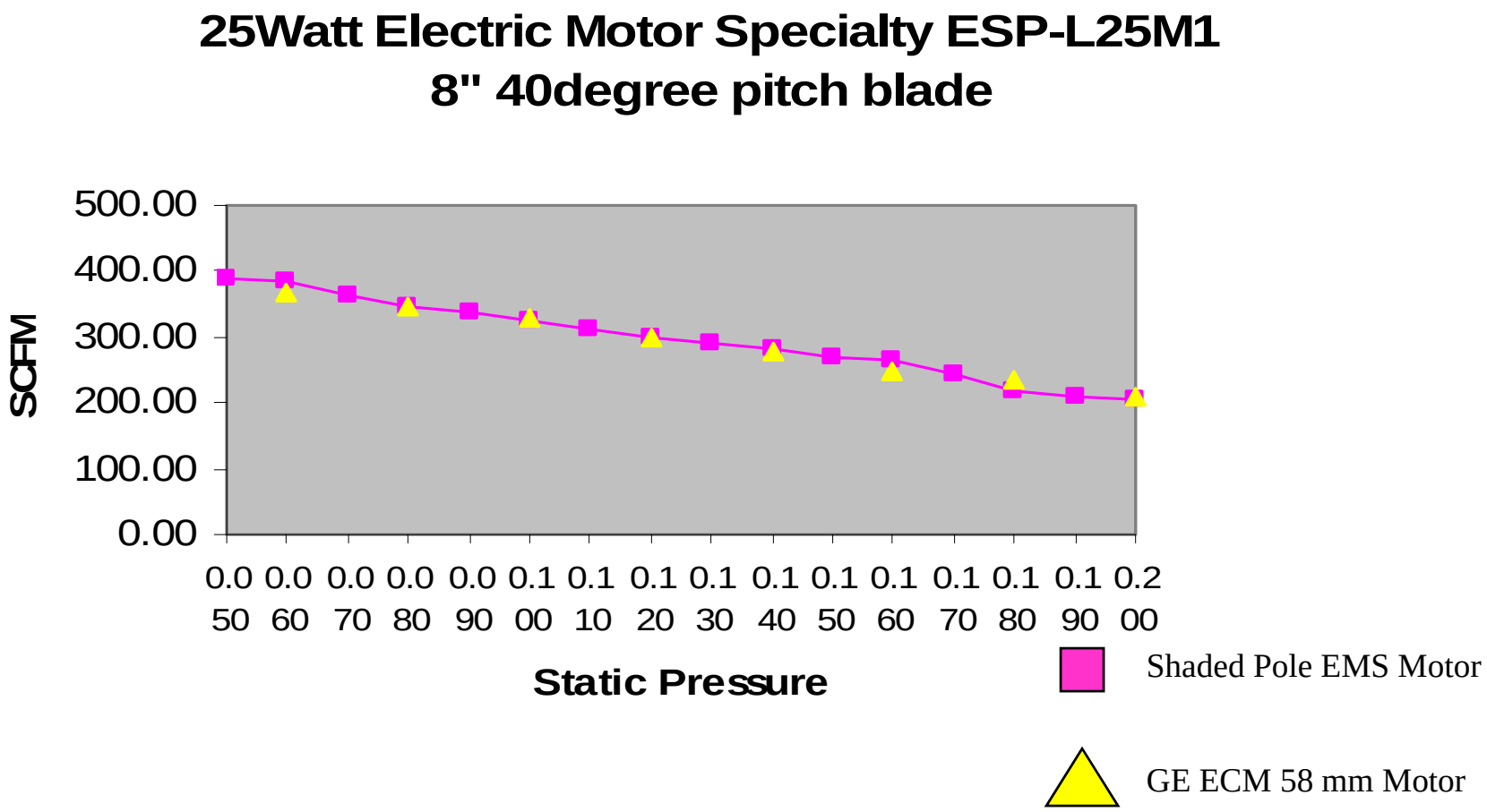
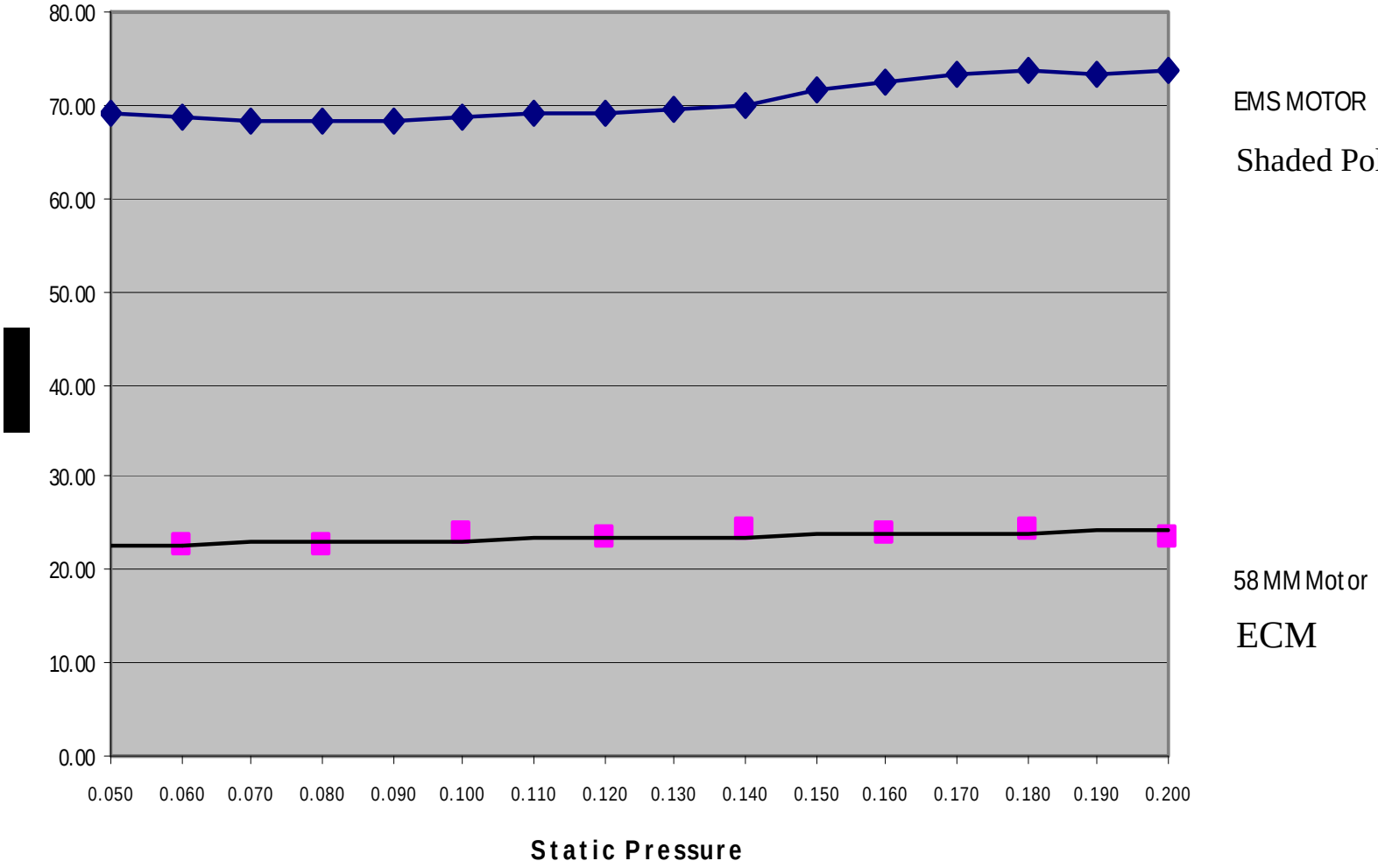
UNIT 2,3,&4 Door Freezer Case Application
Airflow Measurement Shaded Pole Versus 58MM ECM Motor
MATCH PERFORMANCE



UNIT 2,3,&4 Door Freezer Case Application
Input Watt Comparison Shaded Pole Versus 58MM ECM Motor



Store #1293 ECM Retrofit Test Program

Store #1293- We metered 3 fan circuit panels providing power to the majority of the stores evaporator motors. We metered 2 out of 3 compressor racks in the store. The meters used were the AMP PRO DM11 Data Logger/Recorder. We also recorded the average daily temperature. Readings were taken every 60 seconds.

We metered existing watt consumption from 5/16 to 6/16 2006. After the retrofit we metered the same circuits from 7/5 to 8/4 2006.

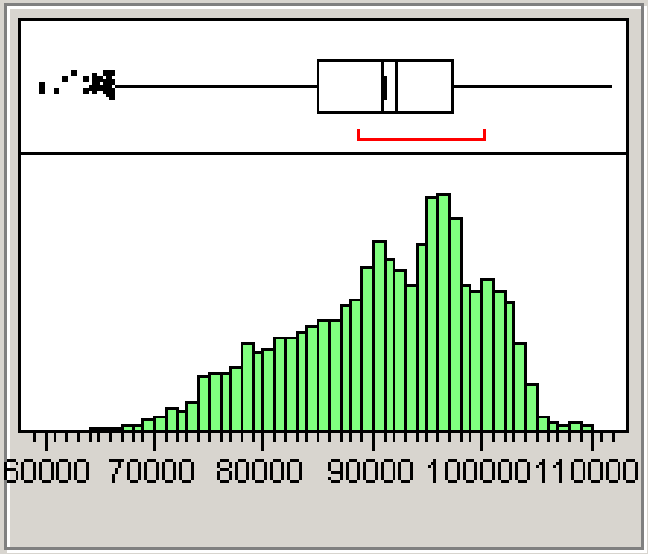
We installed the following motors:
205- 58MM Motors in Reach-In Food Cases
29- Artic Walk-In Cooler Motors

Based on the pre store audit we performed we estimated the savings as follows:
Motor to motor watt savings would = 9,200 Watts
Total savings with contribution factor would = 15,000 Watts

Actual metered savings not adjusted for temperature (Mean):= 15,691 Watts

The out door temperature increased significantly after the retrofit. When we viewed the data comparing like temperature days our savings increased to over 20,000 watts.

Total Pre watts — STORE 1293 DATA RECORDING FROM 5/16 to 6/16 2006



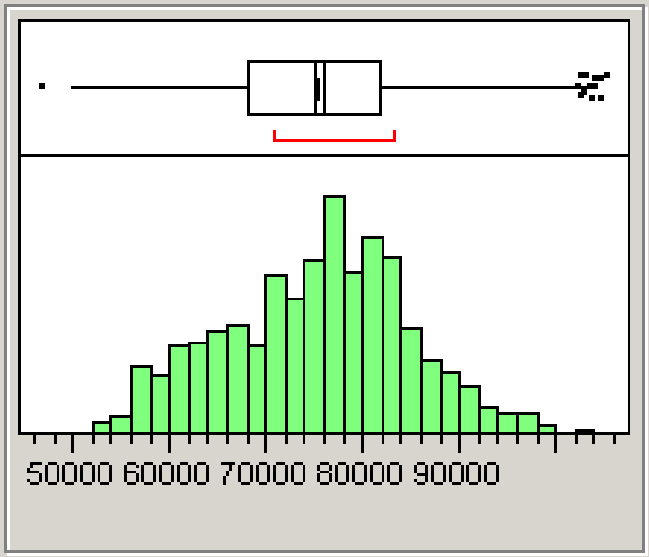
Quantiles

100.0%	maximum	111835
99.5%		108173
97.5%		103999
90.0%		101313
75.0%	quartile	97362
50.0%	median	92108
25.0%	quartile	84969
10.0%		78329
2.5%		72798
0.5%		67608
0.0%	minimum	59739

Moments

Mean	90918.721
Std Dev	8649.4111
Std Err Mean	91.926623
upper 95% Mean	91098.918
lower 95% Mean	90738.523
N	8853

Total Post watts — STORE 1293 DATA RECORDING FROM 7/5 to 8/4 2006



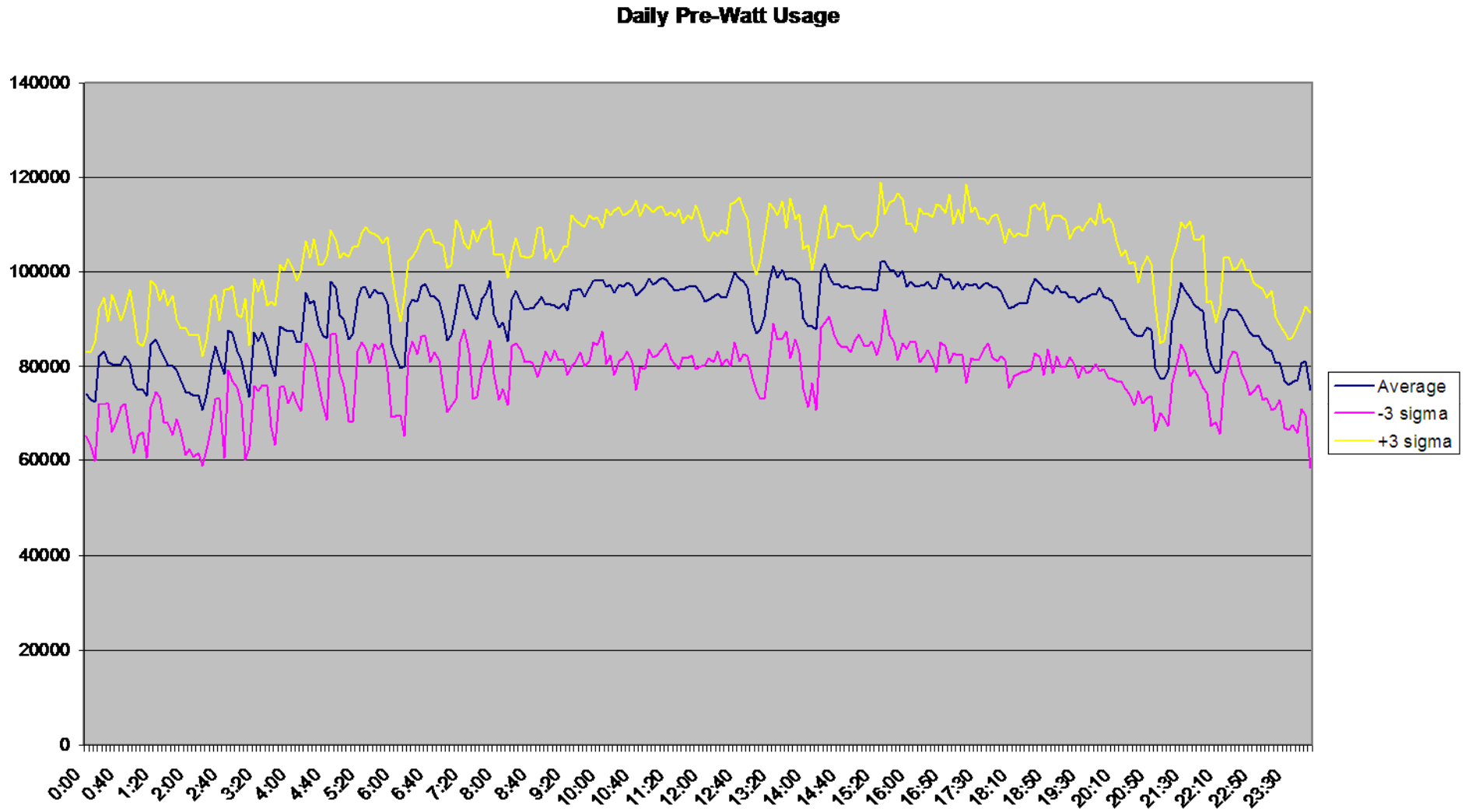
Quantiles

100.0%	maximum	105430
99.5%		98690
97.5%		94440
90.0%		87268
75.0%	quartile	81880
50.0%	median	76127
25.0%	quartile	68191
10.0%		61242
2.5%		56655
0.5%		53462
0.0%	minimum	46962

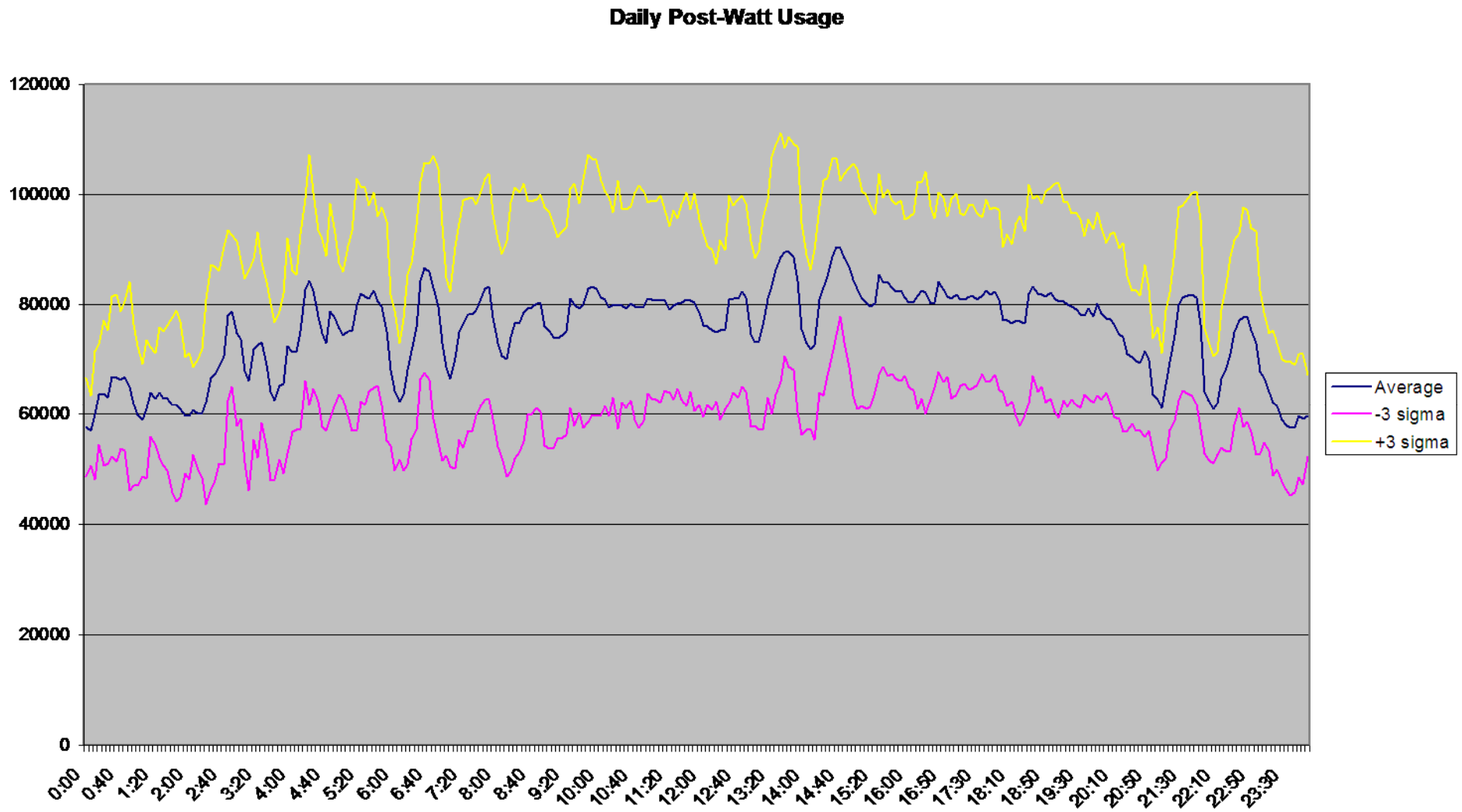
Moments

Mean	75227.983
Std Dev	9710.5616
Std Err Mean	98.748637
upper 95% Mean	75421.551
lower 95% Mean	75034.415
N	9670

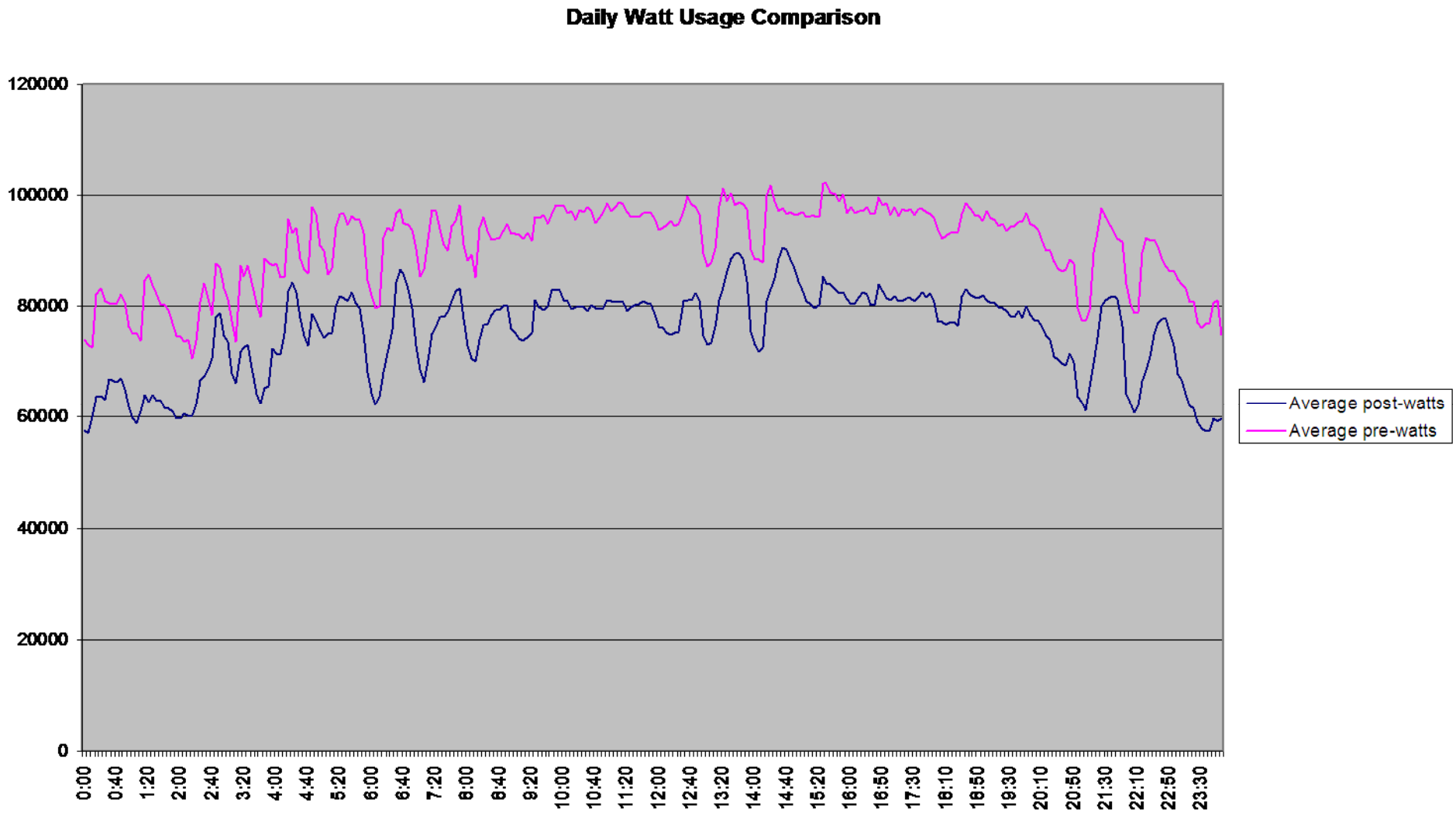
STORE 1293


Daily Pre-Watt Usage
140000
120000
100000
80000
60000
40000
20000
0
0:00
0:40
1:20
2:00
2:40
3:20
4:00
4:40
5:20
6:00
6:40
7:20
8:00
8:40
9:20
10:00
10:40
11:20
12:00
12:40
13:20
14:00
14:40
15:20
16:00
16:50
17:30
18:10
18:50
19:30
20:10
20:50
21:30
22:10
22:50
23:30
Average
-3 sigma
+3 sigma

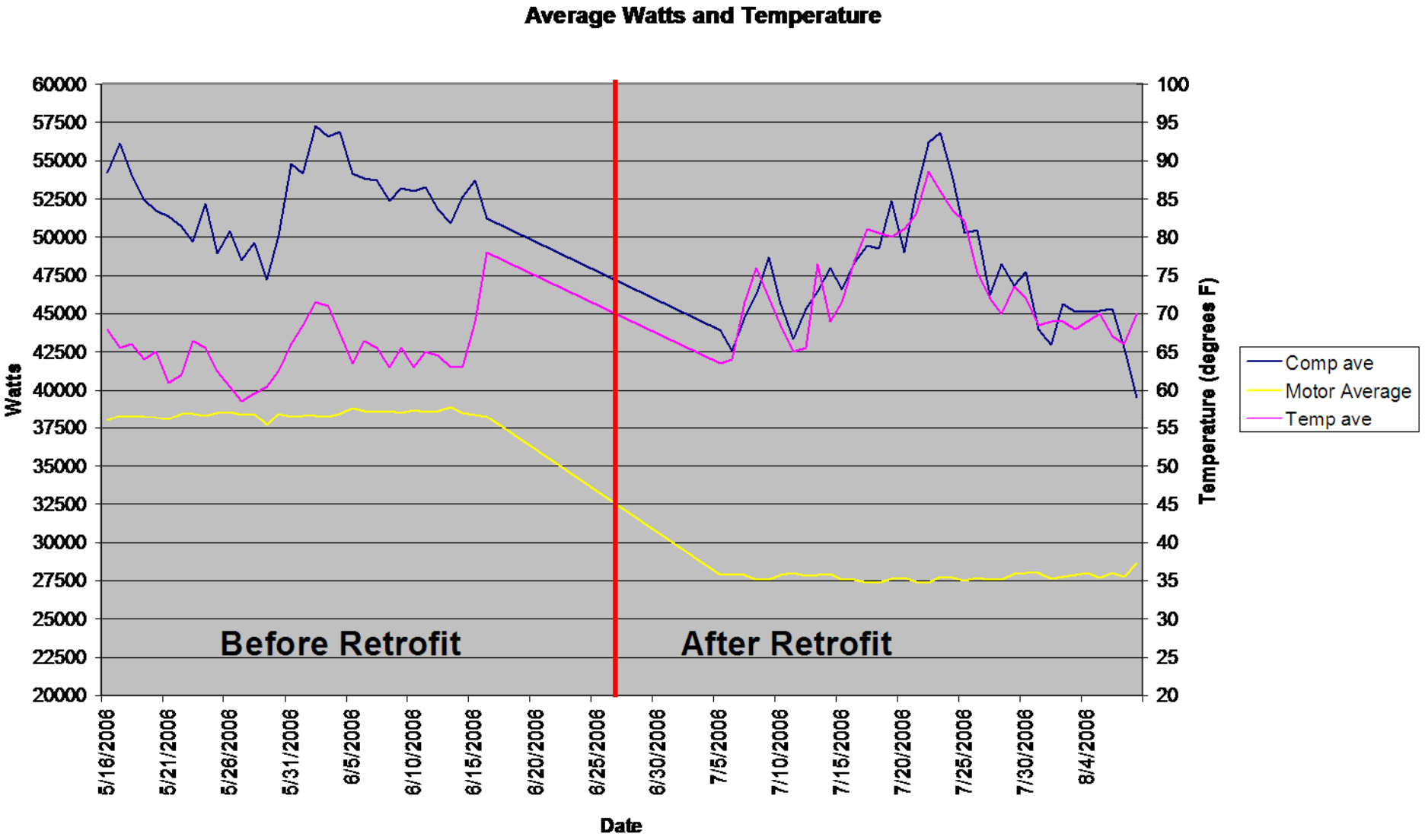
STORE 1293


Daily Post-Watt Usage
120000
100000
80000
60000
40000
20000
0
0:00
0:40
1:20
2:00
2:40
3:20
4:00
4:40
5:20
6:00
6:40
7:20
8:00
8:40
9:20
10:00
10:40
11:20
12:00
12:40
13:20
14:00
14:40
15:20
16:00
16:50
17:30
18:10
18:50
19:30
20:10
20:50
21:30
22:10
22:50
23:30
Average
-3 sigma
+3 sigma

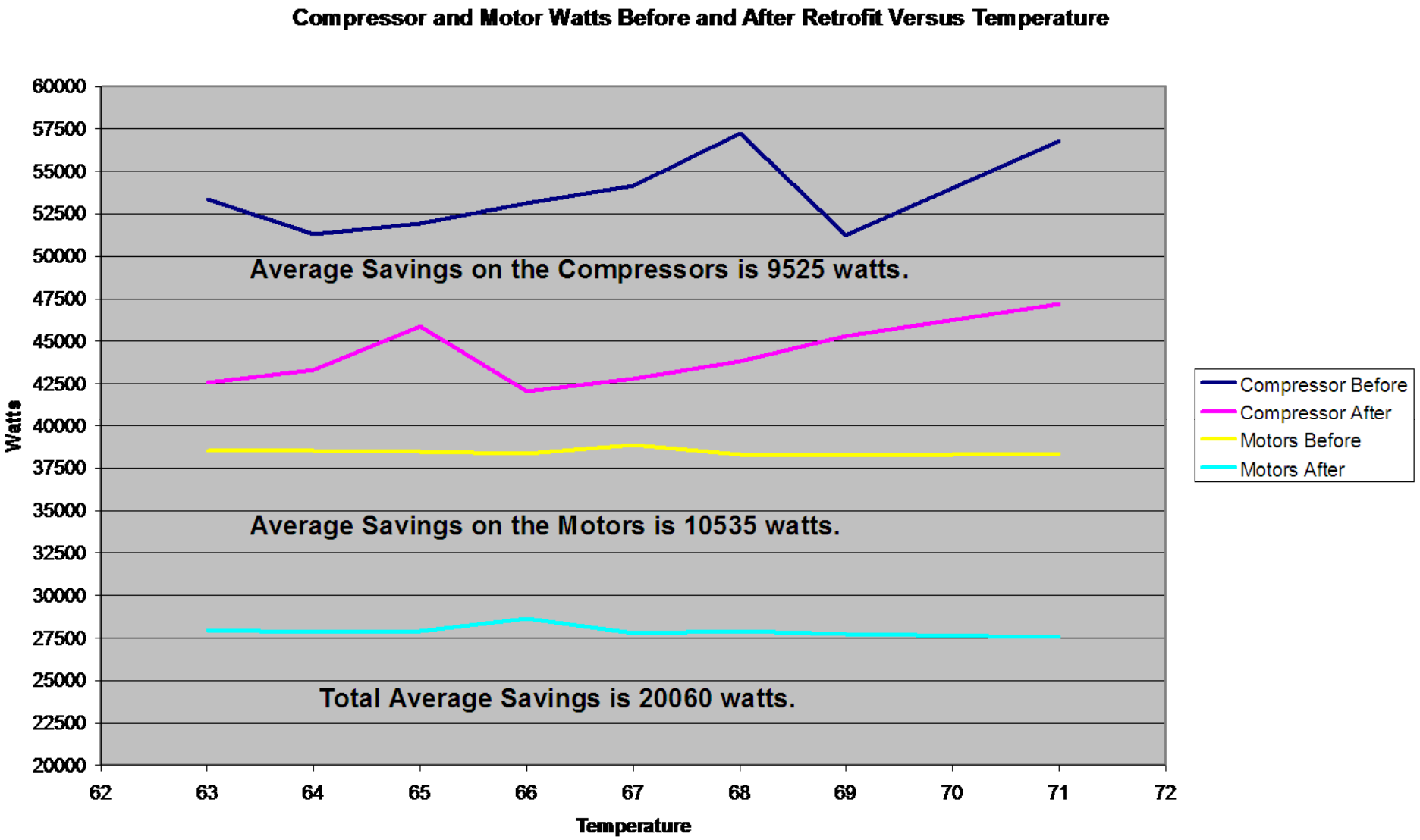
STORE 1293


Daily Watt Usage Comparison
120000
100000
80000
60000
40000
20000
0
0:00
0:40
1:20
2:00
2:40
3:20
4:00
4:40
5:20
6:00
6:40
7:20
8:00
8:40
9:20
10:00
10:40
11:20
12:00
12:40
13:20
14:00
14:40
15:20
16:00
16:50
17:30
18:10
18:50
19:30
20:10
20:50
21:30
22:10
22:50
23:30
Average post-watts
Average pre-watts

STORE 1293


Average Watts and Temperature
Watts
Temperature (degrees F)
Date
Before Retrofit
After Retrofit
Comp ave
Motor Average
Temp ave
60000
57500
55000
52500
50000
47500
45000
42500
40000
37500
35000
32500
30000
27500
25000
22500
20000
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
5/16/2006
5/21/2006
5/26/2006
5/31/2006
6/5/2006
6/10/2006
6/15/2006
6/20/2006
6/25/2006
6/30/2006
7/5/2006
7/10/2006
7/15/2006
7/20/2006
7/25/2006
7/30/2006
8/4/2006

STORE 1293


Compressor and Motor Watts Before and After Retrofit Versus Temperature
Watts
60000
57500
55000
52500
50000
47500
45000
42500
40000
37500
35000
32500
30000
27500
25000
22500
20000
62
63
64
65
66
67
68
69
70
71
72
Temperature
Average Savings on the Compressors is 9525 watts.
Average Savings on the Motors is 10535 watts.
Total Average Savings is 20060 watts.
Compressor Before
Compressor After
Motors Before
Motors After