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Caribbean Distributor of 3M Prestige Series Window Films and AIRCOSAVER
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CAP JULUCA ENERGY REDUCTION STUDY

Caribbean Energy Savers
AIRCOSAVER

3M Prestige Series Clear Heat Control Window Film

Background:
Caribbean Energy Savers conducted the following Energy Study in an effort to demonstrate the effectiveness of the company's energy saving technologies: 3M Prestige Series "Clear Heat Control" Window Films and AIRCOSAVER air conditioning optimization device. The purpose of the study was to develop a strategy that maintains the property's architectural integrity and employ technologies that do not adversely affect the guest experience and comfort, while reducing the energy consumption of property.

Strategy:
The largest consumer of electrical power of the property is Air Conditioning. Our strategy looks at two of the major contributors of excessive air conditioning operation, while focusing on enhancing the guest experience. These factors are excessive heat gain through the window glass, which causes the property's air conditioning systems to work continuously in an effort to cool the villas and integrating technology to the air conditioning systems that allow for greater operating efficiency.

3M Prestige Series "Clear Heat Control" Window Film utilizes nano-technology by embedding over 250 layers of "optical grade" polymers onto the film. These polymers are strategically angled and positioned to attack the Infrared (IR) light spectrum and filter 99.9% of the sun's harmful and damaging Ultra Violet (UV) rays. The film contains no metals or dyes and allows all of the natural light to pass through without altering or changing the architectural value of the window glass. As an additional benefit, the "optical grade" polymers actually enhance visibility looking through the window glass to "High Definition" standards making colors more vibrant and crisp.

Testing Equipment:

LUTRON DW-6092 Three (3) Phase Power Meter Analyzer with Real time Data logger
MICRO DAQ Log Tag Temperature Data Logger , Model # TRID30-7R

Dates and Location of Testing:

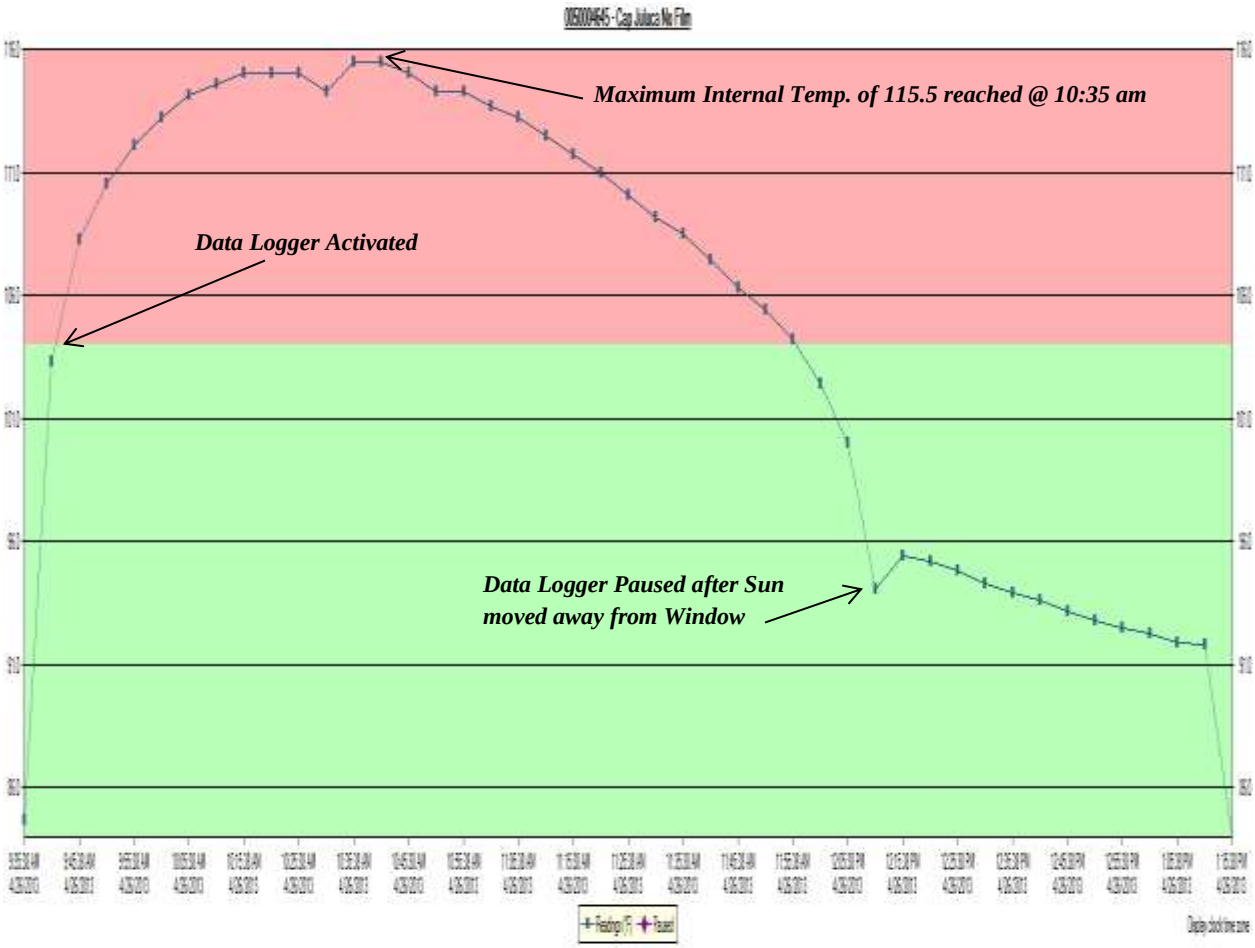
Cap Juluca Resort, Anguilla. Villa 15 was selected by [redacted], as the ideal location to conduct the study. The study was conducted April 26th, 27th and 28th, 2013.

Observations:

The master bathroom located within Villa 15 has a glass wall overlooking the scenic waters of Anguilla with spectacular views of St. Maarten. This glass wall faces southeast and is exposed to direct morning sun from approximately 8:30am until 12 pm. This exposure to the intense Anguillan sun causes the bathroom area to get excessively warm and has been subject to many past guest complaints. This problem is exasperated by the fact that there is no cooling vent located within the bathroom. The closest cooling vent is located in the hallway coming into the bathroom and is not sufficient to overcome the excessive heat gain being transmitted through the wall of window glass. The windows located within the main room of the villa have the same southwest orientation of the bathroom. The same excessive heat gain was identified entering the main room of the villa. This condition will cause the guest to turn down the air conditioning in an effort to overcome the excessive heat gain and thereby increase the cooling expense of the property.

Temperature Data Logging Study:

MICRO DAQ Log Tag Temperature Data Logger was programed and set up in the bathroom to record internal temperature readings at five minute intervals. The device was activated at 9:35am and recorded a maximum internal temperature of 115.5 degrees in front of the window. This excessive heat condition is no match for the cooling system and causes the air conditioning to continuously run in an effort to overcome the heat load. The detailed time stamped study is attached to the report for your review.

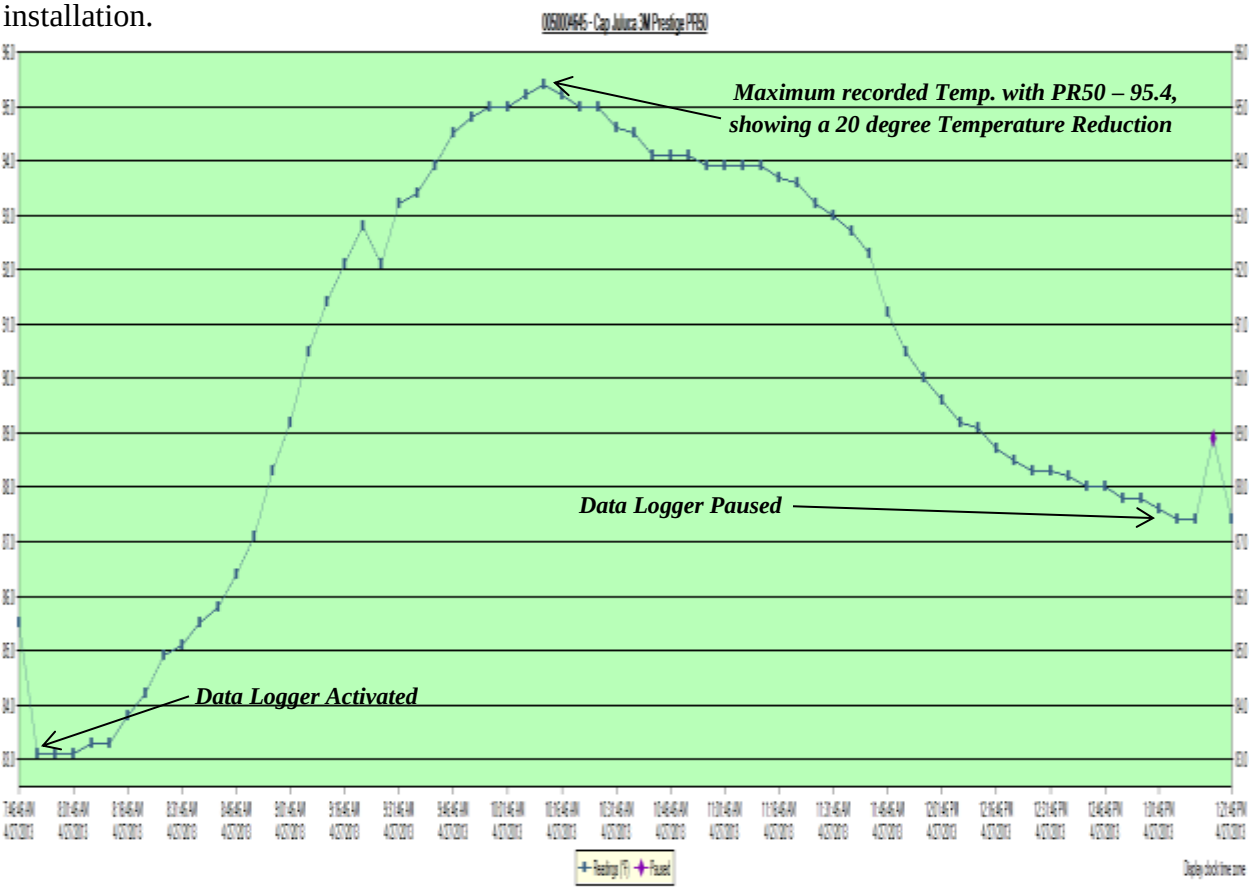


Listed below is the actual recorded temperature readings from the bathroom located within Villa 15:

Index	Date	Time	Elapsed Time	Readings (°F)
1	4/26/2013	9:35:38 AM	00:00:00	84.7
2	4/26/2013	9:40:38 AM	00:05:00	103.3
3	4/26/2013	9:45:38 AM	00:10:00	108.3
4	4/26/2013	9:50:38 AM	00:15:00	110.5
5	4/26/2013	9:55:38 AM	00:20:00	112.1
6	4/26/2013	10:00:38 AM	00:25:00	113.2
7	4/26/2013	10:05:38 AM	00:30:00	114.1
8	4/26/2013	10:10:38 AM	00:35:00	114.6
9	4/26/2013	10:15:38 AM	00:40:00	115.0
10	4/26/2013	10:20:38 AM	00:45:00	115.0
11	4/26/2013	10:25:38 AM	00:50:00	115.0
12	4/26/2013	10:30:38 AM	00:55:00	114.3
13	4/26/2013	10:35:38 AM	01:00:00	115.5
14	4/26/2013	10:40:38 AM	01:05:00	115.5
15	4/26/2013	10:45:38 AM	01:10:00	115.0
16	4/26/2013	10:50:38 AM	01:15:00	114.3
17	4/26/2013	10:55:38 AM	01:20:00	114.3
18	4/26/2013	11:00:38 AM	01:25:00	113.7
19	4/26/2013	11:05:38 AM	01:30:00	113.2
20	4/26/2013	11:10:38 AM	01:35:00	112.5
21	4/26/2013	11:15:38 AM	01:40:00	111.7
22	4/26/2013	11:20:38 AM	01:45:00	111.0
23	4/26/2013	11:25:38 AM	01:50:00	110.1
24	4/26/2013	11:30:38 AM	01:55:00	109.2
25	4/26/2013	11:35:38 AM	02:00:00	108.5
26	4/26/2013	11:40:38 AM	02:05:00	107.4
27	4/26/2013	11:45:38 AM	02:10:00	106.3
28	4/26/2013	11:50:38 AM	02:15:00	105.4
29	4/26/2013	11:55:38 AM	02:20:00	104.2
30	4/26/2013	12:00:38 PM	02:25:00	102.4
31	4/26/2013	12:05:38 PM	02:30:00	100.0
32	4/26/2013	12:10:38 PM	02:35:00	94.1
33	4/26/2013	12:15:38 PM	02:40:00	95.4
34	4/26/2013	12:20:38 PM	02:45:00	95.2
35	4/26/2013	12:25:38 PM	02:50:00	94.8
36	4/26/2013	12:30:38 PM	02:55:00	94.3
37	4/26/2013	12:35:38 PM	03:00:00	93.9
38	4/26/2013	12:40:38 PM	03:05:00	93.6
39	4/26/2013	12:45:38 PM	03:10:00	93.2
40	4/26/2013	12:50:38 PM	03:15:00	92.8
41	4/26/2013	12:55:38 PM	03:20:00	92.5
42	4/26/2013	1:00:38 PM	03:25:00	92.3
43	4/26/2013	1:05:38 PM	03:30:00	91.9

44 4/26/2013 1:10:38 PM 03:35:00 91.8 Paused

After the sun had moved away from the window, 3M Prestige Series PR50 “Clear Heat Control” Window Film was installed onto the window glass and the Log Tag Temperature Data Logger was re-programmed to take readings for the following morning. The above referenced photograph is actual picture of 3M PR50 installed onto the bathroom window wall of Villa 15. Below is the graphical analysis showing a 20.1 degree temperature reduction post PR50 installation.



Listed below is the actual recorded temperature readings from the bathroom located within Villa 15 after the installation of 3M Prestige Series PR50 “Clear Heat Control” Window Film:

Index	Date	Time	Elapsed Time	Readings (°F)
1	4/27/2013	7:46:46 AM	00:00:00	85.5
2	4/27/2013	7:51:46 AM	00:05:00	83.1
3	4/27/2013	7:56:46 AM	00:10:00	83.1
4	4/27/2013	8:01:46 AM	00:15:00	83.1
5	4/27/2013	8:06:46 AM	00:20:00	83.3
6	4/27/2013	8:11:46 AM	00:25:00	83.3
7	4/27/2013	8:16:46 AM	00:30:00	83.8
8	4/27/2013	8:21:46 AM	00:35:00	84.2
9	4/27/2013	8:26:46 AM	00:40:00	84.9
10	4/27/2013	8:31:46 AM	00:45:00	85.1
11	4/27/2013	8:36:46 AM	00:50:00	85.5
12	4/27/2013	8:41:46 AM	00:55:00	85.8
13	4/27/2013	8:46:46 AM	01:00:00	86.4
14	4/27/2013	8:51:46 AM	01:05:00	87.1
15	4/27/2013	8:56:46 AM	01:10:00	88.3
16	4/27/2013	9:01:46 AM	01:15:00	89.2
17	4/27/2013	9:06:46 AM	01:20:00	90.5
18	4/27/2013	9:11:46 AM	01:25:00	91.4
19	4/27/2013	9:16:46 AM	01:30:00	92.1
20	4/27/2013	9:21:46 AM	01:35:00	92.8
21	4/27/2013	9:26:46 AM	01:40:00	92.1
22	4/27/2013	9:31:46 AM	01:45:00	93.2
23	4/27/2013	9:36:46 AM	01:50:00	93.4
24	4/27/2013	9:41:46 AM	01:55:00	93.9
25	4/27/2013	9:46:46 AM	02:00:00	94.5
26	4/27/2013	9:51:46 AM	02:05:00	94.8
27	4/27/2013	9:56:46 AM	02:10:00	95.0
28	4/27/2013	10:01:46 AM	02:15:00	95.0
29	4/27/2013	10:06:46 AM	02:20:00	95.2
30	4/27/2013	10:11:46 AM	02:25:00	95.4
31	4/27/2013	10:16:46 AM	02:30:00	95.2
32	4/27/2013	10:21:46 AM	02:35:00	95.0
33	4/27/2013	10:26:46 AM	02:40:00	95.0
34	4/27/2013	10:31:46 AM	02:45:00	94.6
35	4/27/2013	10:36:46 AM	02:50:00	94.5
36	4/27/2013	10:41:46 AM	02:55:00	94.1
37	4/27/2013	10:46:46 AM	03:00:00	94.1
38	4/27/2013	10:51:46 AM	03:05:00	94.1
39	4/27/2013	10:56:46 AM	03:10:00	93.9
40	4/27/2013	11:01:46 AM	03:15:00	93.9
41	4/27/2013	11:06:46 AM	03:20:00	93.9
42	4/27/2013	11:11:46 AM	03:25:00	93.9
43	4/27/2013	11:16:46 AM	03:30:00	93.7
44	4/27/2013	11:21:46 AM	03:35:00	93.6
45	4/27/2013	11:26:46 AM	03:40:00	93.2
46	4/27/2013	11:31:46 AM	03:45:00	93.0

47	4/27/2013	11:36:46 AM	03:50:00	92.7
48	4/27/2013	11:41:46 AM	03:55:00	92.3
49	4/27/2013	11:46:46 AM	04:00:00	91.2
50	4/27/2013	11:51:46 AM	04:05:00	90.5
51	4/27/2013	11:56:46 AM	04:10:00	90.0
52	4/27/2013	12:01:46 PM	04:15:00	89.6
53	4/27/2013	12:06:46 PM	04:20:00	89.2
54	4/27/2013	12:11:46 PM	04:25:00	89.1
55	4/27/2013	12:16:46 PM	04:30:00	88.7
56	4/27/2013	12:21:46 PM	04:35:00	88.5
57	4/27/2013	12:26:46 PM	04:40:00	88.3
58	4/27/2013	12:31:46 PM	04:45:00	88.3
59	4/27/2013	12:36:46 PM	04:50:00	88.2
60	4/27/2013	12:41:46 PM	04:55:00	88.0
61	4/27/2013	12:46:46 PM	05:00:00	88.0
62	4/27/2013	12:51:46 PM	05:05:00	87.8
63	4/27/2013	12:56:46 PM	05:10:00	87.8
64	4/27/2013	1:01:46 PM	05:15:00	87.6
65	4/27/2013	1:06:46 PM	05:20:00	87.4
66	4/27/2013	1:11:46 PM	05:25:00	87.4 Paused

Temperature Data Logging Results:

The maximum recorded internal temperature of the untreated bathroom glass located within Villa 15 reached a staggering 115.5 degrees. Post installation of the 3M Prestige Series PR50 “Clear Heat Control” Window Film, the maximum recorded temperature of the same location was 95.4 degrees. This represents a 20.1 reduction in internal temperature readings and a significant improvement from the previous readings of 115.5 degrees.

This significant reduction in heat gain will allow for the air conditioning system to maintain more comfortable temperatures for resort guest and a significant decrease in the operational expense of the air conditioning system to cool this space.

Air Conditioning Control Electronics:

AIRCOSAVER is a retrofit controller that increases the energy efficiency of the air conditioning system.

At Cap Juluca, there is a HUGE potential for savings and efficiency improvements in Air Conditioning. Air Conditioning is the single largest consumer of energy and accounts for a very significant part of the resorts electric bill.

The following explains the shortcomings of typical A/C systems and how AIRCOSAVER achieves increased operating efficiency:

When switched on, typical air conditioning systems operate continuously until the room thermostat senses the desired temperature and turns the system off. As the room warms up, the thermostat switches the air conditioner back on and the cycle repeats. Running the system continuously until the room thermostat switches it off means that the system wastes energy by operating with excess capacity most of the time. When the cycle starts, the compressor pushes cooling energy into the heat exchanger which stores energy. At this stage, the system works with high efficiency because compressors operate most efficiently when fully loaded. In normal weather conditions, the energy storage is soon fully "charged up". From this point onwards, the compressor provides more cooling energy than the heat exchanger can take up (thermodynamic saturation). Running the compressor beyond this stage does not increase the cooling effect any more but the compressor will keep running and in turn, waste valuable energy.

AIRCOSAVER overcomes your A/C's shortcomings and adds intelligence to the compressor by detecting thermodynamic saturation and optimizes the compressor to avoid inefficient and unnecessary operation of the compressor by switching into "saver mode". The fan keeps running and your system makes maximum use of the stored cooling energy in the heat exchanger. Once the stored energy is used up, the compressor will resume operation and can work efficiently again. The set room temperature is reached without the inefficient parts of the cooling cycle and results in significant energy savings without compromising cooling comfort.

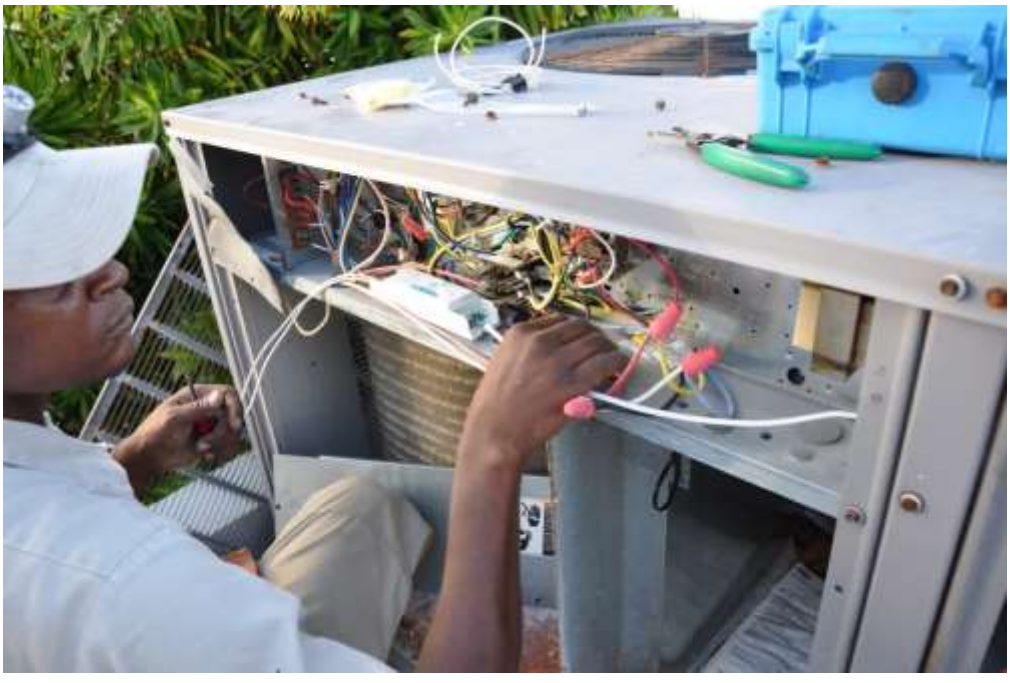
Since the correct point to switch on and off the compressor varies from unit to unit and changes with different weather conditions, the AIRCOSAVER is designed to adapt to any condition to ensure efficient operation of your air conditioning system at all times.

Reduction of air conditioning operational cost range between 20 – 30%, providing for a quick payback measured in months, not years.

Collection of Baseline Energy Consumption Data:

LUTRON DW-6092 Three (3) Phase Power Meter Analyzer with Real time Data logger was tied into the main breaker panel located at Villa 15. The energy monitor was programmed to take real time energy consumption readings in 30 second intervals for a full 24 hour period to develop a baseline of daily energy consumption. All four (4) air conditioners were set at 70 degrees by [redacted] Cap Juluca Maintenance Technician, as directed by [redacted]

After the initial 24 hour baseline reading was downloaded, [redacted] directed Cap Juluca Maintenance Technician, [redacted], to perform the installation of the AIRCOSAVER devices to all four (4) air conditioning units located within Villa 15. Once the installation of the AIRCOSAVER's was completed, the LUTRON Energy Monitor was reset and reprogrammed to take an additional 24 hour energy consumption readings at 30 second intervals. All other conditions remained constant.

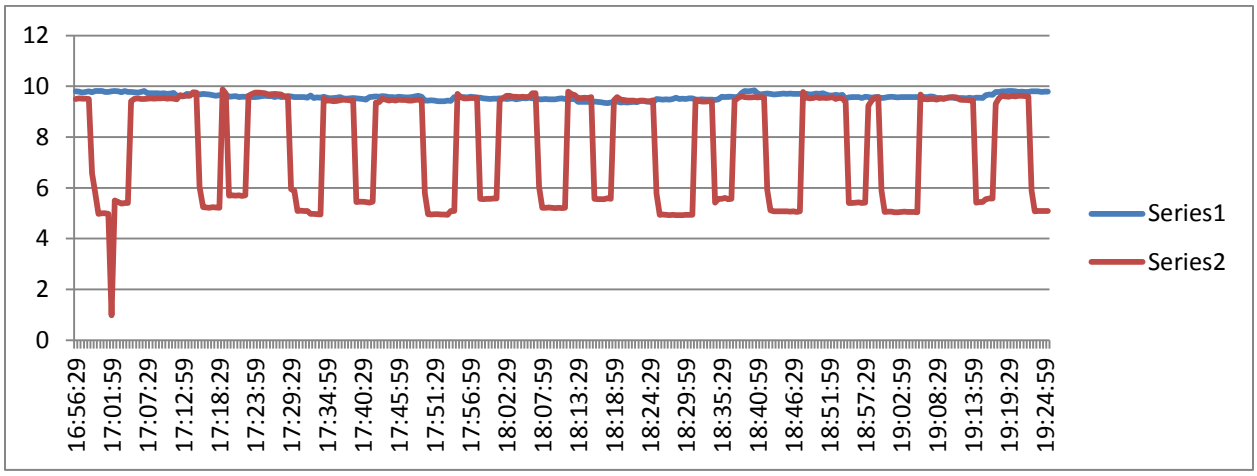


The following are the baseline KW consumption readings and post AIRCOSAVER installation taken in 30 second intervals of Villa 15:

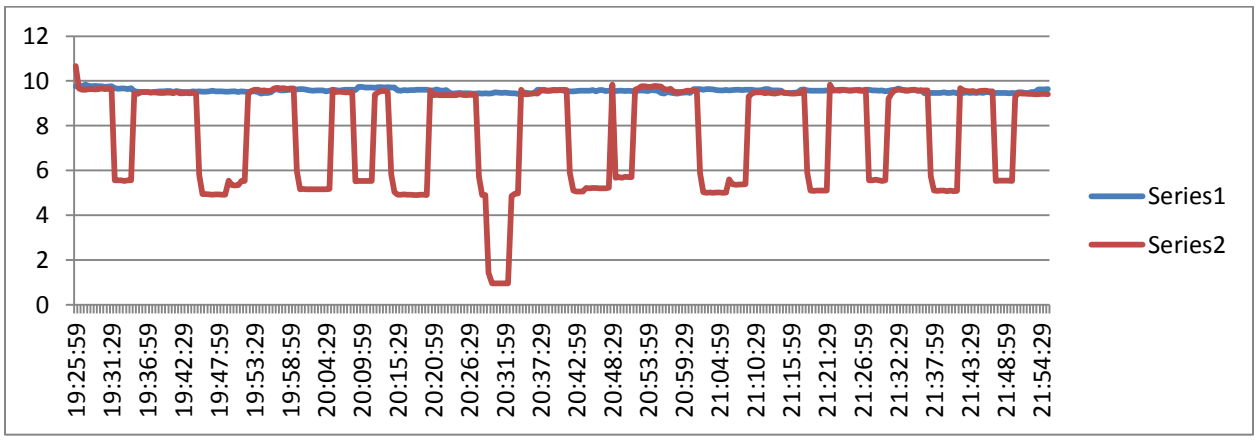
Series 1 – Baseline KW consumption without AIRCOSAVER

Series 2 – KW consumption with AIRCOSAVER

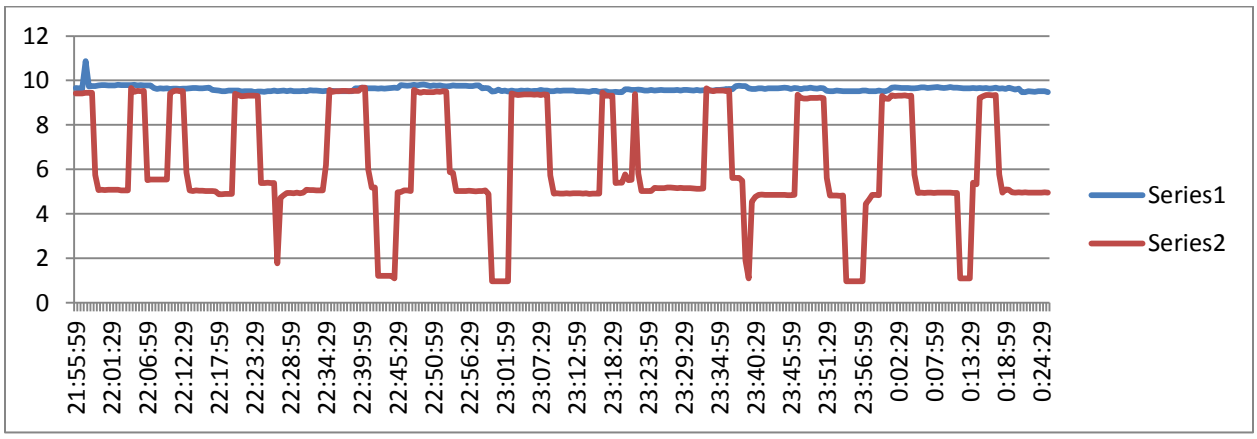
LUTRON DW-6092 KW CONSUMPTION READINGS CAP JULUCA VILLA 15



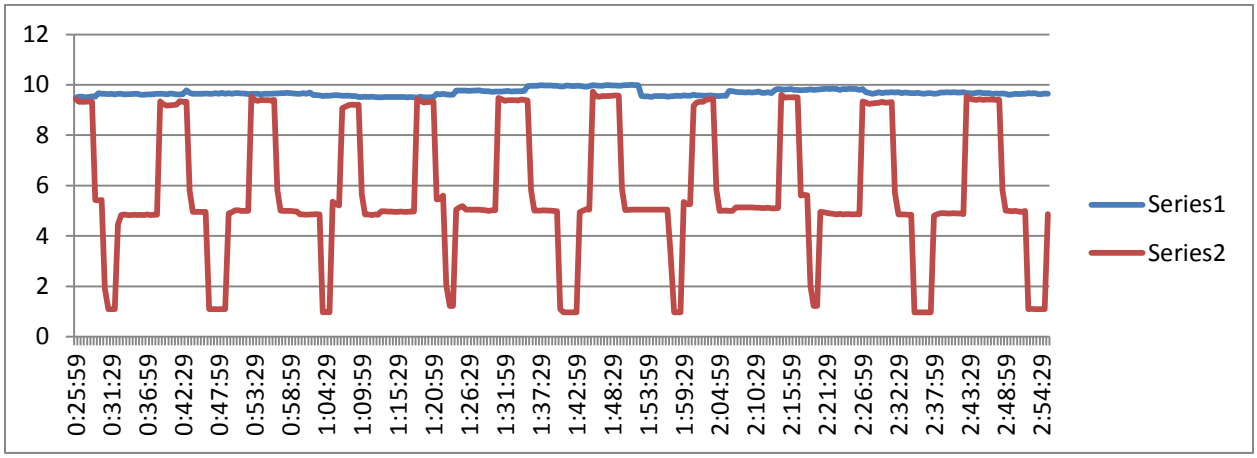
LUTRON DW-6092 1 KW CONSUMPTION READINGS CAP JULUCA VILLA 15



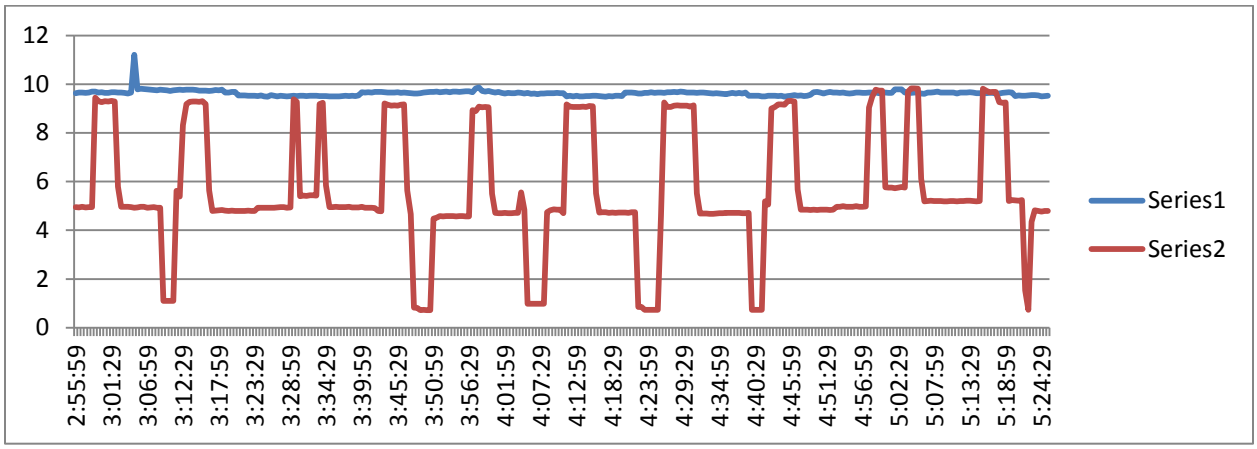
LUTRON DW-6092 KW CONSUMPTION READINGS CAP JULUCA VILLA 15



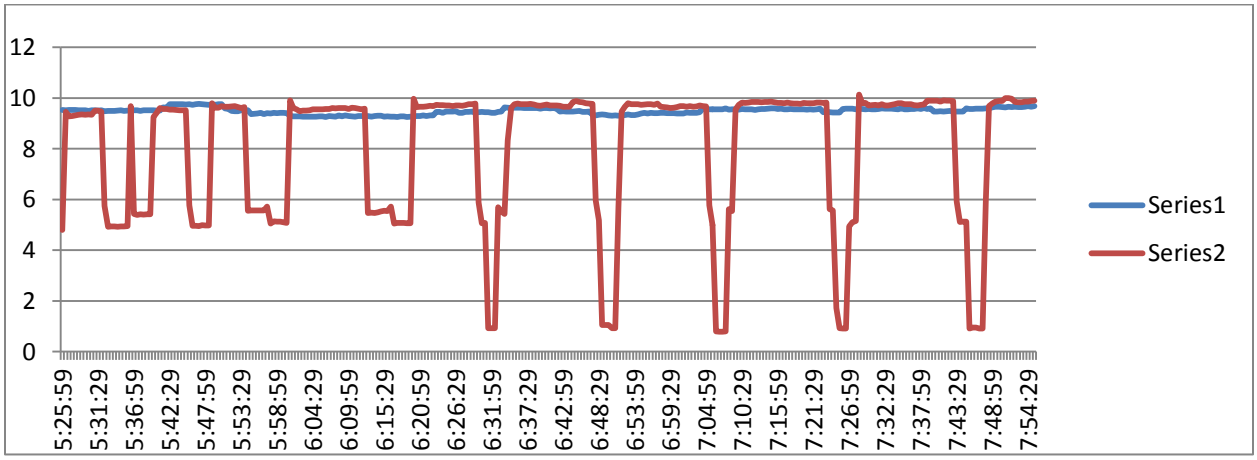
LUTRON DW-6092 KW CONSUMPTION READINGS CAP JULUCA VILLA 15



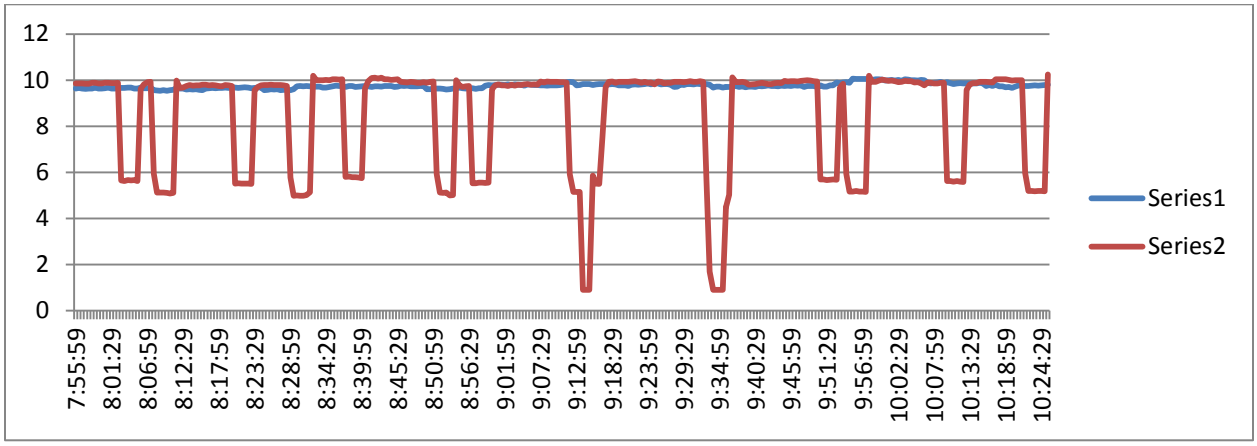
LUTRON DW-6092 KW CONSUMPTION READINGS CAP JULUCA VILLA 15



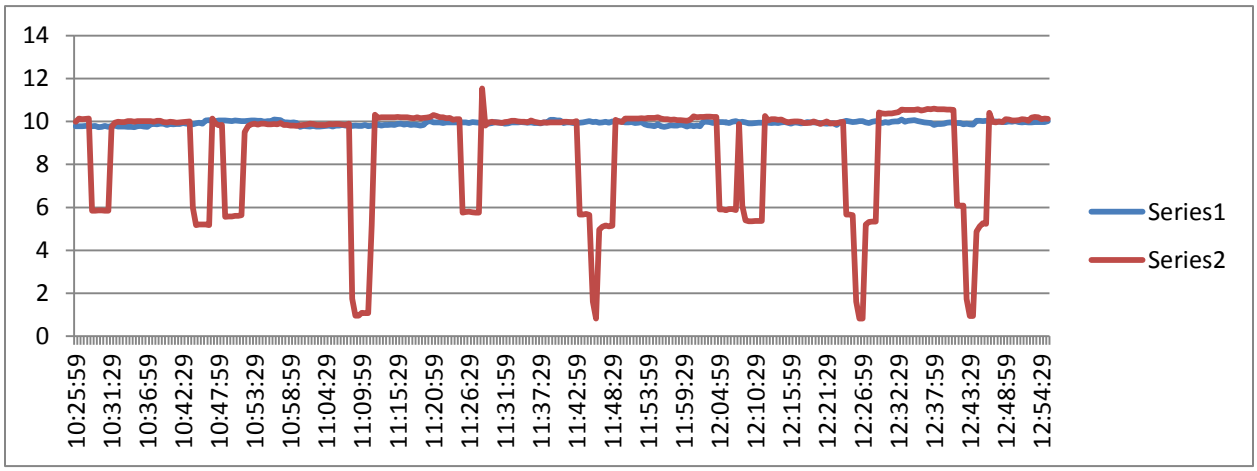
LUTRON DW-6092 KW CONSUMPTION READINGS CAP JULUCA VILLA 15



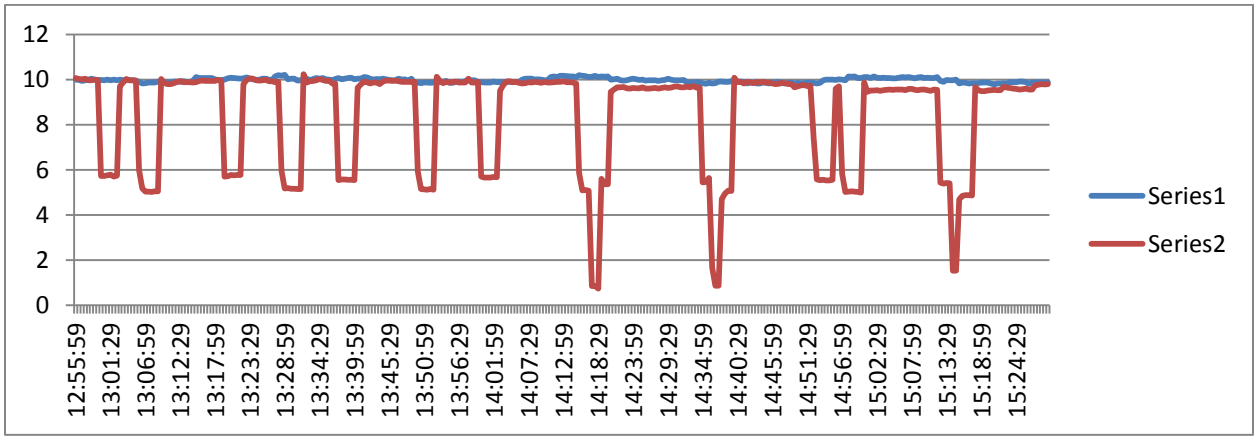
LUTRON DW-6092 KW CONSUMPTION READINGS CAP JULUCA VILLA 15



LUTRON DW-6092 KW CONSUMPTION READINGS CAP JULUCA VILLA 15



LUTRON DW-6092 KW CONSUMPTION READINGS CAP JULUCA VILLA 15



AIRCOSAVER - Energy Consumption Reduction Results:

As demonstrated in the above series of graphs, the Series 1 baseline KW consumption readings show a fairly steady consumption rate of energy. The slight movement in the line is the air conditioners reaching thermostat room set temperatures and shutting down the a/c compressor for very short intervals.

Series 2 KW consumption readings are post installation of AIRCOSAVER to all four (4) air conditioning units, two 5 ton Roof Top Units (RTU) and two 3 ton units. The significant downward movement in the Series 2 line represents the AIRCOSAVER sensing the air conditioner reaching Thermal Dynamic Saturation and allowing the compressor to take control by turning itself off; thereby allowing the fan to move out all of the stored cool energy. When the Series 2 line returns upward, this represents the AIRCOSAVER recognizing that the storage is low and the compressor needs to resume operation. This pattern repeats throughout the graphical analysis and demonstrates the effectiveness of the AIRCOSAVER retro-fit installation.

Series 1 baseline graphical analysis shows an average 9.7 KW consumption rate per 30 second interval reading. Series 2 graphical analysis overlay shows energy consumption post AIRCOSAVER installation with average consumption reading of 7.38 KW per 30 second interval, demonstrating a KW Consumption Savings of 24%.

Energy Consumption Reduction: 24%
Projected Return on Investment (ROI): 3 months