

An investigation into the energy reduction impact of a solar assisted air conditioning unit supplied by Totally Solar SA.

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Introduction:

RTE was born from an amalgamation of a number of companies that were industry leaders in their own right, thus giving RTE extensive experience in the energy measurement and monitoring arena.

With the growing concerns of increased electricity tariffs, many of the residential, commercial and industrial property owners and investors are taking a keen interest in lowering their overheads by reducing their energy bills. This can be achieved by using energy efficient alternatives for lighting, heating, cooling and cooking. Solar assisted air conditioning & refrigeration has been introduced to our market place and has shown significant potential to reduce energy costs.

An energy comparison of two systems identical in capacity was undertaken for Totally Solar. The first is being a 12,000 Btu, variable drive air conditioning unit and the second a 12,000 Btu, ThermX air conditioning unit which is assisted with solar thermal collectors. The testing of the two systems was done in the server room of East London Vinegar in order to verify whether the one unit performed more efficiently than the other.

Method:

Electrical energy measurements were logged on the two systems. These electrical measurements were logged with an Egauge EG 3000 data logging unit. Both units were identically installed in the server room and were both programmed to maintain the room at a constant temperature of 21 degrees Celsius. The variable drive systems' electrical energy was measured every 5 minutes for 65 days from the 22nd Sep 2013 to the 25th Nov 2013. The variable drive unit was then replaced with the ThermX unit from SolX Energy Ltd. The electrical energy consumed was also measured every 5 minutes with the same data logger and was done for 26 days from the 27th Nov 2013 the 22nd Dec 2013.

Results:

The following data presented in the figure below are the daily averages for the systems.

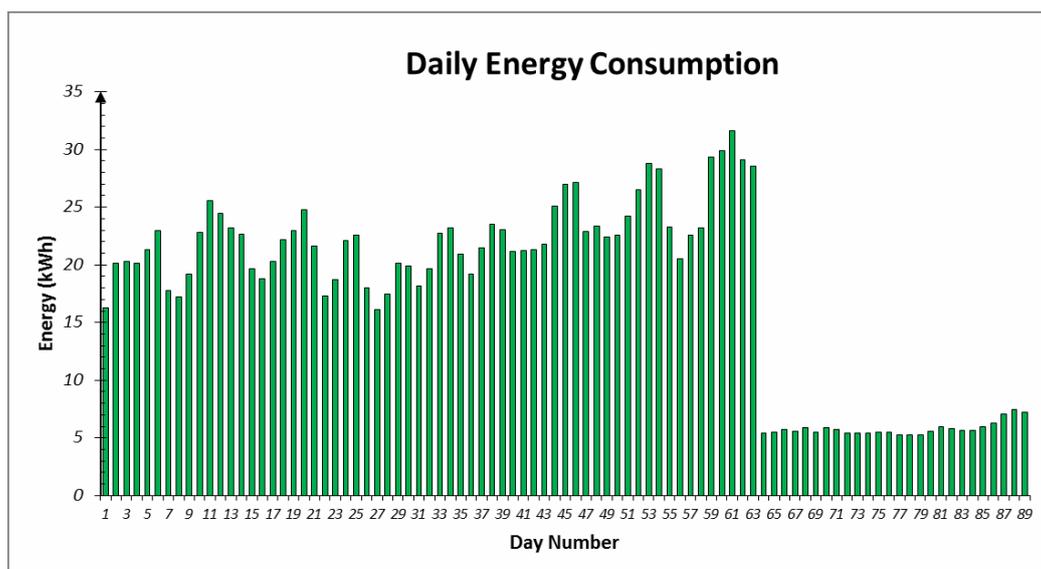


Figure 1.A Electrical Energy Consumed by the air conditioning units over the time period of the study.

Seen in the figure above is a significant decrease in energy consumption at the point where the ThermX system was installed.

The following chart is the accumulation of energy consumed by both air conditioning units over the time period stated above.

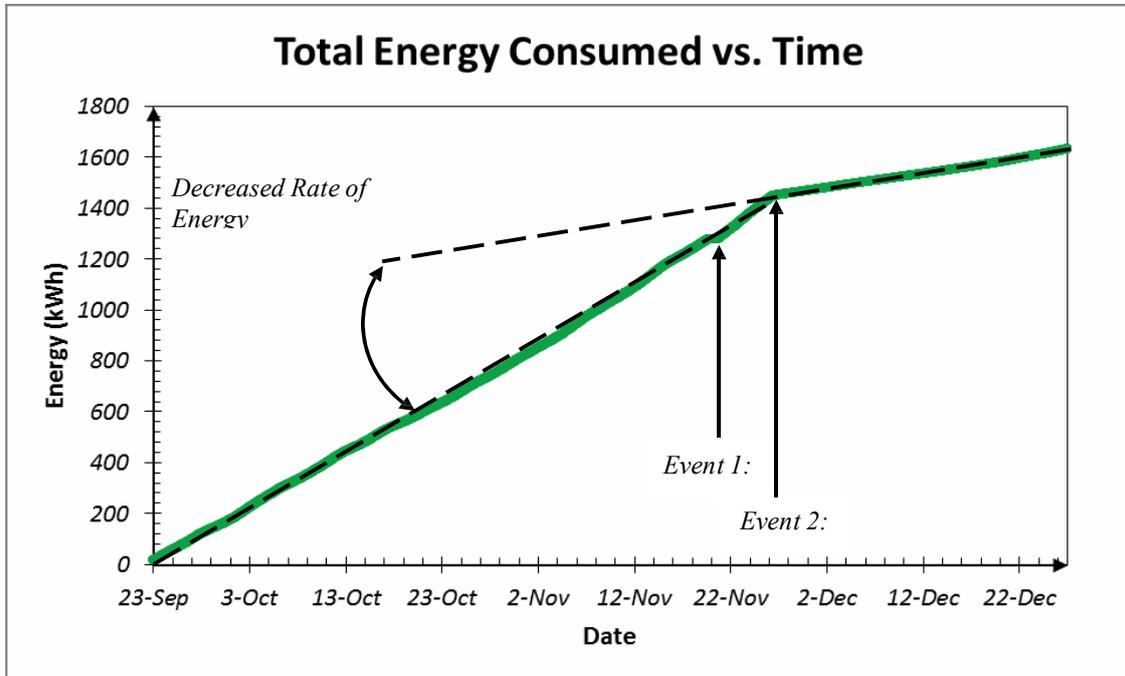


Figure 1.B Electrical Energy accumulation by the air conditioning units over the time period of the study.

Shown in the figure above are two events. Event 1 occurred due to a power failure and no energy was consumed by the air conditioner. The data on the day which event 1 occurred was ignored. Event 2 is the swap over to the ThermX air conditioning unit. Visually it is clear that the rate at which the ThermX unit consumed energy was much lower than the variable drive air conditioner.

The following table lists the results of the investigation. Listed in the results are the average daily electrical consumption and savings, minimum daily electrical consumption/savings and the maximum daily electrical consumption/savings. The electrical consumption is listed in units of kilowatt hours and the savings as a percentage.

Table 1.A Summary of the results

	Average Daily Consumption (kWh)	Percentage Savings (%)	Maximum Daily Consumption (kWh)	Percentage Savings (%)	Minimum Daily Consumption (kWh)	Percentage Savings (%)
Variable Drive Air	22.0	73.6	N/A	66	N/A	76.4
ThermX Air	5.8		7.2		5.2	

The energy data results show that the ThermX system saved between 66 and 76.4% of the electrical energy required to maintain the server room at a constant temperature.

Additional Evaluation

Further to the energy usage monitoring above, we conducted further separate tests at various points on a 3.5kW (R410a) system to ascertain ThermX's potential impact on the overall unit. This was a side by side application, using identical rooms, cooling load and the same size systems - one with, and one without ThermX.

The following data shows the relevant temperature and pressure data around the whole of the system when the ThermX system is in operation.

Results:

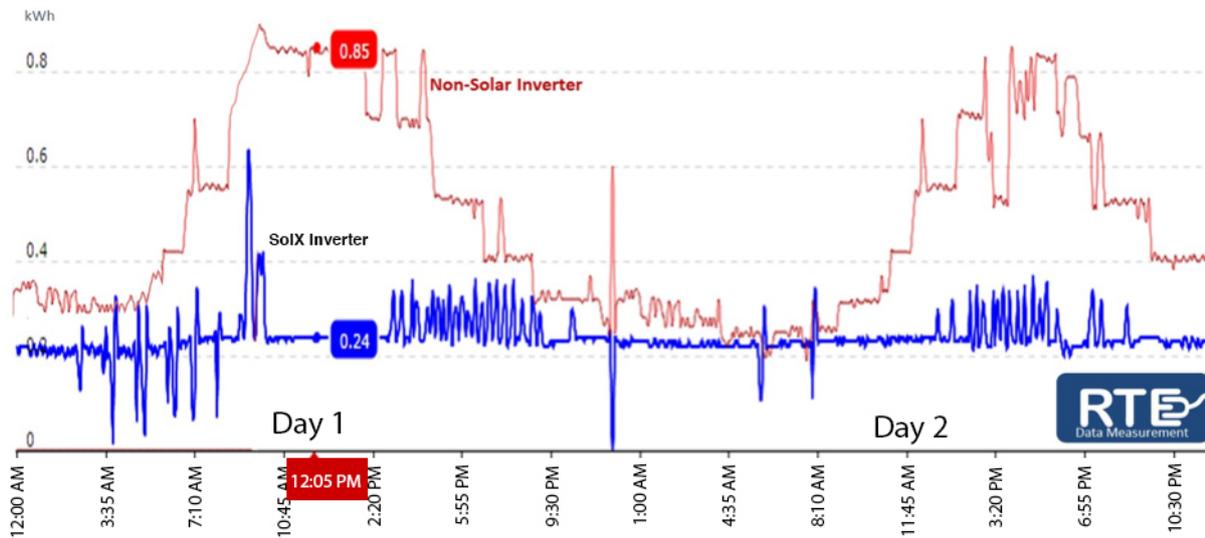


Figure 2.A clearly illustrating the differential in energy consumption as the sun penetration increases.

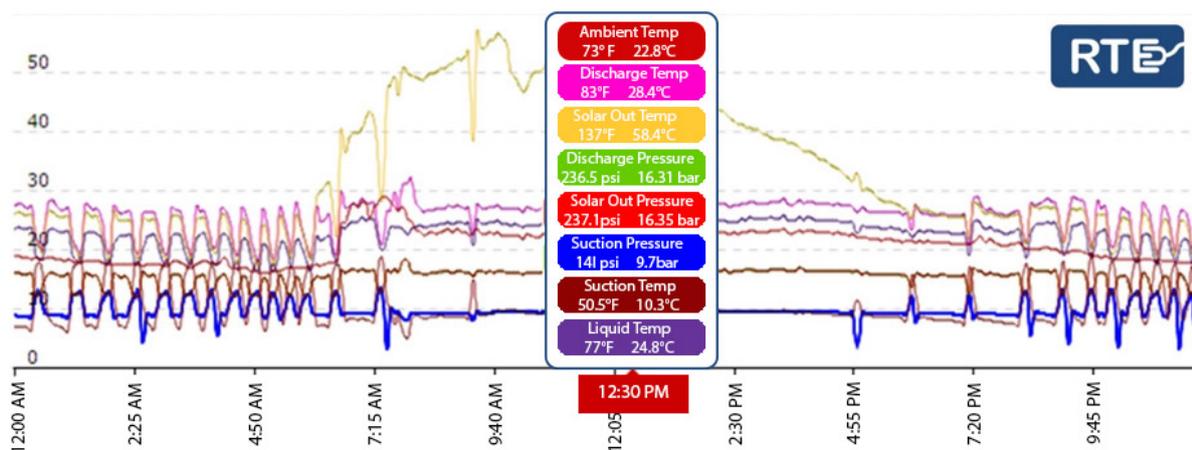


Figure 2.B showing all relevant temperatures and pressures around the system with ThermX.



Summary:

A study performed on several systems.

Firstly, to quantify the energy consumption and the energy savings of the newly introduced ThermX system. These results show that if a variable drive system is replaced by the similar sized ThermX air conditioning unit that 66 - 77% and on average 73.6% of the electrical energy consumed may be saved. These saving are born from two areas, the ThermX unit increases the compressors capacity, which results in the indoor area reaching temperature much earlier than with the conventional system, therefore the compressor slows or shuts down on a more regular basis.

Secondly, to quantify the overall effect that the ThermX unit has on the complete system. The measurements above show that there are no negative impacts on the overall system, in fact it could be confidently argued that the ThermX unit has only a positive impact in regards to lifespan of the equipment.

Yours Sincerely



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