Petrol Retail Outlet

Coolnomix

Trial Data Report

Report compiled by Tim Twohig

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1. Introduction

As specialists in the field of Critical Power and Cooling, EMC Renewables were invited to conduct a site survey to assess the suitability of Coolnomix being integrated into the existing sites DX cooling and refrigeration systems, plus any other potential issues that could improve the efficiency within the garages.

Coolnomix was deemed suitable with the Arneg refrigeration on site and although the Mitsubishi Air conditioning was an ideal system the site usage is seriously reduced by the amount of refrigeration used onsite. Monitoring was to be conducted at the Incoming 3 phase supply in the Cooling DB.

2. Room Overview

The Shop front Area contained a Mitsubishi ducted air-conditioning system, with the main indoor unit FDU250VF mounted at high level inside the storage area, 10 indoor Arneg fridge units and a freezer unit. The other areas were just general shelving & display units.

The refrigeration was set out in two systems, 4 x wall positioned units (All internal 303w units) were returned to 1 x outdoor condensing unit and the 6 x central units (2 x 341w, 1 x 193w, 2 x 136w & 1 x 125w) returned to a second condensing unit.

For trial purposes we fitted 3 x AR-01 Coolnomix units to the Central refrigeration system (Accounting for 818w of the 1272w in total) and monitored the Outdoor condensing unit at the 3 phase C32amp Supply.

3. Recorded data

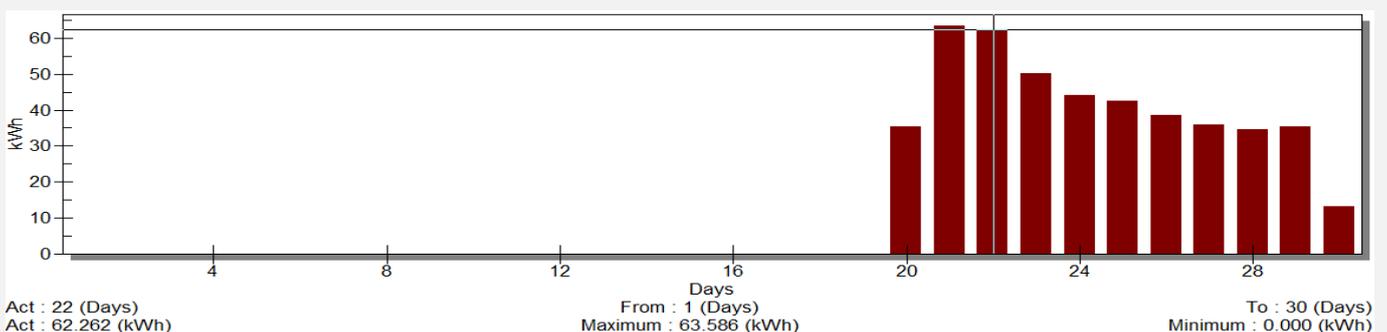Measurements recorded during the trial period were split into 2 sections.

- Normal operation – meaning the system was working without additional Coolnomix controls.

- On Coolnomix – meaning the system was benefitting from the additional Coolnomix controls.

It should also be noted with Refrigeration, Energy Consumption is variable due to outside factors like, temperature, Loading, cooling set points etc and so the data below is only a reflection of what can be expected during the conditions seen at the time of testing.
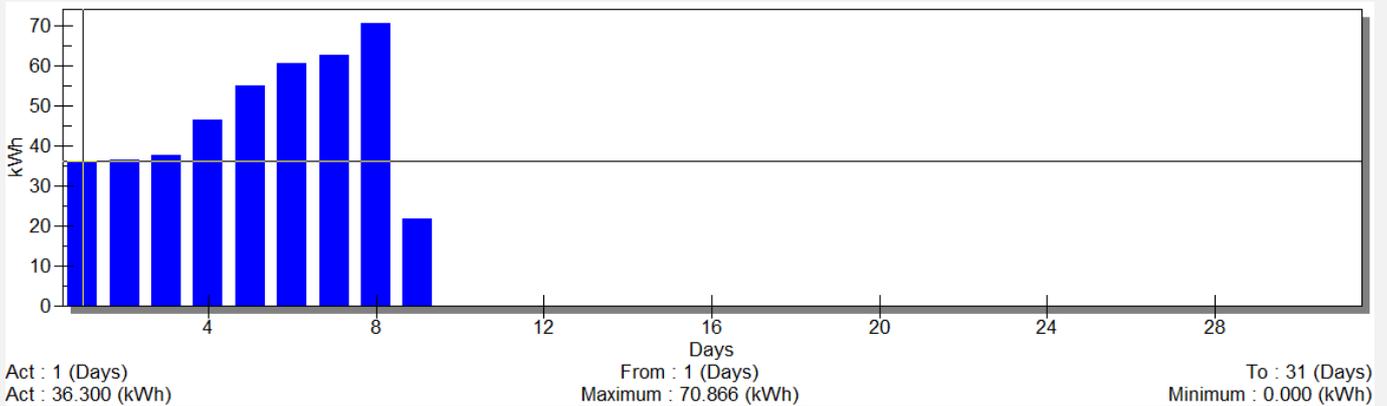
Normal Operation

Monitoring was added to the external supply and the refrigeration was monitored between April 21st and 29th to provide a base line against its general usage.

General usage varied between 63.586KWh and 34.516KWh in April (based on full 24hour monitoring periods) and totalled 337.26 KWh for a typical 7-day period with average outside temperatures varying between 6'c and 19'c

Act : 22 (Days)   From : 1 (Days)   To : 30 (Days)
Act : 62.262 (kWh)   Maximum : 63.586 (kWh)   Minimum : 0.000 (kWh)

On Coolnomix

With the Coolnomix system added to 3 of 6 Internal refrigeration units the usage varied between 70.866KWh and 34.300KWh in May (based on full 24hour monitoring periods) and totalled 335.388 KWh for a typical 7-day period with average outside temperatures varying between 10'c and 24'c

Act : 1 (Days)   From : 1 (Days)   To : 31 (Days)
Act : 36.300 (kWh)   Maximum : 70.866 (kWh)   Minimum : 0.000 (kWh)

As can be seen the total does not show a great saving if calculated as pure KWh usage over a 7-day period, but on analysis of the data the savings from the Coolnomix system can be proven to be substantial.

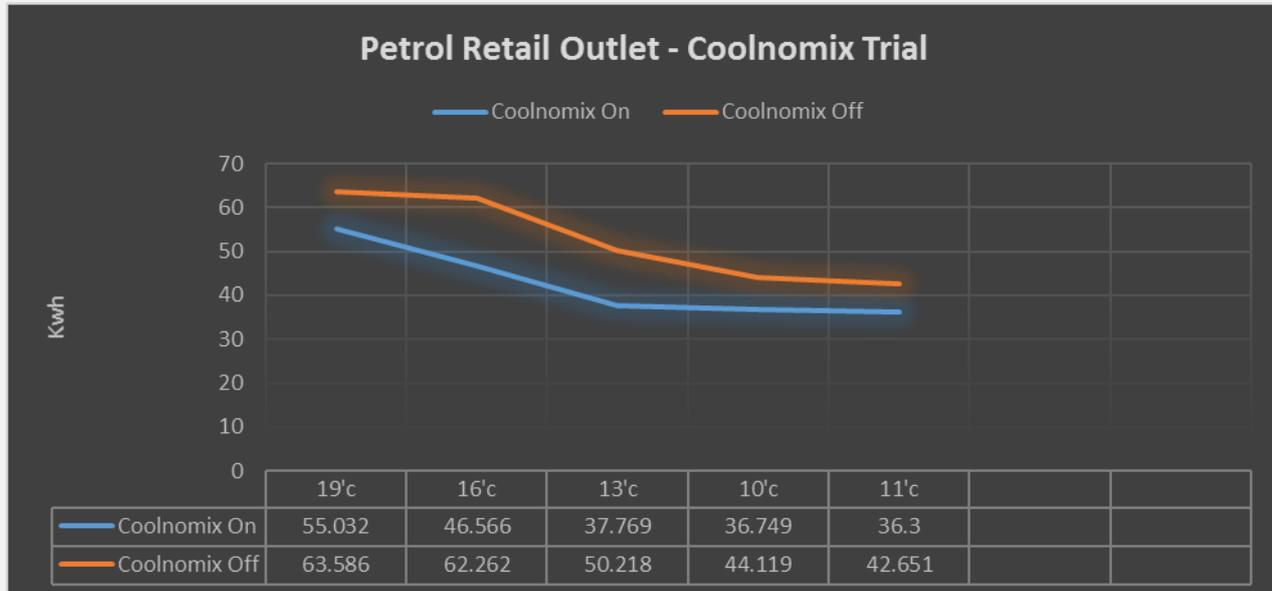# 4. Coolnomix Energy Optimisation Systems – Petrol Retail Outlet

With the unit having some spare capacity suitable for Coolnomix installation the test was set up to operate on Coolnomix for 7 days and in Normal operation for 7 days, clearly the data below shows that good savings can be made.

Calculation results

The KWh usage on days with matching temperatures shows that savings between **15%** and **25.2%** can be achieved with Coolnomix attached. The comparison table below helps illustrate that fact.

kWh Usage Normal Operation		% Energy Saving	Temperature	kWh Usage with Coolnomix	
21/04	63.586	13.5%	19'c - 21'c	55.032	05/05
22/04	62.262	25.2%	16'c – 17'c	46.566	04/05
23/04	50.218	24.8%	13'c – 13'c	37.769	03/05
24/04	44.119	17.3%	10'c – 10'c	36.479	02/05
25/04	42.651	14.9%	11'c – 12'c	36.300	01/05
26/04	38.648	N/A	10'c – 22'c	60.557	06/05
27/04	35.775	N/A	6'c – 24'c	62.685	07/05
21/04 – 27/04	**337.259Kwh**			**335.388Kwh**	06/04 - 12/04

The average trend data shown in the graph below clearly illustrates the Coolnomix energy saving when compared using outside temperatures as a baseline over the monitoring period.

Petrol Retail Outlet - Coolnomix Trial

	19'c	16'c	13'c	10'c	11'c		
Coolnomix On	55.032	46.566	37.769	36.749	36.3		
Coolnomix Off	63.586	62.262	50.218	44.119	42.651		

It also shows as outside air temperatures increase during the summer season we would expect the Coolnomix kWh savings to significantly increase during this period**.**

Other factors also to be considered are that only 3 of the 6 Central refrigeration units were being optimised with the Coolnomix system calculating at 818w of the 1272w Total. (64.3% of Indoor unit power consumption.)

We therefore could also then further calculate improved KWh savings would be achieved with all 6 of the units having Coolnomix optimisation system attached.

To summarise, due to the short period of the trail and the varying outside air temperatures, accurate annual kWh usage is difficult to extrapolate. However, EMC Renewable is confident and can demonstrate that with an average percentage saving of 20.5% the Coolnomix would have a **return of investment of under 36 months**, when run for the full course of a year.

5. Recommendations

Following on from the successful trial of the 3 Coolnomix units, the next step would be to install the solution permanently and depending on budget the quickest return on investment would involve identifying the best sites from the asset list and installing the Coolnomix accordingly.

Although, based on the approximate number* of suitable units across the portfolio, with estimated average savings utilising the Coolnomix unit, as per recorded results against average temperatures, the energy consumed by the sites refrigeration could see a reduction of over 207,099 kWh annually. (*based on 20 sites).

For further information and to discuss how we can help your business, please find our contact details at www.emcrenewables.co.uk