



**COOLNOMIX™ ENERGY CONTROL SYSTEM
REFRIGERATION PERFORMANCE REPORT FOR SHINE & SHINE
FOOD CO.**





EXECUTIVE SUMMARY

Shine & Shine Food Co. invited Agile8 Consulting Limited to carry out an investigation to confirm the energy-saving delivered by the **COOLNOMIX™** Optimized Refrigerant Supply (ORS) technology when used with a modern walk-in refrigeration unit.

The **COOLNOMIX™** device is an active energy controller which uses a comparison of the room temperature and cold supply air temperature to optimise the running time of the compressor without affecting the walk-in refrigerator space temperature. The compressor is the main power consuming component in any air-conditioning system.

For this test a **COOLNOMIX™ AR-01** was installed on 11th June 2013 on a newly installed 750 ft.² walk-in refrigeration unit. Here the **COOLNOMIX™** unit worked with a 4.4 kilowatt (5.8 hp) compressor used to deliver cooling to this walk-in refrigeration unit. For the purposes of the test the **COOLNOMIX™** unit was set to operate at a working temperature of 2°C.

Comparative energy consumption tests were carried out on a 24 x 7 basis over three days commencing Tuesday, 18th June 2013 using the **COOLNOMIX™** equipped 750 ft.² walk-in refrigeration unit and an identical 750 ft.² walk-in refrigeration unit with the conventional thermostat also set to 2°C.

Power consumption measurements were made using two WattsClever EW4006 visual power monitors. At the same time Shine & Shine monitored temperature levels in the two subject walk-in refrigeration units.

At the conclusion of this three-day test test it was confirmed that the **COOLNOMIX™** delivered refrigeration related energy saving was **24.5%**. At the same time excellent temperature stability was maintained in both of the subject walk-in refrigeration units.

	Without COOLNOMIX	With COOLNOMIX	% REDUCTION
June 21st	69.29 kwh	52.29 kWh	24.5%



1. INTRODUCTION

The **COOLNOMIX™** energy control system makes use of a patent applied for technology called Optimized Refrigerant Supply (ORS). Developed for use with air-conditioning and refrigeration units, **COOLNOMIX™** is designed to reduce operational costs by minimising energy consumption while maintaining required temperature levels in business critical environments such as those encountered in the food industry.

Once the **COOLNOMIX™** unit has achieved a required refrigeration temperature, energy savings are delivered by reducing the running time of the compressor which is the main energy consuming component in any refrigeration system.

In operation, the **COOLNOMIX™** AR-01 energy control system makes use of two temperature sensors. Important tasks include:

- Firstly, **temperature control at the required level.** The **COOLNOMIX™** unit will ensure that the compressor runs all the time until a required refrigeration temperature has been achieved (e.g. 2°C).
- Secondly, **optimising energy savings.** **COOLNOMIX™** achieves this by controlling temperatures more effectively than a conventional thermostat. A conventional thermostat with the set point of 2°C might allow temperatures to range between 1°C and 4°C. By contrast, **COOLNOMIX™** would attempt to maintain temperatures within +/-0.25°C of a target temperature.
- Thirdly, **eliminating evaporator coil icing** and the need for any defrosting cycle. This is achieved by placing the **COOLNOMIX™** cold temperature sensor in between the fins at the base of the evaporator coil (where ice start to form). In this situation the **COOLNOMIX™** cold temperature sensor will prevent any compressor restart until all ice has been removed.





2. COOLNOMIX INSTALLATION

A single **COOLNOMIX™** energy control system was installed to operate in conjunction with a 750 ft.² walk-in refrigeration unit as shown in Figure 1 below.

The energy consumption performance of this **COOLNOMIX™**-equipped walk-in refrigeration unit identified as No 1128 was then compared with that of an identical walk-in refrigeration unit identified as No 1133 over a three-day period between Tuesday, 18th June 2013 and Friday, 21st June 2013.



Figure 1. COOLNOMIX Installation

Two WattsClever EW4006 visual power meters were used to monitor power consumption in the two subject walk-in refrigeration units. These WattsClever units were connected wirelessly to current clamps attached to each of the compressor units. These visual power monitoring units served to monitor a single phase of each three-phase supplied compressor in providing provide an hourly update of the actual power consumption.



Meanwhile, Shine & Shine logged temperature data within the two subject refrigeration units once every 15 minutes throughout the trial period.

3. RESULTS OBTAINED

Figure 2 below indicates the energy consumption situation at the conclusion of the three-day evaluation of **COOLNOMIX™**.

It can be seen that the walk-in refrigerator Number 1133 operating in normal control, non-energy-saving mode consumed 69.28 kW of electricity. By contrast the **COOLNOMIX™** equipped walk-in refrigerator No 1128 consumed 52.29 kW of electricity during the same time frame.



Figure 2. Final Power Consumption Figures

At the same time temperature measurements provided by Shine & Shine and taken every 15 minutes throughout the testing period provide an interesting comparison of the temperature stability within each of the two 750 ft.² walk-in refrigeration units.



Figure 3 below shows the profile of these temperatures gathered between 10:30 AM on Tuesday, 18th June 2013 and 10:30 AM on Friday, 21st June 2013.

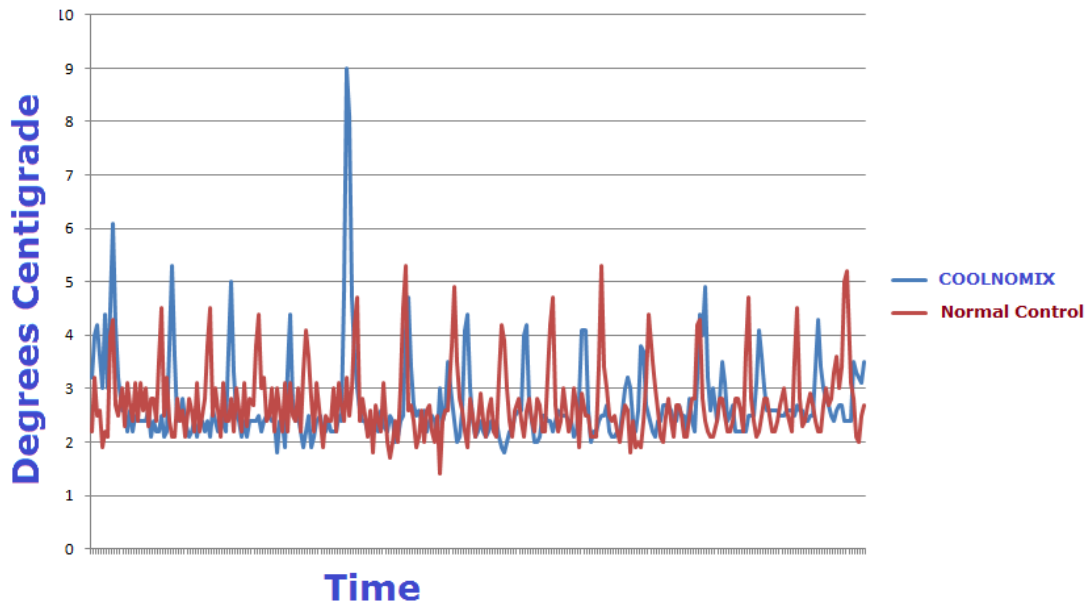


Figure 3. Walk-in Refrigeration Temperature Profiles

3. ANALYSIS OF RESULTS

3.1 Power Consumption Analysis

Analysis of the power consumption figures delivered by the two WattsClever visual power monitors indicates a significant energy saving during the three-day comparative test as follows:

Power consumption of the No 1133 walk-in refrigerator = 69.28 kwh
Power consumption of No 1128 with energy-saving = 52.29 kwh

Total energy-saving = $(69.28-52.29)/69.28 * 100\% = 24.5\%$

In estimating the annualised operating cost reduction delivered by the COOLNOMIX™ unit the above energy consumption figures need to be



multiplied by the square root of three (1.732) to derive a three-phase power consumption figure.

Thus the three-day energy-saving equates to:

$$(69.29 - 52.29) * 1.732 = \mathbf{29.44 \text{ kWh}}$$

As the walk-in refrigerator runs on a 24 x 7, 363 days per year basis the annual saving will be = $29.44 * 365 / 3 = \mathbf{3,582 \text{ kwh}}$.

3.1 Temperature Analysis

Referring to Figure 3 and taking into account the temperature variations due to operational requirements there is a remarkable similarity temperature profiles of unit No 1133 and the **COOLNOMIX™** equipped No 1128 walk-in refrigerator.

In fact, an analysis of the average temperatures in each of the walk-in refrigeration units between 10:30 AM on Tuesday, 18th June 2013 and 10:30 AM on Friday, 21st June 2013 shows the following results:

No 1133 average temperature	= 2.72°C
No 1128 average temperature (with COOLNOMIX™)	= 2.71°C.

4. CONCLUSIONS

Overall, the results of this trial indicate that the **COOLNOMIX™** energy control system can be very effective in reducing operating costs and delivering significant energy savings while preserving temperature levels within operational requirements.

The subject trial was carried out during a typical, busy working week within a business critical environment where temperature stability is a major concern.



4. REPORT ACCEPTANCE

Shine & Shine Juice Company had invited Agile8 Consulting Limited to demonstrate the performance of the **COOLNOMIX™** energy control system when installed on a 750 ft.² walk-in refrigeration unit.

During this three-day trial the average temperature within the subject walk-in refrigeration unit was **2.71°C** and the final energy saving was as follows:

	Without COOLNOMIX	With COOLNOMIX	% REDUCTION
June 21st	69.29 kwh	52.29 kWh	24.5%

Shine & Shine Juice Co.
Company

Agile8 Consulting Limited
Company

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