The Customer

Outback Jacks Northbridge

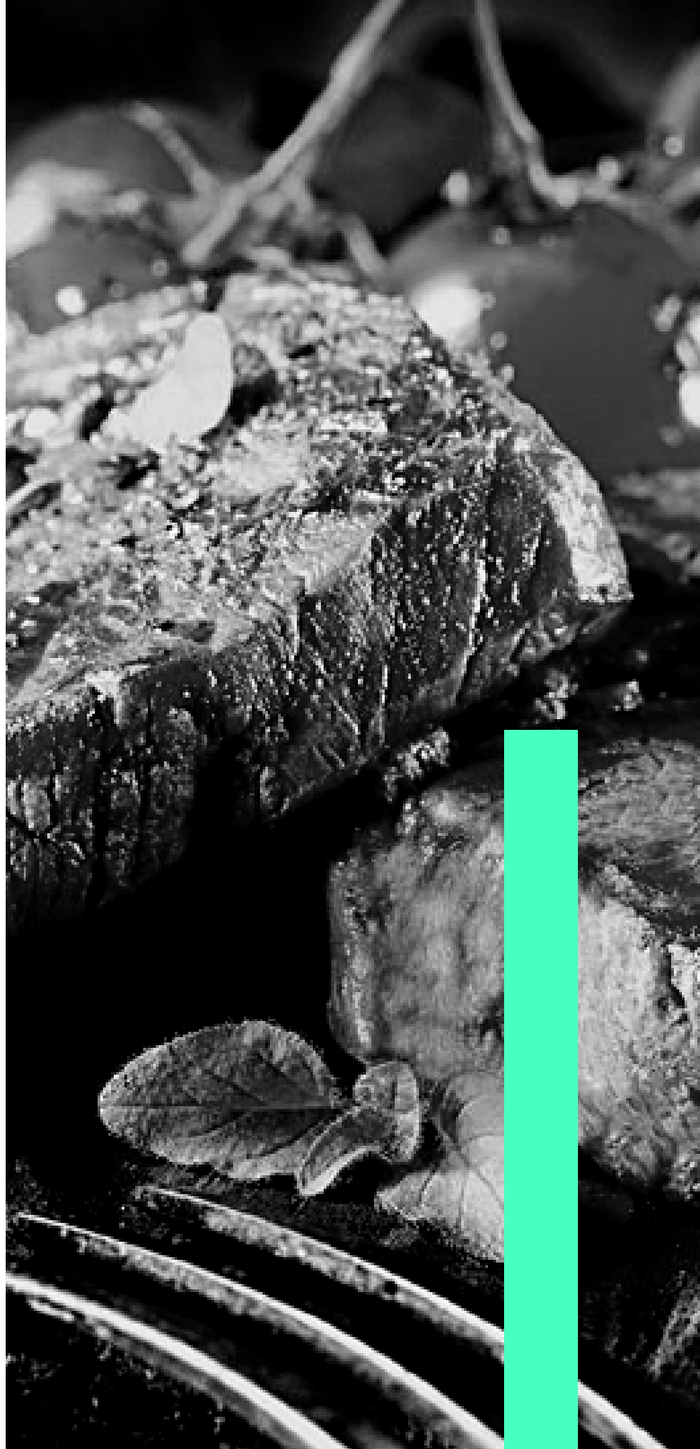
Outback Jack's Northbridge is part of a franchise chain of restaurants that offers relaxed casual dining with full bar facilities and the largest range of steaks on any menu in the world, as well as being the industry leader in serving Australian game meat.

Voted Perth's #1 steak house on Trip Advisor and winner of Entertainment's Gold Award for Casual Dining, the restaurant is known for its tender steaks and ribs char-grilled in an open kitchen.

Outback Jacks Northbridge became an Engixo customer after hiring our company to attend to a breakdown on their cold room in 2015. As a result of that first service, they engaged in an ongoing maintenance contract to reduce breakdowns and systematically replace all old equipment.

With all old equipment replaced and the costs with breakdowns eliminated, Outback Jacks Northbridge owner and restauranteur Jake Strauss was looking for further opportunities to improve energy efficiency and reduce costs whilst maintaining an award-winning service in the hospitality industry.

To cater the customer needs, our team suggested a hydrocarbon retrofit case study to be carried out on the main cool room to determine the direct efficiency gains from an operational refrigeration plant.



The goal is to reduce the overall energy consumption by up to 20% when running on an M50 drop-in replacement refrigerant in the Outback Jacks Northbridge cool room.

The Project

In previous hydrocarbon retrofit case studies we have found that the we were able to reduce the overall energy consumption by up to 20% when running on an M50 drop-in replacement refrigerant, therefore our core predictions for this feasibility study were:

- Reduction of overall energy consumption by approximately 20%
- Reduction in refrigerant charge by 50%
- Similar operational characteristics to the original R22 refrigerant
- ROI (return on investment) of less than 3 years

Plant monitoring equipment was installed on the refrigeration system for 8 weeks to record all operational data and power consumption being 7 weeks using the regular R22 and the last week using M50. Power and plant monitoring equipment was used to record operational data and energy consumption before and after retrofit works to give accurate results and eliminate estimations.

SPECIFICATION SUMMARY

Outdoor Unit Model: Kirby KN028MH1-1
Indoor Unit Model: Kirby KCR32
Cooling Capacity kW: 2010w @40°C
Unit HP Rating: 1hp
Cooling Input power kW: 1650w
Voltage: 240v
Design Run Load Amps: 7 Amps
Expansion Valve Type: Thermostatic
Energy Efficiency Ratio: 1.22
Compressor Displacement: 26.8cc
Compressor Type: Hermetic Reciprocating with CSR Motor
Refrigerant Type: R22
Refrigerant Charge: 2.4Kg

Plant monitoring equipment was installed on the refrigeration system for 8 weeks to record all operational data and power consumption, being 7 weeks using the regular R22 and the last week using M50.

The Results

The graphs on the right show the average weekly ambient temperature v's refrigeration plant power consumption, confirming a directly proportional relationship.

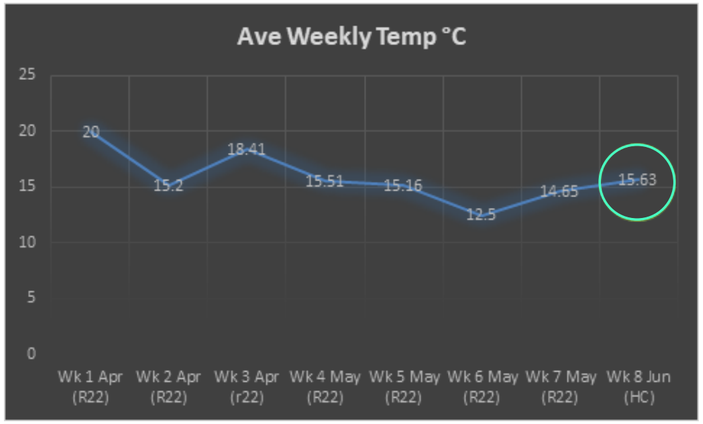
Denotes the recorded week following the hydrocarbon retrofit.

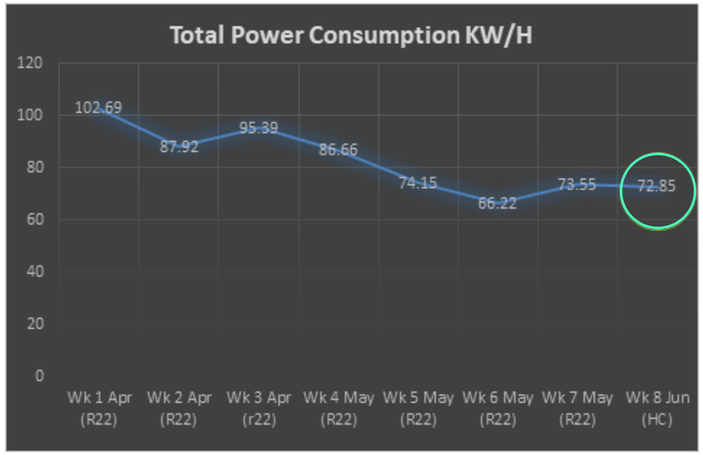
- Week 1 - 7 Plant monitoring on R22 refrigerant
- Week 8 Plant monitoring on hydrocarbon Engas M50 Refrigerant

After analysing the test data, we could confirm as expected that the energy consumed by the refrigeration plant was directly proportional to the weekly average ambient temperature.

This is due to:

- Raised latent heat and operational pressures in the outdoor unit condenser;
- Additional ambient heat load on the building fabric;
- Additional heat load from room air changes during warmer ambient conditions.



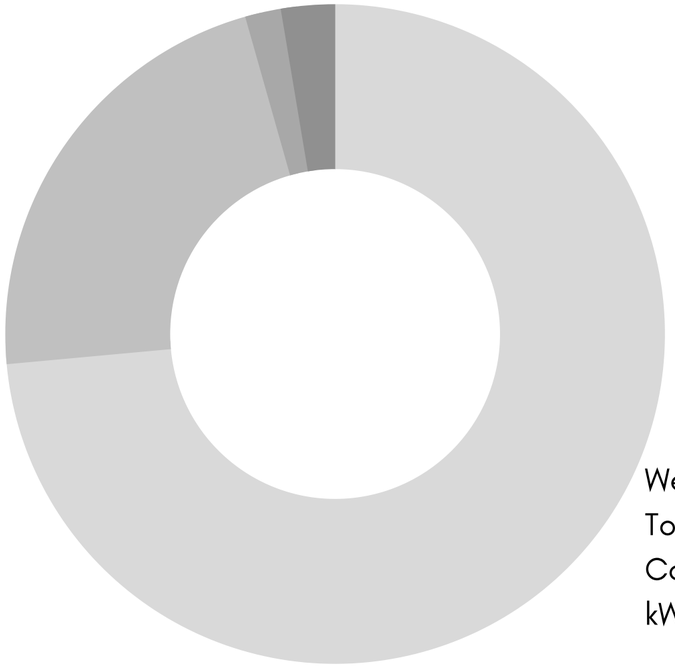


The chart below shows the average weekly current draw from the compressor and the total system, and the cool room plant monitoring results. This is shown as a comparison between week 4 and week 8.

R22 Average Compressor Current: 2.07

R22 Average Total System Current: 3.11

Previous Cool Room Weekly Running Cost @ $0.30 / kW/h: $26.00

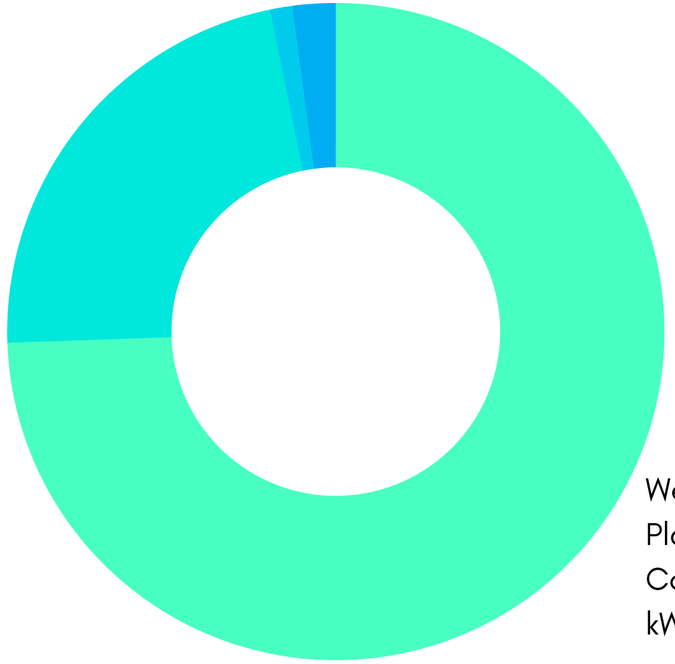


Week 4 R22 Total Plant Power Consumption kW/h: 86.66kW/h

M50 Average Compressor Current: 1.07

M50 Average Total System Current: 2.07

Previous Cool Room Weekly Running Cost @ $0.30 / kW/h: $21.85



Week 8 M50 Total Plant Power Consumption kW/h: 72.85 kW/h

Operation Log Using R22

Suction Pressure	1.98 Bar (-15°C)
Suction Pipe Temperature	6.6°C
System Superheat	21.6K
Discharge Pressure	12.57 Bar (35°C)
Discharge Temperature	58.4°C
Discharge Superheat	23.4K
Liquid Line Temperature	38.1°C
Liquid Subcooling	3.1K
Compressor Running Amps	4.76A
Total Amp Draw	5.97A
Room Temperature	4.85°C
Room Pull Down Rate From 11 to 4 °C	15.35 mins
Refrigerant Charge	2.4Kg

Operation Log Using M50 (Hydrocarbon)

Suction Pressure	1.75 Bar (-18°C)
Suction Pipe Temperature	10.6°C
System Superheat	28.6K
Discharge Pressure	12.76 Bar (38°C)
Discharge Temperature	50.8°C
Discharge Superheat	12.7K
Liquid Line Temperature	35°C
Liquid Subcooling	2.6K
Compressor Running Amps	4.3A
Total Amp Draw	5.6A
Room Temperature	4.48°C
Room Pull Down Rate From 11 to 4 °C	15.21 mins
Refrigerant Charge	1.2Kg

*The tables above show plant operational data for week 4 running on the R22 refrigerant and week 8 running on the drop-in replacement hydrocarbon Engas M50

500Kg
Cool Room Annual CO2 Reduction

718.12kW/h
Annual Energy Savings

2.3 Years
Return on Investment (ROI)

13.81kW/h	Total Weekly Consumption Savings kW/h
16%	Total Direct Savings %
$215.80	Total Annual Cost Saving
$500.00	Total Cost of Retrofit Works

Our Conclusion

The retrofit works have been carried out safely, with the flammable refrigerant hazard management being imperative to the project.

In conclusion we have found that with a total direct saving of 16%, carrying out a hydrocarbon retrofit on this cool room refrigeration system was a low-cost direct saving for the customer with a very appealing ROI of 2.3 years.

Our previous retrofit case studies in air conditioning systems have shown higher direct energy savings of up to 28% but due to the longer running times of cool room plant the overall low ROI of less than 2.5 years makes this a viable option for the remaining air conditioning and refrigeration systems on site. In addition to the direct savings that the hydrocarbon refrigerant will bring, there are also indirect savings to take in consideration but have not been included in this report such as:

- Reduced refrigerant change - Half of the original charge required compared to R22
- 75% cost reduction per Kilogram of refrigerant
- Lower plant repair costs - Refrigerant M50 has a zero-ozone depletion potential and as such can be released without any environmental impact.

With the above direct and indirect savings taken into consideration we can predict future projects to have huge cost and environmental savings especially with larger plant and equipment and look forward to generating these savings for our clients.