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ENGAS HYDROCARBON REFRIGERANT CONVERSION REPORT

NATURALISTE VINTNERS

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NATURALISTE VINTNERS

Information taken from www.naturalistevintners.com

"Naturaliste Vintners is a dedicated, state of the art contract winery. Our custom crush winemaking facility was specifically engineered to optimise winemaking for small to medium sized parcels of premium fruit.

Naturaliste Vintners is a full service facility, which allows small to medium producers to benefit from NV's economies of scale, while also giving them access to all the right equipment and expertise. Each client enjoys the ultimate flexibility of not being locked into a production level needed to justify a winery. Our complete focus is your winemaking. The success of our clients is the driving force for the success of Naturaliste Vintners.

Our highly qualified and experienced winemaking team is led by Senior Winemaker and Director Bruce Dukes (B. Sc. Agric UWA; M. Sc. Vitic.Enol. UC Davis). The NV team optimise wine quality with a sense of style and balance which pays respect to the traditions of the Old World as well as exercising the freedom and science we enjoy in the New World.

We work closely with our clients to ensure that their wines are made in the intended style. Each parcel of fruit is treated as a unique entity, which has complete and transparent computerised records.

Wine styles are fine-tuned to suit our client's requirements, ranging from hand- picked, whole cluster pressed, barrel fermented and matured wines, to aromatic red wines matured with micro-oxygenation and oak alternatives.

We have a proven track record with highly successful producers. We are proud of our recent success in winning the 'Best Winemaking Facility' at the 2010/2011 WA Wine Industry Awards. Our Senior Winemaker, Bruce Dukes, was awarded "Best WA Winemaker 2011" by Wines of Western Australia. "

Naturaliste Vintners Philosophy

"Our total focus is on integrity, purity, quality and service.

We approach viticulture and winemaking as a holistic entity. We strive to conduct ourselves using best practices in winegrowing which are environmentally sustainable.

We specialise in using multi-disciplinary science and experience to help us understand winemaking, and thus how we can improve on these processes. Particular areas of interest are on optimising and improving wine quality while minimising the use of processing aids.

Naturaliste Vintners will maintain and improve on ecological efficiency by exploring and challenging cleaner production methods. "

Naturaliste Vintners

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NATURALISTE VINTNERS

The Fluid Chillers Australia Brine Chiller installed at this facility has a nominal capacity of 180 Kilowatts utilizing two Bock Compressors and a Buffalo Trident twin circuit Condenser, model number LDV227B.

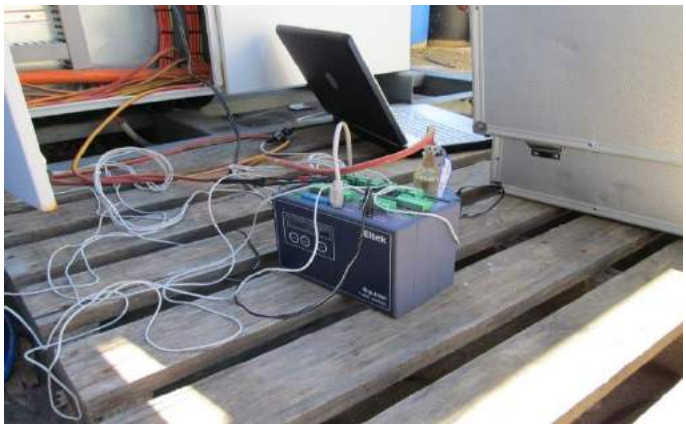
Since the installation of this Chiller approximately 2 years ago, it has never performed to the satisfaction of the client, and general observations indicated that the system was never commissioned properly, by the manufacturer or the installation company.

Head pressure was fluctuating wildy with condenser fans cycling on and off at random, even when that one particular circuit was off. This was in part caused by a non standard controller being used – and never set up correctly.

There was severe icing on the suction accumulators and also on the compressors, at times ice would be covering half of the compressor.

Prior to any work being carried out we fitted various, non evasive sensors linked to a Grant Squirrel 1200, 24 channel data logger, and left the logger on site for a period – to record an indication of the current running condition.

GRANT DATA LOGGER



On returning to site we downloaded the previous data, and exported it to MS Excel format – raw download data is available on disk if required. This 'before' data was saved to be compared with 'after conversion' data.

As stated previously the head pressure / fan speed control system was not operating normally – causing more issues rather that making it run better. As we

were unable to get any assistance from the manufacturer of the chiller as to commissioning data for these controls it was decided that the system be by-passed and a simple straight forward fan speed/head pressure control system was fitted.

Utilising two, twin stage pressure switches, switching each circuit, 1 fan on low speed, and rise in pressure 1 fan on high speed. This would maintain a far better head pressure and increase the performance of the system.

During the installation of the head pressure/ fan control, the existing refrigerant R22, was recovered into suitable recovery cylinders, and the core filters were replaced. The original lubricant was in very good condition, and therefore replacement was not needed.

One circuit was processed at a time, ensuring continued operation if required. Both circuits were subjected to extended deep vacuum to ensure complete removal of the original refrigerant.

Both circuits were leak and pressure tested, then charged to the correct charge weight with Engas M50 Hydrocarbon Refrigerant.

The charge was balanced, and adjustments were made to the TX valves as necessary.

Further extensive leak tests were made, the unit was fully labelled, and left running.

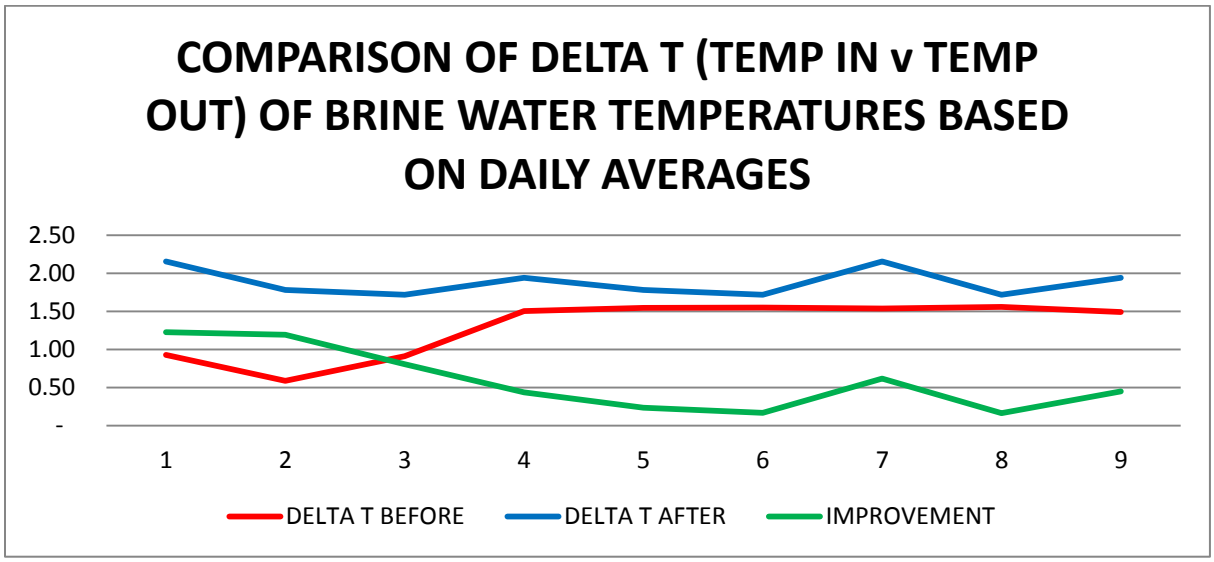
Returning to site some weeks later, the 'after' data was downloaded from the Grant Data Logger, verified then exported to Excel format.

With both sets of data (before and after) any readings taken when the unit was not running or where the unit had cycled off were eliminated – basically it's no fun reading loads of zero's.
The data was then compared. Whilst recordings of the following were taken – the ones in red indicate they are more to assist us, than give you a mass of unnecessary data.

1 Condenser Air On Temperature
2 Condenser Air Off Temperature
3 Suction Line Temperature
4 Discharge Line Temperature
5 Liquid Line Temperature
6 Brine return Temperature
7 Brine supply Temperature
8 One Phase of the power supply – in AMPS

From channel 6 (Brine return Temperature) and channel 7 (Brine supply Temperature) we can derive the Delta T – which indicated how much actual work – or cooling the Chiller is accomplishing.
Taking the typical daily averages, the following information with regards to the Delta T was established.

DELTA T BEFORE	DELTA T AFTER	IMPROVEMENT
0.93	2.16	1.23
0.59	1.78	1.19
0.91	1.72	0.81
1.51	1.94	0.44
1.55	1.78	0.23
1.55	1.72	0.17
1.54	2.16	0.62
1.56	1.72	0.16
1.49	1.94	0.45



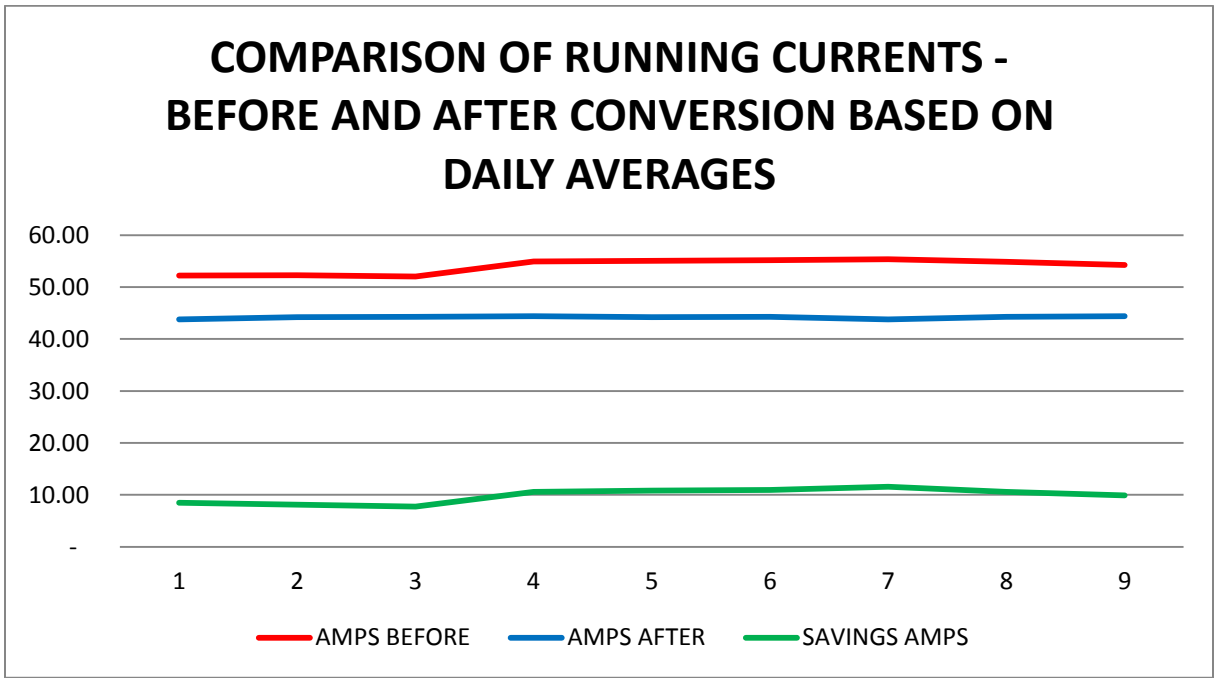
We then compared the running current, based on the readings taken from phase one of circuit one.

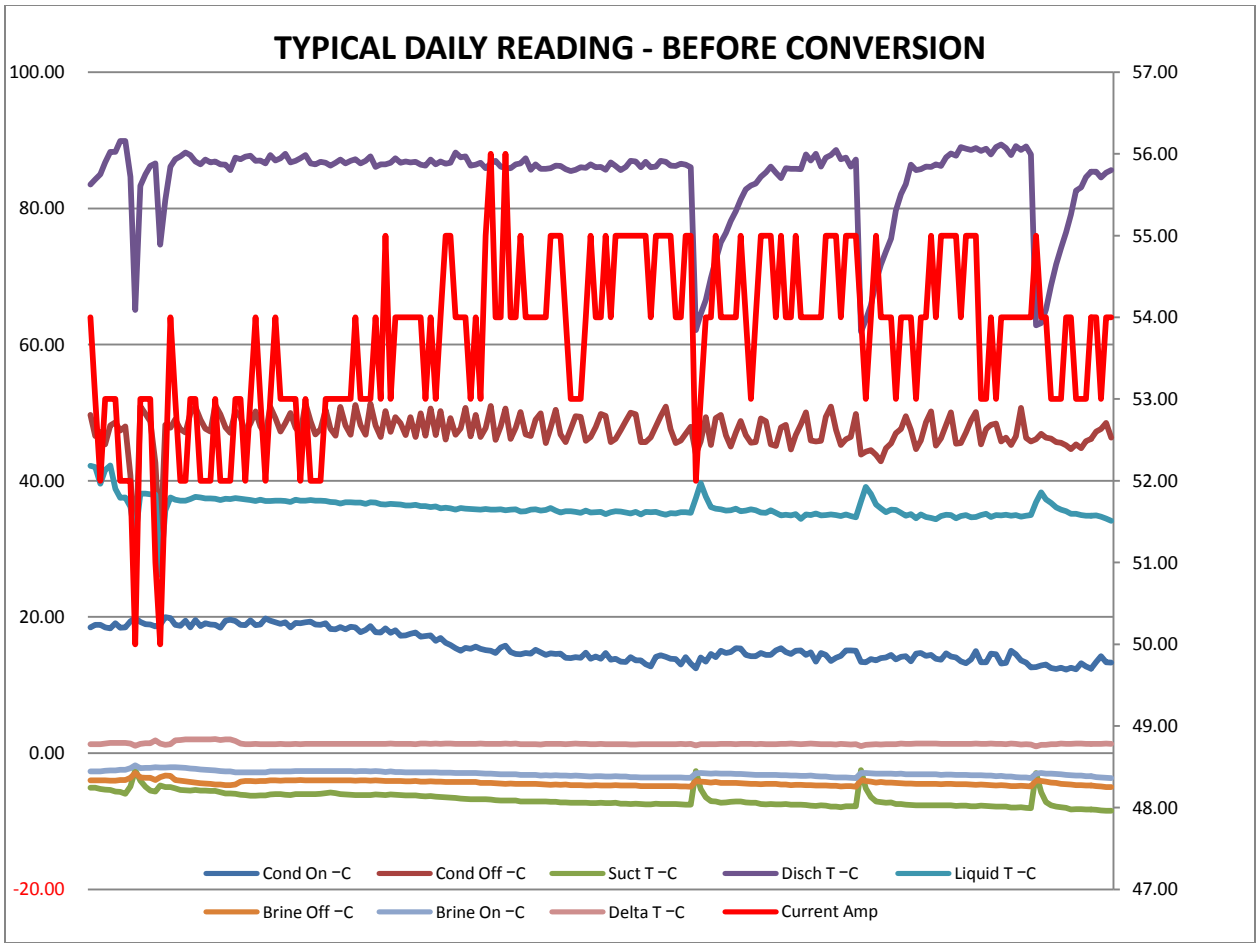
We did not record the running currents/times of the condenser fans, as we – and I believe the client was also aware – that they were set up wrong in the first place, however after looking at the performance data we believe that the system, with better cycling of the condenser fans, will also result in energy savings.
The before and after current readings were:

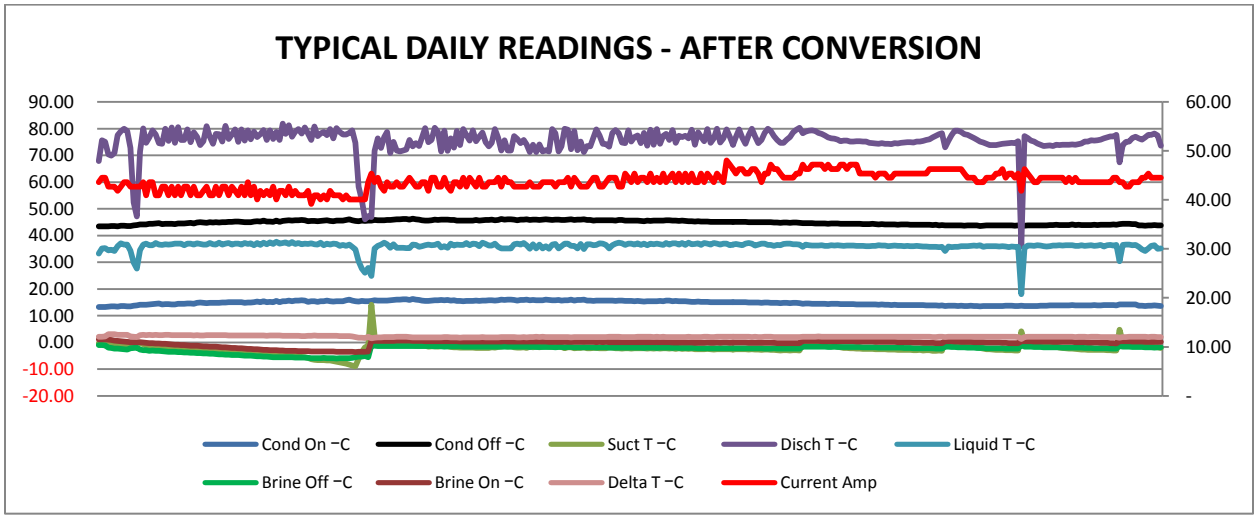
AMPS BEFORE	AMPS AFTER	SAVINGS AMPS	PERCENT
52.25	43.79	8.46	16.19
52.31	44.22	8.09	15.47
52.03	44.27	7.77	14.92
54.92	44.38	10.54	19.20
55.06	44.22	10.84	19.69
55.20	44.27	10.93	19.80
55.36	43.79	11.57	20.90
54.87	44.27	10.60	19.32
54.26	44.38	9.88	18.21

This gives the average readings of the following:

AMPS BEFORE	AMPS AFTER	SAVINGS AMPS	PERCENT
54.03	44.18	9.85	18.19

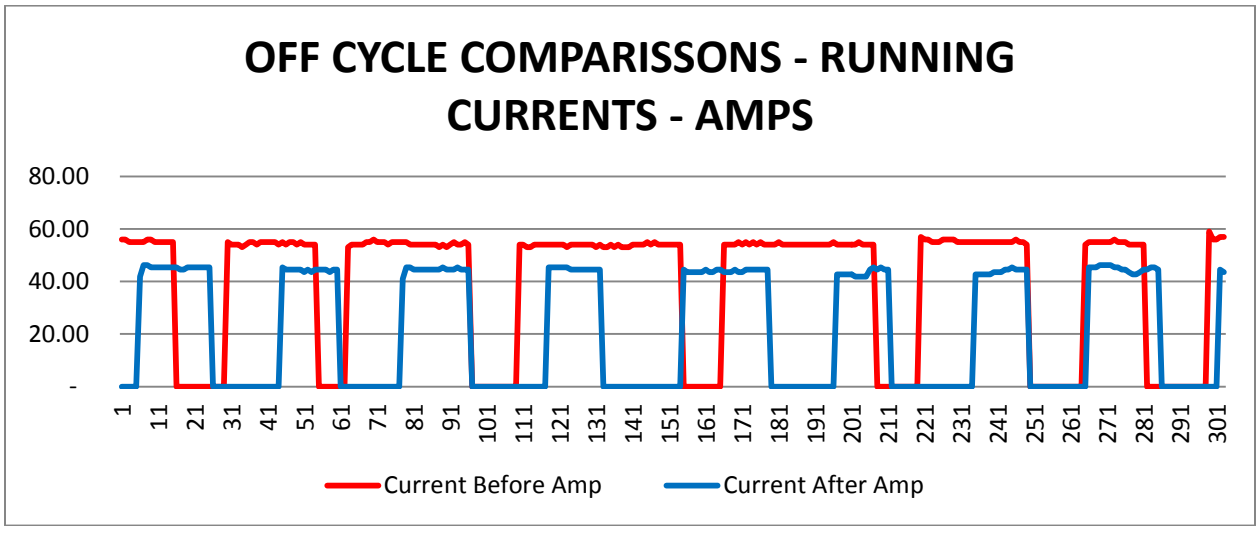






Referring back to the raw data, before we eliminated the zeros, we then analysed the 'off cycle' which reflects on the faster cool down times of the HC refrigerants.

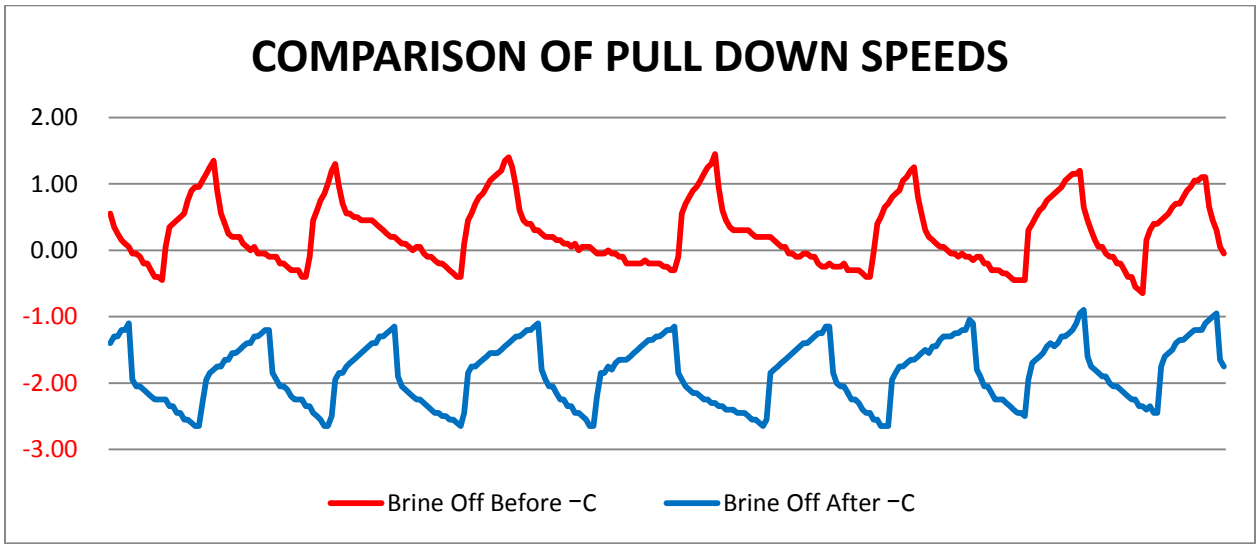
The graph below clearly shows that over the same period – after the conversion the system was 'off cycle' far more than when running on R22. This was confirmed by the owner/operators – who had noted that whilst the brine was always down to the correct temperature – the system appeared to be 'off' more than before.



Using the same readings, and gaining average running current over the same periods – the figures are as follows

AVERAGE CURRENT BEFORE	AVERAGE CURRENT AFTER
38.31	21.40

So not only is the HC refrigerant pulling the system down to a lower set point, the system is also pulling down faster, see graph below.



Conclusion

The Energy Saving based on the recorded data and taking into account actual power savings appears to be 32% at the point of conversion."

Naturalist Vintners Barrel Storage Room (Cool room)

The Barrel Storage Room is cooled by one Bitzer Compressor Model 4H 15.2Y which is connected to two Indoor Buffalo Trident Evaporators. This system was operating on the Chemical Refrigerant R134a. This room is controlled by a digital thermometer which is set at 14 degrees Celsius.

The R134 was reclaimed and replaced with Engas M30 Hydrocarbon Refrigerant. The measurement of the energy saving was accomplished by manual readings taken from Fluke Electrical Multi Meters and Digital Thermometers.

Conclusion

The Energy Saving based on the recorded data and taking into account actual power savings appears to be 21 % at the point of conversion."

-END OF REPORT-