

PnP Centre Point goes natural refrigerant



From left to right Dr Wolsey Barnard CEO Sphere, Ray Feng-Ju Shih CFO Sphere, Raymond Ackerman Founder Pick n Pay, Sharkey Simons Regional Coordinator at Pick n Pay.

When Pick n Pay decided to install its first CO₂ trans-critical system in the Western Cape at their new store in the completely redeveloped Centre Point mall in Milnerton they picked Pro Active Refrigeration for the job. This was a joint effort between Pro Active Refrigeration, Matador Refrigeration and Sphere Solutions.

The decision to go for CO₂ racks reveals the big push for SA's large retailers to go 'green', and bring local stores in line with their global counterparts.

The Centre Point site had just gone under redevelopment with the demolition of the existing shopping facility to make way for a modern retail centre. The contract value for the redevelopment is estimated at around R270 million and yielded 10 000m² of retail space.

Pro Active Refrigeration started on site on 23 July 2018 and, despite many challenges, was able to remain on schedule for the store opening date of 27 September 2018.

Environment friendly

The choice of CO₂ follows the international phasing out of CFC and HCFC refrigerants and the unknown future of their replacements. This has led the supermarket industry to look to alternative, long-term, future-proof energy-efficient solutions. Carbon dioxide (R744) is rapidly becoming the refrigeration industry's choice for retail and industrial applications due to its favourable environmental properties and efficiency.

CO₂ is a low global warming potential (GWP=1) refrigerant and an excellent choice when it comes to reducing greenhouse gas emissions. It provides high performance and has exceptional properties for heat reclaim, due to its high heat transfer

capabilities. CO₂ also has excellent volumetric efficiency (more than five times the cooling effect per unit volume of R22), resulting in reduced compressor and pipe sizes for the same cooling effect.

As important, CO₂ is widely available as a by-product of several industries and is drastically cheaper than Freon refrigerants. In Europe HFC prices increased 5 times in 2017 and by 2018 had increased 20 times. The price growing in proportion to the GWP. This has a great impact on South Africa as the countries we import from are phasing out HFC gases, creating a supply and demand dilemma and as a result sharp price increases.

An advantage when using a trans-critical CO₂ system is that it only uses CO₂ gas as opposed to a cascade system (generally R134a MT/CO₂ LT).

Another important reason to choose CO₂ is that it can be used safely in public spaces such as retail trading floors, where other natural refrigerants like ammonia are restricted.

Challenges & solutions

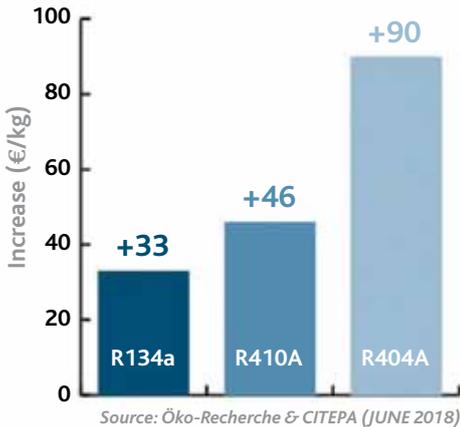
When Pick n Pay insisted that a trans-critical CO₂ system be installed in favour of the traditional sub-critical CO₂/134A refrigeration system it came with a number of challenges.

No delays were permitted, the cost had to be approximately no



The CO₂ transcritical refrigeration pack was built by Sphere.

Prices of commonly used HFCs across the supply chain in Europe



more than 10% higher than the previously quoted sub-critical system and no municipal water could be used to assist the gas cooler unit.

In addition, the refrigeration plant room is on the rooftop of the Mall which it shares with residential units while the trading floor is two stories below at the opposite end of the Mall.

A Sphere Solutions trans-critical booster parallel system was designed and built with 10 compressors, four of which run the medium temp, two doing parallel compression, three running the low temp and one satellite low temp compressor.

The system incorporates four variable speed drives one on each lead compressor. The hybrid gas cooler used includes 4 x 910mm EC fans, stainless steel piping and integrated Carel controls.

The entire refrigeration system is controlled and monitored by a Carel electronic control network, that enables remote monitoring and adjustments to be done 24/7. All evaporators are fitted with Carel electronic stepper expansion valves. Cabinets built to the trans-critical CO₂ spec were supplied by Colcab and installed by Recold. Refrigeration tubing to the shop floor is thick walled copper pipe specially imported by Matador Refrigeration and the pipe runs are over 100m each with a vertical lift of approximately 12m, double risers assist with oil return. High pressure piping to and from the gas cooler is schedule 40 stainless steel TIG welded and x-rayed.

Because of the residential apartments, the plant noise level had to be kept to a minimum. The location and direction of installation was thus considered when placing the equipment, 800mm EC fans



The dairy line-up with doors.

were selected for the adiabatic condenser for their low noise. The close proximity to the sea meant that all equipment had to be corrosion resistant.

As no municipal water was to be used in the adiabatic condenser a water harvesting system had to be designed and installed. Water is harvested in the basement from the A/C, cold/freezer rooms and cabinets. It is then filtered in a system designed and supplied by East Midlands Water and then pumped to the roof where it is stored and supplied to the gas cooler as needed.

Conclusion

As the site is relatively new the plant has only run for few months. Nonetheless, the initial indicators show good performance

levels. Merrick Smith, Pro Active's managing director says, **"We do expect there to be favourable energy savings from the system and we will continue to monitor it's progress."**

Meanwhile Pick n Pay has been happy with the result and is already fitting CO₂ trans-critical systems out at other sites. The whole CO₂ trans-critical project was a successful hands-on cooperation between Pro Active Refrigeration in Cape Town, Matador Refrigeration in Midrand and Sphere Solutions. The combined team notes that optimistic enthusiasm, a high level of cooperation and combined engineering talent ensured a successful project of a quality that their client has come to expect.

About Sphere:

Sphere Solutions is a Johannesburg-based, black owned sustainability company that focusses on expertly engineered solutions for the cooling environment that are designed to be future-fit. This is also its approach to purposeful business, insight, partnerships, and people.

"We are passionate and focused, and are conscious that every one of our actions must have a significant positive impact. We are mindful of the present and of the future, committed to practical idealism about the role we play in a changing world and the mindsets of all who live in it. We design with a conscience. We create with foresight. We are sustainable by design."

Sphere Solutions manufactures a green, technologically-advanced, customisable range of solutions for all heating and cooling needs. Using their engineering, technical and design expertise, Sphere Solutions produces unique products such as CO₂ trans-critical refrigeration packs, chillers and heat pumps, based on customer size and requirements.



Sphere.



For more information on this and future collaborations contact Maurice Robinson, director Sales & Marketing at Sphere.

email: maurice@spheresolutions.co.za | Cell: 083-285-9888 | Tel: 011-882-3000