



Improving energy efficiency through Cooling as a Service (CaaS)

Pick 'n' Pay & Energy Partners Refrigeration
Ceres, Western Cape Province

Through the installation of a new efficient refrigeration system, provided on a shared savings model, Pick 'n' Pay Ceres reduced average refrigeration energy consumption by 35%.

Challenge

Pick 'n' Pay (PnP) is a large commercial supermarket chain. The Ceres franchise was operating an end-of-life simplex refrigeration system which serviced significant cooling requirements, particularly in the frozen food and open display case sections. However, this existing system was inefficient and leaking refrigerant, which was leading to additional maintenance costs and operational losses. This led the owners to explore cost effective alternatives.

Solution

Energy Partners Refrigeration (EPR) compared the existing energy and maintenance costs to modelled and estimated future costs over the full life cycle of the refrigeration system. EPR determined that a new efficient refrigeration system could be installed at no upfront cost to the client, on a shared savings model, where EPR own, maintain and optimise the performance of the system. The life-cycle investment by the client is reduced by taking a portion of the cost savings each month. In this arrangement, PnP Ceres are guaranteed hassle-free refrigeration at a reduced rate over a multi-year term (~10-15 years). The service provided protects the client from any operational or maintenance issues on the refrigeration plant, improves the quality of clients' products through better temperature quality and control, and provides quicker response times with 24/7 active plant monitoring.

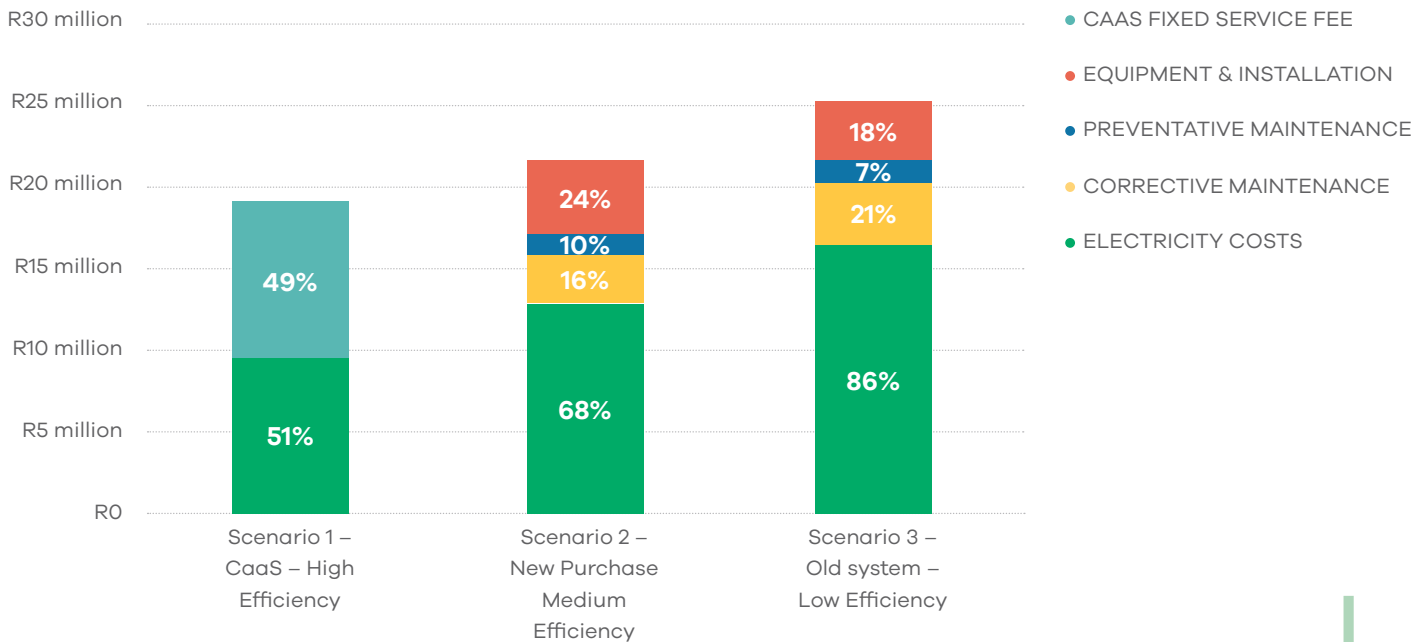
The specific technical solution selected was a proven air-cooled, direct expansion multiplex rack configuration, with design evaporation temperatures of -100C for the medium temperature loads and -320C for low temperature. The relatively new R407F refrigerant, which has a significantly reduced global warming impact when compared with the R22 that was being replaced, was used for the medium temperature component. Additionally, variable speed drives were installed on the lead compressors on each rack to provide stable capacity control and reduce start-up currents – translating into further energy savings.

Furthermore, to achieve the required efficiency, the following measures were implemented:

- Floating the condensing pressures down from the maximum design value when ambient temperatures allow.
- Maintaining the suction pressures at the highest level possible while maintaining evaporator temperature set points.
- Keeping evaporator superheat to a minimum by using electronic expansion valves.

A supervisory system was also installed which allows the EPR 24hr support team to continuously monitor the system, and ensure the required performance levels are maintained.

Illustrative Comparison – Total Project Costs



Business benefits

- Improved refrigeration system reliability, resulting in reduced stock losses and avoidance of reputational damage.
- Reduction of average refrigeration electricity consumption by 35%.
- Overall reduction in cost per refrigeration-hour of 30%.
- Ability to apply capital in other areas.
- Lower environmental impact from reduced energy consumption and refrigerant leakage.
- Reduced overhead requirements due to outsourced monitoring and maintenance.

For further business benefit

1. Visit the CaaS E-summit on current and future developments: <https://www.caas-initiative.org/>
2. Become a GreenCape member and receive industry updates, news and events info: <https://www.greencape.co.za/become-a-member/>

Lessons learned and future plans

Refrigeration and cooling accounts for a significant portion of the energy requirements for many commercial and retail businesses. There is significant potential for energy savings of ~15-35% through the replacement of older, end-of-life plants with bespoke and holistically designed systems. Due to the technical complexity, investments in these systems are often perceived as grudge buys as retailers are hesitant to take on the maintenance and performance risks and costs of these systems. This no longer needs to be a barrier, as the CaaS model ensures performance and reliability at a reduced rate over a long fixed term. A key to the significant cost savings potential of CaaS is the guaranteed optimised energy performance as this plays a greater role than capital and maintenance in the overall lifecycle cost of the refrigeration system.

CaaS also has strong applications for the industrial sector:

https://www.caas-initiative.org/wp-content/uploads/2020/10/201005_DrOetker_CS-1.pdf



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