Integral Display Case Technology Will Change the European Retail Landscape

Emerson has commissioned a study by an independent institute comparing two different refrigeration system architectures and by using a leading European discounter as a reference. The savings applied to the total store portfolio of the particular retailer from the entire life-cycle assessment were in the three digit million Euro range, in favour of the integral display case architecture. *See details overleaf.*

10 years life cycle cost savings from using R290 integral display case system architecture instead of a CO_2 remote rack	Saving
Investment	€29,204
Energy	€9,093
Service, maintenance, insurance	€6,429
Decommissioning	€2,014
3 days early opening	€1,800
Cost of shut down refurbishment	€1,800
Loss of performance due to leaks	€715
10 Years Total Saving / Store	**€51,055**
10 Years saving at typical European discounter with 10,000 stores world wide	**€510,548,544**

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The study focused on the medium temperature display cases of a typical European discounter store with 10 display cases per store and approximately 1,000 m^2 vending area. System A was designed as a remote display case architecture supplied by a centralized transcritical CO_2 rack. System B was designed as an integral display case architecture with integral compressors. Further details about individual assumptions are described below. All costs shown assume costs to the retailer.

Investment. This has taken into account all costs including planning, rack, free cooler, machine room, condenser and control. Display cases themselves are not included, but the cost adder for the integration of the refrigeration circuit into the integral cases has been taken into account. Determined lifecycle costs per store were as follows: System A: 142 k€; System B: 113 k€.

Energy consumption. Energy consumption is depending on ambient conditions. The figures shown are assuming the temperature profile in Munich/Germany, but other locations have been simulated as part of the sensitivity analysis. 149 k€ are the determined energy costs for the CO_2 system while the integral display case system accounts for 136 k€ over the lifespan of the systems. Around 80% of energy consumption accounts for compressor energy consumption, other factors include condenser/free cooler, pumps. Operational costs for the machine room, such as lighting, ventilation have not been considered. This would have increased the savings gap in favour of the integral system further.

Service, maintenance and insurance. The study assumed a fully comprehensive maintenance contract including regular service, hygienic cleaning, but also reactive maintenance according to guideline VDI 2067/1. The integral display case concept requires reduced maintenance compared to the remote system. Total determined costs were as follows:
System A: 35 k€; System B: vs 29 k€.

Decommissioning. The study has assumed that both systems will be taken out of service after 10 years.

3 days earlier opening & cost of shut-down due to refurbishment. According to market feedback, a store fully constructed of integral cases can be ramped up faster and in particular during refurbishment, shut-down may be completely avoided as this can be accomplished during night and week-end hours. Of course this greatly depends on other parts of the retail store operation. However, the assumption of 3 days earlier opening or avoided shut-down is considered conservative. Assuming an average daily turnover of 20 k€ and an EBIT of 3% results in an advantage of 1,800 € per store.

Loss of performance due to leaks. In line with market feedback, the remote system was assumed to show higher leak-rate than the integral display case system. Both refrigerants being of the natural type, emissions as such are not the issue. However, leakage frequently leads to deterioration of performance and systems tend to run with deteriorated performance, in this case with lower evaporating temperature, for quite a while prior to detection of the leak. It has been assumed that the remote system would run throughout its 10 year lifespan at a 2 K lowered evaporating temperature for an accumulated period of 1 year, leading to a 6% increase in compressor energy consumption during this period. Note that there may be additional reasons for why a system may run at lower evaporating temperature than designed.

For more details, see www.emersonclimate.eu

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FFR196-EN-1711