

Client: Valefresh

LPA – Liquid Pressure Amplification

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ValeFresh, based in the Vale of Evesham, Worcestershire, stores, ripens and packs fresh produce for some of the UK's leading supermarkets and food processors. It is part of Fresca Group, the country's largest privately-owned fresh produce supplier.

Smart Thinking Delivers Cool Dividends

An essential retrofit of critical refrigeration plant to meet the pending ban on R22 has produced big savings for a leading fruit and vegetable logistics business.

Smart thinking and a willingness to innovate has enabled ValeFresh, a leading UK fresh produce contractor, to meet targets for the removal of R22 refrigerants used to chill temperature-controlled holding rooms, without any downtime and avoiding a £1 million cost to replace the entire refrigeration system.

In a unique profit-sharing solution developed with refrigeration engineers, IRS Ltd of Bromsgrove, that took just four weeks to complete, ValeFresh was not only able to move to a compliant refrigerant but saved almost £30,000 on energy and maintenance in the first year.

ValeFresh, had commissioned the refrigeration plant at its 20,000m² Evesham facility in the 1990s, before there was general recognition of the damaging effect of HCFCs and before the introduction of legislation to control and limit their use.

The purpose-built facility includes extensive, modular, temperature-controlled chillers and ambient space to maintain perfect storage conditions for a range of fresh produce. Each holding area has to be controlled at precise temperatures between 0.5°C to 10°C depending on the type of fruit or vegetable being stored.

The direct expansion (DX) refrigeration plant consisted of two discreet systems, each served by a 12-cylinder Sabroe SMC compressor feeding 16 x 25Kw evaporators (Nominal), with air cooled condensers. Each of the systems served 50% of each holding area, giving some standby cover in the case of a plant failure.

Choices

The plant used R22 refrigerants and with the deadline for a complete ban looming, ValeFresh weighed up the options.

- They could continue to use R22 but, as it would be illegal to handle the refrigerant after the end of December 2014, any plant failure after that could be catastrophic for the business.
- They could replace the entire refrigeration system. In many ways this would have been an ideal solution, as a new plant with a primary/secondary system operating with glycol as the secondary refrigerant, would have delivered better operating efficiencies. But the cost, at over £1 million, and the impact of many weeks of disruption to the business ruled it out.
- The only remaining choice was to retrofit the existing plant to allow new, compliant refrigerants to be used.





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Working with IRS, who had been responsible for maintaining the plant for the previous 5 years, it was decided to explore the possibility of retrofitting each circuit in turn during the coldest and quietest time of year. Several weeks of trials showed that the business would be able to operate normally during this period with 50% available refrigeration. Planning was made easier by

Over the following weeks, a series of brainstorming meetings were held and IRS and ValeFresh's engineering teams analysed all aspects of the system to identify any potential weaknesses in the plan. One of the key findings was that the business was exposed to risk during busy summer months if one of the two compressors suffered catastrophic failure. The installation of a third, standby compressor would not only protect the plant but would make the retrofit process much simpler.

LPA

It was also decided to investigate the benefits of using LPA (liquid pressure amplification), which can, in some installations, enable refrigeration equipment to operate at more efficient levels by allowing the compressor discharge pressure to float with the ambient temperature. IRS had previously installed sub-metering at ValeFresh so that energy consumption of the refrigeration plant could be monitored closely. The data persuaded them that LPA would make a real contribution to energy savings and they backed their judgement by offering to fund part of the costs in return for a share of the savings.

"Businesses can be understandably hesitant to invest in technology like this as there is no clear-cut case for energy saving," said Dan Downes, Financial Director of IRS Ltd. "It varies from one installation to another and depends a great deal on the size of plant, its operating hours and the cost of electricity. "But in cases where we are confident that savings can be achieved, like this one, we are always willing to put our money where our mouth is by funding part of the costs."

ValeFresh Site Manager, Johan Van Deventer, explained that the installation of sub-metering gave them a better understanding of energy usage and enabled them to react more effectively.

"We realised just how inefficient the old systems were, so there was real pressure to do something about it, aside from the need to move away from R22," he said.

"We knew that the ideal would be to move to a glycol system, but the costs and the impact of such a major refit made it impractical. It made more sense for us to retrofit the existing compressors and consider liquid pressure amplification to reduce energy costs.

"But there was a cost involved and it is tough these days to get capital expenditure sanctioned, especially if the return is uncertain."

"IRS were so confident that LPA would work in this case, that they gave us an £18k discount on the cost of the system, with a 50% share of any savings generated.

"As it turns out, it was a great decision for them and for us and we are now considering extending the use of LPA in our plant."

Planning

The project was planned with military precision. February through March was identified as the ideal time to carry out the retrofit. It was historically the coldest period, when production demands were at their lowest.

The operation was going to involve extensive engineering works, so the opportunity was taken to replace, upgrade and improve components





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throughout the plant. A detailed survey showed that:

- expansion, isolation, access and solenoid valves required replacement
- compressor seals and gaskets needed to be replaced
- a standby compressor was essential to minimise risks during peak production times
- a gantry would be installed to speed any future compressor/motor replacement
- calculations showed that LPA would provide significant energy savings in this installation
- the correct choice of a replacement refrigerant would be critical

The retrofit

The retrofit operation began with research to find the best replacement refrigerants based on efficiency, longevity and cost as well as Ozone Depletion Potential (ODP).

Then, in December 2012, temperature trials were carried out to ensure that the decision to take one of the compressors off-line would not jeopardise production. With the trials successfully completed, the new compressor was ordered from Sabroe and, in January, IRS started work on pre-fabrication of all the replacement valves.

Work started on the retrofit of the first system as soon as the new compressor arrived at the end of January. This involved reclaiming the R22 refrigerant, removing the old compressor so that it could be returned to Sabroe for retrofitting, replacing it with the new compressor; installing the pre-fabricated valve assemblies and installing the LPA system. During the second week in February, the first system was pressure tested, evacuated, the new refrigerant was introduced and it was commissioned and run under observation for three days. The procedure was then repeated for the second system, using the retrofitted compressor with the original being returned for retrofitting and use as a standby for both systems.

The whole project took just under four weeks to complete, considerably less than estimated.

Mark Parson, founder and Managing Director of IRS, puts the success down to a strong working relationship between IRS, ValeFresh and subcontractors.

"We have been maintaining the ValeFresh refrigeration plant for 5 years now and have an intimate understanding of its strengths and weaknesses.

"Every maintenance visit is logged by our engineers in real time and all the details of any repairs, of components used or refrigerant replaced, are stored on our database. So we could analyse pretty accurately where improvements could be made. This knowledge served us well and helped us to deliver a great result for ValeFresh."

Johan Van Deventer agrees. "IRS has been a strong and proactive partner to ValeFresh over the past few years and the success of this project is a direct reflection of that relationship."





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The Results

Energy Saving

In the 12 months prior to the completion of the project, the energy cost of operating the system was over £68,000. But the first nine months since the project was completed have indicated an annual saving of £9,500 – representing an investment payback period of six years.

System Reliability

But while improvements in the system's efficiency, largely due to the use of LPA, have cut energy costs, even bigger savings have been made through improved reliability.

In the 12 month period prior to the operation, IRS spent 360 reactive hours on the plant, using 771 Kgs of refrigerant. This equalled a total spend of \pm 20,444.

But, in the 12 month since completion of the project IRS had to spend just 11.5 reactive hours on the plant, and no refrigerant was required. This equalled a total spend of £610.

Together, the improved energy efficiency and reliability have saved ValeFresh almost £29,500 in the first year.







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