Case Study:

Perfect partners for salmon production line upgrade

Dean & Wood supports CB Refrigeration.

Leading contractor CB Refrigeration has paid tribute to the flexibility and professionalism of equipment supplier Dean & Wood following the first phase of a major refrigeration overhaul at Labeyrie Fine Foods' Farne Salmon processing plant near Berwick-upon-Tweed.

The project involved the installation of a new production room and additional Individual Quick Freeze (IQF) tunnel, powered by a high-efficiency 92kW LT SCM Frigo Plug'n'Cool CO_2 refrigeration pack. The IQF process sees the salmon move through a tunnel of circulating cold air to freeze it quickly, efficiently and with minimal effect on cell structure to maintain food quality and yield.

During final installation it was discovered that the IQF tunnel delivered by the manufacturer was different to the quoted specification, meaning CB had to redesign part of the proposed system and controls. Dean & Wood was able to respond swiftly to the client's needs and offer full technical support as well as supplying the additional components required.

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Tom Hannaby, Managing Director of CB Refrigeration, said:

"SCM and Dean & Wood, in particular Nicola Smithson (Business Development Manager) worked very hard to ensure we had the best quality equipment delivered to a remote location and on time. Hayley Cattell (Group Sales Director) also supported the process by initially laying the foundations for CB to engineer a complete solution to a difficult problem the customer was facing."

The upgraded system is delivering energy cost savings of 66% compared to the previous system without compromising product yield, while CO2 emissions are reduced by 95 tonnes per year. Further phases of the work will see the two previously installed IQF tunnels converted to a CO_2 direct expansion (DX) system, futureproofing the entire production process and resulting in additional operational savings.

New custom evaporators were sourced by the end-user and built into the IQF, while the bespoke oil return system, designed by CB Technical Consultant Nick Franzen, uses a ¼-inch 'pick-up' line inside the suction return riser to maintain adequate refrigerant velocity in part load conditions. In addition to the 92kW pack selected at project design conditions, Dean & Wood also supplied new Danfoss CO_2 thermostatic expansion valves for the 2kW plate evaporators and Danfoss CCM electronic expansion valves for the 10kW coils, along with K65 pipework and EVU solenoid valves.

CB was first referred to Labeyrie in March 2021 and when this new project started they liaised closely with the customer. CB learned about all aspects of what the site produced, how it operated and what it needed to achieve from the potential investment. Labeyrie wanted to increase production capacity by adding a third IQF tunnel. The two existing 70kW tunnels operated from one dilapidated 140kW HFC pack system to a plate heat exchanger and a pumped secondary fluid consisting of a 77% water and 23% ammonia solution. The water/ammonia solution was pumped at -35°C to the two tunnels, which would go through an expensive daily flooded defrost.

It was important to the client to incorporate an additional natural refrigerant system capable of operating both the new IQF and one of the existing tunnels in the event the HFC plant failed. In line with its sustainability goals, Labeyrie also wanted to explore potential energy reduction and reduced maintenance. After extensive investigations into the operation and yield of the tunnels, CB looked at various options with the client to create a robust plan which incorporated clear and transparent energy and operational cost comparisons.

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The plan involved simplification of operation and future maintenance by using a DX CO_2 solution for each individual tunnel. It was demonstrated that a CO_2 (R744) DX system would be the best option, as it was the most energy efficient and reduced the complexity of the system. A plan was put forward to install a new DX system in Year 1, and then convert the two existing IQF tunnels to CO_2 DX in Years 2 and 3. The secondary system, using chilled ammonia/water, would then be decommissioned and scrapped. This will ultimately eliminate any single point of failure, deliver savings on energy costs and carbon emissions, and futureproof all three tunnels.

Working with the IQF manufacturer, CB developed additional control methods to ensure safe and considered operation of the system, while also reducing the need for high-energy defrost cycles.

- The net reduction in energy is more than 20% compared to the flooded defrost system
- Maintenance costs are reduced significantly, with no pumps or harmful fluids to maintain
- The cost of installation and capital equipment was reduced due to simplification
- Product yield is comparable to any traditional flooded IQF system.

Nick Franzen said:

"This was a very interesting project to work on, mainly because after we had evaluated all the different options, it soon became apparent that DX CO2 was the best solution for the customer. As far as we were aware however, at that time DX CO2 had not been used on an IQF tunnel and therefore we had no previous reference on how it should be done. This presented a few challenges and some creative thinking regarding the system oil management, and it also presented an opportunity to use CO2 components newly released to the market by Dean & Wood."

Client Verdict

Jim King, UK Group Engineer for Labeyrie Fine Foods, said:

"Many of the decisions made about the type of system to be used were based on the future; for example cost, maintenance, environmental impact, servicing and redundancy. CB returned a very comprehensive proposal addressing all our requirements - and several that we had not considered - to provide what we believed to be a comprehensive solution at a competitive price.

During the final installation we realised that the spec of the delivered tunnel was different to the quoted specification and this created a significant issue for CB, who had to redesign part of the proposed installation and controls. For me as the client it was no issue because CB ran with the changes and had a solution within a couple of weeks ready to implement, despite the need for extensive additional components.

The system continues to perform quietly and efficiently in the background, supplying our high-speed slicing lines through the Christmas campaign and providing major supermarkets with fresh smoked salmon."

Contractor Verdict

Tom Hannaby, Managing Director of CB Refrigeration stated:

"Throughout the project, we sourced not only the main equipment but all the components and materials from Dean & Wood, who always delivered and helped with best-in-class selections from its extensive portfolio of products."

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