CASE STUDY

DESIGN AND INSTALLATION OF AMMONIA REFRIGERATION PLANT FOR FIRST MILK

INTRODUCTION

Farmer-owned dairy production co-operative, First Milk, was looking for a new refrigeration system to run at its main live dairy site in Wales. Precise regulation of the water temperature of the water necessary for its everyday processes, including cooling its products to specification, which is vital for the successful operation of the dairy. On top of this, one of the co-op's core focuses is the sustainability and regeneration of the British dairy industry and First Milk wanted its new plant to keep emissions to a minimum.

CREATED A BESPOKE SOLUTION FOR FIRST MILK, USING THE LATEST HVAC TECHNOLOGIES TO DESIGN AND INSTALL A BESPOKE CENTRAL AMMONIA REFRIGERATION PLANT.

PROJECT OVERVIEW

J & E Hall worked closely with First Milk to align the changeover from the old system to the new plant with its annual dairy shutdown at its Haverfordwest site. This meant timings were tight - the new plant had to be installed and dry-tested in two days before operations started up again – there was no room for error.

The main plant includes two off inverter driven HallScrew HSO2028 compressors with Fridgewatch controllers, as well as a BAC CXVE type evaporative condenser to remove excess heat from the cooling system. The HallScrew compressors are designed to be compact and efficient, with low noise and vibration.

The new plant features a surge vessel station, which delivers liquid ammonia via gravity feed to a falling film water chiller. This allows the plant to cool chilled water from +6.0°C down to temperatures ranging between +0.5°C and +1.0°C, which is necessary for the dairy's process requirements.

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NEW AMMONIA PLANT FOR FIRST MILK

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BENEFITS

The new plant is set to hugely improve the operations of the First Milk dairy, it's a high-tech solution which optimises the dairy's performance, reduces energy use, increases efficiency and ultimately cuts costs.

Optimising performance

One of the key priorities for J & E Hall when contracted to design the plant for First Milk was to improve its performance through more efficient and cost-friendly temperature regulation.

J & E Hall's bespoke refrigeration solution utilises floating head pressure control, enabling adaptation to lower ambient conditions to optimise the plant's performance.

Saving energy

To align with First Milk's emissions goals the plant was designed to run on ammonia, one of the most efficient solutions in the market for both high and low temperatures.

Additionally, the plant uses an evaporative condenser to remove excess heat from the cooling system. Compared with air cooled condensers, an evaporative condenser requires a lower temperature.

Improving efficiency

As a result of the central ammonia refrigeration plant, the dairy now has a constant chilled water temperature of 0.5°C in all ambient conditions, assisting the dairy in processing cream and whey.

The HallScrew compressors used in the plant feature a high efficiency capacity control mechanism even at lower loads, which regulates capacity with a corresponding reduction in power input. Finally, the plant uses a common gravity vessel, which maximises the evaporator surface and ensure that all compressors operate at the same suction pressure, further improving efficiency.

KEY FACTS & STATS

- Around 412 tonnes less CO_2 emissions per annum produced versus the old plant.
- Ammonia coolant has zero environmental impact in terms of Ozone Depletion Potential (ODP) and Global Warming Potential (GWP).
- With the plant installed, the dairy now has a constant chilled water temperature of 0.5˚C in all ambient conditions.
- Cooling Capacity and Redundancy Benefits:
  - Factory load requirement at the required conditions: 1.5MW
  - Duty of refrigeration plant installed at the required conditions: 2.0MW
- Each compressor installed is suitable for providing 66.7% of the overall required duty.

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Nigel Roberts, Chief Engineer at First Milk, said:

"We chose J & Hall as the best provider for our climate needs. Having worked with our local branch for many years also gave us confidence that the maintenance and servicing would be well taken care of. We feel confident that our new chilled water plant will adequately meet the growth and any cooling requirements that new developments on the First Milk site present. The new ammonia system is a safe and sustainable choice for the future."

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