

# Freezer Plant Installation for Miller Food Service

## FOREWORD



Miller Food Service supplies ambient, chilled and frozen food to hospitality and leisure venues throughout Yorkshire. Responding to increased demand, they needed to expand LT storage with the addition of a new freezer plant. Refrigeration specialist Personal Refrigeration designed and installed the new system, prioritising low energy

consumption and running costs.

Instead of using standard technologies with only basic control options and intensive energy consumption, Personal Refrigeration developed a bespoke solution taking environmental impact and energy-efficiency into account.

## THE SOLUTION

Energy efficiency and optimal control of plant equipment and defrosting formed the primary objectives. The aim was to reduce energy consumption and operating costs whilst providing advanced, environmentally-friendly solutions.

Standard technology has high energy consumption and only provides basic control. As a result, custom technologies were adopted to provide variable speed compressor systems and advanced defrosting functionality. While inverter driven compressor PLC algorithms provide a custom isothermal, low-pressure hot

gas defrosting system.

A dual three-compressor LT freezer pack system serves multi-evaporators in the LT area and a small HT area. Evaporators were selected and split over two packs for contingency in case of single point failure. Compressor loading matched real time demand condition, to integrate the advanced tech designed in the solution.

Environmental considerations included refrigerant leak monitoring and independent plant shutdown on leak condition.

- Twin refrigeration LT packs for contingency with inverter driven lead compressor.
- High-efficiency evaporator coil design with reduced refrigerant volume.
- All electronic EEV, EPR and hot gas modulation valves for efficient operation.
- Multi point leak detection system for environmental consideration.
- High-efficiency condenser coil design with reduced refrigerant volume and EC fans.

## SYSTEM DESIGN

All bespoke control algorithms were written in-house for the entire project utilising Resource Data Management's (RDM) PLC software TDB. Strategies include monitoring and control of compressor loading, including inverter driven lead compressors.

- Monitoring and control of compressor loading - including inverter-driven lead compressor with floating condensing and evaporating temperatures.
- Monitoring and control of LT defrost algorithm with isothermal low-pressure hot gas defrost with auto change over to electric if required or hot gas failure. With the option to drive an electronic hot gas regulation valve.

- LT electric defrost for optimisation of residual heat algorithm from defrost heaters. Heaters can be used as needed (pulsed on/off) – reducing energy cost, and helping prevent unnecessary heat overspill from each evaporator, and ice formation on the ceiling.
- HT area cooling EEV and cooling cycle EEV via twin stepper controller with EEV driver.
- HT area EPR via twin stepper controller with EPR driver, with auto float and adjust for varying loads.
- Auto select HT defrosting between "off cycle" and electric, dependent on predicted coil frost algorithm.
- Energy monitoring with predicted running costs on DMTouch.

- High-efficiency condensers and evaporators with reduced refrigerant volumes.
- EC condenser fans.

### RDM Equipment

- 2x Intuitive PR0650TDB controllers with PR custom pack software.
- 6x Intuitive PR0652TDB controllers with PR custom LT and HT evaporator software.
- LT steppers to drive EEV and hot gas defrost modulation valve.
- HT steppers to drive EEV and auto adjusting EPR for higher evaporating temperatures under varying loads.
- 1x DM Touch.

## SYSTEM DESIGN BENEFITS

The custom isothermal, low-pressure hot gas defrosting delivered exciting results – as the advanced hot gas system overcame negative features associated with standard systems.

Thermal shock from high pressure changeover and the risk of liquid flood back were avoided because of the low-pressure operation of the defrosting phase. Modulation of the

hot gas keeps hot gas pressure in the evaporator below saturation point for sensible heat to be used to achieve ice removal.

Auto-set point adjustment of EPR's to varying loads in the HT storage area are also utilised. If the load in the HT storage area increases, the evaporating temperature will be lowered automatically to control the

additional load.

RDM's front-end control and monitoring system DMTouch, provides an overview of all assets and alerts staff to potential problems. It provides energy usage statistics and predicts budgets to facilitate energy management.

## ENERGY SAVINGS

System running costs can be proven, due to energy and site energy cost monitoring software installed on the DMTouch. Energy savings have been conservatively estimated to be 25-30%, based on the assumptions of compressor running times, with reduced system loadings and defrost costs.

*"The system installed here has been very reliable and has created a comfortable "frost free" and therefore safe environment for our staff. The control and automation side of the plant also means that it pretty much looks after itself."*

*"Our due diligence is also looked after by the monitoring system provided. Electricity bills are also noticeably lower than we would have expected. The team at Personal Refrigeration were a pleasure to work with, very professional and I'd highly recommend them."*

Gareth Wilson - Site Manager

