



## **A1 Engineering Solutions Ltd**

### **Case Study**

Marks and Spencer  
Cheshire Oaks  
Eco Store

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## 1. Cheshire Oaks – Eco Store

This sustainable flagship store opened in late 2012, and was designed to have a minimum environmental impact and to provide the lowest Carbon footprint of any store in Marks & Spencer estate. The challenge to all designers, installers and OEM's was to produce a finished product that met this aspiration whilst constructing one of the largest out of town stores in the chain.

An accompanying package of obligations made by M&S included –

- Environmental plans and promises for changes in the transport infrastructure.
- BREEAM Excellent status.
- To create more than 350 local jobs on completion.
- To complete an independent POE assessment of the installation and its operation as a true reflection on the target to objective success of the scheme.



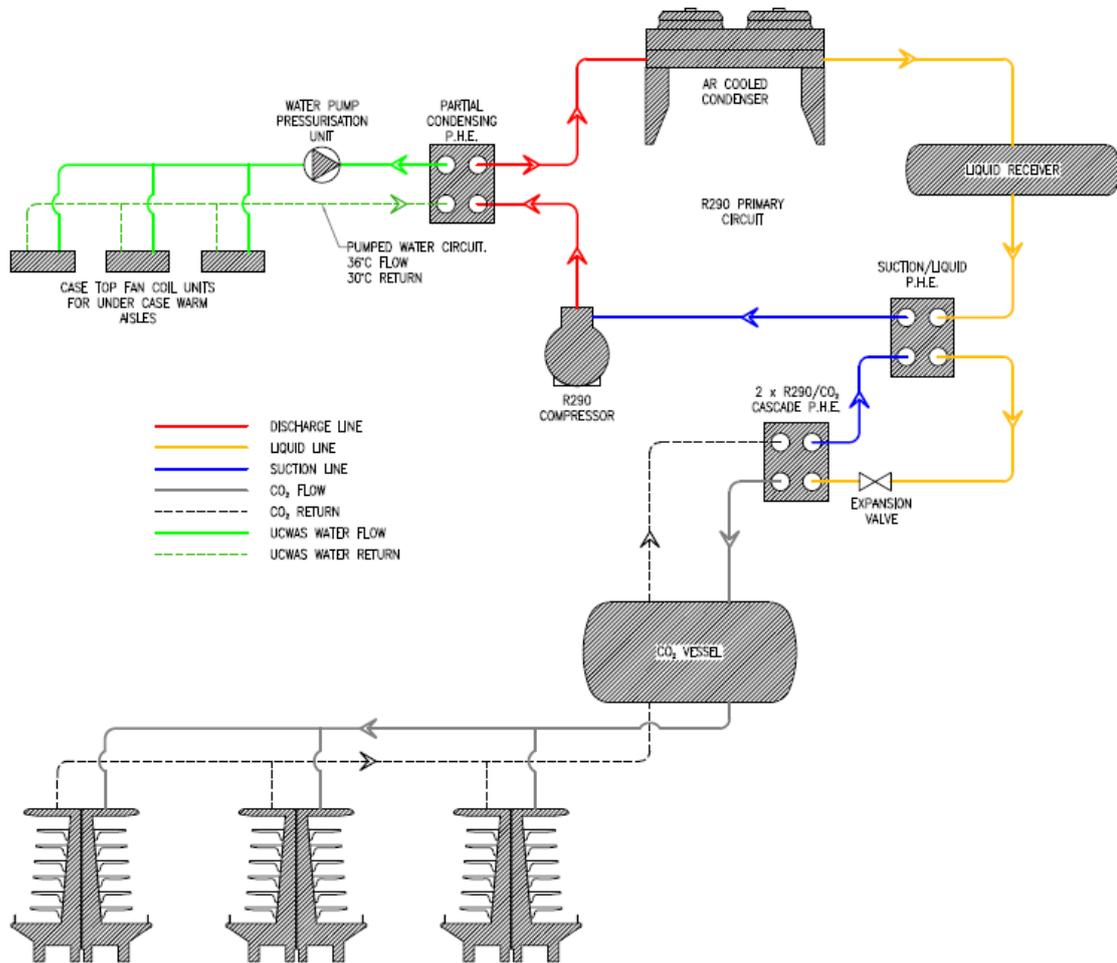
## 2. Project Description

The brief was to design a refrigeration system using wholly natural refrigerants and followed a specific installation that offered a sympathetic approach to the wooden substructure of the core building construction.

Using Hydrocarbon primary refrigerants and CO2 sub critical pumped secondary cooling circuits the installation was completed by a dedicated team of installers from A1 Engineering Solutions and was supported through design and site commissioning by Emerson Retail Solutions.

A1 Engineering completed the scheme in line with the stringent demands of the brief and optimised the engineering developments that were taken in to the scheme, in both the Central Plant structure and the display cases and may form part of other applications to this awards process.

### 3. Technology Utilised



Using a Hydrocarbon primary refrigerant to cool a CO<sub>2</sub> fluid secondary cooling medium to the sales floor, the system has a total natural refrigerant charge of 120kg divided across two central plant systems. 50% splits in each central system provide additional resilience to support the cooling in the event of any single item failure.

A cascade CO<sub>2</sub> sub critical cooling system supports the Frozen Food demands in the store. All plant systems are close coupled in a grouped arrangement on the north side of the building to ensure minimum solar impact and to ensure the system can be run at the lowest system differentials possible whilst protecting from operational risk.

Low temperature differential case mounted heat exchangers overcome the cold aisle affect via heat recovery from the central plant without any elevation of system operating characteristics. Pumped system differential controls ensured minimum pump power for the secondary fluid with a saving on the pump benchmark of -80% Pabs. The independent 3rd party auditors reported that as a whole the refrigeration system has a profile compared to the benchmark of -43% Pabs.

High resolution monitoring has been installed for all controls and gas detection and provides full off site visibility for ongoing maintenance and support of the systems operating characteristics throughout the life cycle of the plant.

#### 4. Health and Safety

The highest standards were set for construction and post construction health and safety, with site access constraints a major consideration throughout. All plant areas were controlled throughout with formal Permit-to-Work controls initiated once the systems were charged with Hydro Carbon.

Contract staff, and subsequently store staff received a high level of training throughout the project to repeatedly identify the H&S demands and operational mechanics of the systems.

The construction period was extensive and required long term plant protection from both the construction trades and the environment, with A1 Engineering providing an on-site presence throughout the construction period to successfully protect both of these aspects. This was demonstrated during the safe movement of 5Tonne plant modules on rolling skids over a distance of more than 80 metres, due to site constraints.

A very high standard of the general construction health & safety for the installation was required to meet the criteria set for this high profile project, with further consideration taken to the operation and safety of the plant post construction. All operatives required training and certification in order to enter plant areas, with an introduction to store staff. Full considerations were looked at during design with the impact in limiting the quantities of refrigerant within individual systems. Installation of refrigeration services at high level within basket supports brought up other challenges due to the nature of the construction of the ceiling with 'Glulam' beams limiting the space available.



## 5. Client Satisfaction

Both the client and main contractor have expressed their satisfaction with the quality delivered by both the installation site team and the backup they received through A1 Engineering Solutions commitment in the completion of the project, this is shown by the glowing testimonials received.

## 6. Environmental Benefits

The integrated nature of the sales floor cooling and under cabinet heating system maintains a 17-18°C aisle temperature and limits the impact on the staff and customers of the refrigeration of product. The development of cabinet air profiles helps reduce the air losses from the display cases to support the general environmental quality of the sales floor.

## 7. Repeatability of Techniques

The lessons learnt, especially in relation to Hydro Carbon primary cooling, have allowed developments in specification and design that make the system more commercially acceptable and considerably less sophisticated in terms of the management of this refrigerant.

Also, the advances in pump technology have helped reduce the parasitic load of the system considerably with the overall system efficiency per kW of cooling now comparing favourably with a standard system.

As a learning store the remote technical support is ongoing, with the process of independent Post Occupancy Evaluation continuing to ensure that the lessons learnt are comprehensive and any success is measured to enable future sites to benefit.

Cheshire Oaks has been a success in setting new benchmarks for his type of system in both design and installation practices for the industry. The willingness of the client to support system evolution and new commissioning standards has provided a model which can be rolled out to future sites without a major cost burden and with a life cycle operating profile significantly reduced from a conventional chemical refrigeration system.

## 7. Testimonials

### **Peter Garner - Marks and Spencer**

Manager of Refrigeration Design and Delivery

“A1 Refrigeration (*now A1 Engineering Solutions*) have proved themselves to be a competent and diligent contractor for Marks & Spencer, their work has been delivered to a high standard with quality being the key focus. Their delivery of the M&S high profile store at Cheshire Oaks is a case in point, here A1 installed a first class project which has surpassed performance expectations. A1 has proved itself as a growing contractor with a bright future.”

### **Tony L Savage - Simons Group.**

Building Services Manger

“The phrase ‘outstanding service’ is not one that I use often. However, I have to hand it to A1 Refrigeration (*now A1 Engineering Solutions*) for the delivery of this project. Not only were the timescales met under difficult circumstances, they surpassed all handover dates and milestones. This was shown throughout the construction period with expert assistance in co-ordination and project management to achieve the successful delivery of a complex project to the client.

From being awarded the works, their brief was not only to install but ensure that the aesthetic appearance within the food hall was paramount. A1’s solution was extremely effective with the client both praising the quality of workmanship and overall management of the scheme, setting a precedent for anyone to follow. From their engineers on site to their support staff and the attention to detail in seeing the project to a close in completion of O&M’s and staff training. A1 delivered this project to exceptionally high standards; I would not hesitate in recommending them for future projects and indeed look forward to working with them again.”