

A pilot supermarket installs a waterloop with R-455A

Elise Kuntzelmann | September 25, 2017 | La Rpf n°1058



Figure 1: A cabinet connected to the chilled waterloop

The NP Discount supermarket in Langenweddingen, Germany is intended to be the first in a long series of stores that will use a cooling system based on a chilled waterloop charged with R-455A.

The newly-renovated NP Discount store (Edeka group), in Langenweddingen, close to Magdeburg, has been fitted with a refrigeration system that includes a chilled waterloop containing R-455A, produced and marketed by Honeywell under the brand name Solstice L40X. This installation is the result of a study that NP

Discount began in 2012 with the aim of improving its energy efficiency. Of the 420 stores in the chain - with a range of surface areas from 400 to 1,200 m², 148 have been retrofitted with R-134a. So by eliminating R-134a, the Langenweddingen store is acting as pioneer in the use of chilled waterloop technology: "NP Discount is going to transform all of its stores, but that takes time", says Dieter Arnold, the technical manager at NP Discount.

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The chilled waterloop system meets the medium-temperature requirements, as well as part of the low-temperature requirements. For now, the remainder of the low-temperature is provided by plug-in units. Over time, the low-temperature units will also be linked to the waterloop.

7 stand-alone medium-temperature units running on the waterloop are used for the same number of cabinets, giving a total length of 25 m. The average charge of R-455A is 1.6 kg per unit. The waterloop system is fitted with Tecumseh compressors.

"The device is like a plug-in, minus the disadvantages", explains Goran Simic, technical sales director for cabinet manufacturer KMW, the system's supplier. "The system is flexible and suitable for stores in city centers and residential areas. It is connected to an external dry cooler designed to chill the water in the circuit which, of course, is far less active in winter than in summer. The hot condensation water generated is used to pre-heat the sales area during the cold months." If the heat recovery device is not enough, a gas burner can be switched on.

The full installation includes 24 low-temperature propane (R-290) plug-ins. The cassette air conditioners also use R-290. Cooling and air-conditioning across the entire system is monitored via a KMW-own interface.

Implementation

"The store was closed for 10 days and completely cleared to allow installation of the cooling system. We had 4 full working days to complete the work. The 4 to 5 technicians present could only work during the day. To begin with, it is better to plan for work to be done in normal office hours. That way, night working is possible if the job doesn't progress as expected", says Goran Simic. The implementation started with the installation of the refrigeration system and the cooling units, then of the air conditioning and water circuit and, finally, the connection of the plug-ins to the system. The renovated store re-opened on May 11, 2017. "Honeywell has been involved in the project since day one, providing us with information and advice", recalls Goran Simic. "The discussions between KMW, NP Discount and Honeywell began during 2016 and led to this long-term, future-proof solution. »

One of NP Discount's aims was to evacuate the heat generated by the cabinets to create a pleasant atmosphere in the store, while reducing use of the air-conditioning. This meant the removal of 16 kW of heat.



1. The supermarket in Langenweddingen (Sachsen-Anhalt) has a total floor space of 1000m², including a sales area of 750 m².
2. and 3. Dry cooler and chiller installed outside. The former will cool the water in the waterloop, the latter is used for the store's air conditioning.

The decision for R-455A

In the past, NP Discount was reliant on CO2. Several cases of increased pressure causing damage that was not covered by their insurers encouraged a change of fluid. "R-455A is classified as A2L and, with a GWP of less than 150, it is easier to handle and the investment is not too high, unlike CO2", says Dieter Arnold. "With propane, the charge cannot exceed 150 g and there are issues around its flammability. " On the financial side, the investment is comparable to a standard technology. "These discussions around cost control led to some new concepts", adds Dieter Arnold.

A flexible solution

"We've looked for a solution that best suits the size of the NP Discount stores. We still have to run trials in the larger stores. The fact that the units are not interdependent becomes an even more desirable feature in the larger stores, should an issue occur", continues Goran Simic. This flexibility, reducing the risk of losing merchandise, is now driving the German discounters to work with several smaller units, rather than a centralized installation. "At the moment, it's still too early to assess the new installation performances. But we can confirm that there has been a 30% drop in peak electricity consumption", says Dieter Arnold. If this pilot project proves economically beneficial, it could become the standard for NP Discount. The objective for stores planned to open by the end of the year in Magdeburg and Cloppenburg is to convert the low-temperature and the air-conditioning to R-455A. Several other re-builds using R-455A are planned in 2018.



1. Additional to the cabinets, there are 24 low-temperature plug-in propane units.
2. A KMW interface is used to monitor the cooling system and the air-conditioning.
3. From left to right Sébastien Casterman, refrigerant sales manager at Honeywell, Dieter Arnold, technical manager at NP Discount, Goran Simic, technical sales manager at cabinet manufacturer KMW and Piotr Temporeale, commercial development manager at Honeywell.

Participants

- **NP Discount** : has 400 sites in Germany and 6,000 employees. It forms part of the Edeka Minden-Hannover group. NP Discount was founded over 40 years ago. The Langenweddigen store opened 19 years ago.
- **KMW** was founded in 1980 in Limburg, Germany. Their unique manufacturing site is dedicated to the development and production of cooling units. KMW cover the construction, installation, service and maintenance. It employs 150 people, including 15 in development. Its new development areas include air-conditioning, heating and heat recovery for supermarkets. The collaboration between NP Discount and KMW began before the year 2000 and intensified in 2013.
- **Honeywell** is a world leader in the development, production and supply of refrigerant fluids that are marketed throughout the world under the Solstice and Genetron brands. They are used for various applications, in particular, refrigeration and air-conditioning for buildings and vehicles. Honeywell and its suppliers have embarked on an R&D investment program worth 900 million dollars and are increasing their capabilities based on Honeywell's hydrofluoro-olefin (HFO) technology.

For more information, visit: www.honeywell-refrigerants.com/europe

Information sheet

MT Refrigeration Unit (per cabinet):

- Refrigerant: R-455A; charge: 1.6 kg. Refrigeration capacity: 13 kW.
- Operating parameters (evaporation temperature/condensation temperature): - 6°C/+ 32°C.
- U.H. compressors (Tecumseh).
- Number of compressors: 1 per unit.
- Number of refrigeration units: 7, i.e., a total of 25 meters for medium-temperature (based on 2.5 meters long with 1.1 kW + 3.75 meters long with 1.6 kW).

LT Refrigeration Unit:

- Refrigerant: R-290.
- Refrigeration capacity: 12 kW.
- Operating parameters (evaporation temperature/condensation temperature): - 27°C/+ 32°C.
- Number of compressors: 1 per unit.

Cold rooms: 3

- 1 for MT,
- 2 for LT (Viessmann).

Plug-ins: 24

External dry cooler with a capacity of 40 to 80 kW, emitting a noise level of 38 dB (A) over 5 meters; built as a single unit, it incorporates a pumping station fitted with 2 pumps operating redundantly, with monitoring and heat recovery, as well as low-noise fans.

Air-conditioning: Teco chiller using R-290.

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