



Opteon™ XL20

Refrigerant (R-454C)

Lowe Rental Ltd Utilizes Opteon™ XL20 from Chemours As A Very Low GWP Replacement for R-404A

Background

Low Rental Ltd, founded in 1977 and based in the UK, has rapidly grown to become a world leading provider of rental refrigeration equipment to major food exhibitions, events, producers, and retailers across the world. After F-Gas regulation EU 517/2014 came into force on 1st January 2015, Lowe became aware of the reduction in quota of CO₂ equivalents that would have an

early effect on the supply of R-404A. Even in advance of the F-Gas regulation, Lowe had been receiving customer requests to use lower GWP products than R-404A in their rental refrigeration cabinets. They quickly realized that they needed new refrigerant solutions to meet the needs of the changing industry.





Picture: © Lowe Rental Ltd

Following the launch of Opteon™ XP40 (R-449A) by Chemours in 2014 and the subsequent approval of this refrigerant by a number of compressor and cabinet manufacturers as an alternative to R-404A, Lowe decided to offer this as an option to their customers. Opteon™ XP40 has a GWP below 1400 and very similar performance to R-404A in retrofit and new equipment.

The introduction was successful and Lowe now has many hundreds of cabinets with Opteon™ XP40 in their rental fleet. The decision to use this product was also made easier by the wide availability of Opteon™ XP40 for service in the supply chain. Jon Carn, Commercial Director of Lowe, stated “with the use of Opteon™ XP40 in our range of cabinets, we can meet customer requirements to move away from high GWP refrigerants and ensure we are secure as the pressure comes on R-404A through the F-Gas phase down”.

Following the success of Opteon™ XP40, Lowe also became interested in very low GWP options, specifically those that avoided using highly flammable refrigerants. In particular, they had an eye on the future ban in 2022 on new hermetic units using refrigerants with GWP >150.

Lowe’s fleet of rental equipment is mobile and can be transported and used in a variety of locations. This makes it very important to ensure the safest possible refrigerant solution is used, as operators and service technicians may vary greatly in their training and skill – depending on the location. Lowe once again turned to Chemours and was introduced to Opteon™ XL20 (R-454C), one of the company’s newly commercialized low GWP refrigerants.

Opteon™ XL20 Refrigerant

Opteon™ XL20 (R-454C) is a non-ODP, low GWP (146) refrigerant with properties that make it suitable as a replacement for R-404A in new equipment. It has a safety classification of A2L, which means that it is mildly flammable and has a much better safety profile than A3 highly flammable industrial gases, such as Propane (R-290).

Following publication of the new EN 378 standard, equipment manufacturers will be able to design and build equipment utilizing new 2L refrigerants making use of the much higher charge sizes, over ten times more than what's possible with hydrocarbons, but still below the limit of GWP 150.

Opteon™ XL20 Properties	
ASHRAE Number	R-454C
Lubricant	POE
Boiling Point	-45.9 °C
Safety Classification	A2L
Temperature Glide	~6 K
LFL*	0.293 kg/m ³

*Based on worst-case formulation (WCF) flammability

First Trial with Chilled Drinks Cabinet

As a first trial, a Lowe chilled drinks cabinet running on R-404A was selected to see if Opteon™ XL20 was a suitable replacement. The 2L product would normally only be intended for commercial use in new equipment; but, in this case, the charge size was well below the limits specified in EN 378, and, so, a simple retrofit was conducted.

The cabinet performance was measured while running on R-404A and then again once the refrigerant was removed and replaced with Opteon™ XL20. The charge size was approximately 350 g. As the unit had a capillary expansion device, it was not possible to adjust the superheat settings; but, the cabinet still pulled down to temperature and operated in a similar way to when running on R-404A.



Picture: © Lowe Rental Ltd

The cooling capacity was measured to be approximately 10% lower and the COP approximately 5% higher than R-404A. The discharge temperature was 5K higher than with R-404A, but well within the limits of the compressor. Due to the relatively lower mass flow of Opteon™ XL20, new equipment designs could be tuned to ensure optimum performance; but, this experiment shows that Opteon™ XL20 is a viable replacement for R-404A in such systems.

This fits in well with the theoretical data shown below:

	Medium Temperature	
Mean Condensing Temperature	30 °C	45 °C
Cooling Capacity	-11%	-9%
COP	+5%	+8%
Relative Mass Flow	-26%	-26%
Suction Pressure	-87 kPa	-93 kPa
Discharge Pressure	-219 kPa	-306 kPa
Discharge Temperature	+6.6 K	+7.7 K

The data above was obtained from theoretical cycle calculations for medium temperature (-8 °C mean evaporating temperature) refrigeration scenarios. For both the medium and low temperature scenarios, the following parameters were used: evaporator superheat = 4 K, suction line superheat 8 K, liquid subcooling 2 K, and compressor efficiency = 70%.

For more information on the Opteon™ family of refrigerants or other refrigerants from Chemours, visit opteon.com

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