CASE STUDY

DuPont™ ISCEON® MO29 in a pumped circulation system

Background

Although ISCEON MO29 (R422D) is well proven as a replacement for R22 in Direct Expansion systems (Dx), many industry commentators have been of the view that direct replacement refrigerants would not work in systems with flooded evaporators.

With this in mind many have been reluctant to replace R22 in such systems. Undeterred by this, Climalife, in conjunction with DuPont, the manufacturers of the ISCEON 9 Series direct replacement refrigerants, have set about trying to prove they have a part to play. In 2006 a Low temperature, Low Pressure Receiver system (LPR) in a cold store was successfully converted to ISCEON MO29, since then other LPRs have also been converted. In 2008 a low temperature pump circulation system on a ship and another in a cold store were converted to ISCEON MO29 in Holland. Both were successful.

Climalife have worked closely with Southern Industrial Refrigeration Ltd based in Maidstone, on a number of HCFC replacement projects and they identified a medium temperature pump circulation system at one of their customer's premises that would be ideal to convert.

Dave Kingsley, Director for Southern Industrial Refrigeration Ltd said "we have been advising our clients over the past months regarding the imminent ban on use of virgin HCFCs for maintenance. We have clearly identified that depending on recycled or reclaimed R22 for the maintenance of critical equipment is a risky business due to potential issues with quality, supply and cost." To this end Southern Industrial had already embarked on a successful program of retrofit of direct expansion (DX) and LPR refrigeration equipment using products from the DuPont™ ISCEON® 9 Series range. They are also a member of the Climalife Experienced Conversion Contractor Register.

Their customer J.A. Colthup & Partners, based in Chilham, near Canterbury, have a number of systems running on HCFCs which are critical for the storage of fresh fruit harvested on their farm, so the produce can be stored under controlled conditions in readiness for delivery to their customers in perfect condition.

The System

The system is of 1984 vintage and consists of 2 Bitzer open type reciprocating compressors, cooling four cold rooms for storage of apples and pears in a controlled atmosphere. Room cooling is achieved via an evaporator flooded with refrigerant at a temperature of between 0ºC and -1ºC depending on the product stored.

The baseline performance with R22 was established before conversion. The R22 was removed from the system into recovery cylinders and weighed at 401Kg. The filter drier and critical elastomeric seals/gaskets were replaced. In this instance it was deemed the shaft seals on the compressor did not need to be changed. An oil change was carried out and the original mineral oil was replaced with Emkarate RL32H, no flushing was required. The system was evacuated and checked for leaks and then charged with ISCEON® MO29. After starting up the charge size was adjusted to the optimum, which was deemed to be 380kg and the oil level in compressor was checked and oil added to maintain proper levels. Finally the system was leak checked and labelled showing the replacement refrigerant used and the system log-book updated.

Results

The system was monitored before and after conversion. Following conversion the system delivered the same cooling performance as evidenced by the maintenance of an air off temperature at the evaporator of 0C. The power required to deliver

Registered Office: IDS Refrigeration Ltd
Green Court . Kings Weston Lane . Avonmouth . Bristol . BS11 8AZ
Tel: 01179 802520 . Fax: 01179 802521
climalife.uk@climalife.dehon.com
www.climalife.co.uk www.climalife.dehon.com

IDS Refrigeration Limited
Registered In England & Wales
Registration No. 3400691 . VAT No. GB 709 447 517

this cooling using ISCEON® MO29 was higher than with R22 as predicted. An increase in power consumption of 8% was measured although average ambient temperature was higher during the ISCEON testing and the throttle valve before the evaporator could be opened further with ISCEON MO29 to reduce superheat and give higher cooling capacity. Monitoring data showed a lower compressor discharge temperature of 20K, typical of ISCEON, which can be useful in extending compressor lifetime. Performance in the condenser and evaporator was very similar between ISCEON® MO29 and R22 although there was an indication that with some fine tuning the power consumption with the retrofit product could be improved still further.

AVERAGE MEASURED CONDITIONS		R22	ISCEON® MO29
Ambient Temperature	ºC	11.1	12.4
Condenser Air In	ºC	11	12
Condenser Air Out	ºC	25	23
Suction Temperature	ºC	-1.4	-3.9
Suction Pressure	bar	2.97	3.26
Discharge Temperature	ºC	74.1	56.6
Discharge Pressure	bar	13.9	14.9
Evaporator In	ºC	-1.0	-0.9
Evaporator Out	ºC	-1.5	-2.6
Power Consumption	Kwhr	68.7	74.5

Fig. 1 Bitzer open drive reciprocating compressors

Fig. 2 Receiver and Witt Refrigerant Pump

Conclusions

The successful conversion of this R22 pumped circulation system has shown that retrofitting to ISCEON® MO29 is a viable alternative for such systems, thus extending the range of application of ISCEON® MO29 from DX equipment into pumped circulation. Although a few systems have now been converted successfully, Climalife recommends that anyone with a pumped system fully evaluates how it is currently operating and consults with Climalife prior to conversion, to ensure that the system is suitable.

For further information please contact: Mel Summers, Marketing Co-ordinator for Climalife in the UK.

Date of issue: 8th March 2012 (Contact details and address updated April 2014)

Registered Office: IDS Refrigeration Ltd
Green Court . Kings Weston Lane . Avonmouth . Bristol . BS11 8AZ
Tel: 01179 802520 . Fax: 01179 802521
climalife.uk@climalife.dehon.com
www.climalife.co.uk www.climalife.dehon.com

IDS Refrigeration Limited
Registered In England & Wales
Registration No. 3400691 . VAT No. GB 709 447 517