

FORANE[®] FX 100 (R-427A*)

THE CONVERSION FROM R-22 TO FORANE[®] FX 100 (R-427A*) OF A DOUBLE COMPRESSION STAGE LIQUID CHILLER

The company SOGEQUIP, member of SNC-Lavalin group, successfully converted a double compression stage liquid chiller from R-22 to FORANE[®] FX 100 (R-427A*) during summer 2005 at the Arkema Research Center in Lyon.

The liquid chiller selected for the conversion was supplying JARYTHERM[®] BT06 at -20°C to chemical reactors.

Unit description

The main characteristics of the converted liquid chiller are as follows:

- 2 parallel semi-hermetic 2 stage reciprocating compressors
- nominal refrigerating power : 50 kW
- water cooled extratubular condensing shell and tube condenser
- intratubular evaporating shell and tube evaporator
- 2 thermostatic expansion valves
- refrigerant charge : 20 kg
- chilled liquid : JARYTHERM[®] BT06 ($\approx 20 \text{ m}^3/\text{h}$)
- chilled liquid temperature set point : -20°C



Retrofit procedure

Non-toxic, non-flammable and zero ODP refrigerant, FORANE[®] FX 100 (R-427A*) requires in most cases only one oil draining and its replacement by a POE lubricant. Optimal performance close to R-22 can generally be achieved without a long and costly rinsing of the circuit thanks to a high tolerance toward residual original oil in the system. However in this case, due to the high complexity of this double compression stage installation it was decided to rinse the circuit once.

After ensuring that the R-22 equipment was in a good state and having measured the performance of the installation with the initial R-22 charge the retrofit was subsequently carried out in 8 steps:

- 1- Draining of the alkylbenzene oil from the system and refilling with POE lubricant
- 2- Change of the filter driers and running of the installation during a few hours
- 3- Recovery of the whole R-22 charge
- 4- Draining of the soiled POE oil from the system and refilling with fresh POE lubricant
- 5- Change of the filter driers
- 6- Evacuation of the installation
- 7- Recharge with FORANE[®] FX 100 (R-427A*)
- 8- Start up of the installation and performance measurement after running conditions had reached a steady state

No modification of the installation was required. Only a slight adjustment of the expansion valves was necessary.

*R-427A : pending ASHRAE public review and approval

Comparative data

Parameters		R-22	FORANE® FX 100 (R-427A*)
Evaporating temperature	°C	-31.9	-34.6
Condensing temperature	°C	39.8	40.3
Suction temperature	°C	-29.3	-31.2
Suction pressure	bar	1.5	1.3
Discharge temperature	°C	90.2	85.1
Discharge pressure	bar	15.3	15.6
Cooling power	KW	38.5	35.7
Power consumption	kW	40.3	39.7
Residual alkylbenzene oil	%	-	3%

Very satisfactory running conditions were reached immediately after restarting the installation. The temperature set points were easily achieved with similar energy consumption as compared to R-22 and operating conditions are stable for more than 1 year.

FORANE® FX 100 (R-427A*) consequently fully satisfies the requirements of the European regulations while enabling existing equipment to continue to perform well without the need for any long and costly plant modifications.

The versatility of FORANE® FX 100 (R-427A*) is also appreciated as it can be used to retrofit low temperature refrigeration equipment as well as air-conditioning installations, resulting in only one retrofit refrigerant for all R-22 units.

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