UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH

REFRIGERANT SOLUTIONS LTD
RS-70
R22 DROP-IN
ZERO ODP

RS-70

REPLACES R22 AT THE POLYTECHNIC UNIVERSITY OF CATALONIA (UPC)

PERIOD: DECEMBER 2013-JANUARY 2014

Cooling unit with network analyser

Features panel

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from

REFRIGERANT SOLUTIONS LIMITED

The Refrigerant Specialists

1. EQUIPMENT STUDIED

To carry out the present study, the equipment on which the performance analysis was run was a heat-fired boiler in operation at the archive of the Rector Gabriel Ferraté Library at the Nord Campus of the Polytechnic University of Catalonia (UPC).

Located on basement floor 1, the unit has a cooling thermal power of 64kW, a heating thermal power of 71kW, an electric power of 30.65kW, a 2.69 EER and a 3.09 COP.

The chiller, from the year 1997, with R22 refrigerant and with a charge of 26 kg, is a circuit with a semi-hermetic Copeland-brand compressor. The oil is mineral 3GS and is in good condition.

The chiller is used to produce cold and hot air during winter, in accordance with the requirements of the area served, and that is the mode in which the study was performed, both the initial one with the old refrigerant and the one carried out following the replacement, at a time when the working conditions were considered to be similar.

Semi-hermetic compressor with heat exchangers

2. BACKGROUND FIGURES

Monitoring of the equipment began on 26 November 2013, using an HT-brand network analyser (portable equipment) and ended on 16 December 2013. Figures were obtained on consumption, power, energy, voltage and intensities.

Other data were also recorded when the equipment was running, such as suction and discharge pressure and discharge temperature.

Operation was also analysed at the start, checking that the circuit was in optimal cooling charge conditions.
A superheat level of 8°C was obtained, along with a subcooling level of 11°C

R22				
DATE	DISCHARGE PRESSURE (bar)	SUCTION PRESSURE (bar)	DISCHARGE TEMP (°C)	MODE OF OPERATION
26/11/2013	19	3.3	75	HEATING
27/11/2013	17.7	3.1	73	HEATING
28/11/2013	14.3	3.7	63	COOLING
29/11/2013	18.2	3.2	69.5	HEATING
02/12/2013	18.5	3	72	HEATING
03/12/2013	18.8	4.7	79	HEATING

R22				
DATE	DISCHARGE PRESSURE (bar)	SUCTION PRESSURE (bar)	DISCHARGE TEMP (°C)	MODE OF OPERATION
04/12/2013	19.6	3.4	82.7	HEATING
05/12/2013	19.1	3.7	80.2	HEATING
09/12/2013	16.5	3.2	65.3	COOLING
10/12/2013	19	3.6	78.2	HEATING
11/12/2013	18.6	3.5	69.6	HEATING
12/12/2013	19.2	3.3	75	HEATING
13/12/2013	12.4	2.6	69	COOLING
16/12/2013	17.9	3.8	75	HEATING

**All readings are gauge pressure*

3. REFRIGERANT REPLACEMENT PROCESS

The refrigerant was replaced on 23 December 2013. All of the existing refrigerant (R22) was recovered and stored in recovery bottles. The unit was kept under vacuum for 48 hours and the mineral oil conserved.

The unit was charged with the new refrigerant gas RS-70 on 27 December. It was charged by weight, approximately the same amount, i.e. 26.8 kg, and kept at a superheat level of 5°C and a subcooling level of 11°C

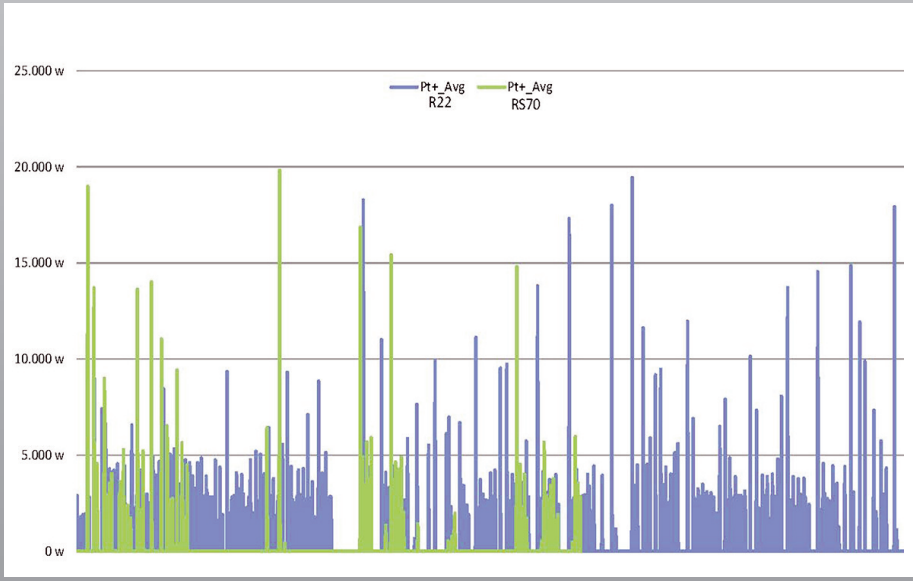
4. DATA OBTAINED

Data began to be recorded on 27 December after the refrigerant was charged, with the RS-70 refrigerant installed. The unit was kept under observation for approximately two weeks and the same variables were recorded both relating to the refrigeration cycle and the power and energy consumed.

RS-70				
DATE	DISCHARGE PRESSURE (bar)	SUCTION PRESSURE (bar)	DISCHARGE TEMP (°C)	MODE OF OPERATION
27/12/2013	21	4.3	60.8	HEATING
30/12/2013	12	2.6	50	COOLING
02/01/2014	14.4	3.3	53.8	COOLING
03/01/2014	16.7	3.1	60	COOLING
07/01/2014	12.9	2.6	58.7	COOLING

RS-70				
DATE	DISCHARGE PRESSURE (bar)	SUCTION PRESSURE (bar)	DISCHARGE TEMP (°C)	MODE OF OPERATION
08/01/2014	20	3.2	62.6	HEATING
09/01/2014	19.7	3.1	60.6	HEATING

**All readings are gauge pressure*



AVERAGE POWER CONSUMPTION CHART

5. CONCLUSIONS

The first point to note with regard to the refrigerant replacement process was the absence of incidences.

The refrigerant has a temperature glide that must be considered when recharging, but the equipment may also be charged by weight, so the error margin is slight; with the same weight the chiller presented similar superheat and subcooling levels.

No changes could be seen with regard to the oil and the different oil pressure readings for the equipment were the same.

With regard to discharge and suction pressures, these were very similar to those of R22.

In terms of performance, it must be noted that the discharge temperature was slightly lower, a positive feature as it means slightly less wear and tear of the internal parts of the compressor, among other factors.

As we can see on the Power consumption chart above, the results were fairly similar to those obtained for R22, and there was no noticeable rise in cooling power consumption. We therefore understand that there was no difference in terms of energy consumption, but there was a clear benefit in the GWP index, the lowest on the market.

In short, the replacement of the R22 refrigerant with the RS-70 is considered strategic, both for current units with R22 and other units already replaced with gases such as R424A or R434A.

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