



RS-44 (R424A) FIELD TRIAL AT LOBLAWS SUPERMARKET, CANADA

In May 2001, R22 was replaced by RS-44 in a walk-in cooler at a store of the supermarket chain Loblaws located in Halifax, Nova Scotia, Canada. The system was operating on alkylbenzene oil and in the first instance no changes were made either to this lubricant or any of the hardware. Oil return was found to be good and the system operated perfectly satisfactorily on alkylbenzene oil.

At a later stage, the alkylbenzene lubricant was removed and replaced by mineral oil, and again the system operated without any problems, and has continued to operate until the present day, a period exceeding three years during which there have been some high ambient temperatures during the Canadian summers.

SYSTEM SPECIFICATIONS

Location: Loblaws Iga supermarket, Wyse Road, Dartmouth, Nova Scotia, Canada

Equipment: 5 HP produce walk-in cooler 9m x 3m x 3m high

Design temperature: 5C

Condensing unit manufacturer: Vos food equipment

Model: N2NH0500 TFC remote air-cooled

Compressor type: semi-hermetic

Voltage: 208/3/60

Oil charge: alkyl benzene viscosity 200

Suction line size: 35 mm, length: 40 m, elevation 7 m total lift

Liquid line size: 13 mm

Evaporator manufacturer: Refplus

Model: EPA 1680-1 16000 BTU @ 5C TD qty: 3

Refrigerant charge: 22.3 kg R22

Temperature control: thermostat mounted in space

Expansion device: txv, qty: 3

MODIFICATIONS TO SYSTEM:

No modifications were made to the system.



STAGE 1

The system was operated for several hours with the original R22 charge. Baseline data was recorded including :

Voltage, amperage, suction pressure, suction temperature, discharge pressure, discharge temperature, liquid line temperature, ambient temperature, space temperature, oil level and compressor run time

STAGE 2

The R22 charge was recovered and the system evacuated. An equal amount by weight of RS-44 was charged into the system and the system was operated. Additional amounts of RS-44 were added to the system until the liquid line sight-glass indicated a full charge. The same data as stage 1 was collected for comparison purposes.

STAGE 3

The alkyl benzene oil was removed and replaced with mineral oil. (three oil changes were done to reduce the residual alkyl benzene oil to below 5%). Additional mineral oil was added as needed. Oil levels were monitored for several months after the change to mineral oil with this process continuing.

RECORDED DATA

	R22	RS-44
Suction pressure	2.76	2.17
Suction temperature	12	9
Discharge pressure	12.4	11.45
Discharge temperature	88	68
Liquid line temperature	31	28
Ambient temperature	16	12
Amperage	15.67	14.39
Voltage	201	201
Space temperature	5.6	5
Run time/24 hours	9.06	10.08
Operating refrigerant charge	22.3	29.5
Operating oil charge (approx.)	3 litres	4.5 litres

Pressures are in bars gauge

Temperatures are in Celsius

All readings were averaged over several hours of operation

Note: the system was operated for 8 weeks with alkyl benzene oil and has since been operating on mineral oil.



GENERAL OBSERVATIONS:

- (1) Suction and discharge pressures using RS-44 were lower than those using R22.
- (2) Discharge temperature was 22% lower with RS-44.
- (3) Operating energy usage was 8% lower with RS-44 and no measurable change in performance or capacity.
- (4) Oil return with alkyl benzene oil was similar to that of R22 once additional oil was added during the first few hours of operation.
- (5) Once the oil in the system was changed to mineral oil it took 3-4 weeks before the oil level was stabilized and an additional 5 litres was added during this time.

CONCLUSIONS

- (1) After conversion to RS-44, equal or slightly better operational performance was achieved with no modifications to the system.
- (2) Significantly lower discharge temperatures after conversion to RS-44 could improve compressor reliability and extend compressor life especially during high ambient temperature.
- (3) The hydrocarbon component of the mixture was providing good oil return to the compressor even with a long suction line and a vertical lift of 7 meters.
- (4) Alkyl benzene oil appears to provide better oil return with less additional oil required than mineral oil in this application with a long suction line and a vertical lift.