ENGINEERING POLICY

Tecumseh Compressor Company
Compressor Group

Engineering Policy on: **APPLICATION GUIDELINES FOR COMMERCIAL REFRIGERATION SYSTEMS USING ROTARY COMPRESSORS**

EP-13
PAGE: 1 of 4
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Application Guidelines:

The following are factors, which should be considered when applying rotary compressors:

A. High Pressure Housing - The rotary utilizes a high-pressure housing. This is accomplished by piping the suction return gas directly into the low side of the compressor mechanism, and discharging the hot gas from the mechanism directly into the housing.

Consequently, the compressor housing is, by nature, hotter than the typical low pressure-housing compressor. This factor should be considered before additional refrigerant is added to cool the housing (typical of low side housing practice) or unnecessary compressor change outs are made. This information should be passed on to the customer's field service group.

The high-pressure housing feature of the rotary minimizes oil pump out caused by the sudden reduction in suction pressure on startup. It also eliminates the arcing problems associated with deep vacuums in low side housing compressors due to closed or restricted suction lines. **(Caution – Never apply power to any compressor when the housing is in a vacuum, e.g. during evacuation).**

It should be noted that a compressor with a high pressure housing may take a little longer to pump up to normal system operating pressures on an initial cold startup, than a compressor with a low pressure housing. This is due to the housing temperature being colder than the saturated discharge temperature at startup, and some refrigerant may condense in the housing, instead of being pumped through the system.

B. Direct Suction - The suction return gas on the rotary compressor is piped directly into the low side of the compressor mechanism. This prevents the gas from picking up heat from the motor before entering the cylinder and thus improves its efficiency.

The rotary compressors have a factory installed suction screen to protect them from system contamination. Consult Policy Bulletin No. PB-120, "USAGE OF DIRECT SUCTION COMPRESSORS" for more information regarding this subject.

C. **Suction and Discharge Tubes** - The suction and discharge tubes on the rotary housing are copper, not copper plated steel.

- Use nitrogen purge while brazing to avoid copper scale.
- Avoid burning the paint on the accumulator and compressor by using a shield or wet cloth, or directing the flame away from these areas.
- Use braze 5/60 or similar brazing alloy with high tensile strength. Do not use 95/5, 50/50 or 40/60 soft solder.
- Use extreme care when cutting and forming tubes to keep contaminants out of the system.
- Take care that flux does not enter the system.

D. **Liquid Control -** Endurance testing of the rotary compressor indicates that the presence of excessive liquid refrigerant in the suction chamber can be very damaging to the compressor assemblies. Further discussion on this subject will follow.

Liquid Flood back – Compressor Running
Some conditions that allow this to occur are:

1. Running with dirty evaporator filters, reduced evaporator airflow, evaporator air recirculation, system overcharge, oversized restrictors and expansion valve stuck open.

2. During and after defrost or harvest cycles. *****

3. Refrigerant dump on start. *****

The above conditions can be corrected by good system design, proper maintenance, service and the use of a properly sized accumulator.

*** A liquid line solenoid may also be used to eliminate flood back due to the conditions in 2 and 3 above.**

Liquid Migration - Prolonged Off Cycle

During prolonged off cycles liquid refrigerant can migrate to the compressor oil sump. This will result in the following conditions:

1. The liquid refrigerant will dilute the oil and reduce its lubricating properties. Upon start up it may not provide adequate lubrication to all of the bearing surfaces.

2. When the compressor starts up with all of this liquid in the housing, the system may act as if it is under charged until the motor heat has raised the oil sump above the condensing temperature. A system with a low-pressure control could experience nuisance trips during the first several minutes of operation. These nuisance trips can be avoided by locking out the low-pressure control for the first several minutes of operation.

3. If the compressor is full of liquid refrigerant and oil, at start up it will immediately pump some quantity of this oil and refrigerant mixture out of the compressor. If the compressor is not allowed to run for a sufficient amount of time, this oil will not be returned to the compressor, and thus jeopardize the lubrication of the bearings.

The use of a crankcase heater should be considered if the above conditions exist and see Policy Bulletin PB-107 for further discussion on this subject.

E. **Pump Down Cycle** – A check valve is required in the suction line.

F. **Motor Protection** - All commercial refrigeration rotary compressors are provided with external overload protectors. The maximum allowable motor temperature is 266 °F (130 °C) measured by the resistance method. **Never connect electrical power unless the compressor's protective cover is securely fastened.**

G. **Voltage Range -** All rotary compressors are designed to operate in the same voltage ranges as Tecumseh's other hermetic compressors.

Voltage Shown on Compressor Nameplate	Voltage Code	Voltage Range
115-60-1 100-50-1	XA	126.5 - 103.5 110 - 90
208-230-60-1 200-50-1	XD	253 - 187 220 - 180
220-240-50-1	XC	264 - 198

Consult Policy Bulletin No. PB-113 for additional information.

H. **Motor Type –** All commercial rotaries are CSR or CSIR with potential or current relay. CSR requires start capacitor and run capacitor. CSIR requires start capacitor.

I. **Oil -** R-22 models use synthetic alkylate. R-134a & R-404A models use poly vinyl ether. Good system design should be followed to insure oil return to the compressor. See Engineering Recommendation No. 9 for further discussion on this subject.

J. **Sound and Vibration** - As with most compressors, shock loops should be designed into the suction and discharge line to allow for torsional movement of the compressor.

K. **Factory or Field Refrigerant Charging –** Following leak checking and evacuation, break the vacuum to a positive pressure using *nameplate refrigerant type* connected to the *liquid line*. Add as much refrigerant as possible into the liquid line between the condenser and metering device, up to, but not exceeding, the correct system charge. *IMPORTANT:* Complete the charging process by starting the compressor and adding the charge balance into the suction side of the system. Liquid refrigerant should not enter the compressor directly. Liquid should be put into a supplemental accumulator inlet if one is present. On systems without a supplemental accumulator, the liquid should enter the suction line through a metering device such as a capillary or an orifice.

L. **High Potential (Hi-Pot) Testing**

When testing a hermetic compressor, if the hermetic motor becomes immersed in liquid refrigerant, it will show higher levels of leakage current than if it were not immersed in liquid refrigerant. This is a common phenomenon and the leakage current does not present a safety issue. Running the compressor for a brief period of time will remove the liquid refrigerant from the shell, and thus lower the level of leakage current.

M. **Angle of Tilt Allowed –** From plane of mounting holes.

RK, RG - ± 7 °
HK, HG - ± 5 °

N. **Related references–** Policy Bulletin numbers PB-107, PB-113 and PB-120 and Engineering Recommendation number 9.

Additional Information:

For additional information regarding the refrigeration rotary compressors, contact your Tecumseh Sales Representative.

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REV.	PAGE	CHANGE RECORD	ENG. NOTICE	DATE
1	1	The maintenance of all Policy Bulletins will be transferred from the Application Department, to the Engineering Records Department. Update the header on all policy Bulletins. Create a change record document for all Policy Bulletins. Under #242740-000, dated 01-07-04 make change to Replace "Tecumseh Products Company" with "Tecumseh Compressor Company" throughout Policy Bulletin. Standardize date on all pages of document Reason/Remarks: To create a change record and maintain the Policy Bulletins, like the Process Specifications are currently being maintained. Reason/Remarks: It is important to the Company that the separateness between the Company and the new subsidiaries be maintained. * Now that information is presented electronically, there is no need for individual REV. Dates on each page, will eliminate confusion in future. Issued by: S. Reiniche	#243737-000	04-15-05
2	ALL	Change all engineering records, stickers and documentation to reflect the new Tecumseh Logo. As per Branding guidelines. Reason/Remarks: Global logo change for all Tecumseh Divisions. Issued by: S. Reiniche	#244935-000	01-15-07
3	1thru6	Please remove all the Engineering Policies (EP's) from the Policy Bulletins and update per attached markups. Reason/Remarks: The files are too large with the imbedded Engineering Policies and this will also allow a change record for Each of the Engineering Policies. Issued by: S. Reiniche	EC8726	04-25-07
4	3	Section I – Oil, Add R-404A as using poly vinyl ether. Reason/Remarks: Commercial Rotary Compressors use R-404A refrigerants. Issued by: M. Norsworthy	EC29784	12-10-09