Application Engineering Bulletin

AE-1247

December 15, 1975

SUCTION ACCUMULATORS FOR HEAT PUMP APPLICATIONS

One of the most critical areas of air to air and air to water heat pump application is the proper control of liquid refrigerant under low ambient heating conditions.

System design must maintain a delicate balance between sufficient flooding to adequately cool the compressor, while avoiding excessive flooding which would adversely affect lubrication. When coil defrost is required, the compressor is exposed to sudden surges of liquid that can create extreme stresses in the compressor.

Both laboratory testing and field experience indicate that a properly designed suction accumulator can provided excellent protection against both potential hazards.

The accumulator can act as a receiver during the heating cycle when system imbalance or an overcharge from field service result in excessive liquid refrigerant in the system, storing the refrigerant until needed and feeding it back to the compressor at an acceptable rate.

Major movements of refrigerant take place at the initiation and termination of a defrost cycle, and while it is not necessary or even desirable to stop this movement, it is essential that the rate at which the liquid refrigerant is fed back to the compressor be controlled. Again the accumulator can effectively maintain the crankcase temperature at acceptable limits.

Laboratory testing revealed that most commercially available accumulators had excessive liquid return characteristics in heat pump systems, and this was traced to the sizing of the orifice provided for oil return. Typical accumulators manufactured for air conditioning or commercial usage have oil return orifices in size from .0625 to .125 inch diameter.

Extensive testing on modified accumulators with an orifice in the .040 to .050 inch diameter size has proven that this simple modification has tremendously improved accumulator performance while still retaining the capability of adequate oil return at the full range of heat pump operating conditions.

One manufacturer has been manufacturing and selling accumulators with the smaller orifice to a number of users who have specified this modification for a number of years with excellent field results. The smaller orifice undoubtedly is more vulnerable to restriction from solder particles or other foreign material in the system, and an inlet screen would appear to be advisable, particularly on systems with field installed piping.

To summarize, field experience and laboratory testing now confirm that suction accumulators of conventional design with an oil return orifice sized from .04. to .050 inch diameter can provide excellent heat pump protection. An accumulator is considered a Copeland specification

requirement on all split system air source heat pumps, and on any air source heat pump 3 horsepower and larger in size. On smaller package systems, an accumulator may not be as critical, but is still highly advisable for good compressor reliability.

Accumulators intended for heat pump applications should have the oil return orifice specified. Accumulator manufacturers can now provide special heat pump accumulators on request. Other features such as a baffled or indirect inlet, and a screen to protect the orifice are desirable and can enhance the accumulator performance.

While testing has not yet been extended to the commercial field, the present evaluation of suction accumulator design would indicate the smaller oil return orifice is unquestionable better for air conditioning applications, and may very well provide for better protection on commercial systems where hot gas defrost is used.

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