

Engineering Recommendation on:
**System Design Considerations for Good Oil
Return on Commercial Systems**
Issued: October 1, 1978

No. ER-9
Revised: June 17, 1999

Page 1 of 2

This recommendation is offered to guide the systems design engineer toward more acceptable practices as regards good oil return. Good system design should be our goal so as to further improve the probabilities of satisfactory and reliable performance of commercial refrigeration equipment.

Considerations:

- 1.1_ Line Sizes: Choose the line sizes so as to maintain the gas velocities within the limits described in ER-8.
- 1.2_ Line Installation: Specify the installation of horizontal suction lines to be sloped downwards in the direction of the compressor at least 2 inch fall per 10 feet line length.
- 1.3_ Refrigerant Control and Evaporator Design: The setting of the refrigerant control device should be such as to maintain a minimum amount of superheat. This is especially true in the case of direct expansion or dry evaporators as opposed to flooded evaporator designs. In the non-flooded type the refrigerant is completely evaporated before reaching the outlet. Any oil present will have been carried toward the outlet. How well this oil returns to the compressor will depend on the velocity of the gas and the viscosity of the oil.

On the other hand, if the evaporator is of the flooded type, it is required that liquid spillover be maintained so as to insure minimum oil concentration trapped in the evaporator. In the event the system balance is such that the evaporator is not totally loaded with liquid refrigerant (flooded) some means of returning the oil laden liquid must be incorporated.

- 1.04 Oil Viscosity: Systems with evaporator temperatures of -10°F or less may require additional considerations regarding the potential viscosity problem. The viscosity of the oil reaches maximum at about 30°F superheat (R22 and R502) and 45°F to 60°F (R12, R134a, R404A, R507). Oil return becomes critical when this degree of superheat occurs and the oil temperature is below 20°F and 40°F . It is, therefore, important to consider a liquid - vapor heat exchanger located as close to the evaporator outlet as possible to warm the oil. The heat exchanger must be located outside the refrigerated space.

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- 1.05 Multiple Evaporator Type Systems: In a multiple evaporator system the suction lines should be designed so as to avoid the possibility of oil from the active part of the system draining into the idle part. If there is need for the suction gas lines to go upwards, and one or more of the evaporators may be idle, then each evaporator should have its own riser sized to that capacity.
- 1.06 Line Insulation: The entire length of the suction line should be properly insulated.

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