Follow These Five Rules for Charging Refrigeration Systems

The process can be tricky without the help of these guidelines

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Charging a refrigeration system is one of the most challenging and puzzling tasks a service technician may face. How much refrigerant a technician should put into a system when charging is a tough question to answer, because it is often the system is properly charged. If there is no nameplate specifying the amount of charge in ounces and pounds, there is really no straightforward answer, because all refrigeration systems differ in the amount of charge they hold. This is especially true for field-assembled refrigeration systems in which liquid and suction line length and size can vary considerably.

Nameplates sometimes specify charge amounts on smaller unitary systems. If the charge amount is specified, a technician is sometimes better off recovering the entire charge, servicing and leak-checking the system, purging the desired vacuum, and charging the nameplate amount of refrigerant into the system. This method leaves no guesswork as to whether or not there is 100% of the refrigerant to the evaporator.

A system can be undercharged and — at a low evaporator heat load — not bubble the sight glass located in the liquid line. At a low-flow rate, the TXV is throttled partly closed, and the receiver has plenty of liquid stored. Unless severely undercharged, only under higher evaporator heat loads will a sight glass bubble. Service technicians must make sure that the sight glass does not bubble under high and low loads in order for the system to be properly charged.

Service technicians will often confuse a bubbling sight glass with a low-flow-rate sight glass. If undercharged and at high load, the receiver will be at its lowest level, and the sight glass will have entrained refrigerant gas bubbles within the liquid. This is referred to as a bubbling sight glass. If, however, the system is charged correctly but experiences a very low heat load on the evaporator, a low-flow-rate sight glass — not a bubbling sight glass — can be seen. Low-flow-rate sight glasses will not have refrigerant gas bubbles entrained in the liquid flow. A low-flow-rate sight glass will only partially fill the volume of the sight glass with liquid refrigerant. The top portion of the sight glass will be occupied with vapor, which does not indicate an undercharge.

FIGURE 1: Evaporator superheat reading guidelines (if the manufacturer specifications are available, use them instead).

<table>
<thead>
<tr>
<th>Application</th>
<th>Heat Pump</th>
<th>Commercial Refrigeration</th>
<th>Low-Temperature Refrigeration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaporator temperature</td>
<td>40°F to 50°F</td>
<td>0°F to 40°F</td>
<td>-40°F to 0°F</td>
</tr>
<tr>
<td>Suggested superheat setting</td>
<td>8°F to 12°F</td>
<td>6°F to 8°F</td>
<td>4°F to 6°F</td>
</tr>
</tbody>
</table>

FOLLOW THE RULES

When charging a refrigeration system, there are five main rules to follow:

Rule 1. Always charge a receiver/sight glass/TXV system under a high evaporator heat load. This can simply mean opening the doors or putting an artificial or false heat load on the evaporator.

Rule 2. For systems under a vacuum, once the desired vacuum level has been reached, the vacuum pump has been isolated from the system, and no leaks exist, always charge liquid refrigerant in the high side of the system until the sight glass stops bubbling.

Rule 3. With the system under high evaporator heat loading, charge refrigerant vapor into the low side of the refrigeration system until the sight glass stops bubbling.

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