YORK®

ESG Service Information

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Equipment Affected: OM Titan Chillers

Refrigerant Charging in OM Titan or Other Always Flooded Chillers

General

This letter establishes guidelines and procedures which a field technician can use to attain a properly charged system at full load and design conditions, without causing overcharging and the resultant added expense in materials, refrigerant, and labor. Use the following steps for charging procedures.

1. Charge the full estimated amount into a storage receiver, if available.
   a. Refer to Unit Arrangement drawings in the IOM under the System Design tab for the estimated amount. You'll find it listed under "ESTIMATED OPERATING WEIGHTS", or on the unit "G & A" drawing.
   b. It's best to begin with, and to maintain a known amount of refrigerant in the system so you always know where you are at during the charging procedure. Do this by weighing all refrigerant cylinders before and after installation of refrigerant into the system and record the weights.
   c. Get and keep all relevant documentation and information about the vendor delivered refrigerant. If the quality of the refrigerant is questioned, you'll have a paper/info trail to the source, which may help diagnose the problem.
   d. Refrigerant testing all cylinders before charging into the system is probably too costly at every site. However, comparing the saturation pressure/temperature with the ambient temperature of each cylinder is a simple process that can be a saver of time and money. Refrigerant vendors can make mistakes. Refrigerant delivered via tanker, has a quality report associated with it. Secure a copy of it.
   e. Be sure that all refrigerant transfer lines are clean and are evacuated/purged free of inerts.
2. Charge 80% to 90% of the refrigerant into the system using refrigerant either from the storage receiver, or directly from the transport cylinders if a storage receiver is not used. When charging, remember it's easier to add than take out refrigerant.
3. Run the system.
   a. Turn the liquid injection valve (sound suppression) off.
   b. Adjust the hot gas de-superheating valve (quench) and leave it at the adjusted position.
   c. Start with a small CHILLED WATER Delta T and decrease the outlet temperature setpoint slowly. This gives you enough control over the system operation to smoothly approach design outlet temperature and prevents creating an unstable condition which could cause the unit to shutdown.
4. Establish subcooler level.
   a. The design level of the subcooler is 50% of the sight glass. This level will physically be in between the top of the subcooler tube bundle and the deck separating the condenser and subcooler.
   b. Tune this level controller to a steady operation. Remember, a change in refrigerant charge will have an effect on the subcooler level. Final tuning occurs at time of charge completion.
5. Operate the system at Full Load/ Design Operating Conditions.

a. Locate these conditions (pressure, temperature, flow…etc) on the Unit Arrangement drawings under the info titled “DESIGN LOAD CONDITIONS”. Other operating parameter information is located on the P&ID drawings of the compressor, gear & motor (if applicable), and turbine (if applicable).

b. As the system capacity increases, the resident charge amount may be low. This can show up as low evaporator pressure. Add refrigerant until you can get to the design load conditions.

c. The system instrumentation must be credible. If any instrument is in question, calibrate and verify. Bad data will confuse the system analysis.

d. Record operating parameters and evaluate them against the design parameters.

e. An elevated suction superheat is normally the result of low charge. Remember, with current tube technology, superheat may not readily be evident.

f. Low or no suction superheat is not always a bad condition. Check for sufficient discharge superheat. Compare the saturated temperature/ pressure with the running conditions. There should be a minimum of 2º of superheat. If it exists then the compressor is not being flooded. If it doesn’t, then the suction is too “wet”, and evaporator or intercooler level is too high. A whirling amount of liquid in the suction line sight glass is not a definitive sign of flooding over. A test for this is to shine a flashlight from one of the sight glasses through to the other while observing the interior of the suction line. If you can see through to the other side and the light, excessive carry over is not happening. If the path is blocked, a dangerous situation has occurred, which requires immediate corrective action.

g. Check the “small difference”. This is defined as the temperature difference between the OUTLET chilled water and the converted from pressure, suction temperature. A unit with “enhanced tubes” can see as low as a 1º Fahrenheit temperature difference (outlet CHW is higher of the two).

h. The evaporator tube bundle is designed to be covered with an ebbulating (rolling boil) refrigerant level. There will be more activity on the chilled water inlet end. Be aware that oil in the refrigerant charge can affect the appearance of the levels in the evaporator. The amount of oil contamination can be determined with a refrigerant sample test.