The Locomotive

Recommend Accident Prevention Procedures for Refrigeration and Air Conditioning Equipment

The Hartford Steam Boiler Inspection and Insurance Company

Hermetic Motors
Annually:
1. Take insulation resistance readings of stator windings. Values below 50 megohms at an ambient temperature of 85 degree F or less may indicate the presence of moisture in the winding insulation and warrant further evaluation by the manufacturer before the motor is placed in service. For hermetic motors over 10 years of age and 100 hp, consideration should be given to current signature analysis to check for loose or broken rotor bars.
2. Inspect the contacts in the magnetic starter for signs of deterioration and check all line and load side terminals for loose connections.
3. Test control relays for proper timing sequence.
4. Measure line voltage and ampere load for proper balance.
5. Test motors, which have been tripped off by any of the protective devices. Do not restart them until the windings have been tested and the motor starter circuits have been examined to determine the reason for the tripping.

Reciprocating Compressors
Annually:
1. Sample oil for spectrochemical analysis. The results of the analyses will indicate any need for a specific service or maintenance activity.
2. Check the crankcase heater circuit for operation.
3. Test the low oil pressure cut-off switch, which should be within the time delay rating and at pressure differential specified by the compressor manufacturer. If it fails to function properly, it should be replaced.

Every Two Years or 10,000 Hours of Operation — Whichever Comes First:
1. Remove the cylinder heads for examination of suction and discharge valves, valve springs, and upper cylinder areas.
2. Remove the crankcase cover plate and inspect the crankcase for metal particles, which would indicate bearing wear and the need to inspect further.
Every Four Years or 20,000 Hours of Operation — Whichever Comes First:
1. Remove connecting rod and piston assemblies to:
   − Check piston rings for wear.
   − Check connecting rod bearing surfaces for wear.
   − Perform dye penetrant test of connecting rod yokes, caps and bolts for fatigue cracks (new rod bolts and nuts may be advisable).
   − Check crankpin diameter for wear. If general wear is noted, remove crankshaft for complete examination of main bearings and journals.
   − Remove the oil pump for examination of parts, particularly the drive tang.
2. Examine the guide vanes for fatigue cracking by nondestructive test:
   − Inspect the guide vane bushings and linkage for lost motion, wear, and sticking vane system.
3. Examine the main shaft, pinions and speed increaser gears by nondestructive examination.
4. Check all bearings for wear tolerance.
5. Drain and clean the oil sump, and test the oil cooler for leaks.
6. Examine the oil pump for wear.

Centrifugal Compressors
Annually:
1. Sample oil for spectrochemical analysis. The results of the analysis will indicate any need for a specific service or maintenance activity.
2. Test all operating controls and safety devices to determine that they function properly and at the settings specified by the compressor manufacturer. Any safety device or operating control, which does not function properly, should be renewed.
3. Clean oil cooler sump and change oil filters. Check the oil heater for proper operation. Check the condition of any moisture indicators and install new filter/drier cores where needed.

Every Five Years or 40,000 Hours of Operation — Whichever Comes First:
1. Disassemble the compressor for examination of critical parts:
   − Examine the impellers by nondestructive test for cracking in highly stressed areas.
   − Examine the area under the labyrinth seal for grooving.
   − Look for evidence of impeller rubbing the casing — indicating excessive thrust clearance.
   − Clean impellers by vapor blast (solvent) prior to dynamic balancing.
2. Overhaul the purge unit. When provided, a purge unit should be overhauled at least once each year, with interim service checks performed as recommended by the manufacturer.
3. Test all system joints for leaks every year. Leaks at pipe joints will allow refrigerant to be lost to the atmosphere in high-pressure systems or air to be drawn into the system where low-pressure refrigerants are used.

After Five Years of Operation:
1. Examine the chiller and condenser tubes by eddy current analysis. This will reveal tube deterioration incident to age and service. The results of the eddy current analysis will determine when the next test should be performed.
Lithium Bromide Absorption Machines
(More Than 100 Tons Capacity)

Annually:
1. Analyze a sample of the lithium bromide solution for the presence of corrosion products and to determine the chemical balance of solution inhibitors.
2. Test all operating controls and safety devices to determine proper functioning at the settings specified by the manufacturer.

Every Three Years:
1. Disassemble the solution pumps and motors to permit examination of bearings, seals, and impellers. Many of these units utilize carbon sleeve bearings, which can wear rapidly when the flow of cooling water is interrupted since the water provides lubrication for the bearings.

Every Five Years:
1. Examine all tubes in the machine by eddy current analysis to detect deterioration, which could lead to tube failure. The results of the analysis will determine when the next examination should be made.

Reciprocating Package Units

Annually:
1. Test all system controls and safety devices to determine that they function properly at the settings specified by the manufacturer; viz. thermostatic controls, flow switches, pressure controls.
2. Check the superheat setting of the thermal expansion valve(s) at both low load and full load.

Vessels and Piping

Annually:
1. Clean water-cooled condenser tubes for optimum heat transfer to prevent high head pressure when in service. After cleaning, tubes should be checked for refrigerant leaks.
2. Check the refrigerant liquid line moisture indicator for the presence of moisture within the system. If moisture is indicated, a liquid line filter dryer should be used to dehydrate the system and an oil sample analyzed for possible acidity.

After Ten Years of Operation:
1. Examine the tubes of the tube and shell type condensers by eddy current analysis. (Chiller tubes, which have “star” inserts, cannot be examined by the eddy current technique.)