

**CENTRIFUGAL CHILLER**

*Annual Inspection*

**Refrigerant Circuit**
- Check and record refrigerant level
- Inspect for leak results
- Calculate refrigerant loss and report to the customer.
- Repair minor leaks as required (e.g. valve packing, flare nuts).
- Visually inspect condenser tubes for cleanliness.
- Check vanes for free and smooth operation.
- Check mechanical linkages for wear.
- Adjust refrigerant level with customer's refrigerant.
- If purge minutes show sign of a leak perform a complete leak test on chiller with electronic detector.
- Tighten flange nuts, bolts, when appropriate.

**Purge System**
- Check purge unit controls for proper operation.
- Check and clean purge drum as required
- Clean the condenser coil
- Clean strainers or replace filters as required.
- Check the purge compressor assembly for leaks as required.
- Check the purge unit for proper operation.
- Inspect and report on operating conditions.
- Confirm purge compressor effectiveness.
- Internal purge condenser inspection and cleaning (includes new gaskets), when applicable
- Inspect purge float, adjust if needed.
- Clean purge sight glass (includes new gaskets), if removable.
- Inspect, adjust solenoid valve, air relief oil separator.
- Perform leak test on purge system.

**Controls and Safety**
- Verify all settings in the electronic control panel.
- Inspect the control panel for cleanliness.
- Inspect wiring and connections for tightness and signs for overheating and discoloration.
- Verify the operation of the vane control system
- Verify the working condition of all indicator/alarm lights and LED/LCD displays.
- Verify the operation of the oil sump temperature control devise.
- Test high condensor pressure safety device. Calibrate and record setting.
- Test low evaporator temperature safety device. Calibrate and record setting.
- Test low oil pressure safety device. Calibrate and record setting.
- Test high motor temperature safety device. Calibrate and record.
- Test operation of chilled water pump and condenser water pump starter auxillary contacts.

**Lubrication System**
- Pull oil sample for spectroscopic analysis.
Check oil for acid content and discoloration. Make recommendations to the customer based on the results of the test.
Measure and record the oil pump voltage and amperage.

Verify the operation of the oil heater. Measure amps and compare readings with the watt rating of the heater.
Change the oil filter.
Verify the oil level.
Tighten terminal on oil pump motors and heaters.
Replace factory mounted refrigerant filter.
Inspect and report on conditions of oil pump, oil cooler, oil heater.

**Motor and Starter**
Clean the starter and cabinet.
Inspect wiring and connections for tightness and signs of overheating and discoloration.
Check condition of the contacts for wear pitting.
Check contactors for free and smooth operation.
Check the mechanical linkages for wear, security, and clearances.
Check tightness of the motor terminal connections.
Meg the motor and record rating.
Verify the operation of the electrical interlocks.
Confirm proper compressor/motor transition time.

**Quarterly Inspection (3 times a year)**
Check the general operation of the unit.
Log the operating temperatures, pressures, voltages, and amperages.
Check the operation of the purge unit.
Check the operation of the control unit.
Check the operation of the lubrication system.
Check the operation of the motor and starter.
Analyze the recorded data. Compare the data to the original design conditions.
Review operating procedures with operating personnel.

Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.
Controls: Inspect, calibrate, test safety controls: log cut-in, cut-off points.
Refrigerant/Lubrication Circuits: Adjust refrigerant level with customer's refrigerant, if available.
Compressor/Motor Assembly: Megger main compressor motor, log tighter terminals.

**MISC:**
Check for proper flows through chiller.
Vibration analysis.
Inspect sight glasses, log levels.
Log amperages/voltages/temperatures/pressures.
Inspect thermometers/gauges.
Analysis of log readings by factory trained service technician, report on unusual conditions.
Generate reports on problems and conditions: log readings and compressor oil.
Condensor tube brushing once annually.
**ANNUAL INSPECTION**
Report in with customer representative
Record and report abnormal conditions, measurements taken, etc.
Review customer logs with the customer for operational problems and trends.

**General Assembly**
Clean debris from platform and surrounding area.
Clean water sump and check condition.
Clean float valve assembly/water level control assembly and adjust.
Check an clean bleed off line and overflow.
Clean tower strainers.
Clean tower spray nozzles and eliminators.
Flush cooling tower after cleaning.
Check sump heaters and thermostats for calibration and proper operation.
Inspect general tower condition for water treatment problems.
Inspect drive belts, check and tighten if required.
Inspect bearings, lubricate when required.
Inspect motors.
Inspect tower fill for deterioration.
Inspect for dust and dirt, wipe down motors and moving parts as required.
Inspect fans for balance/vibration.

**Structure**
Disassemble all screens and access panels for inspection.
Inspect the conditions of the slats, if applicable.
Inspect the condition of the tower fill.
Inspect the condition of the support structure.
Inspect the condition of the basins (upper and lower) and/or spray nozzles.
Verify clean basins and strainer(s).
Verify the condition and operation of the basin fill valve system.

**Mechanical**
Inspect gear box for leaks.
Inspect drive and coupling for condition and security.
Inspect fan assembly for condition, security, and clearances (e.g. blade tip clearance).

**Lubrication**
Lubricate motor bearings.
Check gear box oil level.

**Motor and Starter**
Clean the starter cabinet.
Inspect wiring and connections for tightness and signs of overheating and discoloration.
Check condition of the contacts for wear and pitting.
Check contactor(s) for free and smooth operation.
Meg the motor and record reading.
Check disconnect terminal block for wear, tightness and signs of overheating and discoloration.
Check the condition and operation of the basin heater contractor(s).

**Quarterly Inspection (3 times a year)**
Check the general condition of the tower.
Verify clean basins and strainers (upper and lower) and/or spray nozzles.
Verify proper water level in the basin.
Verify proper operation of the water level control device.
Verify smooth operation of the fan(s).
Verify proper operation of the bypass valve(s), if applicable.
Review operating procedures with operating personnel.

Provide a written report of completed work, operating log, and indicate uncorrected deficiencies detected.
Inspect drive belts.
Inspect bearings, lubricate when required.

**Cooling Tower Cleaning -(1 per year)**
Turn off and lock out cooling tower electrical disconnects.
a) Fan
b) Heat tape
c) Basin heaters
Close Make-up water valve to cooling tower.
Close condensor water supply and return valve.
Close weir gates if applicable
Drain cooling tower
Inspect fill and tower structure for damage and report to team leaders of account manager any findings.
Verify use of cleaning materials needed to tower.

**CAMUS BOILER**

**Annual Maintenance**
Report in with customer representative
Record and report abnormal conditions, measurements taken, etc.
Review customer logs with the customer for operational problems and trends.
Record inspection log for State Boiler.

**General Assembly**
Secure and drain the boiler.
Open the fire and water side for cleaning and inspection.
Check the heating surfaces and water side for corrosion, pitting, scale, blisters, bulges, and soot.
Inspect the refractory.
Check the expansion tank and drain if needed.
Clean the fire inspection glass.
Check the blow-down valve packing and lubricate.
Check and test boiler blow-down valve.
Perform hydrostatic test, if required.

**GAS TRAIN BURNER ASSEMBLY**
Check the gas train isolation valves for leaks.
Check the gas supply piping for leaks.
Check the gas pilot solenoid valve for wear and leaks.
Check the main gas and the pilot gas regulators for wear and leaks.
Test the low gas pressure switch. Calibrate and record setting.
Test the high gas pressure switch. Calibrate and record setting.
Verify the operation of the burner fan air flow switch.
Inspect and clean the burner assembly.
Inspect and clean the pilot igniter assembly.
Inspect and clean the burner fan.
Run the fan and check for vibration.
Inspect the flue and flue damper.
Burner control panel: Inspect for cleanliness, and inspect for wiring and connections for tightness and signs of overheating and discoloration.
Clean burner fan wheel and air dampers. Check for vibration.
Verify tightness of the linkage set screws.
Check the gas valves against leakage (where test cocks are provided).

**Controls and Safety**
Disassemble and inspect the low water cutoff safety device.
Reassemble the boiler low water cutoff safety device with new gaskets.
Clean the contacts in the program timer, if applicable.
Check the operation of the low water cutoff safety device and feed controls.
Verify the setting and test the operation of the operating and limit controls.

*Quarterly Inspection *(3 per year)*
Check the general condition of the unit.
Inspect the burner.
Adjust the burner controls to obtain proper combustion.
Check the operation of the pressure relief valve.
Check the operation of the low water cutoff and feed controls.
Check the setting and test the operation of the operating and limit controls.
Check the operation of the modulating motor.
Lift the safety/relief valves with at least 70% of rated pressure.
Blow down and try gauge cocks to confirm glass water level.
Check and test boiler blow-down valve.
Log operating conditions after the system has stabilized.
Review operating procedures with operating personnel.
Provide a written report of completed work, operating log, and indicate uncorrected deficiencies detected.

**PUMPS**
Annual Inspection
Report in with customer representative
Record and report abnormal conditions, measurements taken, etc.
Review customer logs with the customer for operational problems and trends.

General Assembly
Check motor shaft and pump shaft for alignment, if applicable.
Inspect the coupling for wear.
Verify that the shaft guard is in place and tight, if applicable.
Verify the water flow through the pump.
Check for leaks on the mechanical pump seals, if applicable.
Verify proper drip rate on the pump seal packing, if applicable.
Verify smooth operation pump.
Clean pump strainers.

provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Lubrication
Lubricate the motor bearings as necessary.
Lubricate the pump bearings as necessary.

Motor and Starter
Clean the starter cabinet.
Inspect wiring and connections for tightness and signs of overheating and discoloration.
Meg the motor.
Verify tight connections on the motor terminals.
Check the condition of the contacts for wear and pitting, if applicable.
Check the contractors for free and smooth operation.
Verify proper volts and amps.

Quarterly inspection -(3 per year)
Lubricate pump bearings per manufacturer’s recommendations.
Lubricate motor bearings per manufacturer’s recommendations.
Check suction and discharge pressures and log.
Check motor voltage and amperage, and log.
Check for excessive vibration and noise.
Verify smooth operation of the pump.
Check for leaks on the mechanical pump seals, if applicable.
Verify proper drip rate on the pump seal packing, if applicable.

Provide a written report of completed work, operating log, and indicated any uncorrected deficiencies detected.

CONTROL SYSTEM SERVICE

Annual Inspection -(1 per year)
Inspect, Test and Verify System Operation
On and off of components
Start and stop
Alarms
Temperature indications
Other applicable system variables and operations

Inspect and Test Circuit Boards
Processors
Control devices: i.e.: BCU, MP581, MP503
Communication between devices
Analog inputs/outputs
Binary inputs/outputs
input and output wiring

Inspect and Test Diagnostics
Control devices
BCU, MP581, MP503, etc.

Inspect and Test Peripherals
Printer
CRT/HMI
Modem
PC, if applicable

Miscellaneous
Perform Tracer program database back-ups on diskette for site.
All System components will be inspected and tested to insure proper operation.
Replace Tracer Processor Back-up Batteries
Inspect and test program operation

Quarterly inspection -(3 per year)
Inspect and Test Program Operation
Chiller Start, Stop, and Sequencing
Chills Water Reset
Pump Sequence and Rotation
Tower Fan Operation

Inspect and Test Diagnostic LED's
Control panel
Processor
Memory
Communication

Inspect and Test Status Display
Event log
Input/output status
Inspect and Test Peripherals
Printer
CRT/HMI
Modem and other communication cards
PC, if applicable

REFRIGERANT & CO MONITOR

Annual Inspection -(1 per year)
General
Inspect location and mounting of monitor.
Inspect location of sensor.
Verify non-used inlets and exhausts are capped.
Check with equipment operator for unit history.
Check Monitor Connections
Test and calibrate Sensor

Case ground
Check 115 volt main power.
Check low voltage wiring for 0-10 VDC or 4-20ma analog wiring.

Complete Startup Procedure
With switch in off position, energize power circuit and check voltage.
Turn power switch on.
Check for stability after warm-up period.

Perform Calibration
Recalibrate monitor.
Check calibration after reinstallation as outlined in manual.
Check circuit board integrity.

Quarterly Inspection -(3 per year)
General
Inspect location and mounting of monitor.
Inspect sensor.
Check with equipment operation logs for unit history.

Check Monitor Connections
Check case ground.
Check 115 volt main power.
Check low voltage wiring for 0-1- VDC or 4-20ma analog wiring.