Scheduled Maintenance

Scheduled Maintenance Service for EMD Engine Driven Stationary Power Units for Standby or Base Load Operation

INTRODUCTION

This Maintenance Guide outlines the minimal services, labor and materials necessary to provide the standard maintenance required to meet OEM (PowerTeam) recommendations for standby and base load power plant operations of our EMD Engine Driven Generator Sets to ensure satisfactory engine operation and economical maintenance costs where average stated load factors and average stated climate conditions (as listed standard performance specifications of each model unit) are encountered.

General Description

This guide provides all normal maintenance required on all EMD equipment. Operator to utilize recommended engine parts, consumables (oil, air and fuel filters) and spare parts.

Standard Assumptions:

- Fuel oil used will meet original specifications provided.
- Lubricating oil used will meet the specifications of original specifications provided and will be changed at the intervals specified.
- Engine coolant used will meet the original specifications provided.
- Lubricating oil, fuel and air filters and replacement parts will be of a quality equal to original equipment and will be changed at the intervals specified.
- All warranty work is performed by PowerTeam or its authorized representative or it’s assigns.
- Operating load limitations will be adhered to.
- Units are installed in accordance with OEM (PowerTeam) minimum recommendations

NOTE

✔ The following recommendations are applicable to stationary power units used for standby or base load power operations.

✔ In the case that the units are being operated in a standby mode, each unit should be operated at least once a week. Each unit should be operated at idle for a sufficient period of time to allow coolant temperature to stabilize at 49°C (120°F) or higher. Once a month each unit should be operated at full speed, full load for a minimum of one half hour.

✔ The operator is required to contact PowerTeam in the case that each unit is not to be operated below a minimal output requirements for maximum efficiency. (Reference appropriate maintenance manual with model number for associated output clarifications)
SECTION 1
Equipment Operating Task be Provided by
Plant Operating Personnel on a Daily Basis

IMMEDIATELY AFTER EACH START
(Automatic or Manual Start Units)

Unit Start Up Procedures

BEFORE EACH START

Check the following:

Cooling System
Check coolant level and add coolant if required

Fuel System
Check main fuel supply to each unit

Air System
Drain condensate.
Check system pressure
Check oil supply in air line lubricator

Governor
Check lube oil level

Lube Oil System
Pre-lube engine if unit has been shutdown for over 48 hours.

Fuel System
Prime system.

Air System
Drain condensate.
Check system pressure.
Check oil supply in airline lubricator.

Engine
Open cylinder test valves and manually bar over engine one complete revolution, check for liquid ejected from valves, and close test valves. If fluid discharge is observed from any cylinder, find the cause and make necessary repairs prior to staring the engine.
FOLLOWING START UP

While Engine is Running

Inspect For Leaks
Cooling system
Fuel system
Lube system
Exhaust system

Lube Oil System
Check lube oil level in pan with engine at idle
Check lube oil pressure at engine

Engine
Check cylinder test valves for leakage. Tighten if required.
Check hand-hole covers for leakage. Tighten if required.
Check air box drains for proper operation and clean.
* If drains are kept closed, drain every 4 hours.
SECTION 2

Description Maintenance Task to be performed by Plant Operators
On a “Running Time” basis.

BASIC INSPECTION RESPONSIBILITIES

EVERY MONTH

Lube Oil System
Take sample for analysis*
*The services of a competent laboratory should be used to monitor the suitability of the oil for continued use.

Lube Oil Circulating Pump and Motor
Check for proper operation

Immersion Heater
Check for proper operation

EVERY TWO MONTH

 Auxiliary Turbocharger Filter (As necessary)
Check for proper operation / pressure and leaks inspections

In-Line “Y” Oil Strainer (Inspect and clean as necessary)
Clean strainer screen

EVERY YEAR

Lube Oil Circulating Pump and Motor
Inspect and clean with dry air.
Remove and clean check valve.

EVERY THREE YEARS

Cooling System Thermostatic Valve
Replace “O” rings and thermostatic elements.

EVERY FOUR YEARS

Cooling System Pressure Cap
Replace.*
*Unless 16,000 hour replacement has occurred first.

EVERY SIX YEARS

Engine
Replace top deck cover seals and check latches.*
*Unless 8000 hour replacement has occurred first.
Replace cylinder head grommets, inlet and outlet seals, and lower liner seals.
*Unless cylinder assembly replacement has occurred first.

Main Generator
Remove bearing cover and inspect for grease contamination, excessive wear and overheating. Apply new grease.*
*Unless 48,000 hour lubrication has occurred first. If generator is other than EMD, refer to manufacturer’s manual.
PERFORM THE FOLLOWING ITEMS PER ACCUMULATING RUN TIME HOURS

AFTER THE FIRST 350 HOURS OF OPERATION

*Engine Nut and Bolt Tightness Check*
Torque to values specified the following:
- Cylinder head crab nuts.
- Exhaust manifold flange bolts.
- Cylinder liner water inlet line nuts and bolts.
- Head frame to crankcase bolts.
- Turbocharger to air duct bolts, after-cooler to air duct bolts and air duct to crankcase bolt
Inspect injectors

EVERY 350 HOURS THEREAFTER

*Fuel Filter*
Check pressure gauge with engine at rated RPM.*
*On units where gauge is connected to filter input side, change filter elements if pressure is greater than 50 psi.

*Lube Oil Filter*
Check lube oil pressure at filter cover with engine running at rated RPM.*
*Change filter elements if input pressure is greater than 25 psi.

EVERY 700 HOURS

*Engine Protector*
Check operation.

*Soak Back Pump And Motor*
Check operation*

*With the engine shut down and soak back pump motor running, remove left rear hand-hole cover and check oil flow through gear train.

*Observe camshaft bearings. If lube oil flows from camshaft bearings with soak back pump running and engine shut down, inspect turbo filter outlet check valve for proper operation.

*Engine Air Filter Fiberglass Type*
Check indicator. *The interval of change for turbocharger air intake filter elements is influenced by load factor, kind of lubricating oil, type of operation, climatic conditions and maintenance of main lube oil filters.

*Heat Exchanger*
Inspect corrosion zinxs.

*Lube Oil Filters*
Check indicators and replaces filter elements as necessary
Clean lube oil strainer.*
*Fill strainer housing with oil before starting engine.

*Turbocharger Oil Filter*
Replace filter elements.*
*The interval of change for turbocharger and soak back filter elements is influenced by load factor, kind of lubricating oil, type of operation, climatic conditions and maintenance of main lube oil filters.
Soak Back Oil Filter
Replace filter elements.*
*Filter elements must be of a quality equal to original equipment. The interval of change for turbocharger and soak back filter elements is influenced by load factor, kind of lubricating oil, type of operation, climatic conditions and maintenance of main lube oil filters.

EVERY 1400 HOURS

Lube Oil Filters
Change filter elements
Clean lube oil strainer.*
*Fill strainer housing with oil before starting engine.

Turbocharger Oil Filter
Replace filter elements.*
*Filter elements must be of a quality equal to original equipment. The interval of change for turbocharger and soak back filter elements is influenced by load factor, kind of lubricating oil, type of operation, climatic conditions and maintenance of main lube oil filters.

Soak Back Oil Filter
Replace filter elements.*
*Filter elements must be of a quality equal to original equipment. The interval of change for turbocharger and soak back filter elements is influenced by load factor, kind of lubricating oil, type of operation, climatic conditions and maintenance of main lube oil filters.

Protective Devices and alarms controls system
Check operation and functionality and repair or replace defective components as necessary.

Fuel Filters
Inspect, clean or replace suction strainer element.
Change engine mounted filter elements.*

Oil System
Change engine oil.* Depending upon fuel sulfur content and quality of lubricating oil, it may be necessary to change lube oil even more frequently.
Clean oil pan.
Clean filter housing.
Clean oil suction screens.
Clean scavenging oil screens.*
*Fill strainer housing with oil before starting engine.

EVERY 2000 HOURS

Fuel Filters
Clean or replace suction strainer element.
Change engine mounted filter elements.*
*Use only elements equal to original equipment.

Cooling System
Check inhibitor concentration.

Engine Air Filter-Fiberglass Type
Replace elements.
**Engine**
Inspect air box.
Inspect crankcase.
Inspect crankshaft and connecting rods.
Inspect pistons and piston rings.
Inspect cylinder liners.
Inspect cylinder head mechanism with engine idling and at operating temperature.
Inspect engine fuel lines and connections for leaks.
Inspect engine water system for leaks.

**EVERY 4000 HOURS**

**Exhaust System**
Remove manifold screen and trap. Check for cracks and clean.

**Eductor Tube** (Exhaust Stack Mounted)
Inspect for carbon deposits and clean, if necessary.

**Oil System**
Change engine oil.*
*Evaluation of engine and oil condition should indicate the frequency of this item. Type of service, type of oil, quality of filter elements and condition of engine will influence the frequency of oil change.
Clean oil pan.
Clean filter housing.
Clean oil suction screens.
Clean scavenging oil screens.*
*Fill strainer housing with oil before starting engine.

**Engine**
Check pressure drop across after-coolers*
*Clean air passages if necessary.
Check exhaust manifold base flange bolts for proper tightness.

**Main Generator**
Inspect collector rings and brushes and replace brushes if required.*
*If generator is other than EMD, refer to manufacturer’s manual.
Reverse polarity of collector rings.

**Governor**
Change oil.
Lubricate linkage moving parts.
Lubricate governor synchronizing motor, motor bearings.

**EVERY 8000 HOURS**

**Engine Nut And Bolt Retorque**
Cylinder head crab nuts.* Loosen and then torque to values as specified in PowerTeam Specifications.
Head frame to crankcase bolts.
Turbocharger to air duct bolts, after-cooler to air duct bolts and air duct to crankcase bolts.

**Engine**
Replace top deck cover seals and check latches
Qualify injectors.
Check injector timing and injector rack length.
Check engine speed.
Remove and clean oil separator element.
Check pressure drop across aftercooler.*
*Clean air passages if necessary.
Inspect vibration gear dampener
Remove, clean, and inspect: replace if necessary.
  - Soak back check valve in the turbo filter inlet.
  - Soak back oil pressure relief valve in the soak back filter head.
  - Soak back filter bypass valve in the soak back filter head.
  - Turbo oil filter check valve in the turbo filter head.

Exhaust System
Inspect manifold connectors for liner cracks and replace if necessary.

Main Generator
Visually inspect and clean.
Replace collector ring brushes.

Exciter
Clean and visually inspect.
Inspect and replace brushes when required. Replace brushes in sets only.

Starting Motors
Clean Strainer and lines of any water or sludge

Soak Back Pump Motor
Inspect and clean with dry air.
Replace brushes.

Cooling System
Inspect and perform pressure test.
Replace pressure cap if defective.

Lube Oil Filter
Remove oil filter bypass valve; clean, inspect and test.

EVERY 16,000 HOURS

Starting Motors (Air)
Disassemble, clean and lubricate.
Renew parts if necessary.

Fuel Pump
Replace coupling spider.

Soak Back Pump
Replace coupling spider.

EVERY 24,000 HOURS

Engine
Install new thrust collars.
Install new lower main bearings.
Replace water pump seals and all worn parts.

Cooling System
Replace flexible coupling seals.
**Lube Oil Cooler**
Inspect, clean and test.

**Heat Exchanger**
Inspect, clean and test.

**Main Generator**
Remove bearing cover and inspect for grease contaminations, excessive wear and overheating. Apply new grease.*
*If generator is other than EMD, refer to manufacturer’s manual.

**EVERY 35,000 – 40,000 HOURS**

**Engine**
Replace oil pumps
Replace water Pumps
Inspect and Qualify Turbocharger for replacement
Remove oil pressure relief valve; clean, inspect, test and reset
Replace Injector Fuel Control Rods
Replace Power Assemblies
Replace Fuel Injectors
Replace Connecting Rods & Bearings
Inspect and Qualify Main Bearings for replacement
Inspect and qualify piston cooling tubes
Replace Rocker Arms Assemblies
Replace Valve Bridge Assemblies
Reset Exhaust and Injector Timing.

**Cooling System**
Replace pressure cap.
Inspect filler neck for damage. Replace if damaged.
Take cooling water sample for lab analysis and corrosion test.

**Turbocharger-To Filter Air Duct and clamps**
Replace.

**Governor**
Recondition.

**Fuel Pump**
Replace Fuel Pump.

**Soak Back Pump and Motor**
Recondition.

**Generator**
Inspect and qualify generator bearing for replacement and replace as necessary.
Check RTD’s and repair as necessary
Inspect Terminations and repair as necessary
Check all Generator Connection Box and repair as necessary
Check engine/generator alignment and re-torque mounting bolts
Section 3

Description of Maintenance Task performed by Plant Operators on a “Calendar Period” basis.
Assuming a limited amount of accumulated RUN TIME on units.

EVERY TWO YEARS

Lube Oil Filters
Change filter elements.*
*Unless filter change, on a running time basis, has occurred first.
Clean lube oil strainer.*
*Fill strainer housing with oil before starting engine.

Turbocharger Oil Filter
Replace filter elements.*
*Unless filter change, on a running time basis, has occurred first.

Soak Back Oil Filter
Replace filter elements.*
*Unless filter change, on a running time basis, has occurred first.

Fuel Filters
Change engine mounted filter elements.*
*Unless filter change, on a running time basis, has occurred first.
Clean or replace suction strainer element*
*Unless filter change, on a running time basis, has occurred first.

Engine Protector
Recondition.*
*Qualify on test stand after renewing springs, “O” rings, and diaphragms.

Lube Oil Circulating Pump and Motor
Recondition.

EVERY TWO WEEKS

Lube Oil System
Take sample for analysis*
*The services of a competent laboratory should be used to monitor the suitability of the oil for continued use.

Inspections with Engine Running

Bi-Weekly
With Engine Running

Inspect For Leaks
Cooling system
Fuel system
Lube oil system
Exhaust system
Air system

**Lube Oil System**
Check lube oil level in pan with engine at idle
Check lube oil pressure at engine

**Engine**
Check cylinder test valves for leakage. Tighten if required.
Check hand-hole covers for leakage. Tighten if required.
Check air box drains for proper operation and clean. If necessary.*
*If drains are kept closed, drain every 4 hours.

**Bi Monthly**
With Engine Not Running

**Inspect For Leaks**
Cooling system
Fuel system
Lube oil system
Exhaust system
Air system

**Lube Oil System**
Check lube oil level in pan

**Cooling System**
Check coolant level

**Fuel System**
Check fuel supply

**Air System**
Drain condensate from lines and tanks.

**Governor**
Check oil level and add oil if required