

## **Major Components**

### **Screen 1:**

#### **Introduction to 7FDL Diesel Engine Components:**

Welcome to the Major Components module of the 7FDL Diesel Engine Basic course. The 7FDL engine is a high-compression, four-stroke, medium-speed engine designed specifically for locomotive service. A high-capacity turbocharger, efficient combustion system, and electronic fuel injection combine to provide a fuel efficient engine that meets strict emissions levels.

At the end of this module, you will be able to:

- Identify the major components in a 7FDL diesel engine.
- State the purpose and location of the major components in the 7FDL engine.

### **Screen 2:**

#### **Engine Mainframe:**

The engine mainframe is a large iron casting, sometimes referred to as the engine block, which provides a base to attach all the other engine components. Oil passages are cast into the frame to reduce the potential for leaks. No cooling water, intake air, or exhaust gases come in direct contact with the mainframe.

### **Screen 3:**

#### **Fuel System:**

The purpose of the fuel system is to deliver high-pressure diesel fuel to the combustion chamber. The fuel system has three components: the high-pressure fuel pump, the high-pressure fuel line, and the fuel injection nozzle.

### **Screen 4:**

#### **Turbocharger:**

The turbocharger is an exhaust-driven air compressor. It provides compressed air to support more complete combustion of the fuel. The turbocharger is driven only by exhaust gases for the entire speed range, and is not run by any belts or gear trains. The turbocharger is mounted to the free end of the engine.

### **Screen 5:**

#### **Exhaust Manifolds:**

The exhaust manifolds channel the exhaust gases from the cylinders to drive the turbocharger. They are located in the vee of the engine.

### **Screen 6:**

#### **Engine Crankshaft:**

The engine crankshaft, which runs through the center of the mainframe, converts the linear motion of the pistons into radial motion to drive the alternator. For the 12- and 16-cylinder 7FDL diesel engines, there are 7 and 9 main bearing journals, respectively, to anchor the crankshaft to the mainframe. The crankshaft and the bearing journal surfaces are nitride hardened to provide longer component life. The crankshaft main bearings are designed to minimize the friction at the points where the crankshaft is anchored to the mainframe. They also provide a base to control the oil film on which the crankshaft rides.

**Screen 7:****Vibration Damper:**

The vibration damper reduces the shock of the combustion stroke. Without the damper, the crankshaft would break. The damper is located at the free end of the crankshaft, and is made up of a flywheel inside a housing.

**Screen 8:****Split Gear:**

The split gear drives the camshaft gears. It is assembled onto the crankshaft in two pieces at the alternator end of the crankshaft.

**Screen 9:****Rubber-Bonded Drive Coupling:**

The rubber-bonded drive coupling provides the interface between the crankshaft and the auxiliary drive gear. The auxiliary drive gear is bolted to the outside ring of the rubber-bonded drive coupling, and drives an idler gear. The idler gear, in turn, drives the water and lubricating oil pumps. In the event that the gear driven oil or water pumps seize or lock up, the rubber bond drive will shear, thus disconnecting the auxiliary drive gear from the crankshaft. This feature is designed to provide crankshaft protection.

**Screen 10:****Camshaft:**

The camshaft is gear-driven off the crankshaft. Lobes on the camshaft provide the motion to open the intake and exhaust valves and operate the high-pressure fuel pumps.

**Screen 11:****Connecting Rod Arrangement:**

Each connecting rod arrangement includes two rods, the master rod and the articulating rod. The master rod is installed in the left bank of the engine. The articulating rod, linked to a master rod by a pin connection, is located in the right bank of the engine.

**Screen 12:****Steel Crown Piston:**

The piston is a critical component in the diesel engine. It compresses air for combustion and transfers the energy produced from combustion to the crankshaft via the connecting rod. The piston is a two piece assembly, consisting of the piston crown and the piston skirt, that is housed within the cylinder assembly. The top or crown of the piston is steel for high strength and resistance. The bottom or skirt of the piston is aluminum for light weight. It houses the piston pin for the connection between the piston and the connecting rod.

**Screen 13:****Cylinder Assembly:**

The purpose of the cylinder assembly is to contain and control the expansion of gases from combustion. The unitized cylinder is made up of three major components: the cylinder jacket, the cylinder liner, and the cylinder head. The cylinder jacket is the outside casting that houses all the other cylinder components. The cylinder liner is a heavy-walled tube that is hardened or chrome plated for extended wear. It is one of the components that forms the combustion chamber. The cylinder liner is assembled inside the cylinder jacket. The cylinder head is welded to the top of the

cylinder liner to form the top of the combustion chamber. The intake and exhaust valve guides are assembled to the cylinder head. The valve seats are provided through welding and angle grinding in the cylinder head intake and exhaust ports.

## **Screen 19:**

### **Summary:**

You have reached the end of this module!

In this module, you learned to:

- Identify the major components in a 7FDL diesel engine.
  - The major components of a 7FDL engine are
    - Engine mainframe
    - Engine crankshaft
    - Vibration damper
    - Rubber-bonded drive coupling
    - Fuel system
    - Split gear
    - Engine main bearings
    - Connecting rod arrangement
    - Steel crown piston
    - Engine camshaft
    - Turbocharger
    - Exhaust manifolds
    - Cylinder assembly
- State the purpose and function of the major components in the 7FDL engine.
  - The engine mainframe provides the base to attach all other engine components.
  - The engine crankshaft converts the linear motion of the pistons into a radial motion to drive the alternator. It runs through the center of the mainframe.
  - The vibration damper reduces the shock of the combustion stroke. It is located at the free end of the crankshaft.
  - The rubber-bonded drive coupling provides the interface between the crankshaft and the auxiliary drive gear.
  - The fuel system delivers high-pressure diesel fuel to the combustion chamber.
  - The split gear drives the camshaft gears. It is assembled onto the crankshaft in two pieces at the alternator end of the crankshaft.
  - The crankshaft main bearings minimize the friction at the points where the crankshaft is anchored to the mainframe and also provide a base to control the oil film on which the crankshaft rides.
  - Each connecting rod includes two rods: the master rod and the articulating rod. The master rod is installed in the left bank of the engine and the articulating rod is installed in the right bank of the engine.
  - The piston compresses the air for combustion and transfers the energy produced from combustion to the crankshaft via the connecting rod.
  - The lobes on the camshaft provide the motion to open the intake and exhaust valves and the high-pressure fuel pumps.
  - The turbocharger provides compressed air to support more complete combustion of the

fuel. It is mounted on the free end of the engine.

- The exhaust manifolds channel the exhaust gases from the cylinders to drive the turbocharger. They are located in the vee of the engine.
- The cylinder assembly contains and controls the expansion of gases from combustion.