The material contained in this course component was accurate and current at the time of course development.
Objective

♦ Define the purpose of the engine lubrication systems

♦ Define the basic principles of operation of engine lubrication systems.

♦ Perform inspections and testing procedures on lubrication systems

♦ Name and describe the components of a typical lubricating system
Purpose of Lubrication

- Maintain a continuous supply of oil
- Reduce friction of moving parts
- Assist cooling the engine
- Help prevent corrosion
- Hold contaminants in oil until drained from engine
Oil

- Viscosity
- Pour point
- Viscosity index
- API Rating
- Additives
API Symbol

- The API Service Symbol "Donut" is divided into three parts:
- The top half describes the oil's performance level.
- The center identifies the oil's viscosity.
- The bottom half tells whether the oil has demonstrated energy-conserving properties in a standard test in comparison to a reference oil.
Oil Pumps

♦ Oil Pump
  • Pressurizes oil
  • Supplies oil volume

♦ Types of oil pumps
  • gear
  • gerotor
  • Crescent
Oil Filter

- full-flow paper element
- anti-drain back valve
- oil filter bypass valve
Pressure Regulator Valve

♦ Regulates Pressure
  • Spring
    – Determines pressure
  • Valve
    – Dumps to suction side of pump
Lubrication

- Lubrication Path
  - Screen
  - Pump pressurizes oil
  - Pressure regulator
  - Full flow oil Filter
  - Main oil galleys
  - Crank and Rod Bearings
  - Upper block for camshaft and lifters
  - Pushrods
  - Rocker arms
Lube Passage in Crank

Lube Passage to Rod Journals
Engine Oil Cooler

- The engine oil cooler is a heat exchanger. It is located inside the left side end tank of the radiator.
Oil Pressure Testing

- Install oil pressure adapter and gauge
- Start engine; increase RPM to 1400
- Make sure vehicle at operating temperature to get accurate reading
- Check oil pressure reading and compare to service information specifications

Notice that the oil pressure gauge and adapter are connected in place of the oil filter.
Leak Detection

- Visual inspection
- Powder Method
- High Intensity Lamp and dye
Gerotor

- Positive Displacement
  - Inner drive rotor
  - Outer rotor
  - Oil Pump Housing
  - Pressure Relief Valve
  - Pressure Relief Valve
  - Spring
  - Cover Bolt
  - Cover
Gear Pump

- Gear oil pump
  - Positive displacement
  - Gears
  - Body
  - Gear shaft
Crescent Oil Pump

♦ Positive Displacement
  - Inner gear
  - Outer gear
  - Crescent
<table>
<thead>
<tr>
<th>Category</th>
<th>Status</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL</td>
<td>Current</td>
<td>For all automotive engines presently in use. Introduced July 1, 2001. SL oils are designed to provide better high-temperature deposit control and lower oil consumption. Some of these oils may also meet the latest ILSAC specification and/or qualify as Energy Conserving.</td>
</tr>
<tr>
<td>SJ</td>
<td>Current</td>
<td>For 2001 and older automotive engines.</td>
</tr>
<tr>
<td>SH</td>
<td>Obsolete</td>
<td>For 1996 and older engines. Valid when preceded by current C categories.</td>
</tr>
<tr>
<td>SG</td>
<td>Obsolete</td>
<td>For 1993 and older engines.</td>
</tr>
<tr>
<td>SF</td>
<td>Obsolete</td>
<td>For 1988 and older engines.</td>
</tr>
<tr>
<td>SE</td>
<td>Obsolete</td>
<td>For 1979 and older engines.</td>
</tr>
<tr>
<td>SD</td>
<td>Obsolete</td>
<td>For 1971 and older engines.</td>
</tr>
<tr>
<td>SC</td>
<td>Obsolete</td>
<td>For 1967 and older engines.</td>
</tr>
<tr>
<td>SB</td>
<td>Obsolete</td>
<td>For older engines. Use only when specifically recommended by the manufacturer.</td>
</tr>
<tr>
<td>SA</td>
<td>Obsolete</td>
<td>For older engines; no performance requirement. Use only when specifically recommended by the manufacturer.</td>
</tr>
</tbody>
</table>
## Diesel Engines

<table>
<thead>
<tr>
<th>Category</th>
<th>Status</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH-4</td>
<td>Current</td>
<td>Introduced December 1, 1998. For high-speed, four-stroke engines designed to meet 1998 exhaust emission standards. CH-4 oils are specifically compounded for use with diesel fuels ranging in sulfur content up to 0.5% weight. Can be used in place of CD, CE, CF-4, and CG-4 oils.</td>
</tr>
<tr>
<td>CG-4</td>
<td>Current</td>
<td>Introduced in 1995. For severe duty, high-speed, four-stroke engines using fuel with less than 0.5% weight sulfur. CG-4 oils are required for engines meeting 1994 emission standards. Can be used in place of CD, CE, and CF-4 oils.</td>
</tr>
<tr>
<td>CF-4</td>
<td>Current</td>
<td>Introduced in 1990. For high-speed, four-stroke, naturally aspirated and turbocharged engines. Can be used in place of CD and CE oils.</td>
</tr>
<tr>
<td>CF-2</td>
<td>Current</td>
<td>Introduced in 1994. For severe duty, two-stroke-cycle engines. Can be used in place of CD-II oils.</td>
</tr>
<tr>
<td>CF</td>
<td>Current</td>
<td>Introduced in 1994. For off-road, indirect-injected and other diesel engines including those using fuel with over 0.5% weight sulfur. Can be used in place of CD oils.</td>
</tr>
<tr>
<td>CE</td>
<td>Obsolete</td>
<td>Introduced in 1987. For high-speed, four-stroke, naturally aspirated and turbocharged engines. Can be used in place of CC and CD oils.</td>
</tr>
<tr>
<td>CD-II</td>
<td>Obsolete</td>
<td>Introduced in 1987. For two-stroke-cycle engines.</td>
</tr>
<tr>
<td>CD</td>
<td>Obsolete</td>
<td>Introduced in 1955. For certain naturally aspirated and turbocharged engines.</td>
</tr>
<tr>
<td>CC</td>
<td>Obsolete</td>
<td>For engines introduced in 1961.</td>
</tr>
<tr>
<td>CB</td>
<td>Obsolete</td>
<td>For moderate duty engines from 1949 to 1960.</td>
</tr>
<tr>
<td>CA</td>
<td>Obsolete</td>
<td>For light duty engines (1940’s and 1950’s).</td>
</tr>
</tbody>
</table>
Thank you for attending
Engine Fundamentals

Lubrication Systems

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