Unit 2 - Equipment
Words of Experience

Click icon to hear firefighter story about pumps.
Objectives

1. Distinguish the differences between the two cycle and four cycle engines, and identify which one of these differences is most important to a pump operator.

2. Label the parts of a commonly used portable pump.
Objectives

3. Identify the purpose of a suction hose and a discharge hose.

4. Match types of wildland fire appliances and tools with their respective purpose.

5. Identify nozzle types.

6. List one type of national portable pump kit.
PORTABLE WATER PUMPS
How Pumps Work

Engine

Pump Head
Types of Engines – Two Cycle

Click on image to play animation.
Types of Engines – Four Cycle

Click on image to play animation.
### Differences – Two Cycle and Four Cycle

<table>
<thead>
<tr>
<th>Factor</th>
<th>Two Cycle Engines</th>
<th>Four Cycle Engines</th>
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<tbody>
<tr>
<td><strong>Lubrication</strong> <em>(very important)</em></td>
<td>Oil is mixed with the gas; engine runs on two cycle oil mixed with unleaded gasoline.</td>
<td>Has a separate oil reserve and lubrication system; runs on unleaded gasoline (gas is NOT mixed with oil).</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Typically lighter weight.</td>
<td>Typically heavier weight.</td>
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<tr>
<td><strong>Fuel Efficiency and Exhaust Emissions</strong></td>
<td>Typically less fuel efficient and produces more exhaust emissions.</td>
<td>Typically more fuel efficient and produces less exhaust emissions.</td>
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<td><strong>Orientation</strong></td>
<td>Can operate in any vertical orientation.</td>
<td>Can only operate on relatively level surfaces due to the location of the oil reservoir and the need for the engine to draw oil from this reservoir to the top of the engine.</td>
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</table>
Carburetor

Choke

Carburetor

Throttle

- Carburetor
- Choke
- Throttle

Throttle Shutter
Choke Shutter

To Combustion Chamber
Air Intake

Fuel

Low Idle Adjustment Screw
High Idle Adjustment Screw
Carburetor - Starting Engine

Click on image to play animation.
Carburetor – Engine Idling

Click on image to play animation.
Carburetor – Engine Running at Full Throttle

Click on image to play animation.
Click on image to play animation.
Parts of a High Pressure Pump

Click on the image above to launch the interactive application. Click “OK” if Microsoft Office asks you to confirm opening the executable file. If for some reason the link to the application is broken, look for the file named “M3_Pump360.exe” in your Unit 2 PowerPoint folder, and double click on it to launch the interactive program.
Types of Portable Pumps

Lightweight Pump

High Pressure Pump

Floatable Pump
### Portable Pump Performance – National Cache Pumps

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High Pressure Pumps

- General description
- Weight
- Fuel
- Pump performance (gpm and psi)

*Move to next slide to view chart.*
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HOSES
Types of Hoses

Suction (Intake) Hose: Designed to handle vacuum.

Discharge Hose: Designed to handle pressure.
APPLIANCES, ACCESSORIES, AND TOOLS FOR HOSE LAYS
Fittings

Thread adapter
Reducer
Increaser
Fittings

Double female

Double male
Fittings

Plain wye

Siamese wye
Valves

- Gated wye valve
- Siamese gated wye valve
- Hose line tee with valve
Valves

Check and bleeder valve

Pressure relief valve

in use
Valves

Ball valve
Intakes

Foot valve/strainer
Hose Accessories and Tools

- Hose shutoff clamp
- Spanner wrench
- Gravity sock
NOZZLES AND SPRINKLERS
**Twin Tip Nozzle (Forester)**

**Straight stream tips (50 psi)**
- 3/16" tip – 7 gpm at 50 psi
- 3/8" tip – 30 gpm at 50 psi

**Spray/fog tips (50 psi)**
- Come in different flow rates such as 3, 6, and 8 gpm.
Adjustable Barrel Nozzle (KK and Lexan)

Available in different sizes.

- 1" provides 20 gpm at 100 psi
- 1½" provides 60 gpm at 100 psi

Rated and work most efficiently at 100 psi.
Adjustable Barrel Nozzle – Garden Hose Nozzle

• Adjustable spray or straight stream
• Attaches to ¾" discharge hose

Sprinklers

• 360-degree coverage area
• 40 to 60 feet in diameter coverage distance
KITS
National Kits

High Pressure Portable Pump Kit

Lightweight Pump Kit
National Kits

Mop Up Kit

Sprinkler Kit
Local Geographic Kits
Review
1. In a two cycle engine, where is the oil located that lubricates the engine?

Answer:

Oil is mixed with the gas.
2. In a four cycle engine, where is the oil located that lubricates the engine?

Answer:

Oil is located in a separate oil reserve (crankcase).
3. Why is it important for the pump operator to know how the engine is lubricated?

Answer:

To ensure the pump's engine is receiving its lubrication from the proper source, whether it be oil reservoir or mixed with the gas, to prevent damaging the engine and making the pump inoperable.
4. Does a two cycle engine typically produce more or less exhaust emissions than a four cycle engine?

Answer: More
5. The fire is in a remote location (no roads), and you need a pump that can provide a lot of pressure and flow? Which types of pumps would work best?

Answer:

• High pressure portable pump
• Floatable pump
• Lightweight portable pump
6. Identify these parts on the pump:

- Suction inlet (intake port)
- Priming port
- Discharge port
- Air filter
- Throttle lever
- Spark plug
- Muffler

To review parts location, click on the pump image to launch Pump Interactive.
7. What is the purpose of a suction hose?

Answer:

Draft water from the water source to the pump; designed to handle vacuum.
8. What is the purpose of a discharge hose?

Answer:

Carry water from the pump to the fire, portable tank, or other location; designed to handle pressure.
9. One of the purposes of this appliance is to help maintain prime if foot valve isn't working correctly. What is the appliance?

Answer:

Check and bleeder valve
10. The purpose of this appliance is to divide one line into two. What is the appliance?

Answer:

Gated wye valve
11. What types of nozzles are these?

Answer: Twin tip

Answer: Adjustable barrel
12. There are several pump and pump-related kits that can be ordered from the national cache. What are the names of those kits?

Answer:

- High Pressure Portable Pump Kit
- Lightweight Pump Kit
- Mop up Kit
- Sprinkler Kit
Objectives

1. Distinguish the differences between the two cycle and four cycle engines, and identify which one of these differences is most important to a pump operator.

2. Label the parts of a commonly used portable pump.
Objectives

3. Identify the purpose of a suction hose and a discharge hose.

4. Match types of wildland fire appliances and tools with their respective purpose.

5. Identify nozzle types.

6. List one type of national portable pump kit.