



East Fork Fire and Paramedic Districts
Training and Safety Division

Apparatus Operator

TOPIC:	USE OF PRESSURE VS VOLUME IN A TWO STAGE PUMP
TIME FRAME:	1:00
METHOD:	Cognitive, Skills
OBJECTIVES:	<ul style="list-style-type: none">• Identify apparatus with two stage pumps• Identify pressure at which transfer can occur• Indicate what happens when transferring at higher pressures• Describe water hammer
MATERIALS NEEDED:	<ul style="list-style-type: none">• Lesson Plan• Apparatus with two stage pump
REFERENCES:	<ul style="list-style-type: none">• <u>Student Info Sheet</u>
ASSIGNMENT:	<ul style="list-style-type: none">• Review pumps on your apparatus
PREPARATION:	Dmage has recently occurred to two stage pumps within the Districts
SUNPRO CODE:	<ul style="list-style-type: none">• ENG 03.03

Multiple Stage Pump

A multiple stage pump is a centrifugal pump two or more impellers attached to the impeller shaft and interconnecting waterways. The impellers can be configured via a transfer valve into two operating modes:

Pressure or Series

Volume or Parallel

The advantages of a two stage pump over a single stage pump are that it will deliver a higher pressure requiring increased engine or pump speed.

The Transfer Valve

The Transfer Valve is a two-position valve that is either hand operated or air actuated. The Transfer Valve transfers (changes over) pump from parallel (volume) to series (pressure) or vice versa.

Series (Pressure)

With the transfer valve in this position a volume of water is directed into the first stage impeller and is discharged under pressure to the second stage impeller. The pressure/velocity of the water coming to the second stage impeller is then increased (supercharged) and discharged from the second stage of the pump at twice the pressure/velocity of the first stage. The same volume of water passes through both stages as water pressure/velocity upon discharge is doubled.

Parallel (volume)

In this position water enters both pump impellers at the same time from a common suction inlet, and leaves through a common discharge creating more pump volume while maintaining the same pump pressure. There is an equal volume of water entering each impeller and water is discharged without being supercharged.

Making The Transfer

The pump must be below 75 psi before making the transfer. If the transfer is made at a higher pressure, damage may be inflicted upon both the pump and the plumbing (water hammer). To make a transfer, decrease the pump pressure to 75 psi or less.

Recent damage to an engine with a two stage pump cost nearly \$600 and the engine was out of service for several days.