



Fire Protection Training

Procedures Handbook 4300

PUMPING

TOPIC: Pump Gauges and Flowmeters

TIME FRAME: 30 Minutes

LEVEL OF INSTRUCTION:

BEHAVIORAL OBJECTIVE:

Condition: A written quiz

Behavior: The student will be able to identify a pressure gauge, identify a vacuum gauge, identify a compound gauge, and read and interpret each of these gauges.

Standard: With a minimum of 70% accuracy

MATERIALS NEEDED:

- Gauges
- Appropriate visual aids
- Audio visual equipment

REFERENCES:

- IFSTA, Fire Department Pumping Apparatus, 7th Edition, Chapter 5
- NFPA, Standard 1901

PREPARATION:

Understanding the operation of and information provided by pump gauges and flowmeters is critical for pump operators. Gauges and flowmeters reveal whether effective fire streams are being produced and allow the pump operator to make corrective adjustments which can significantly enhance fireground operations. Conversely, the inability of a pump operator to understand these readings can have adverse consequences for the nozzleperson at the point of attack.



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PUMP GAUGES AND FLOWMETERS

PRESENTATION	APPLICATION
<p>I. PUMP GAUGES</p> <p>A. Types of Mechanical Gauges</p> <ol style="list-style-type: none">1. Vacuum gauge<ol style="list-style-type: none">a. Connected to suction side of pumpb. Usual calibration is from 0 to 30 inches of vacuum on the negative sidec. Measures vacuum present<ol style="list-style-type: none">(1) During priming(2) During draftingd. When vacuum gauge registers 20 inches, the pump is operating near maximum capacity2. Pump pressure gauge<ol style="list-style-type: none">a. Connected to discharge side of pumpb. Usual calibration from 0 - 600 PSIc. External connection to gauge required for pump tests and gauge calibrationd. Not used on centrifugal pumps. Flow through plumbing would destroy gauge during negative pressure operations.3. Individual line discharge pressure gauges<ol style="list-style-type: none">a. Measures pressure downstream from the outlet gate valveb. Allows measuring flows to separate discharges when multiple lines are flowing	



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<ul style="list-style-type: none">c. When water not flowing, pressure reading should be the same as on pump pressure gauge4. Compound gauges<ul style="list-style-type: none">a. Measures both positive and negative pressureb. Calibration<ul style="list-style-type: none">(1) Measures 0 - 30 inches negative pressure or vacuum<ul style="list-style-type: none">(a) Priming operations(b) Drafting operations(2) Measures 0 - 600 PSI positive pressure<ul style="list-style-type: none">(a) Discharge from pump(b) Residual pressure from suction side of pump<ul style="list-style-type: none">(i) Hydrant operations(ii) Supply line operationsB. Flowmeters<ul style="list-style-type: none">1. Provide an accurate reading of water flow expressed in gallons per minute2. Digital read out3. Flowmeter may be provided for each discharge valve on apparatus4. Flowmeters eliminate the need for hydraulic calculations for variables including:	



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<ul style="list-style-type: none">a. Length of hoselineb. Friction lossc. Elevation <p>5. Types of flowmeter sensors include</p> <ul style="list-style-type: none">a. Differential<ul style="list-style-type: none">(1) Measure flow within plumbing both upstream and downstream(2) Differences between the two valves is actual flow(3) Not used in fire service due to clogging characteristic and high maintenanceb. Turbine<ul style="list-style-type: none">(1) Mounted in center of discharge flow(2) Blades turn as water flows through and revolutions are translated into GPM readings(3) Not widely used in fire service<ul style="list-style-type: none">(a) Debris in water stream damages blades(b) Water flow significantly impeded by turbine placement within stream(c) Unit is bulky and requires excessive spacec. Spring probe	



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<ul style="list-style-type: none">(1) Stainless steel spring probe senses water movement in discharge flow(2) The bend in the spring increases (as flow increases) electrical impulse transmits rate of flow to flowmeter(3) Relatively impervious to damage(4) Maintenance requirement low since only one moving part(5) Relatively new technology	
d. Paddlewheel	
<ul style="list-style-type: none">(1) Tee is placed in discharge plumbing(2) Flow sensor located in top of discharge line(3) Spokes on paddlewheel extend into discharge flow(4) As paddlewheel turns revolutions are converted into GPM's and are displayed on flowmeter(5) Does not significantly impede water flow(6) Relatively maintenance free	Information sheet #1

II.



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SUMMARY:

An experienced pump operator can use pump gauges and flowmeters to anticipate fire stream problems. By anticipating these problems, the operator can take corrective action to minimize overall operational problems and increase the safety of nozzle operators.

EVALUATION:

A written quiz.

ASSIGNMENT:

To be determined by instructor(s).