



FIRE INSTRUCTOR I

Student Presentation Lesson Plan

14-Properties of Liquid Fuels

Outline of Instruction

Objective

Upon successful completion of this lesson, the student shall be able to:

- Recognize the physical states of fuel. [NFPA® 1001, 5.3.10]

Instructor Directions

1. Set up non-projectable training aids
 - a. Chart pad to include:
 - i. Title Page
 - ii. Acronym
 - iii. Summary
 - iv. 1 Application scenario
 - v. 2 Evaluation questions
2. Set up projectable training aids (LCD projector & computer)
3. Present lecture utilizing this outline of instruction, non-projectable and projectable audio visual aids.
 - a. Overall time 18 min. (set up, present topic, and take down of audio visuals)
 - b. Presentation time 8-12 min. (presentation time is part of the 18 min)
4. Breakdown of projectable training aids.

Reference Stowell, F.(2013). Essentials of Fire Fighting and Fire Department Operations (6th ed.). Upper Saddle River, N.J.: Brady Pub.; ISBN# 978-013-314080-4

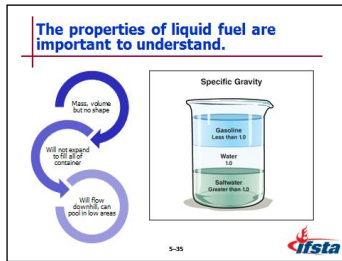
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Preparation

Introduction

- Instructor introduction
- Objectives
- Preparation Step

Presentation



Liquid Fuel

Properties

Have mass, volume but no definite shape –
Except flat surface or shape of container

Will not expand to fill all of container

When released on ground, will flow downhill, can pool in low areas

Density compared to water

Specific gravity – Ratio of mass of given volume of liquid compared with mass of equal volume of water at same temperature

Water assigned specific gravity of 1

Liquids with less than 1, will float on surface

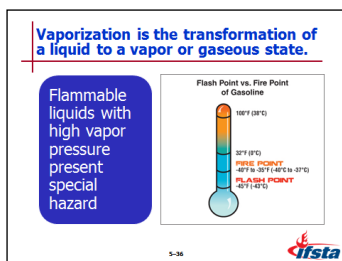
Liquids with greater than 1, will sink

Must be vaporized to burn

Vaporization – Transformation of liquid to vapor or gaseous state

Escaping vapors must be at higher pressure than atmospheric pressure to occur

Vapor pressure – Pressure vapors escaping from liquid exert; indicates how easily substance will evaporate or go into air



Flammable liquids with high vapor pressure present special hazard for firefighters

As liquid heats, vapor pressure increases with rate of vaporization

Volatility (ease) with which liquid gives off vapor influences how easily it can be ignited

Flash point – Minimum temperature at which liquid gives off sufficient vapors to ignite, but not sustain combustion

Fire point

Temperature at which sufficient vapors are being generated to sustain combustion reaction

Commonly used to indicate flammability hazard of liquid fuels

Extent to which liquid gives off vapor also influenced by how much surface area is exposed to atmosphere

Solubility

Extent to which substance will mix with water

Expressed in qualitative terms or as percentage

Miscible materials – Mix in any proportion

Hydrocarbon fuels – Do not mix

Polar solvents – Readily mix


Liquids less dense than water difficult to extinguish using water as only extinguishing agent

Fuel will not mix with water, adding water may disperse burning liquid instead of extinguishing; potentially spreading fire

Solubility is a factor to consider regarding liquid fuels.

Solubility
– Extent to which substance will mix with water

- Miscible – Mix in any proportion
- Hydrocarbon – Do not mix
- Polar solvents – Readily mix

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Density is also a factor to consider regarding liquid fuels.

Liquids less dense than water difficult to extinguish with water alone

- Fuel will not mix with water – Adding may disperse burning liquid
- Extinguish with appropriate agent

Water-soluble mix with agent – Become less effective

- Avoid use with foams specifically designed for polar solvents

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Should be extinguished with appropriate
foam, chemical agent

Water-soluble liquids will mix with agent,
become less effective at extinguishing fire
– To avoid use foams specifically designed
for polar solvents

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Chart Pad:

Title Page

- Name, Department, Title of Presentation

Acronym

- **L.I.P.** (Life Safety, Incident Stabilization, Property Conservation)
instructor relates these priorities to the lecture

Summary (2-4 key points)

- Instructor reviews 2-4 key points of the lesson plan to clarify uncertainties, prevent misconceptions, increase learning and improve retention

Application (1 scenario)

- The student is given a scenario where the student will apply all of the knowledge that was given in the lecture. *This is not a question*, it is merely the explanation of the scenario.

Evaluation (2 questions)

- Instructor should ask students 2 direct questions that were presented during the lesson. *Answer to the questions must be give after asking the question.*