



# Specifying Foam Systems



## Three Simple Steps for Success

- 1. Identify and size hazards**
- 2. Size and select the proportioning system**
- 3. Design the apparatus**

**NOT THE OTHER WAY AROUND!**

**Note: If doing a retrofit – obviously the vehicle already exists. You still need to complete steps 1 and 2. At that point you may find it makes more sense to install the system on a different vehicle than you originally planned.**



# Identify and Size Hazards



# Identify And Size Hazards

- What is your fire protection responsibility?
  - Residential
  - Wildland
  - Industrial
  - Marine
  - A Combination





# Identify And Size Hazards

- What are the applications?
  - Class A, B, C or D?
  - Bomb suppression
  - Chemical or biological decontamination







# Identify And Size Hazards

- Determine critical application rates and duration:
  - 15, 125 or 25,000 GPM?
  - Minutes or hours?
  - Guidelines available – NFPA
- Plan to succeed!





# Identify And Size Hazards

- Understanding critical application rate

**The flow rate (water or solution) on a fire at which the fire does not grow:**

- Exceed the critical application rate and the fire is extinguished
- Flow less than the critical application rate and the fire burns unchecked

**Goal: How much water to treat**



# Identify And Size Hazards

- Determining critical application rate

**Class A applications – Structures**

**IOWA Formula: Cubic feet / 100 = GPM**

**Example: 50' x 40' x 16' Structure**

**32,000 Cubic feet / 100 = 320 GPM**





# Identify And Size Hazards

- Determining critical application rate

**Class B applications – Liquid fuels**

**NFPA 11**





# Identify And Size The Hazards

- NFPA 11 recommends minimum application rates
  - Flow
  - Duration





# Identify And Size Hazards

- Spill Fires – Non Diked Areas

Minimum Application Rates	GPM per SQ./FT.
<b>Hydrocarbons:</b>	
AFFF/FFFP	0.10
Protein / Fluoroprotein	0.16
<b>Alcohol / Polar Solvents:</b>	
AR Concentrate (Typical)	0.2
<b>Min Discharge Time</b>	15 Min

$$\text{AFFF } 2500 \text{ Sq/Ft} \times .10 = 250 \text{ GPM}$$

$$\text{AR-AFFF } 2500 \text{ Sq/Ft} \times .20 = 500 \text{ GPM}$$



# Identify And Size Hazards

- Tank fires – Full surface (Type III)

Minimum Application Rates	GPM per SQ./FT.
Hydrocarbons	0.16
Alcohol / Polar Solvents	Refer To Listings (0.3)
Min Discharge Time	
Flash Point Above 100 F	50 Min
Flash Point Below 100 F	65 Min
Crude Petroleum	65 Min

$$\text{AFFF } 2500 \text{ Sq/Ft} \times .16 = 400 \text{ GPM}$$



# Size & Select System





# Size And Select System

- What water additives?
  - One or several?
  - System compatibility?
- What are proportioning rates?
  - Class A: 0.1% to 1.0%
  - Class B: 1%, 3% or 6%
  - Gels: See manufacturer's recommendations





# Size And Select System

- Determine minimum and maximum flow rates:
  - How many discharges are required?
  - What are the Min/Max flow rates of each discharge?
  - How many in service at any given time? Min/Max?





# Size And Select System

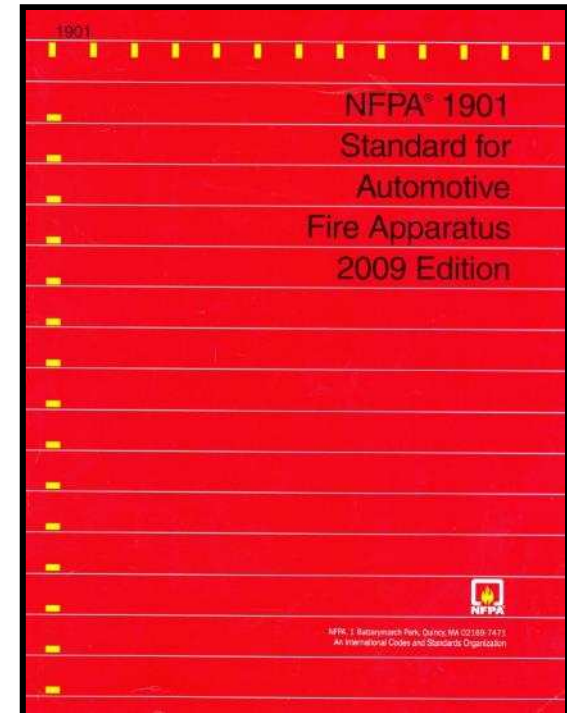
- Systems available span a wide range of:
  - Performance
  - Features
  - Cost (Both initial install and ongoing operational)
- Thoroughly Investigate:
  - Understand the capabilities and limitations of each system
  - No one system does it all
  - Realistically define your needs based on the hazards





# Size And Select System

- How accurate?
  - NFPA (minimum standard) or something tighter?
  - Know the accuracy of the system(s) you are considering and calculate the wasted foam:
    - Cost
    - Tank size
    - Logistics







# Size And Select System

- Concentrate viscosity?
  - System capability?
    - How does system manufacturer rate the system?
  - Foam concentrate?
    - How does the concentrate manufacturer measure viscosity?







# Size And Select System

- What are operating pressures?
  - Intake and discharge: Min/Max?
  - Will you be using both normal and high pressure discharges?



# Size And Select System

- Operating conditions:
  - How long are hose lays?
  - What is nozzle elevation?
    - High rise or aerial operations?
- Will these or other conditions affect your system's operation?





# Size And Select System

- Duration of the attack?
  - How much foam will you require?
  - Where will your foam supply come from?
    - On-board tank
    - Off-board pickup
    - Both
    - Refill system
- Will the system(s) you are considering be capable of handling these sources?





# Size And Select System

- Do you require the ability to calibrate the system to the viscosity of the concentrate(s) you will be using?
  - Can the system be calibrated to the viscosity of the concentrate without consuming foam?
  - Can you flow foam where you operate to calibrate the system?



# Size And Select System

- Require the ability to periodically test the system for readiness?
  - Concentrate flow required for testing?
  - Allowed to flow foam for testing?







# Size And Select System

- A word of advice...

**Keep It SIMPLE!**



# Size And Select System

- Selecting The System
- Numerous technologies available
  - Eductors
  - Balanced Pressure
  - Direct Injection
- Several sources of power
  - Water
  - DC
  - Hydraulic





# Size And Select System

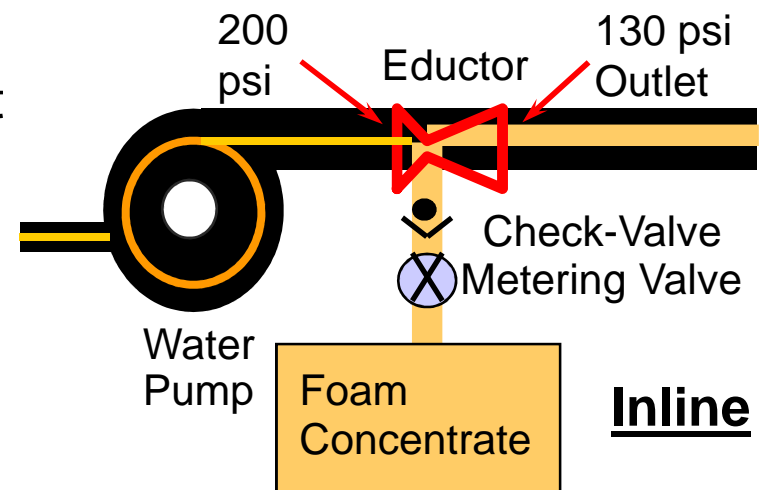
- In most cases, there are several manufacturers offering systems in each category
  - Within a category – not all are the same across competitors
  - Carefully check out performance, features, capabilities, limitations and reliability
    - Research the specs
    - Talk to current or previous users



# Size And Select System



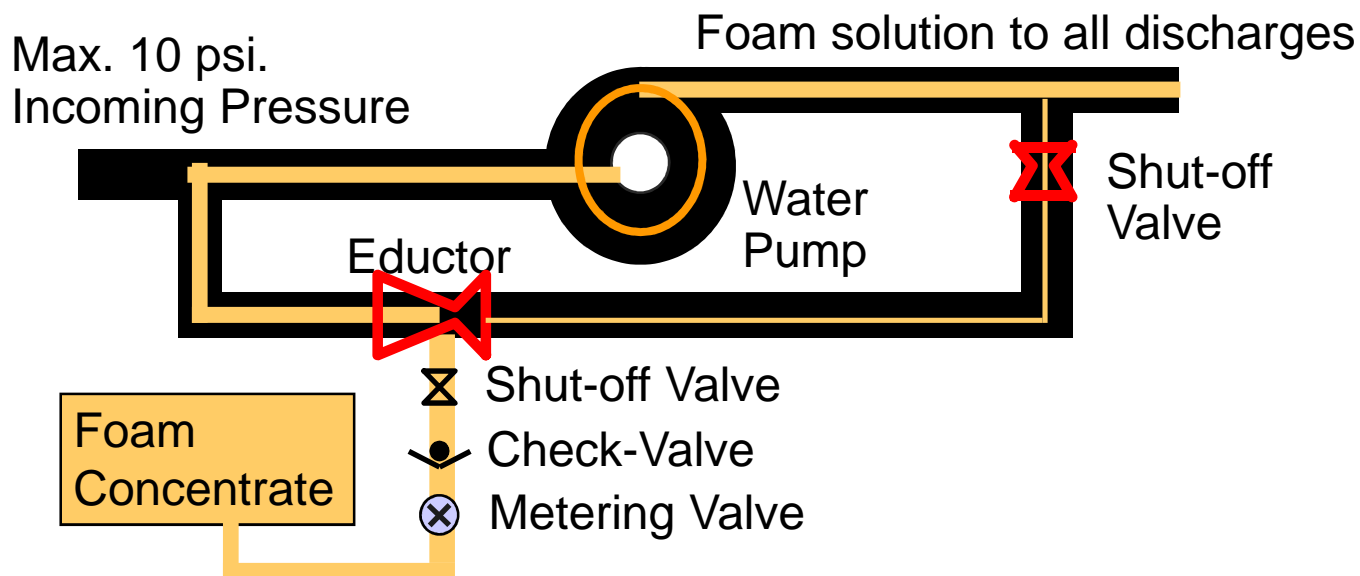
- Eductors
  - Nozzle, In-line and By-pass
- General Characteristics:
  - Narrowest performance range
  - Lowest system and installation cost
  - Accuracy varies
  - Operating cost varies
  - Single point injection
  - Inlet pressures (typically 200psi)
  - Hose lay length
  - Nozzle & elevation
  - On-board / Off-board foam pickup capabilities can vary





# Size And Select System

- Around-The-Pump
  - Same General Characteristics as Inline and By-Pass Eductor Systems



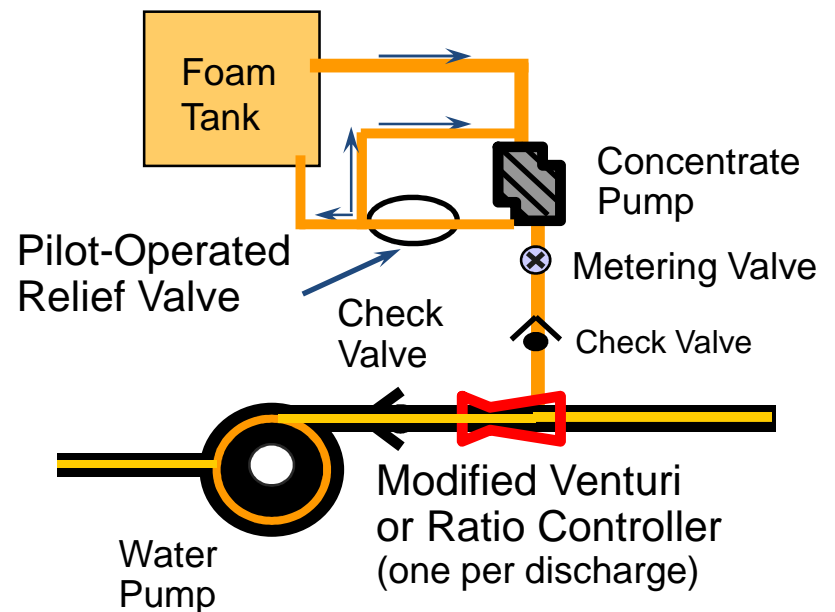




# Size And Select System

- **Balanced Pressure**
  - Pump based (DC/Hydraulic/PTO), water powered, bladder tank
- **General Characteristics:**
  - Medium performance range
  - Higher system and installation cost
  - Accuracy varies
  - Operating cost varies
  - Some have pressure loss
  - Single or multiple injection point
  - On-board / Off-board foam pickup capability varies

## Balanced Pressure System

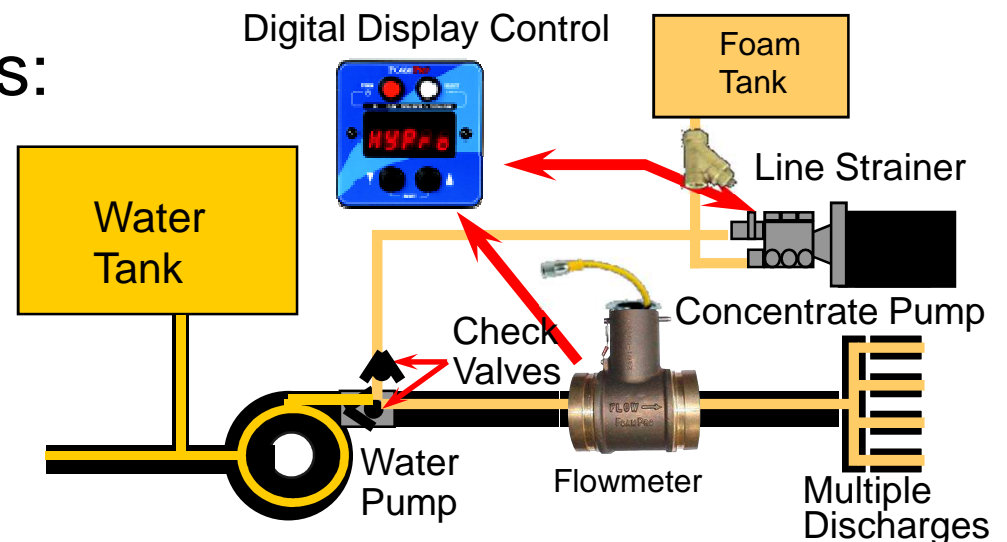




# Size And Select System

- Direct Injection
  - Pump based (DC/Hydraulic)
- General Characteristics:
  - Widest performance range
  - Higher system and installation cost
  - Highest accuracy
  - Minimal pressure loss
  - Single or multiple injection point - varies
  - On-board / Off-board foam pickup capability varies

## Direct Injection





# Size And Select System

Disch	Size	Min Flow	Max Flow	Min %	Max %	Min Conc	Max Conc
1) Rear	3"	80	500	0.3%	1%	.24	5
2) PreCon	1-1/2"	30	200	0.3%	1%	.09	2
3) Op Panel	2-1/2"	40	300	0.3%	1%	.12	3
							10



# Designing the Apparatus



# Designing

- Key points to discuss with installer
  - Power requirements for your system
    - Electric
    - Load requirements
    - Load balancing
    - Hydraulic
      - PTO availability
      - HP requirements
      - Cooling – Oil to Air or Oil to Water?
  - Water
    - Pressure / flow loss
    - Filtration



# Designing

- System Footprint?
  - Accessibility requirements
    - Service
    - Calibration
    - Maintenance
    - Repair
  - Any location limitations
    - Temperature
    - Physical damage due to
      - Road dirt
      - UV
      - Temperature
    - EMI /RFI interference





# Designing

- Plumbing requirements?
  - Accessibility requirements
    - Service / Calibration / Maintenance / Repair
  - Common fitting approaches
    - Threaded / Flanged / Grooved Victaulic
  - System Requirements
    - Flow meters – straight pipe
    - Foam concentrate injection point(s)
  - Provide drains for cleaning / cold weather



# Designing

- Concentrate source?
  - On-board (single or multiple tanks) / off-board / both
  - Does the system require flooded suction or is it capable of drafting
  - Be sure to provide for:
    - Tank shutoffs
    - Foam strainers
    - Tank level and low-tank sensors
    - Foam selector valving
    - Foam tank profile





# Designing

- Flushing
  - How?
  - Flush water pressure?
  - If gel, what will you be flushing the system with?
    - Does that require a separate reservoir to hold the flushing agent?





**Questions?**



# Thank You & Stay Safe!

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