

# Planit Safe™

A New Environmentally Acceptable Concept for Testing Foam Systems Using Surrogate Liquids



## Foam System Testing Issues

- Foam testing presents new challenges since free release of foam is not permitted
- Containment, cleanup and disposal of foam solution is costly
- Facility owners want no part of foam testing due to lost time and environmental liability
- Insurers and risk management want assurance of system integrity but no environmental problems
- Fluorochemical in AFFF has long biodegradation cycle



## Foam Solution Discharge Concerns

- Accidental uncontrolled release of foam to the environment
- Fish toxicity
- Persistence and biodegradability issues
- Foaming and other problems encountered by waste water treatment plants
- Nutrient loading



## 2016 NFPA-11 Annex A

- Provides foam users with summary of environmental information
- Highlights applicable regulatory status
- Offer guidelines for coping with regulations and suggest other sources of information
- Encourage planning for foam discharge scenarios
- Goal of Annex E is to foster use of foam in an environmentally responsible manner so as to minimize risk from their use



## Options for Foam Solution Disposal

- Release to wastewater treatment facility after receiving permission from facility operator
- Release to on site waste treatment facility
- Provide proper collection and containment with possible pretreatment prior to release to treatment plant
- Arrange for transportation to a wastewater treatment facility by properly licensed environmental disposal company



## Wastewater Treatment Considerations

### BOD- (Biological Oxygen Demand)

- Stated in units of mg/kg
- Measurement of dissolved oxygen demand of bacteria in liquid substrate over a period in the bacteria's life cycle
- High BOD can cause "shock loading" upset at treatment facility
- Consult foam manufacturers for five day BOD figures (may be necessary to calculate foam solution BOD if manufacturer only gives BOD of pure foam concentrate)



## Foam Solution Treatment Options

- Dilute to 588 gal water per gallon foam solution
- Large quantities may require more dilution or release to treatment plant at a reduced flow rate. (Generally not to exceed 1700 ppm)
- Use defoamer to reduce problems in handling and treating foam solutions
- Use on site water treatment equipment (activated carbon) and ultra filtration (reverse osmosis) if available



## Wastewater Treatment Considerations

- COD- (Chemical Oxygen Demand)
- Stated in mg/kg
  - Measurement of the dissolved oxygen required to breakdown a chemical in the liquid to its complete oxidized state



## Issues Concerning Foam Solution Discharge During System Test

- Must consult with state (or province) and local authorities before testing to determine how much foam solution effluent can be handled by the local wastewater treatment plant
- Uncontrolled release of foam solution to the environment is unacceptable
- Containment and collection of foam solution is required
- Time and cost of handling foam solution discharge is a major factor



## Wastewater Treatment Considerations

- Theoretical biodegradability equals BOD/COD
- The time period used for AFFF is twenty days compared to five days for most wastewater
- Provides more accurate BOD value at the end the bacterial life and misses the lag phase in the early period of bacterial breakdown
- Generally accepted that BOD<sub>20</sub>/COD ratio more than 0.50 is considered suitable for release to a wastewater treatment plant



## Storm Drain Discharge Considerations

- Some industrial facilities are permitted by state regulations to release effluent having no greater than 300 BOD<sub>5</sub> and 600 COD
- Foaming of the effluent stream is not acceptable
- Minimize release by proper planning
- Final decision regarding site specific effluent release rests with local environmental AHJ



## BOD/COD Typical Values

AFFF vs Planit Safe Solution

	Typical 3% AFFF Foam Solution	Planit Safe 3% AFFF Test Solution
BOD <sub>5</sub>	8,750 mg/kg	18 mg/kg
COD	12,000 mg/kg	238 mg/kg



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### AR AFFF vs Planit Safe Solution

	Typical 3% AR AFFF Foam Solution	Planit Safe 3% AR AFFF Test Solution
BOD <sub>5</sub>	2,745 mg/kg	118 mg/kg
COD	8,700 mg/kg	513 mg/kg



## 2016 NFPA 11 Annex D.5 Provides New Testing Guidelines

- Para. D.5.2 describes use of surrogate non-foaming liquids in lieu of foam discharge
- Defines surrogate liquid test method including use of portable data acquisition equipment
- Figures D.5.2.2(a-d) illustrate the surrogate liquid test setup arrangements for various system types



## Testing In Accordance With NFPA

•NFPA 11, 16, 25, and 409 foam related standards all allow for use of conductivity measurement to determine concentrate injection rate for fresh water systems

Conductivity measurement method is not suitable for systems using brackish or salt water



Typical test setup with tanker for collection and disposal of foam



Test Header with Flow Meter Setup



## So what is the **Planit Safe**™ test method?

- A concept involving a complete system of components and surrogate test liquid working in unison to provide an environmentally compatible means for testing foam systems



## Planit Safe™ Awarded FM Global Certification

For new system commissioning or testing existing installations that already contain foam concentrate



## So Where Has **Planit Safe™** Test Method Been Used?

- Military hangars and related facilities
- Chemical production & paint plants
- Commercial applications where flammable liquids are present
- Warehouses storing flammable liquids
- Fuel storage/handling facilities

## Planit Safe™ Design Basis

- Employs proven conductivity method for injection rate measurement
- Cost effective – No "real" foam concentrate used and no clean-up
- Uses environmentally benign, readily biodegradable foam surrogate test liquid
- Non-foaming surrogate test liquid characteristics prevents fish mortality

## Planit Safe™ Design Basis (cont.)

- Fast data acquisition reduces run times – typically 30 seconds or less of operation
- Online real time data provides more complete system performance information
- Troubleshooting is easier as a result of real time complete data gathering
- Qualified technicians provide on-site safeguards to assure proper test protocol

## Fast Information Gathering by Electronic Data Acquisition

- System flow rate
- Water and foam concentrate pressures at proportioner
- Foam injection rate based on conductivity measurement
- Data gathering rate about 8 lines per second

## Instrumentation & Data Acquisition

- A high pressure conductivity sensor placed downstream of the foam proportioner sends an output signal to a computer corresponding to injection rate based on calibration (base curve) made using site water and Planit Safe test liquid
- 0-300 psi pressure transducers placed on system piping send proportional output signal to the data acquisition system

## Instrumentation & Data Acquisition

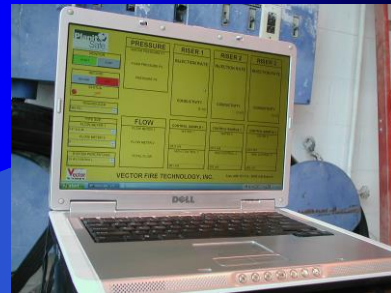
- Paddlewheel flow meter sensors are installed in flow tubes in hose lines and connected by cables to data acquisition system
- Flow meter sensors can also be placed in system piping to measure flow rate based on pipe size and velocity



Flow meters measure system flow and conductivity sensor (center) measures injection rate



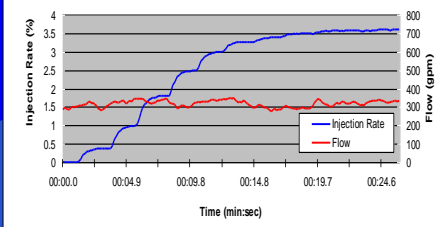
Surrogate test solution can usually be discharged directly to ground



Online real time data acquisition provides complete system performance information



Flow vs Injection Rate



Recorded data can be used to plot proportioning system performance



## Planit Safe™ Major Elements

Major elements include:

- Environmentally clean foam concentrate substitute foam liquid
- Test liquid injection device
- Test instrumentation
- PC based high speed data acquisition package
- Well trained field service technicians



## Planit Safe™ Surrogate Test Liquids

- Mimics the physical properties and flow behavior of the foam concentrate being used in the system
- Made from environmentally clean constituents
- SDS with published BOD & COD values
- Must have low BOD & COD values
- Non-foaming and safe for fish
- Fish toxicity studies available



Substitute liquid mimics the physical properties of foam concentrate (Even viscous AR-AFFF types)



Planit Safe™ test liquids are shipped in disposable fiber (plastic lined) drums



## Planit Safe™ Environmental Profile

- Surrogate test liquids are specifically formulated to be environmentally clean and contain no ingredients reportable under SARA Title III (Super fund Amendments & Reauthorization Act), Section 313 of CFR 372 or CERCLA (Comprehensive Environmental Response & Liability Act)



## Planit Safe™ Liquid Injection Device

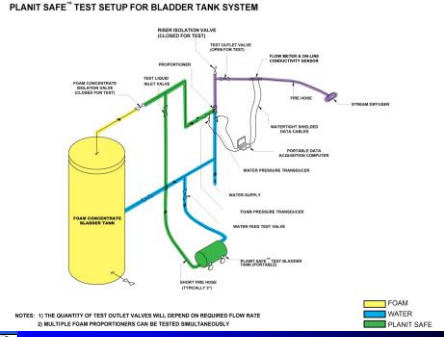
- The substitute liquid is placed in an isolating type injection device capable of withstanding a >200 psi system operating pressure
- Device provides positive separation of the substitute liquid from the real foam concentrate or water used to force the liquid into the foam system



Planit Safe™ liquid interface tank connected to foam system



## Typical Bladder Tank **Planit Safe** Test Setup



Pressure transducers measure foam concentrate and water pressures



Riser isolation and test outlet valve



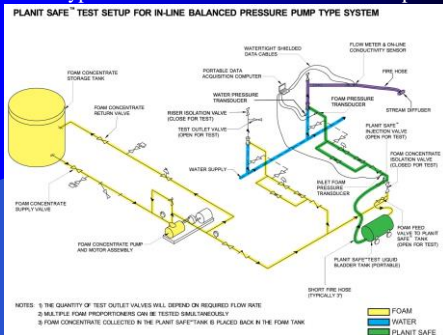
**Planit Safe** interface tank application



**Planit Safe** connections on bladder tank system with multiple risers



## Typical ILBP **Planit Safe** Test Setup



Typical Navy ILBP Foam Stations Hangar Installation



Typical ILBP Pump Skid Installation



Typical Navy ILBP Foam Riser in Hangar



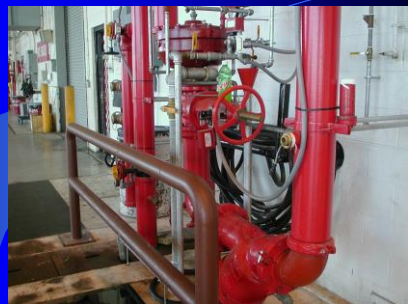
Typical ILBP Navy Foam Riser Fitted with Pressure Transducers



Typical ILBP Navy Foam Riser Fitted with Conductivity Sensor



Typical ILBP Navy Foam Riser Fitted with Flow Meter Sensor





24 ILBP Risers Protecting a 3 Bay Aircraft Hangar  
Total System Flow 18,000 gpm



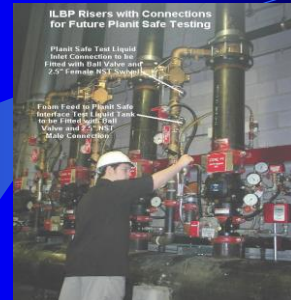
**Planit Safe** Test Setup to Measure Flow and Injection Rate of 8 Risers Operating Simultaneously



**Planit Safe** Test Setup to Measure Flow and Injection Rate of 8 Risers Operating Simultaneously



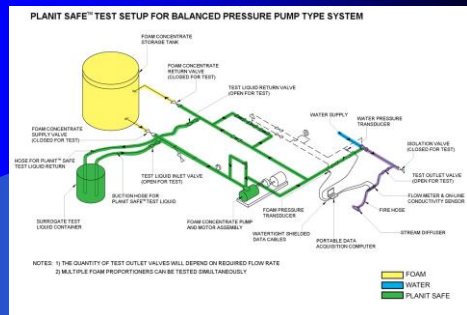
ILBP Foam Risers Fitted with Future Connections for Use with **Planit Safe** Interface Tank



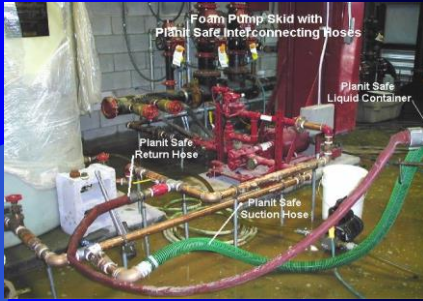
ILBP Foam Risers Fitted with Future Connections for Use with **Planit Safe** Interface Tank



Typical BP System **Planit Safe** Test Setup



### Typical BP System **Planit Safe**™ Installation



### Typical BP System **Planit Safe**™ Installation



### Who Provides Planit Safe Testing Service?

- Five companies are currently licensed to provide Planit Safe type testing



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