

# Which Foam to Choose for Hydrocarbon Tank Fires



# AFFF Weakness - Fire Crew Safety



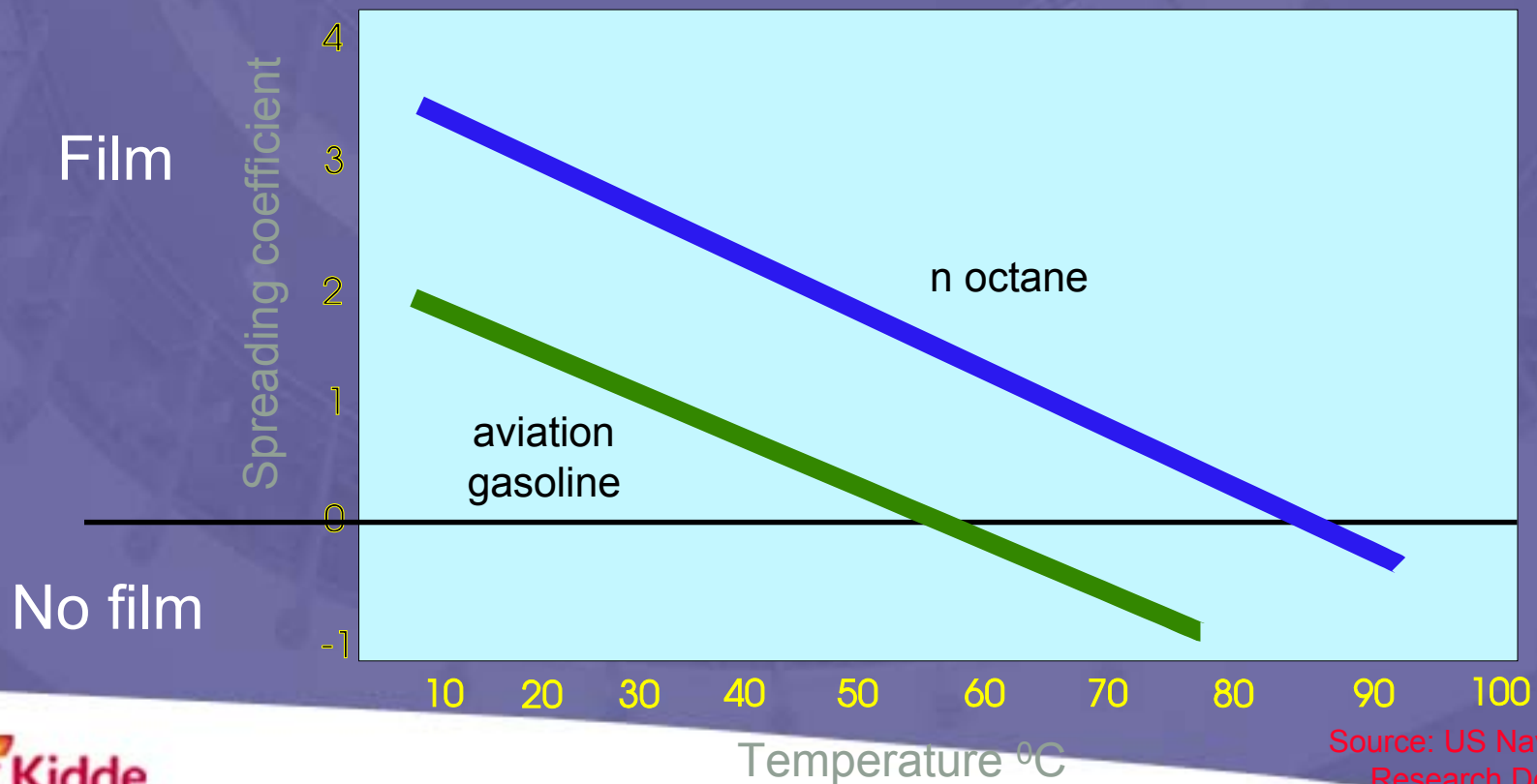
*“...foam blanket stability, burnback rate, and wicking action modify the relative degree of efficiency of AFFF on open spill fires...”*

*“The AFFF blanket should not be relied on to be permanent and should be renewed from time to time as the rescue operation proceeds”*

Source: NFPA 403 (1978)

# The effect of heat on film formation

- At high temperature film formation will not take place on most hydrocarbons



Source: US Naval Weapons Research Department

# Storage Tank Fire Fighting



- No longer shallow spill fire
- Been burning for several hours before foam attack
- Fuel volatile and very hot (~400deg C)
- Needs a foam with
  - Good bubble quality
  - Resistance to flame attack
  - Resistance to radiated heat
  - Good edge sealing against tank shell
  - Good cooling effect
  - Good post fire security - no flashbacks!

= *Modern FP/AR foams*

## AFFF difficulties on tank fires

- AFFFs shown to struggle on many tanks
  - no film formation
  - fast drainage & poor heat resistance
- Detergent base emulsifies with hydrocarbons
  - emulsifies with fuel when applied forcefully
  - causes flashbacks and re-ignition risk
- AR-AFFFs are also used on tanks but:
  - polymer needed for polar solvents only
  - thicker concentrates can give proportioning difficulties
  - expensive option (2-3x cost FP!)

# FP is designed for tank fires



- Most SERIOUS fires are large and deep seated (tank fires)
- Good quality FP foam benefits:
  - slow draining foam cools hot fuel
  - seals well against hot metal shell
  - no emulsification with fuel
  - proven performance on tank fires
  - no thick polymers
  - resists severe flame attack (strong protein bubbles)
  - excellent **post-fire security**
  - reliability, no flashbacks
  - cost -effective
- Foam tests help assess suitable products
  - UL 162 (ability & system integrity)
  - Lastfire (representative)



- Detergent-free
- Fuel repellent
- Protein skeletal structure
  - Resistance to heat
  - Edge sealing
  - Cooling effect
- Post-fire security
- Most ***COST-EFFECTIVE*** protection

Major users:

Exxon -Mobil, BP, Shell, Caltex  
*Formerly marketed as FP70 Plus*



- *Applications:*
- Hydrocarbons
- 100% MTBE
- Unleaded Gasolines (20% MTBE)
  
- Semi-asp & Asp. Monitors
- Top Pourers
- Rimseal Pourers
- Base Injection
- MEX Bund Pourers
- Foam sprinklers





# Performance Characteristics

	AFFF	FP	FFFP	AR-AFFF	AR-FFFP
Typical Application	Aviation	Oil Tanks	Aviation	Multi-purpose	Multi-purpose
Knockdown	★★★★★	★★★	★★★★★	★★★	★★★★(*)
Burnback Resistance	★★	★★★★★	★★★	★★★	★★★★★
Fuel Tolerance	★★	★★★★★	★★★	★★★	★★★★★

The more ★ the better!

## 2 Foam tests help assess products for tank fires



Why is



important?



- totally independent test house
- comprehensive UL 162 standard
- no profit motive
- charge manufacturers for testing
- every product tested by foam specialists
- follow up service monitors quality over time
- ensures consistent product supplied
- all listings shown at [www.ul.com](http://www.ul.com)
- Poor products FAIL!

*Key Global OPC approval!*

# LASTFIRE Tank Test



**= Representative!**

- Good Test NEEDS:-

- Large fire area (~ 5 m<sup>2</sup>)
- Long preburn (~ 3 mins)
- Deep fuel layer (> 6 cm)
- Large qty (~ 300 litres)
- Tall wall height (~ 50 cm)
- With metal obstructions
- Fixed specification volatile fuel
- Foam quality matches real equipment (semi-aspirated monitor, aspirated monitor and fixed pourer nozzles)

**BP, Shell, Exxon-Mobil,  
MOL, Total-Fina-Elf,  
Chevron - Texaco, Repsol,  
Saudi Aramco etc.**

# LASTFIRE test



0 3 10 12 23 25 30 mins

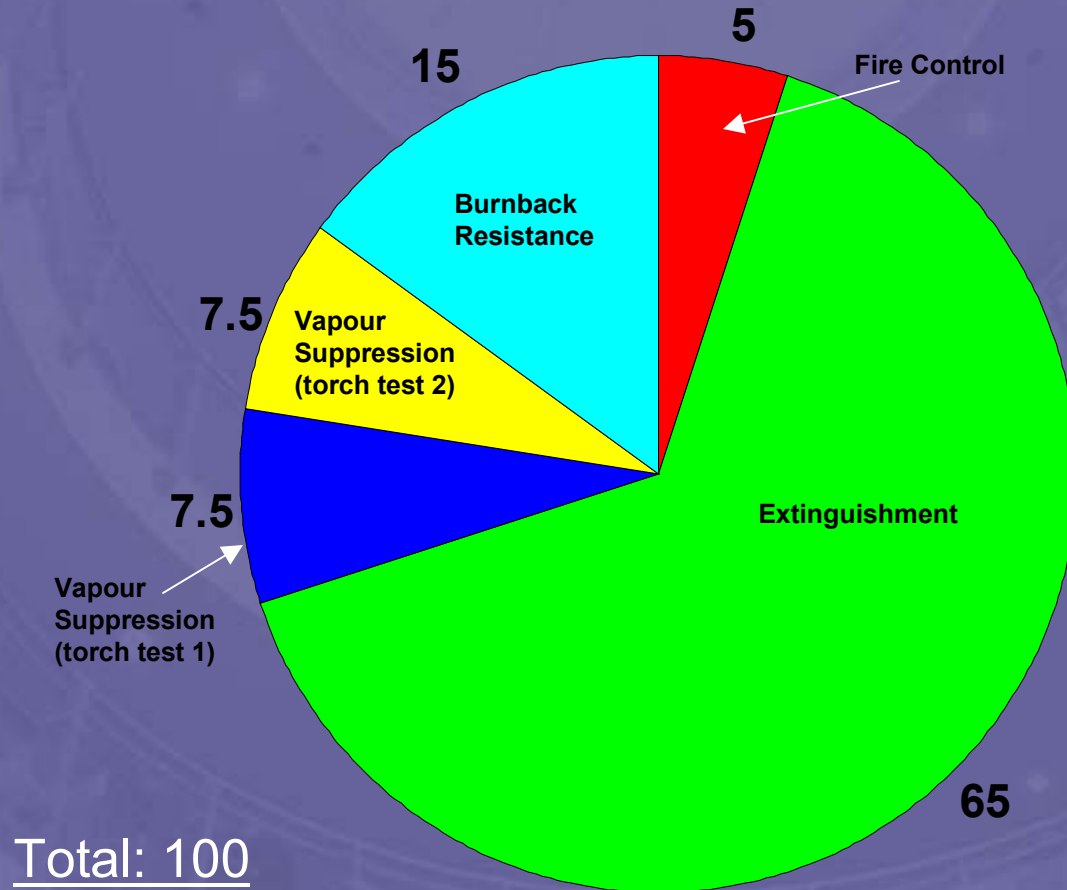


Preburn Foam Torch Burnback

# LASTFIRE test results



Maximum 300 points,  
100 available for  
each 3 stages of  
LASTFIRE TEST



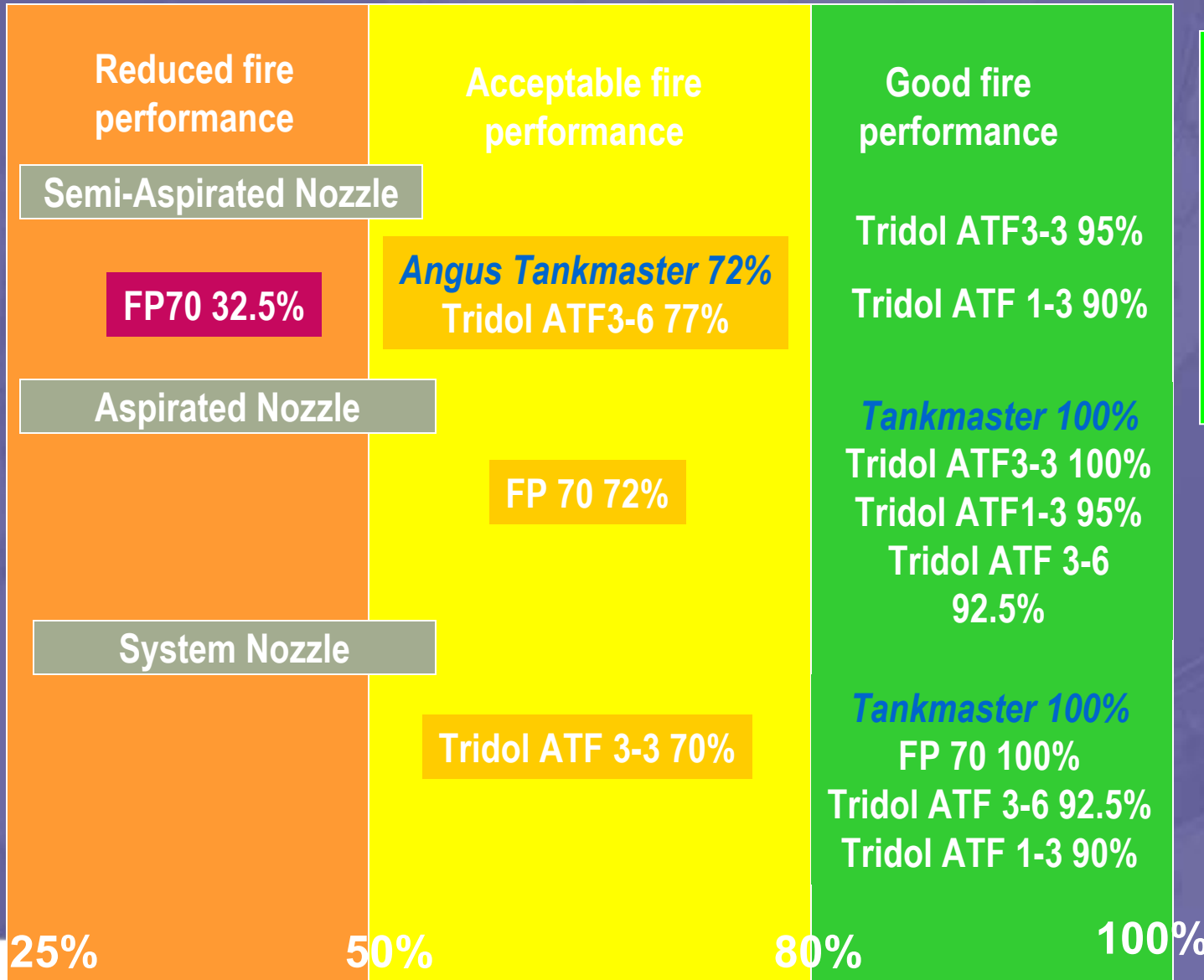
End users relative importance of LASTFIRE Test fire performance criteria  
*(Developed from poll of end users)*

# Post-fire security crucial!

- Aspirated applications = best results
- Foam needs to control/prevent edge flickers and resist re-ignition
- Post-fire security is very important
- Foams that suddenly flashback can be dangerous to firefighters!
- More common with AFFFs/ AR-AFFFs
- More common during semi-aspirated applications



# ANGUS FIRE FOAMS: LASTFIRE TESTED



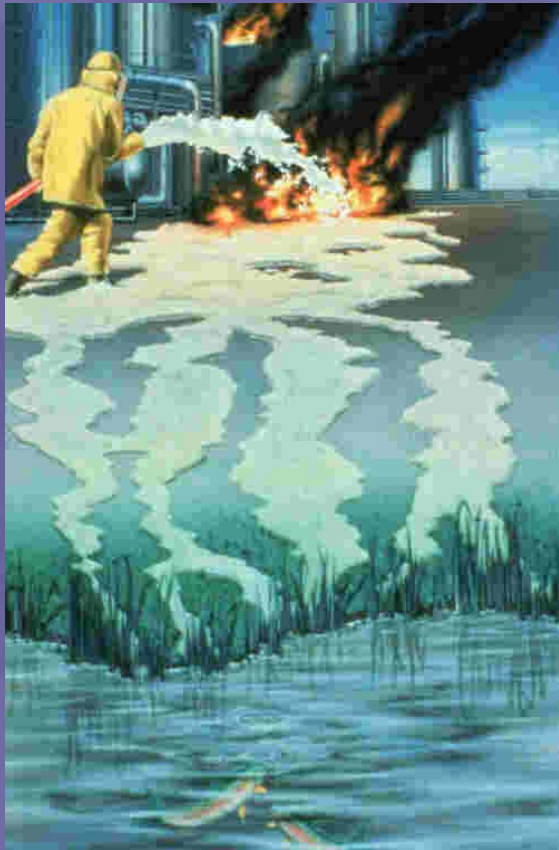
**Total Scores:**

ATF1-3	275
FP70 Plus	272
ATF3-3	265
ATF3-6	264.5
FP70	202





# Environmental Issues



- Comprehensive Data - mild effect only on fish & aquatic organisms
- Rainbow trout LC50 (48 hrs) for TANKMASTER >10,000ppm
- 10,000 ppm = 1% foam solution
- Protein base = Lowest Environmental Impact
- UK Environment Agency Advice - Avoid Detergents
- ***NB - the higher the ppm number the more you can use before bad effects!***

# Environment: Improved WWTP



*“AFFF fire fighting foam significantly disrupted a refinery’s wastewater treatment plant (WWTP)”.*

Source: Industrial Fire Safety, Nov/Dec 92

FP foams like  are far less disruptive

Also readily biodegradable

Natural protein base (FP) more easily digested by bacteria

Can use more before any problem

## AFFF Toxicity - Detergent



*“Detergent is the most acutely toxic of the main foam constituents”*

Source: UK Environment Agency

24 Hour  $LC_{50} < 20 \text{ mg l}^{-1}$

# Oil / Water Separators

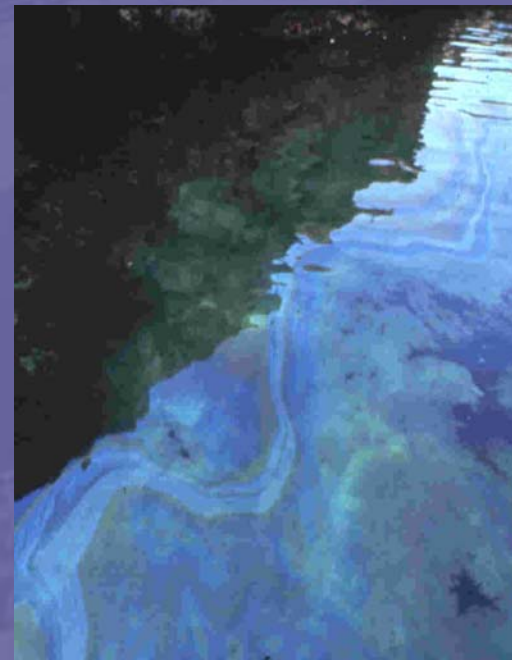


***“Foams that contain detergent can mix with the fuel itself and carry it into the water environment, giving rise to much higher oxygen demands in the water”***

Source: UK Institution of Water & Environmental Management

***“The only solution for fire fighters is to avoid the use of foams that contain detergent”.***

Source: UK National Environmental Technology Centre



# Proven Emergency Response



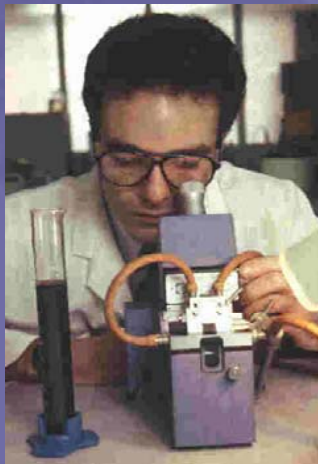
- Repsol S. Spain - Aug. 03
- Antonov - 100kL
- Trucks - non-stop 2 drivers ea.
- Wide range products incl. Alcoseal, Niagara & Tridol ATF
- Idemitsu, Japan- Sept. 03
- Boeing 747 - 60kL
- Alcoseal & ATF3-6
- Atas Refinery, Turkey- Mar 04
- A 300 Airbus - 42kL FP70
- 100kL  replenishment



# Comprehensive Foam Service



- 24hr/365 days Emergency Service
- Bulk emergency stocks
- Technical support - Foam/Equipment
- Full range Portable & Fixed Eqpt.
- Full Foam Testing Service
- Your Partners in Protection!



ANGUS  
FIRE



# ALL OPTIONS COVERED



**WHEN YOU NEED IT MOST!**

Atas Refinery Tank Fire,  
Turkey - July 2004

