



**SCHAUM**  
GEGEN  
**FEUER**

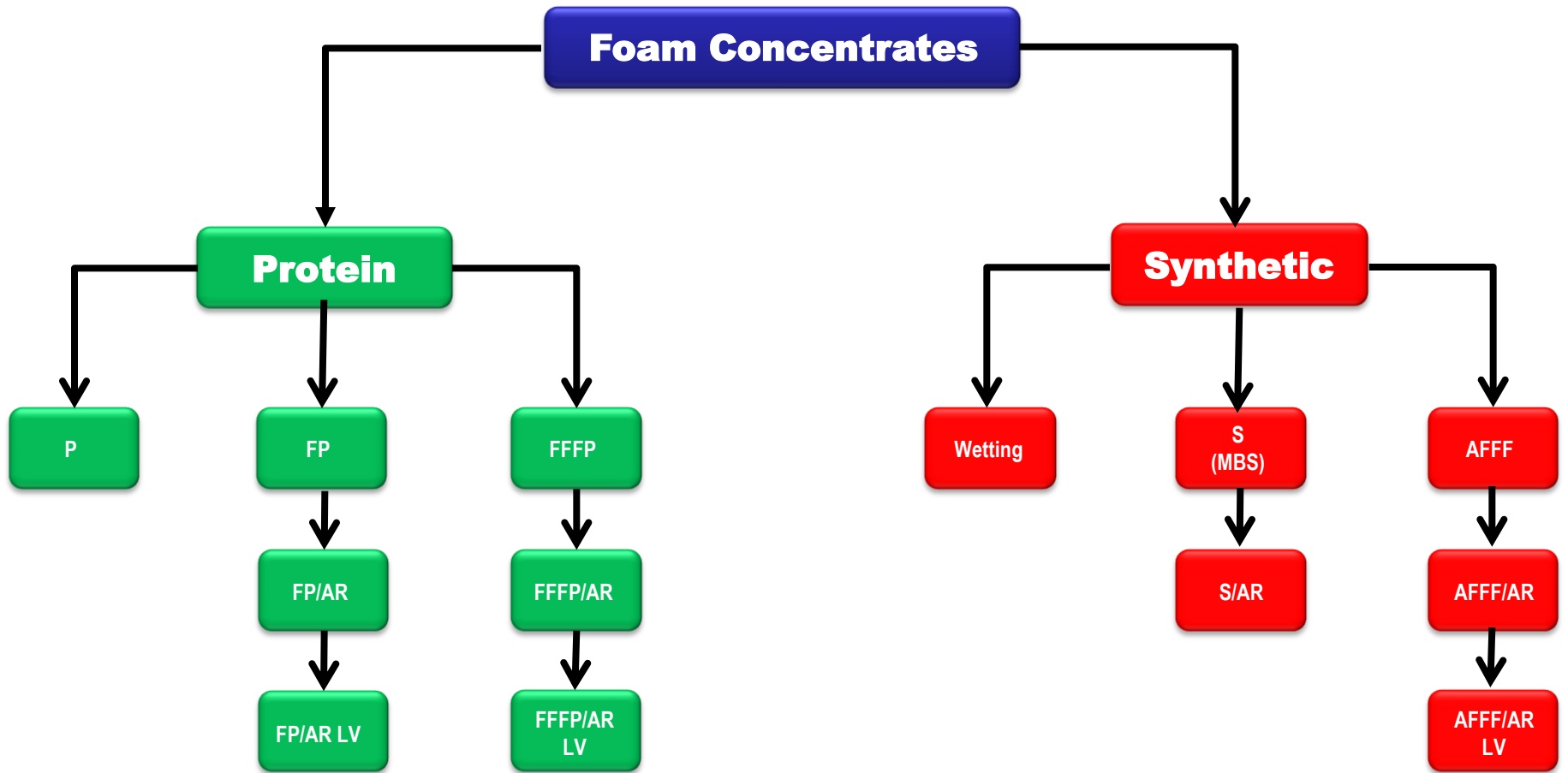
***FOAM and Environment***  
***27.01.2011/Gardermoen Airport***

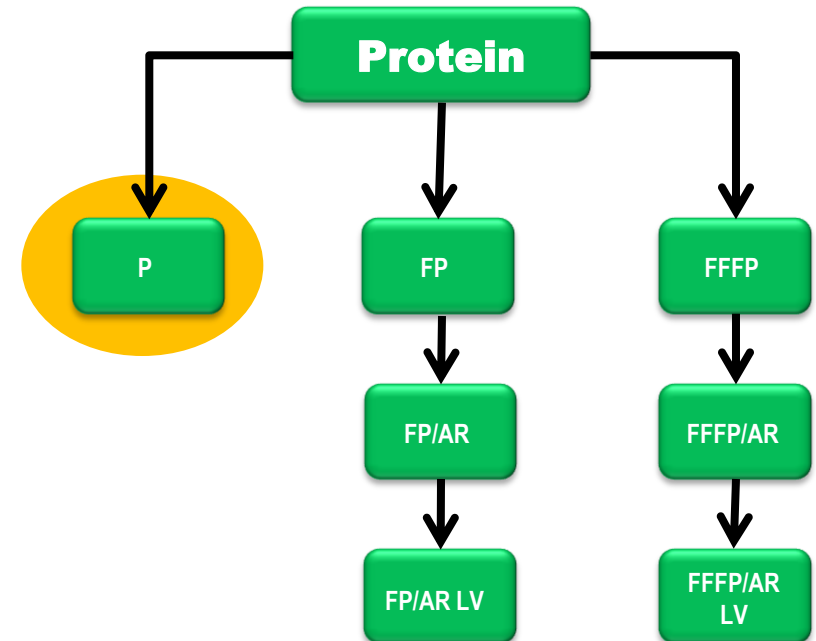
Thank you  
Avinor  
Oslo Airport  
Egenes Brannteknik



**EGENES**  
BRANNTTEKNIKK AS

# Foam Concentrates





## Standard-Protein (P)

**FOAMOUSSE 3%, 6%**

- Dark brown to black liquids
- Induction rate 3% or 6%
- Stable foam of small bubbles
- Frost resistance usually  $-15^{\circ}\text{C}$  or  $-25^{\circ}\text{C}$
- Can only be used as low expansion foam

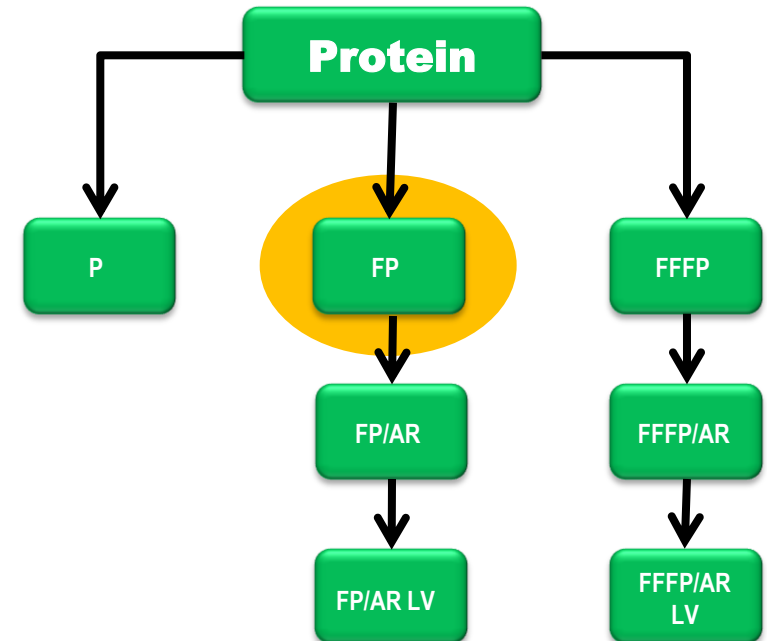
### - Operational areas:

- petrochemical industry
- refineries
- storage tank fields
- offshore

## Fluoro-Protein (FP)

FLUOR-FOAMOUSSE 3%, 6%

- like P + additional fluoro components
- Additional operational areas:
  - „sub-surface“, resp. „base-injection“
  - direct application

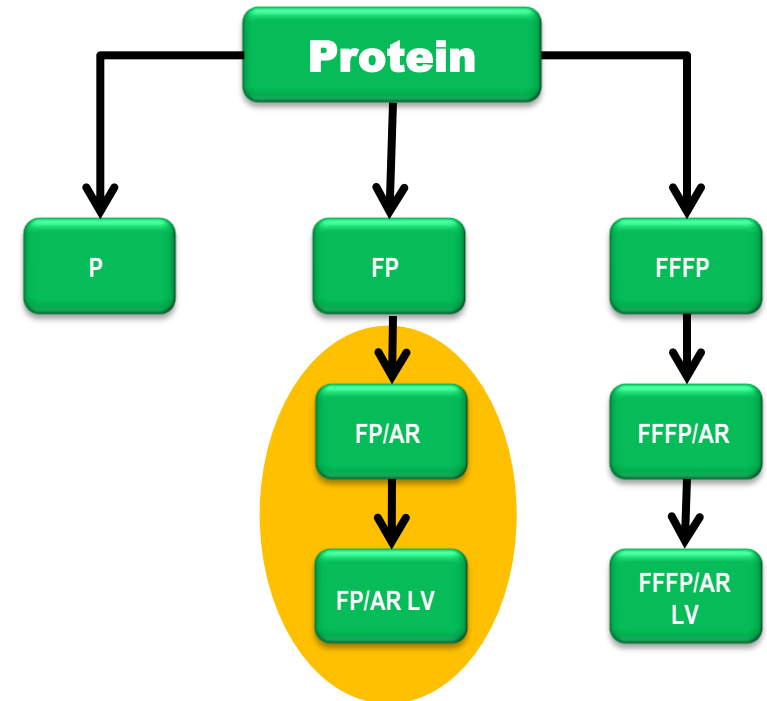


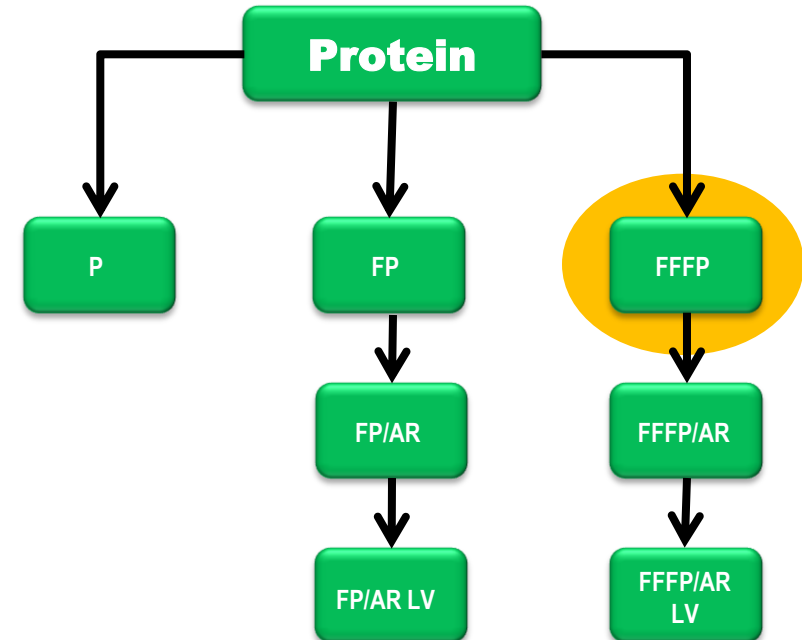
Alcohol resistant Fluoro-Protein (FP/AR)

FOAMOUSSE-FP/AR 3/3, 3/6

like FP + can additionally be used on alcohols

- Additional operational areas:
  - chemical industry
  - chemical tankers





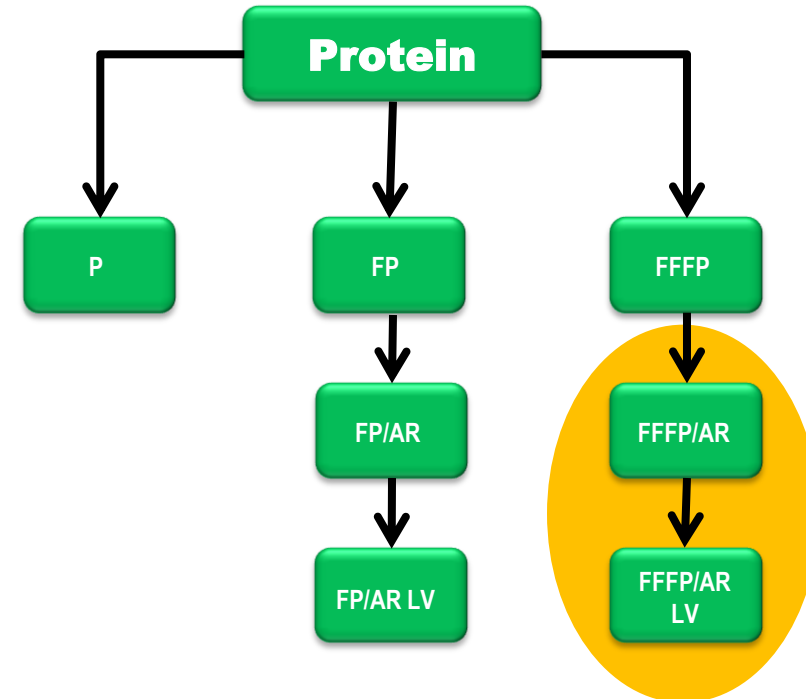
## Film Forming Fluoro-Protein (FFFP)

FOAMOUSSE-FFFP 3%, 6%

like FP + an aqueous film is formed on non-polar solvents

- Additional operational areas:
  - airports





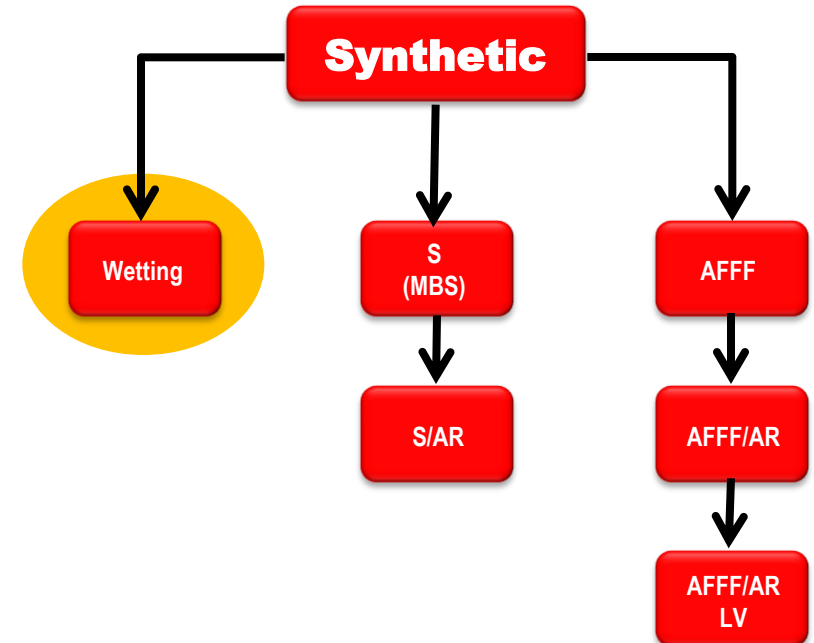
Alcohol resistant FFFP (FFFP/AR)

FOAMOUSSE-FFFP/AR 3/3, 3/6

FOAMOUSSE-OMEGA 3/3

like FFFP + a polymer film is built on polar solvents

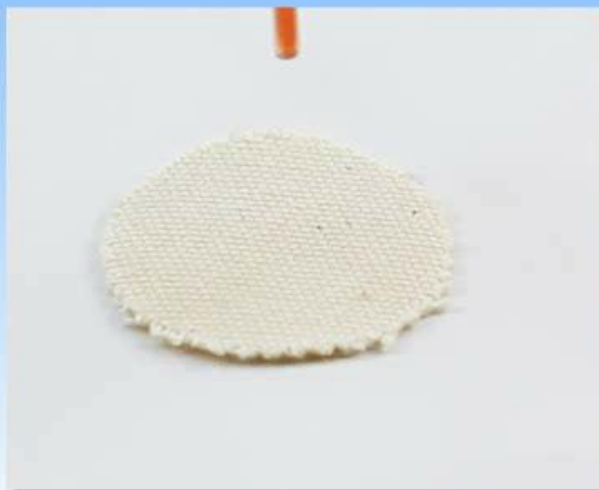
- Additional operational areas:
  - chemical industry
  - chemical tankers



Wetting Agent:  
**STHAMEX-ultraWet**

- lowers the surface tension, does not foam very good
- Induction rate 0,1%
- Only class A fires

**Wasser**



**Water**

**Wasser mit  
0,1% STHAMEX-ultraWet**



**Water plus  
0.1% STHAMEX-ultraWet**

Synthetic or multi purpose foam (MBS):

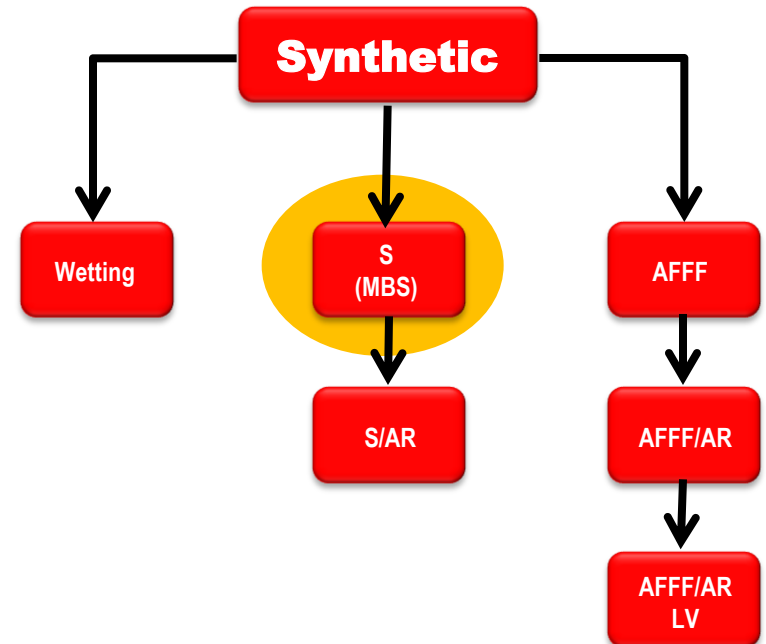
STHAMEX F-6, F-15, F-25

STHAMEX class A

-can build low  
medium  
high  
expansion foam --> ER 2 to 1000

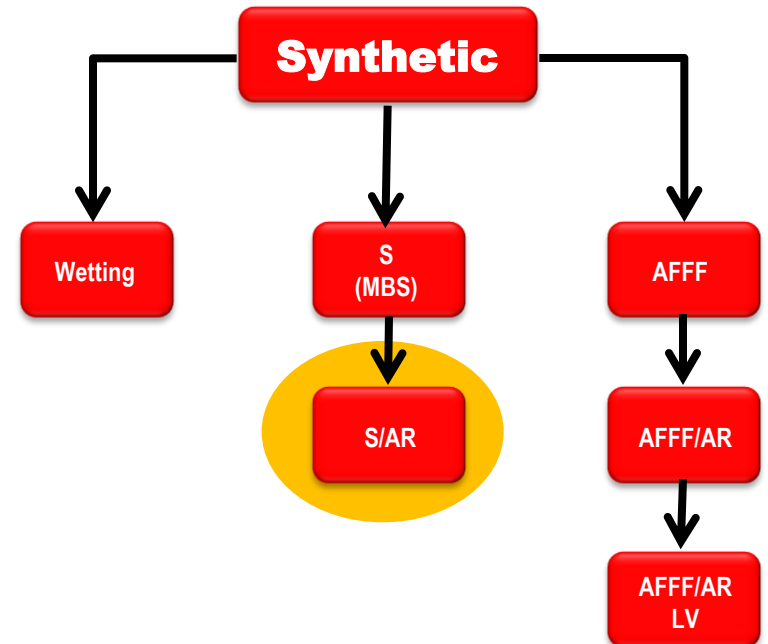
- Induction rate: 6%, 3% or 1%, sometimes 2% with high expansion

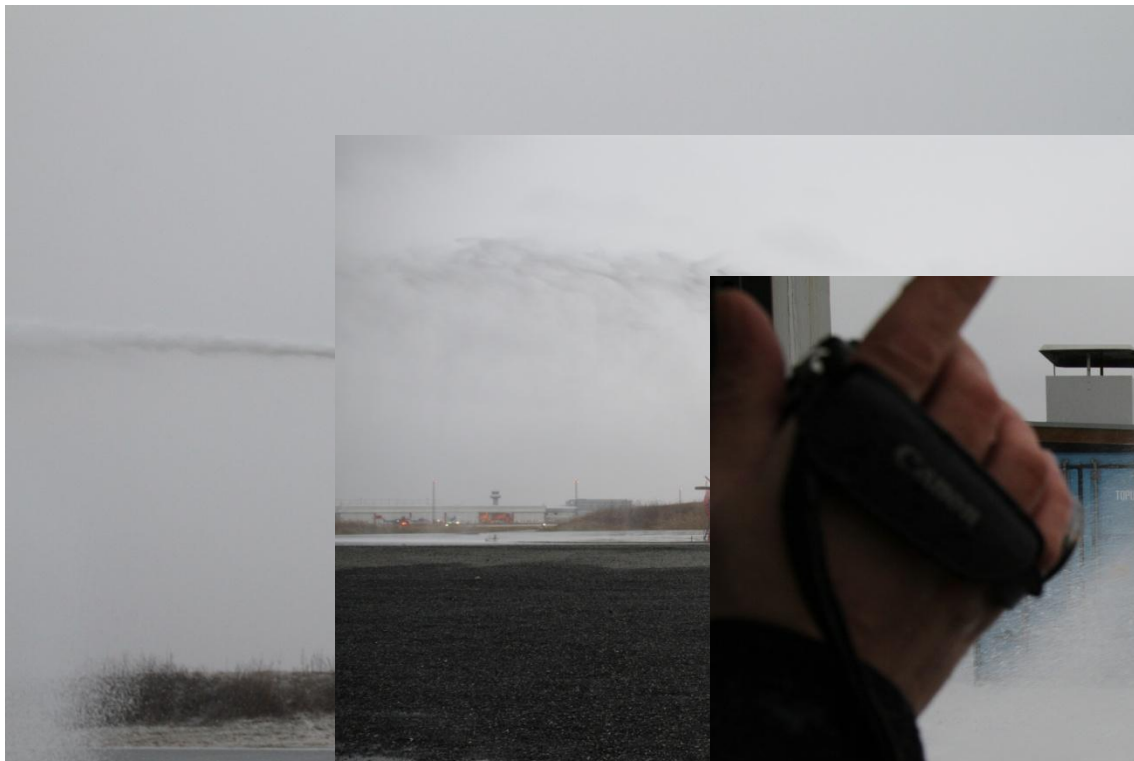
- Application:                   municipal fire brigades  
class A and small class B fires  
CAFS



Alcohol resistant synthetic foam:  
**MOUSSOL-FF 3/6**

- fluorine free alternative for AFFF/AR
- approved acc. to EN 1568-1,3,4 and ICAO Level B
- can be used on solid fires as well as polar and non-polar liquids







## FOAM PHYSICAL PROPERTY TEST

In accordance with NFPA Standard No. 412



Date: 11.01.2011

Test No: 1

Location: Bole Airport/Stevanger

Ambient temp: 0°C

Relative humidity: high

Wind speed: 10 km/h

Wind direction: .....

Water temp: 4°C

pH-value: .....

Water hardness: ..... \*d

Source: Tap water

Test Subject: Foaming Properties

Vehicle: Super Buffalo with R600 pump and RM80E Nozzle

Type Foam Liquid Concentrate: MOUSSOL-FF 3/8

Foam Maker: RM80E Monitor

Foam Concentration: 3% |

	Volume of Foam	Height of Foam (cm)	Time	10"	1"	10"	1"	10"	1"	Flow Expansion	20% Drainage Time	20% Drainage Time	Stable foam	Leaking Rate (%)	Flow Range (l)	Flow Rate (l/min)	Injection pressure (bar)	Operating pressure (bar)	Remarks	
1	1800	210								7.5	50	1.00		2.0	60-70					
2	1800																			
3	1800																			
4	1800																			

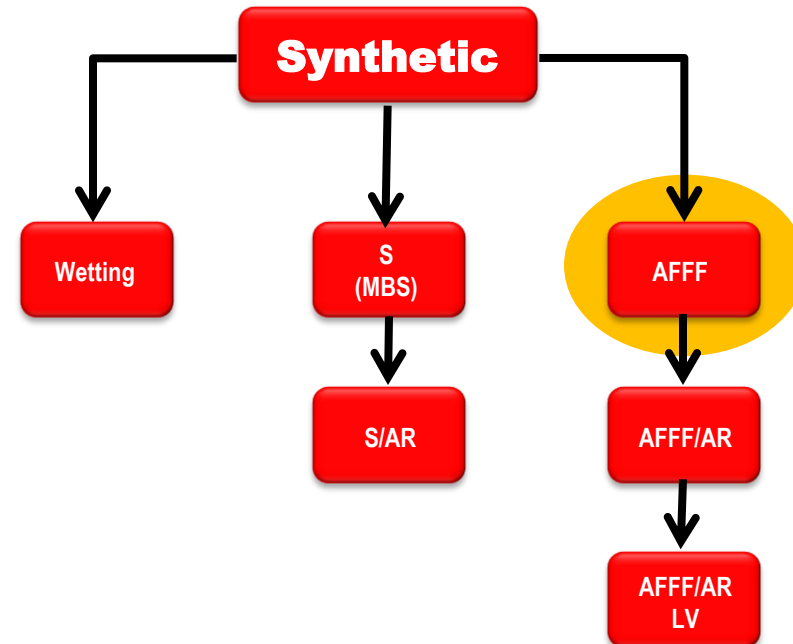
Remarks:

Nozzle operator: .....

Lab tester: Dr. M. Ball

Signed: .....





### AFFF foam concentrates:

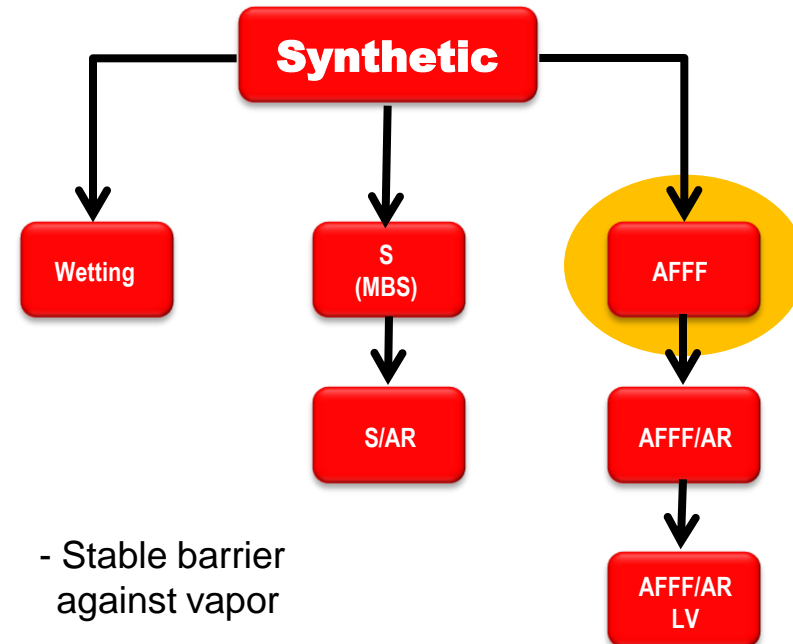
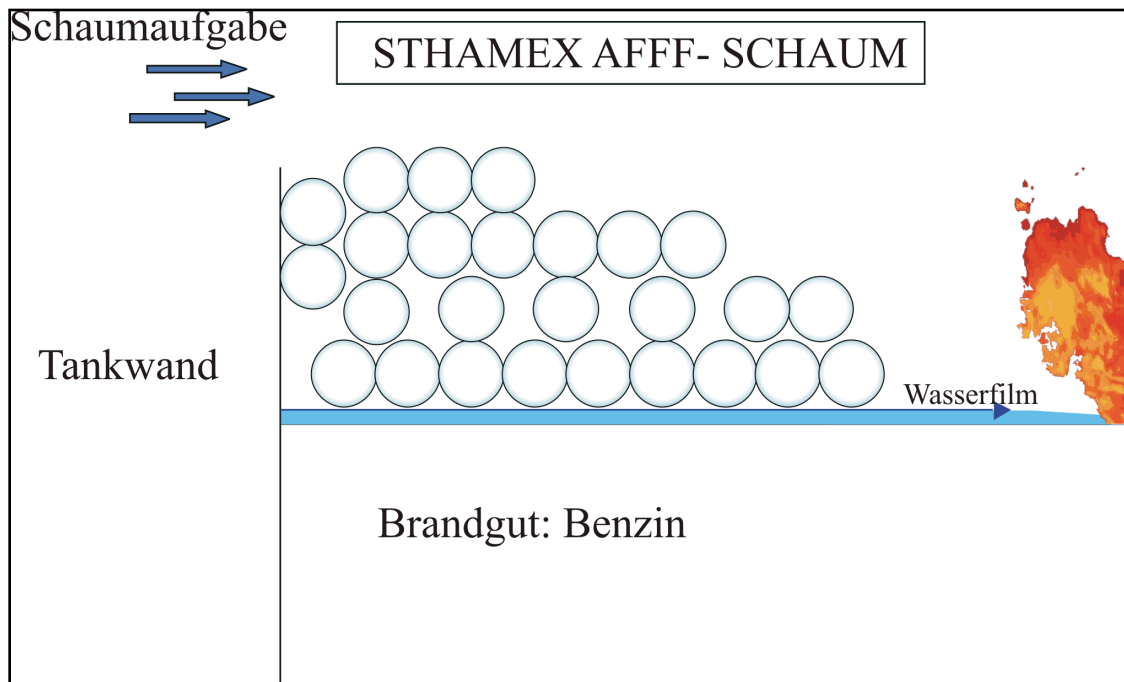
STHAMEX-AFFF 1%, 3%, 6%, F-15  
STHAMEX-AFFF 3% F-15 Premium

- contain fluoro surfactants
- AFFF: „Aqueous Film Forming Foam“
- Induction rate: 1%, 3%, 6%
- Application: chemical/petro-chemical industry  
airports  
offshore  
"sub surface", resp. „base injection“  
sprinkler systems

**Wasserfilmbildung bei  
Sthamex AFFF und Moussol APS  
auf unpolaren Brennstoffen**

*Forming an aqueous film on  
non-polar solvents by  
Sthamex AFFF and Moussol APS*

Aqueous film runs in front of the foam  
→ fast foam spreading



- Stable barrier against vapor

→ good

burnback

- direct application  
→ low fuel pick-up

## **Direkte Schaumaufgabe**

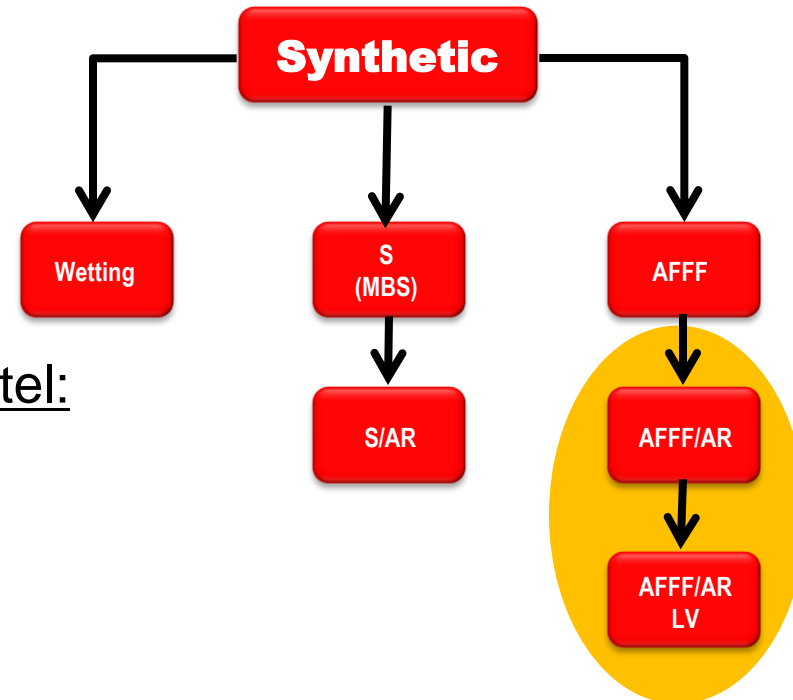
*Direct foam application*

# **TANK FIRE FIGHTING TEST**

**26. APRIL 2005**

**HUNGARY**





### Alkoholbeständiges AFFF-Schaumlöschmittel:

MOUSSOL-APS 1/3, 3/3, F-15

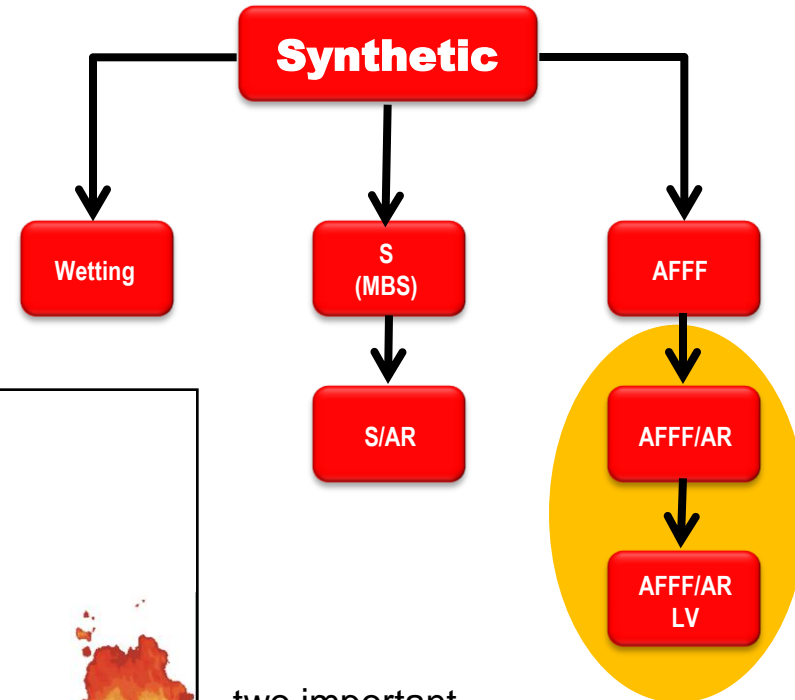
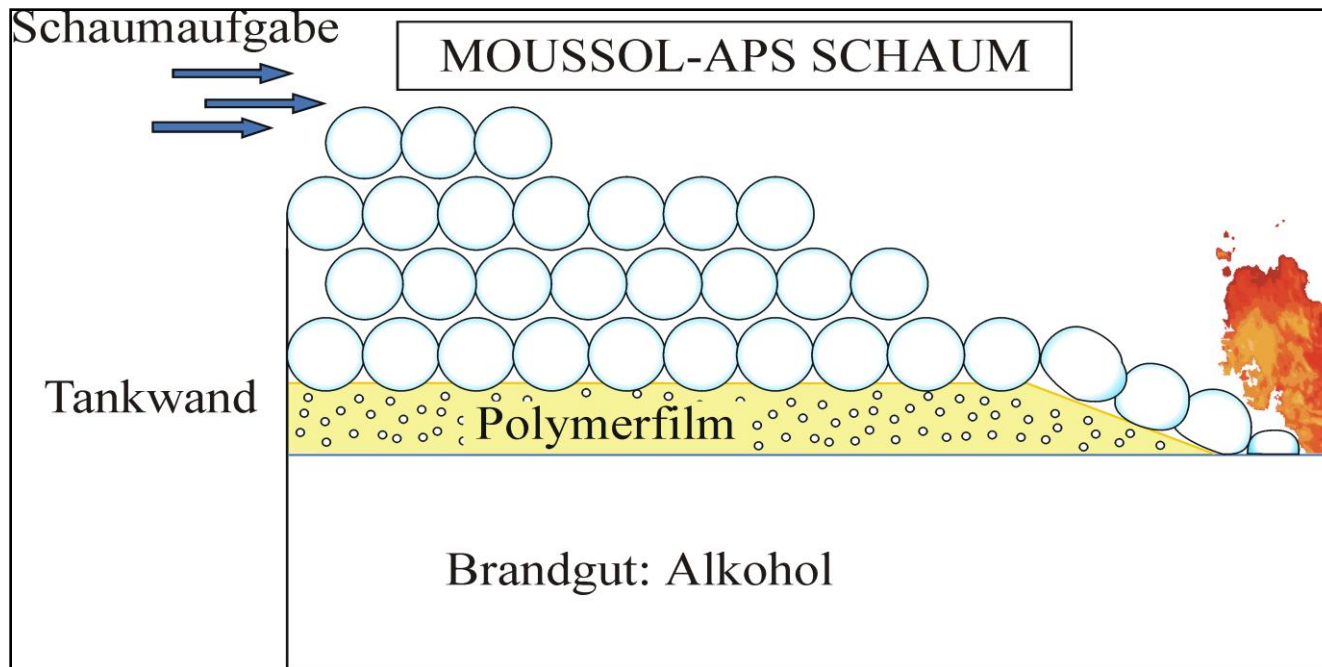
MOUSSOL-APS LV 1/1, 1/3, 3/3

- Same properties as AFFF + fires of polar solvents
- Polymer film builder, pseudo-plastic
- Induction rate: 1/3%, 3/3%, 3/5%
- Application: chemical/petro-chemical industry  
airports  
offshore  
"sub surface", resp. „base injection“ **only non-polar**  
sprinkler systems

## **Polymerfilmbildung bei Moussol APS und Moussol FF**

*Forming of a polymer film with  
Moussol APS and Moussol FF*

- On polar fires  
→ Formation of a gel-like protective layer between solvent and foam

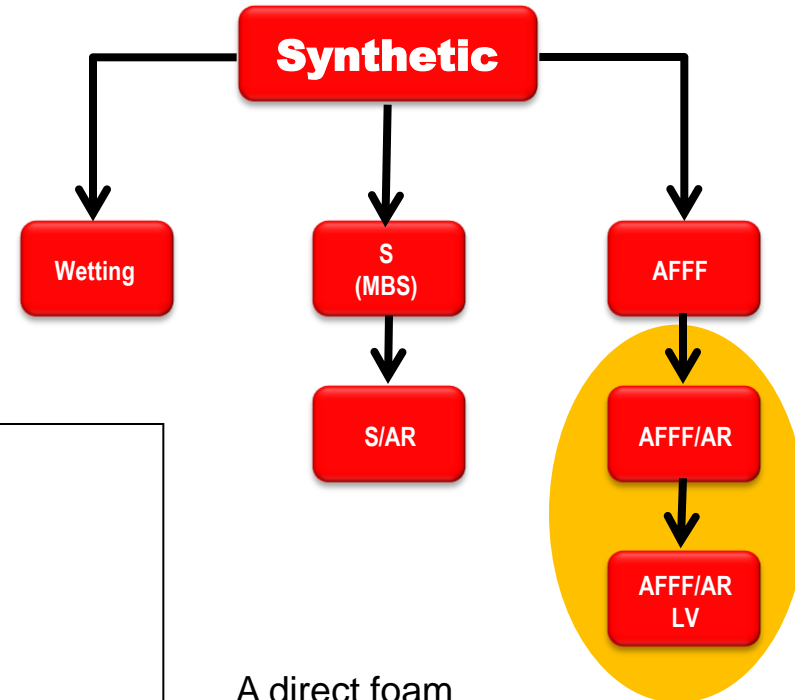
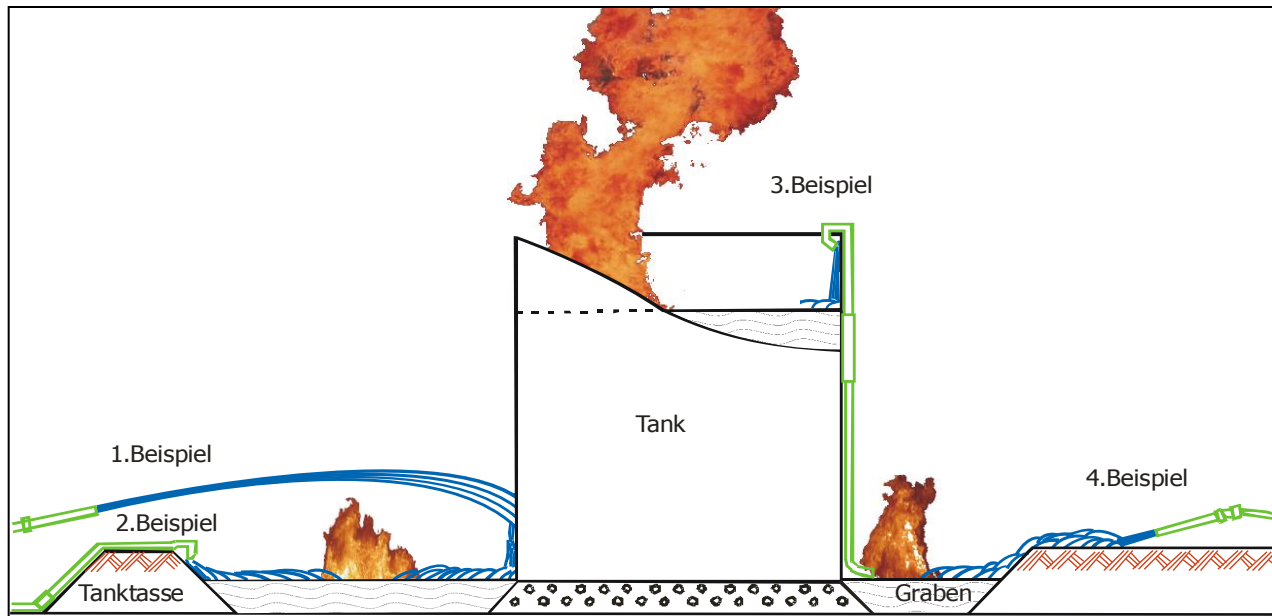


two important factors:

- good foam expansion
- gentle foam application



The foam application has to be gentle to allow the formation of a coherent and tight film.



A direct foam application like on non-polar solvents is not possible. The foam must glide onto the liquid surface.

# Quality Control

The quality of fire fighting foams can be controlled by our lab. The following values are important:

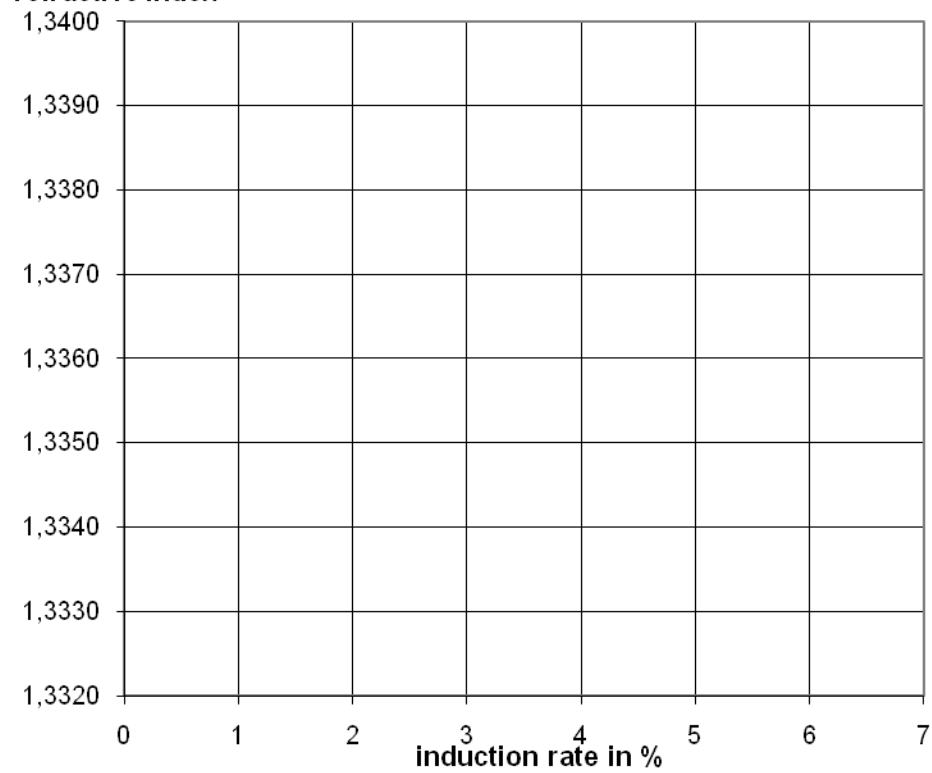
- pH-Value
- Density
- Sediment
- Frost resistance
- Viscosity
- Surface tension
- Expansion ratio
- 25% + 50% drainage time
- Induction rate



Date	:		
Customer	:		
Foam Compound	:		
Marking of Sample	:		
<hr/>			
pH Value at 20° C	:		
Density at 20° C	:		
Foam Expansion	:		
Underline kind of water	:	Tap / Sea /	
		Brackish Water	
Temperature Water	:		° C
Temperature Foam Compound	:		° C
Temperature Air	:		° C
Induction Rate	:		%
Gross Foam Weight	:		g
- Tare	:		g
= Net Foam Weight	:		g
Volume Foam Sample	:		ml
Container	:		
Foam	:	$\frac{\text{ml}}{\text{g}}$	
Expansion	:		times
25 % Value	:	$\frac{\text{g}}{4}$	
25 % Value by minutes	:		ml
Remarks	:		



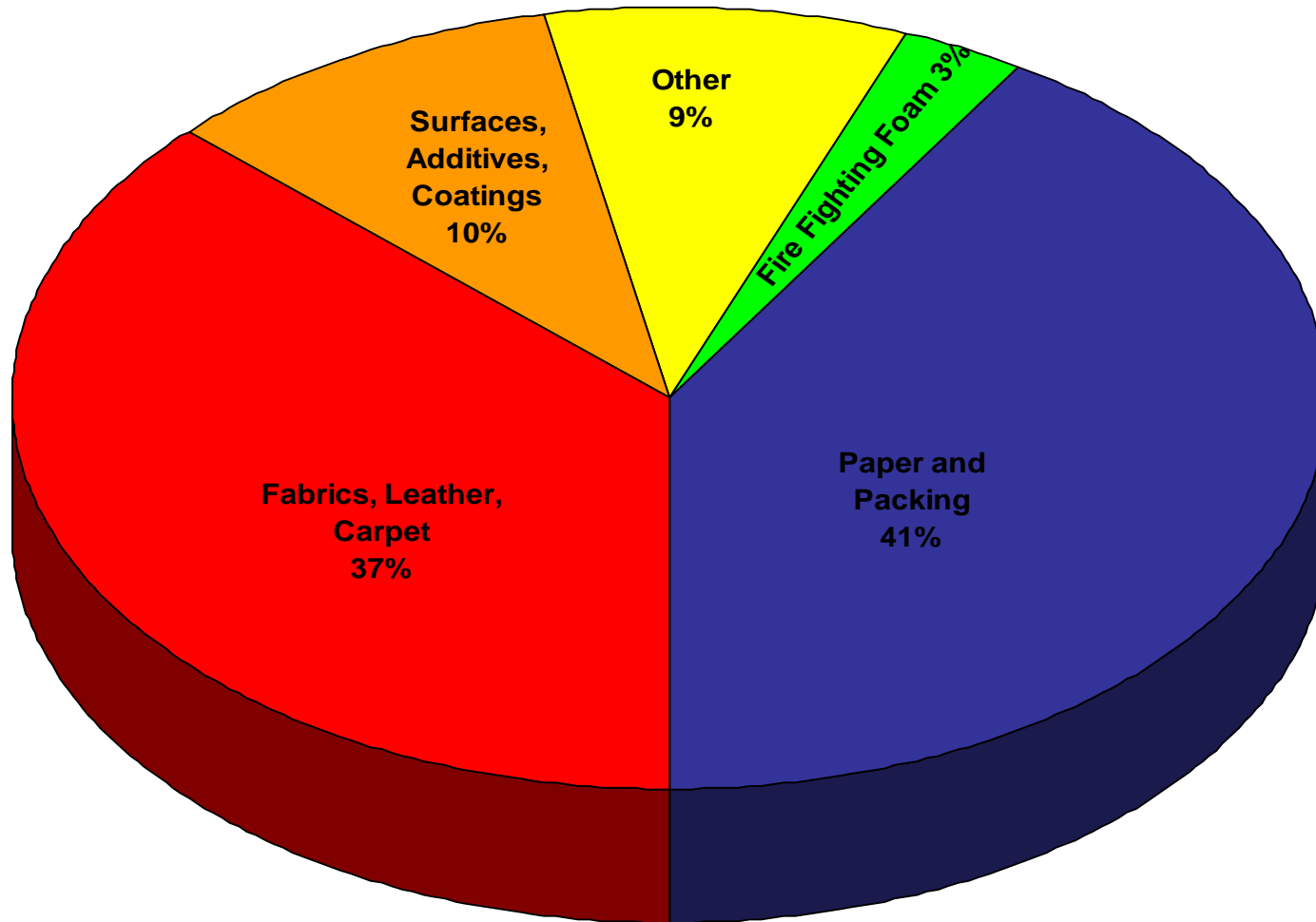
refractive index



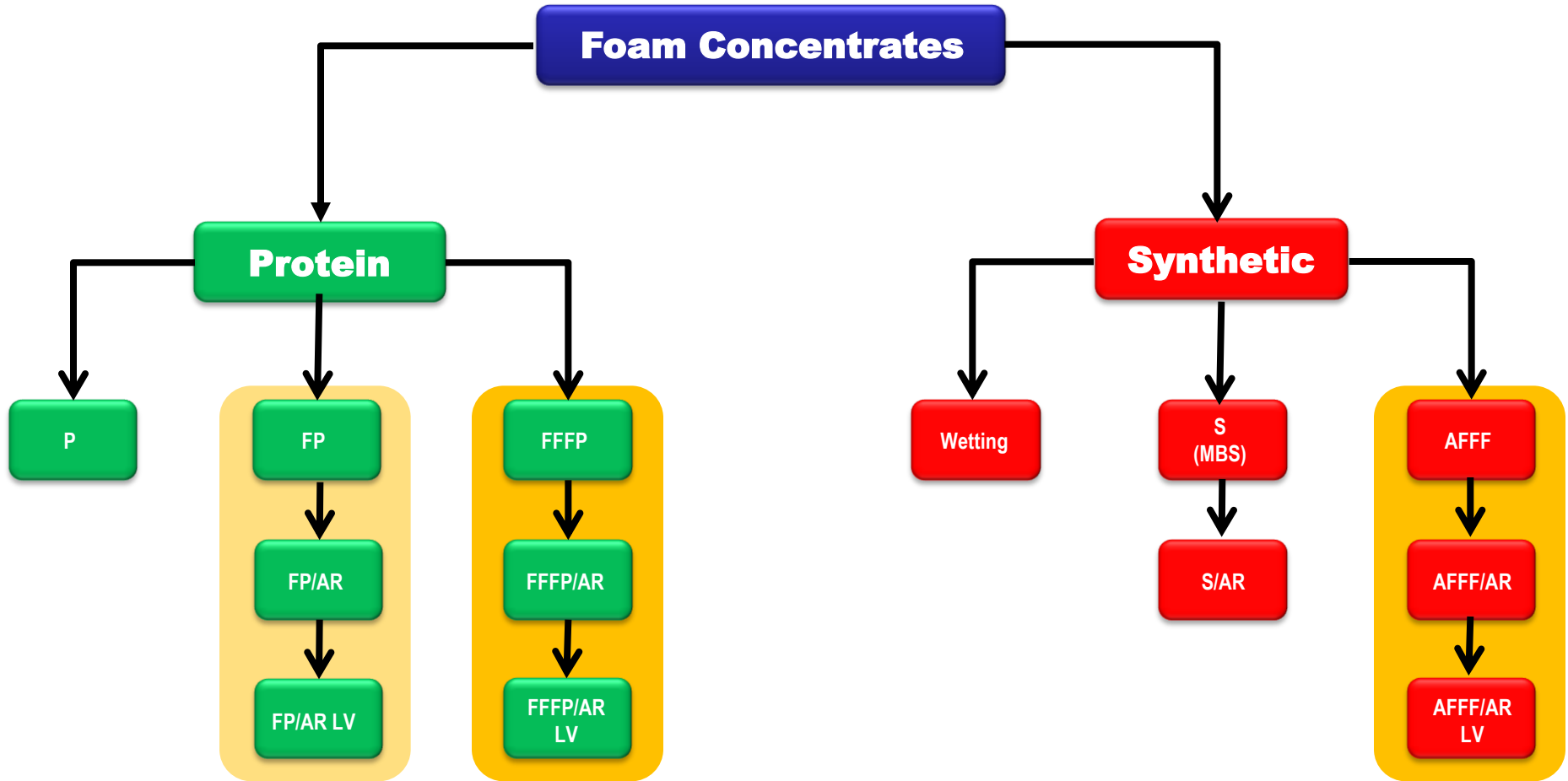


Date	:		
Customer	:		
Foam Compound	:		
<u>Marking of Sample</u>	:		
<hr/>			
pH Value at 20° C	:		
Density at 20° C	:		
Foam Expansion	:		
Underline kind of water	:	Tap / Sea /	
		Brackish Water	
Temperature Water	:		° C
Temperature Foam Compound	:		° C
Temperature Air	:		° C
Induction Rate	:		%
Gross Foam Weight	:		g
- Tare	:		g
<u>= Net Foam Weight</u>	:		g
Volume Foam Sample	:		ml
Container	:		
Foam		<u>          </u> ml	
Expansion		<u>          </u> g	:
			times
25 % Value		<u>          </u> g	
		4	:
25 % Value by minutes	:		ml
Remarks	:		

# Fluorosurfactants in Foam Concentrates







- AFFF foam concentrate:

- water
- hydrocarbon surfactant
- glycol derivatives
- **Fluorosurfactant**

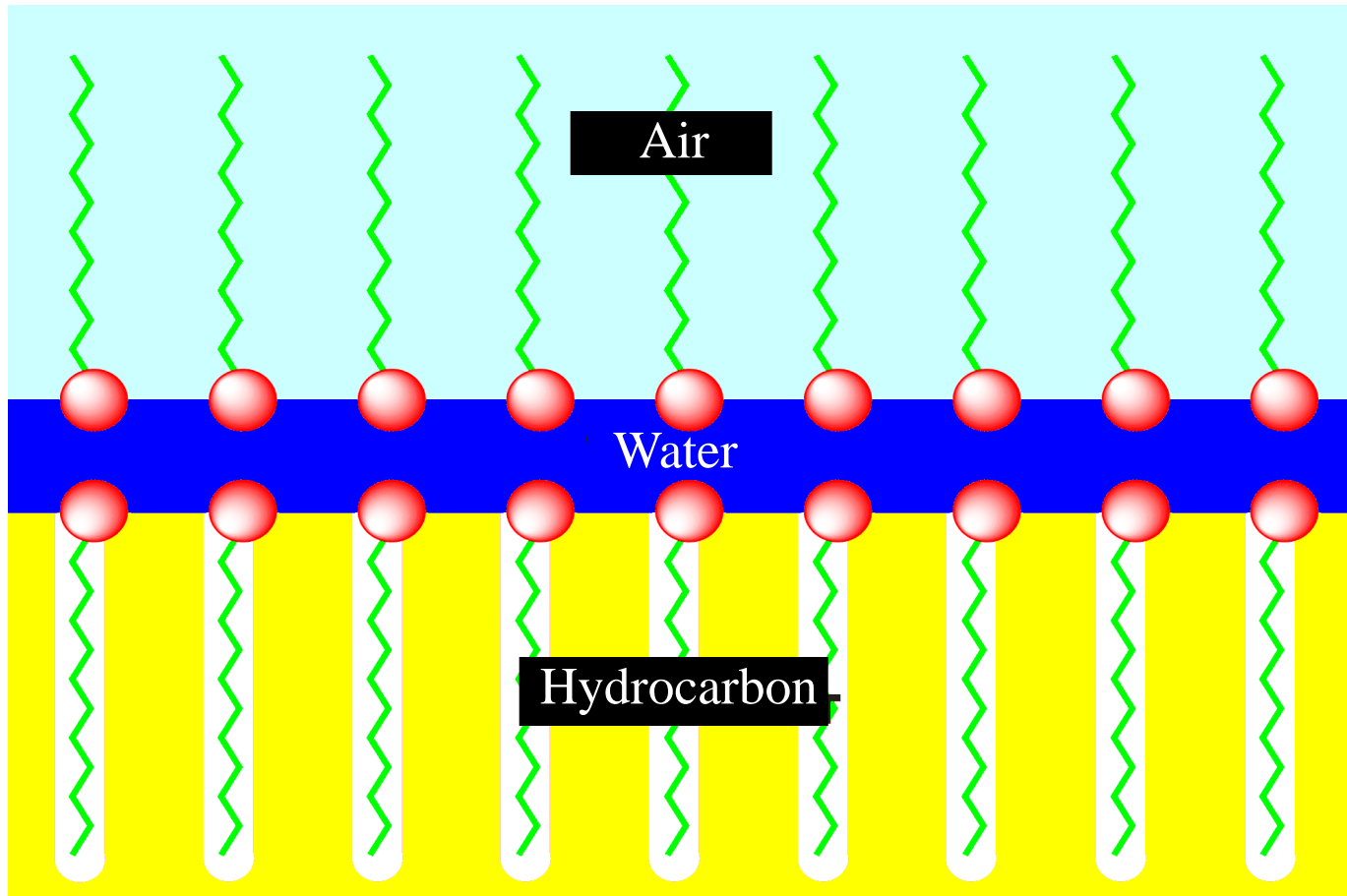
FFFP foam concentrate:

- water
- hydrolyzed protein
- foam stabilizer
- **Fluorosurfactant**

- AFFF: „Aqueous Film Forming Foam“

FFFP: „Film Forming Fluoro Protein“

- Formation of a 10 to 30  $\mu\text{m}$  aqueous Duplexfilm on class B liquids (non-polar hydrocarbons)



# PFOS/PFOA in Foam Concentrates

## PFOS:

The EU-law 2006/122/EG is adopted by all EU-Members + Switzerland and Norway.

Foam concentrates with PFOS > 50 ppm are only allowed to be used up to 27. June 2011. After that date they have to be disposed of by high temperature incineration.

**Dr. STHAMER foams purchased from 2003 all fulfill 2006/122/EG and therefore have PFOS levels lower than 50 ppm.**

PFOA:

Germany has initiated the inclusion of PFOA into the SVHC list.

Norway and Switzerland already included PFOA with a threshold value of 0,005%

Telomer-based products have PFOA-levels far below 0,005%.

As raw materials go to „zero“ PFOA, the products do as well.

**Dr. STHAMER foams purchased from 2003 also have PFOA levels lower than 50 ppm.**

# Fluorotelomers in Foam Concentrates

	<b>PFOS</b>	<b>6:2-Telomer</b>
Toxic?	yes	no
Cancerogenic?	yes	no
Bioaccumulative?	yes	no
Persistent ?	yes	yes



Telomer-Fluorosurfactants are also not biological degradable.

In „normal“ runoff water with AFFF-addition 0,03% FS

Collection and treatment/disposal of runoff waters should be part of the overall concept (fire fighters – constructors – insurance)

The use and induction of Telomer-based AFFF is not banned.

The induction of Telomer-based AFFF solutions into a wastewater treatment plant is not forbidden by law, but with respect for the environment it should be minimized or stopped.

# Fluorine Free Foams

## Extinguishing performance acc. EN 1568-3 (Fuel: Heptane)

Extinguishing performance	Burnback resistance	Gentle application test		Forceful application test	
		Extinction time not more than	Burnback time not less than	Extinction time not more than	Burnback time not less than
I	A	Not applicable		3	10
	B	5	15	3	Not applicable
	C	5	10	3	
	D	5	5	3	
II	A	Not applicable		4	10
	B	5	15	4	Not applicable
	C	5	10	4	
	D	5	5	4	
III	B	5	15	Not applicable	
	C	5	10		
	D	5	5		

Ratings acc. to DIN EN 1568-3 (non-polar fuels – Heptane)

	<b>Tapwater</b>	<b>Saltwater</b>
STHAMEX-AFFF	IA or IB	IA or IB
MOUSSOL-APS	IA or IB	IA or IB
STHAMEX F-15	IIIC	IIID
FOAMOUSSE 3%	IIIB	IIIB
MOUSSOL-FF 3/6	IIIB	IIID
Competitor's products 1	IIIB	DNE
Competitor's products 2	IIIB	DNE
Competitor's products 3	IIIC	Not tested

## Correction Factor for Non-Polar Solvents acc. DIN EN 13565-2

Extinguishing performance	Foam Type	Factor Spills	Factor Tank
IA	AFFF(AR), FFFP(AR)	1,0	1,0
IB	AFFF(AR), FFFP(AR)	1,0	1,1
IC	AFFF, FFFP	1,1	1,25
ID	AFFF, FFFP	1,1	N/R
IIA	FP, FP(AR)	1,0	1,0
IIB	FP, FP(AR)	1,0	1,1
IIC	FP	1,1	1,25
IID	FP	1,1	N/R
IIIB	S, P	1,5	N/R
IIIC/IIID	S	1,75	N/R

Fluorine free foams are used for „gentle“ tasks:

- gentle applications like:
  - goose necks, foam pourer
  - medium expansion foam
  - high expansion foam
- high application rates
- good foam quality
- hydrocarbon fuels with high boiling points

**Filmforming Foams are used for „hard“ tasks:**

- forceful/direct application
- low to critical application rates
- low- or non-expanded application like:
  - monitor application
  - water sprinklers, spray nozzles
- All kinds of hydrocarbon fuels

## Oil separators:

- Can not hold back foam concentrates or foam solutions
- Foam solutions are also cleaning solutions
- Inducing foam solutions into separators cleans the separators from hydrocarbons.

**MOUSSOL-FF 3/6 can be induced into sewage systems, but should not go through oil separators.**

Thank you for your attention