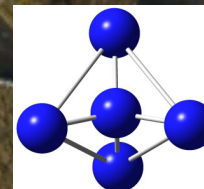


Firefighting Foam in Context

A Broader View

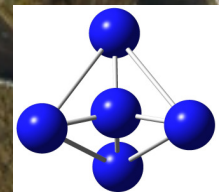
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Firefighting Foam in Context

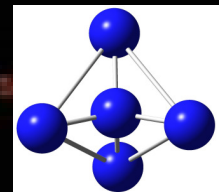
- Procurement
- Training
- Storage facilities

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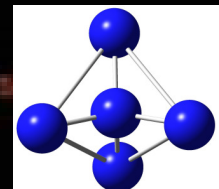
Foam Procurement

- Fit for Purpose?
- NO – wrong question!
- Surprised?
- *then read on => => => => =>*



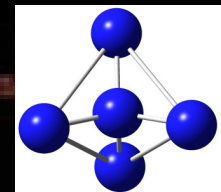
Foam Procurement

- Fit for Your Purpose!
 - Class A or Class B
 - AFFF, FFFP, FP, FFree, Protein, Synthetic
 - Alcohol-resistance (AR)
 - Extinction times
 - Application rates
 - Flow and drainage characteristics
 - Saltwater compatibilty
 - Blanketing and vapour suppression
 - Use at low, medium and high expansion
 - Environmental sensitivity
 - Storage stability



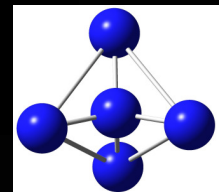
Foam Procurement

- Fit for Your Purpose!
- Is a one-stop combined Class A and Class B foam practicable for municipal fire brigade use?
- With provisos:
 - (i) no long-lived breakdown products when used dispersively as Class A, e.g., for wildland fires;
 - (ii) Class A performance not compromised by using a product originally formulated for Class B use;
- Effectively excluding fluorosurfactant foams as a one-stop solution.



Foam Procurement

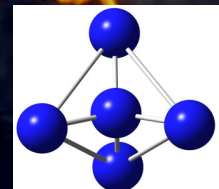
- Fit for Your Purpose!
- Require approvals certification from a reputable test house with levels of pass, i.e., EN 1568, UL 162, ICAO, etc., not just pass/fail;
- Require detailed LASTFIRE batch data;
- Require BOD/COD/Fluorine-content data;
- Compare cost even for like products;
- Use trade directory for alternatives;
- Above all do not believe anything that salesmen claim without evidence, especially if it concerns their competitors' products!



Foam Training

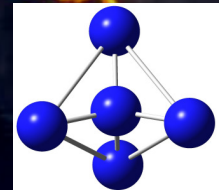
- Training must be fit-for-purpose
- Risks must be balanced against justifiable training outcomes
 - Risks to personnel
 - Risks to the environment
 - Financial or legal risks
 - Cost-benefit analysis

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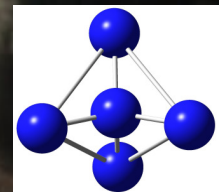
Foam Training

- Training foam versus operational foam
 - Cost
 - Environmental impact
 - Foam behaviour
 - » Extinction, burn-back
 - » Film or blanket formation, vapour suppression
- Two-stage training
 - Phase 1 – LPG-fired gas rig for equipment handling
 - Phase 2 – operational foam for fire/foam behaviour on a “petrochemical” rig with a Class B fuel (\pm AR)
- Exception – ICAO airport ARFF training



Storage Facilities

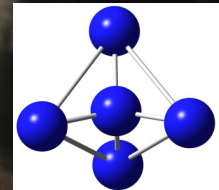
- Petrochemical, pharmaceutical or chemical process industry sites
 - expertise and equipment on-site
- Stand-alone storage facilities – tank farms
 - one man and his dog (security not firefighting)!
- Isolated storage tanks
 - often automated
- COMAH requirements for FS training
 - occupier of premises



Storage Facilities

Risk Assessment

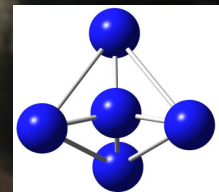
100 m



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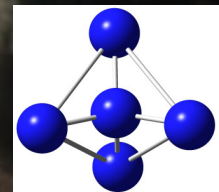
Storage Facilities

- Imagine an isolated 30m diameter tank 20m high filled with xylene in a 60m square bund:
 - tank volume 14137 m³
 - bund area including tank 3600 m²
 - complete rupture into bund
 - Burn-off rate = 5.4 kg/m²/minute = 15 tons/min
 - Time to burn out = 12-15 hours!!
 - Radiant heat 100m from bund centre ~30 kW/m²



Storage Facilities

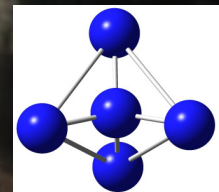
- Flame surface emissivity
 - 270 kW/m² – fireballs
 - 130-270 kW/m² – jet flames
 - 50-100 kW/m² – LPG pool fires
 - 30-50 kW/m² – smoky hydrocarbon fires



Storage Facilities

- Radiant heat

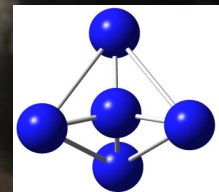
- 0.7 kW/m^2 – hot summer sunshine
- $1.6\text{-}3. \text{ kW/m}^2$ – cable softening / flaring
- 5 kW/m^2 – limit for people to escape
- 12.5 kW/m^2 – wood, paper, paint ignite
- $35\text{-}40 \text{ kW/m}^2$ – tank walls deform



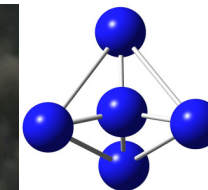
Storage Facilities

- Bund design

- must hold tank contents plus fire fighting foam plus cooling water or run-off disposal be available
- be fire-proof, solvent-proof and properly maintained
- risk analysis to include effects of radiant heat and blast (TNO model) on adjacent tanks for worst case scenario
- calculation of foam application rates, time of application, and foam stocks to be held on-site required
- water requirements and availability to be assessed
- local sources of turbulence, i.e., pipework, trees, etc.



Storage Facilities



- 3F Foam Wizard
 - based on DIN 144493-100

3F Foam Calculator

Foam	Expansion	Type of installation	Storage Density l/m ²
AFFF	LO	Fixed-roof	1250
FFFP	MED	Fixed-roof with floating lid	
FFree	HI	Floating roof with foam ring-main	
FP	1%	Floating roof without foam ring-main	
PROT	3%	Tank-in-Tank	
SYN	6%	Movable container height <= 3.5m	

Polarity: water-miscible / **not water-miscible**

induction rate

Other: **Mobile** / Stationary/half-stationary

Area in m²: 3600

Calculate

3F

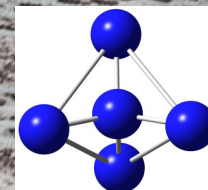
Foam concentrate stocks required = 29.9 tons FFFP (3%)

Minimum application rate = 9.2 litre/min/sq.metre

Minimum total volume = 33.2 cubic metre (tons)/min

And that was where I intended to
stop!

Roger A. Klein, 6-7 July 2009



So finally

- thank you for your attention!

R.A. Klein, Reebok 6-7 July 2009

