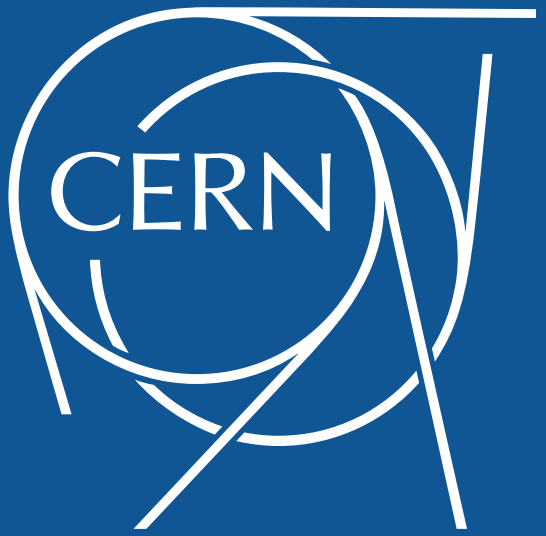

CERN

Michael Plagge and Christoph Schäfer

CMS high expansion foam tests

High expansion foam systems

ATLAS

- 14 generators
- About 6,000 liters of foam concentrate
- ≈ 31,000 m^3 to protect

CMS

- 12 generators
- About 5,000 liters of foam concentrate
- ≈ 22,000 m^3 to protect

All other system parts are merely identical. Thus upgrade and maintenance to be carried out for both.

Why testing?

SP Fire Technology Report 2001:01

"The general conclusion is that the most important parameters for a successful fire fighting performance are the activation criteria and application rate."

"In existing standards for foam concentrates (EN 1568, ISO 7203) the ability to produce foam with inside air is not considered."

EDMS 1213276 – Conclusions of system's review 2013

"From the literature it was clearly shown, that the usual way for designing and proving the efficiency of such a system could only be achieved by experimental tests. These shall be performed for the whole system as one entity."

Inside air market survey

Foam concentrates

- Sthamer IAF
- Eau et Feu Expandol
- Tyco Meteor P+

Alternative generators:

- SKUM HG 25
- Tyco Fomax 7

No standards!

Only foam concentrate: 22k to 84k CHF every ten years!

Déjà vu from the 80s

ENTRE EUROPEEN POUR LA RECHERCHE NUCLEAIRE

RAPPORT INTERNE
15.06.1990

M/RI/90-05

UCTION DE MOUSSE
A PARTIR D'AIR
GAZ DE

UNISERAL A107 (AYP)	Desautel CRODA-UNISER	1,05	4.400	5	5,7	5,1	32,6	31	3,36	543	603	5'03"	510	375
S 2 S	Schiffers	1	7,5	3	4,9	4,4	22,55	22,55	3,22	455	507	4'21"	660	415
F 15	STHAMEX	1	20	3	3,53	3,17	16	16	3,22	453	505	4'20"	450	310
SV2	STHAMEX	1	15	3	3,2	2,8	16,2	16,2	3,1	421	475	4'10"	490	476
HYDRAL ARK (AFFF)	Desautel	test arrêté après 15 minutes												
PLUREX NK	Desautel	1,07	500	5	10,7	9,7	46,2	43,2	3,7	404	444	3'30"		

28,7	25	126,2	312	284	20	

Test configuration

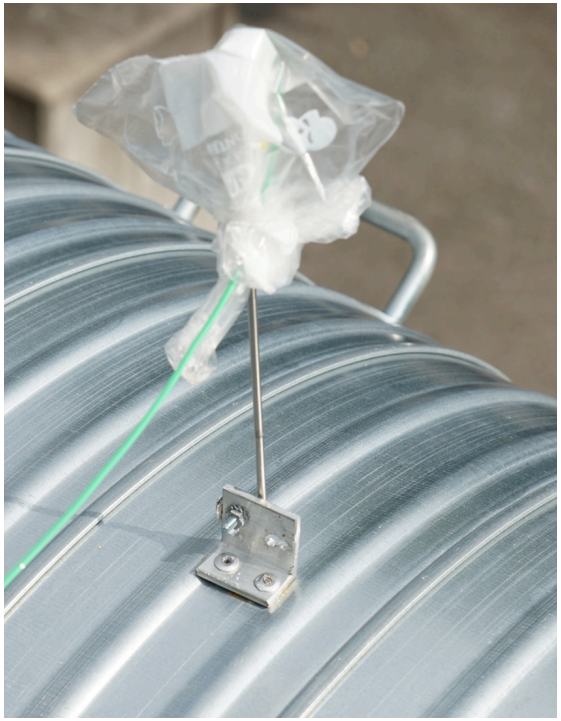
- Experimental volume
- two generators
- four foam concentrates
- dedicated mixture system
- Measurements devices
- Pump, hoses, etc…

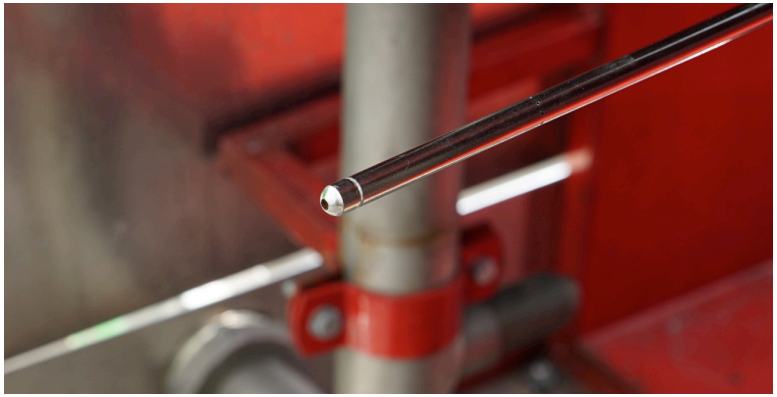
Fire load

- Wood
- IS 23 cables
- Fuel for ignition purposes

Measurements

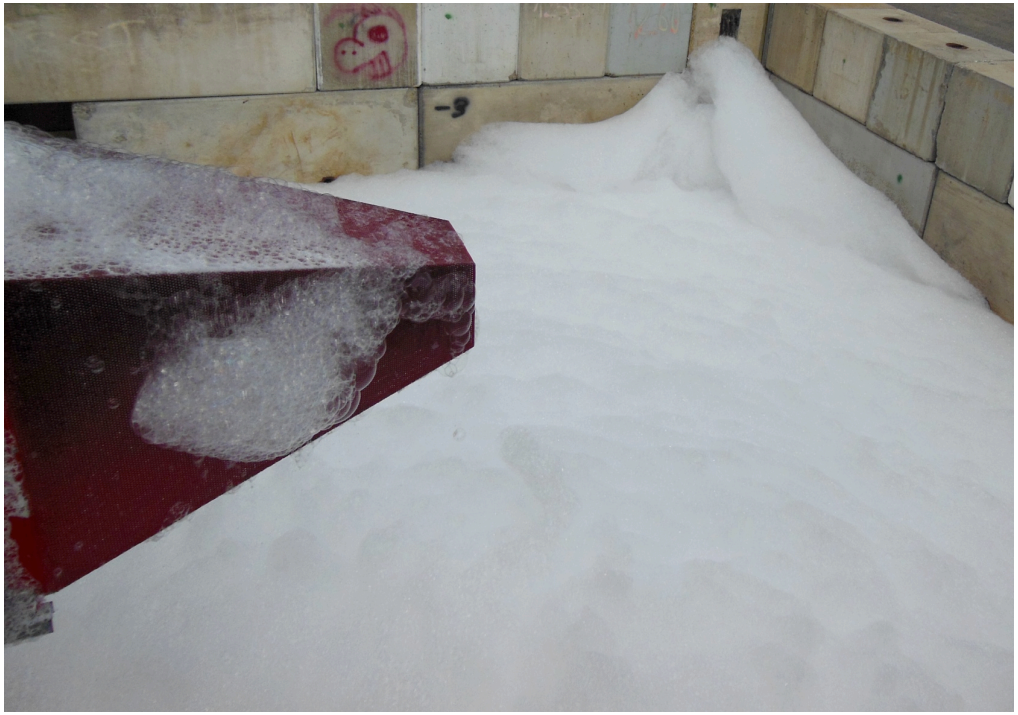
- Pressure
- Temperature
- Air speed
- Expansion ratio
- Water half time





First lessons learned

- Foam stability
- Air/smoke consumption (up to 275 $m^3 \cdot min^{-1}$)



Preliminary results 2014

- Full scale tests are feasible
- Current Kidde Sinto K 4S foam concentrate is inoperative (aged too much)
- First inside air tests proved suitable foam concentrate candidates
- Mixture system has to be revised; not only due to a new foam concentrate.

Why foam?

Preliminary conclusions

- ATLAS & CMS systems unique at CERN
- Inside air depending foam systems must be validated experimentally
- Tests have a tradition at CERN: well defined concepts and documentation
- First results are very promising
- Inside air foam use is beside water mist the only current possibility for smoke scrubbing

➔ Use of high expansion foam for underground installations is a serious choice in terms of fire **and** radiation protection