

**COMMITTEE OF EXPERTS ON THE TRANSPORT OF
DANGEROUS GOODS AND ON THE GLOBALLY
HARMONIZED SYSTEM OF CLASSIFICATION
AND LABELLING OF CHEMICALS**

**Sub-Committee of Experts on the
Transport of Dangerous Goods**
(Nineteenth session, 2-6 July 2001,
agenda item 11(c)(i))

**GLOBAL HARMONIZATION OF SYSTEMS OF CLASSIFICATION
AND LABELLING OF CHEMICALS**

Physical hazards

Criteria for flammable aerosols

Transmitted by the expert from France

The sub-committee is invited to look at some test results in order to clarify the discussion on the "heat of combustion criteria".

Further some explanations of the "deflagration density criteria" are presented.

The proposals are made in reference to the document 2001/22 of the secretariat presenting the flow chart schemes for classification which is suggested to be taken as the base document for the discussion.

1) Heat of combustion

The two tables annexed to this document compare the classification resulting from the tests methods to the classification resulting from the heat of combustion criteria only, for both sprays and foam.

It appears that there is no simple relation between the two criteria:

- an aerosol may be flammable or extremely flammable according to testing and have a low combustion heat.
- The reverse is true also, aerosols with a combustion heat over 30 Kj/g may be classified as not extremely flammable but simply flammable according to testing.

Therefore it is not acceptable to exclude an aerosol from flammability or to classify it in a lower category only on the basis of its combustion heat.

Testing is the only way to evaluate the flammability danger in a use condition and may never be optional.

Another example showing how the heat of combustion is inappropriate to exclude aerosols from flammability is given by aerosols using 1.1 difluoroethane (HFC152a) as propellant gas. It is flammable but has a heat of combustion of only 6,3Kj/g. According to the heat of combustion criteria only, such an aerosol would be non flammable independently of its flammable content!

Nevertheless it is acceptable to use the upper limit of heat of combustion (30KJ/g) as one of the criteria for classifying as extremely flammable, because the fire resulting from the aerosol will be more intense in that case.

Consequential amendments to the flow chart in doc. 2001/22:

Delete BOX 6

2) Deflagration density (only for sprays)

In the classification scheme annexed to his last INF paper the CSPA says that equivalent time is equal to deflagration density based on a typical aerosol flow rate of 1g/s.

This is not correct.

The most commonly commercialized aerosols have a flow rate between 0,5g/s and 1,2g/s, although some very specialised product may have higher flow rates.

This points out the problem exactly: different aerosol generators containing exactly the same flammable products will have different test results depending on their flow rate.

In most cases a higher flow rate will induce a more severe classification, on the contrary a very low flow rate may even lead to a classification as non flammable according to the tests. And this is exactly that is pursued by these testing methods which try to evaluate the danger of aerosols during their use.

On the other side the flow rate of aerosols has no incidence on what happens during a transport or storage accident, like a fire engulfment. And these aerosols having the same content but different flow rates will react in the same way and present the same danger in transport or storage conditions.

Obviously there is a need of an additional criteria evaluating the ability of an aerosol to deflagrate or produce a fireball. Therefore the deflagration density criteria has been introduced. Of course this criteria is not depending on the flow rate but only the content of the aerosol dispenser.

The value of 600g/m³ has been determined after extended testing performed in Europe which lead to the conclusion that over this value no deflagration danger was noticed (see doc. 2000/23 presented by the FEA)

AEROSOLS GENERATORS - SPRAYS

% FLAMMABLE CONTENT	DEFLAGRATION DENSITY (g/m ₃)	TIME EQUIVALENT/m ₃ secondes	IGNITION DISTANCE (cm)	COMBUSTION HEAT (Kj/g)	After testing (according to the CSPA scheme)	According to heat of combustion
77.5	> 120	> 225	30	19.7	flammable	Non flammable
95.5	64	118	45	24.2	flammable	flammable
97	76	100	45	28.2	flammable	flammable
96.5	66	72	45	24.6	flammable	flammable
96.5	56	105	45	32.2	flammable	extremely flammable
97.5	60	89	30	30.4	flammable	extremely flammable
85	57	115	30	36	flammable	extremely flammable
98.7	67	110	30	33	flammable	Extrêmemen t inflammable

AEROSOLS GENERATORS - FOAM

FOAM	% FLAMMABLE CONTENT	FLAME HEIGHT (cm)	FLAME DURATION (secondes)	COMBUSTION HEAT (Kj/g)	AFTER TESTING	ACCORDING TO HEAT OF COMBUSTION
1	18 %	45	33	5.9	extremely flammable	Non flammable
2	28.3 %	25	10	8.2	extremely flammable	Non flammable
3	10 %	50	20	4.3	extremely flammable	Non flammable
4	25 %	10	3	7.4	flammable	Non flammable
5	79 %	40	90	34.2	extremely flammable	extremely flammable