

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

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EXPLOSIVES, SELF-REACTIVE SUBSTANCES AND ORGANIC PEROXIDES

Ammonium nitrate emulsions, suspensions and gels

Transmitted by the expert from Spain

Introduction

The Norwegian Competent Authority has presented an informal document (UN/SCETDG/24/INF.28), with an attachment from the Dyno, opposing the Spanish proposal to modify SP 309, presented in document ST/SG/AC.10/C.3/2003/31.

The argument presented by Dyno, which is accepted by the Norwegian Competent Authority, is that the intention of the new UN 3375 entry was to introduce a new UN number for “non-sensitised ammonium nitrate emulsions” and that the inclusion of sensitising products in the definition goes against safety. It also argues that they are afraid that more importance is given to the Series 8 Tests than to the properties of the substance.

Comments

The following points and arguments relating to the Spanish proposal are provided in response to both the informal document of the Norwegian Competent Authority, and the arguments of Dyno:

1. Although the UN initially proposed the creation of a new entry for matrix emulsions (precursors of emulsion explosives), it was subsequently determined that the new number 3375 should also include all explosives precursors, independently of whether they are in an emulsion form or in suspension. This was on the basis that it would completely eliminate the uncertainty regarding safety that arises when some of these substances continue to be included in generic numbers such as UN 3139 - oxidising substances NOS. As a result, the title for the new UN 3375 entry was adopted as “AMMONIUM NITRATE EMULSION or SUSPENSION or GEL”, intermediate for blasting explosives (ANEs). However, the fact that SP 309 only contains the definition of emulsion precursors leaves the amendment of this title without effect in the case of suspension precursors, which continue to be included in UN 3139 despite being referred to in the UN 3375 entry. This is a clear contradiction of intention.
2. The purpose of the new UN 3375 entry was to describe bulk explosives precursors that do not have explosive properties, as defined in Test Series 1 and 2, and that require sensitisation to transform them into Class 1 explosives. As it has already been demonstrated in the technical studies (UN/SCETDG/23/INF.12), the precursors in suspensions, according to the definition of suspension in the Spanish proposal, do not have explosive properties, as they clearly pass the Test Series 1 and 2. The suspension type precursors, like the

emulsion type, need to be sensitised in order to transform them into explosives of Class 1. This sensitisation is achieved by introducing a sufficient number of suitably distributed gas bubbles into the suspensions, the same as for emulsions.

3. The use of the term "unsensitised" is giving rise to confusion and misinterpretations, which might be intentional. To avoid this, either the term "non sensitive" should be used, or the term "sensitised" should not be linked to the presence of sodium or potassium perchlorate and/or hexamine or monomethylamine nitrate. It is important to note that precursors in emulsion do not contain these products since they are sufficiently sensitive "per se" given that the oxidants and combustibles are found in a liquid state and intimately mixed. Thus, quoting H.A.Bampffield (Explosives Research Laboratory, C-I-L- Inc., Canada) and J. Cooper (Detonation Research Group, ICI PLC, Scotland): "Their (emulsion explosives) detonation capabilities and particularly, their high velocities of detonation depend on maintaining a very intimately mixed, all-liquid system" (reference 1, page 282). The fact that the physical state and distribution of the different components of the emulsions make them highly sensitive, compared with suspensions, is clearly demonstrated by the fact that emulsions lose their intrinsic sensitivity when they crystallize. In addition, to increase the sensitivity of an emulsion it is not necessary to add the abovementioned substances. All what is needed is a reduction in the size of the drops of the oxidant solution or a reduction in the water content of this solution. Thus, quoting the same authors, "the desired sensitivities are achieved by controlling water levels in the formulation" (reference 1, page 283).

4. In the document presented by the Norwegian Competent Authority, more importance on the definition than on the Tests is placed. Spain is of the opposite opinion, since we are talking about the classification of the substance as a whole, not by separate components. Therefore, we are trying to evaluate the sensitivity, and thus the safety, of a substance and not its individual components. Thus, there are cases of substances with a much lower risk than some of their components, as is the case of precursors in suspension whereas with emulsion precursors, the final product has a higher risk than the individual components. The definition should be an accurate reflection of all substances not likely to exhibit explosive properties and not to be limited to exclude future formulations that were not contemplated at the time of its initial conception. The definition of emulsion given in SP 309 clearly does not limit the sensitivity of the emulsion precursors, since it does not describe the characteristics of the mixture. It is the Test Series 8 that limits the sensitivity of the substance. Thus, it should not be through the definition that 3375 limits the sensitivity of the substances covered but through the application of the tests.

Conclusion

We believe that the proposed wording of SP 309 fully satisfies the aim of the new UN 3375 entry as:

a) it fully clarifies the difference in composition between the different precursors, presenting the two composition ranges for emulsions and suspensions separately.

b) it allows all precursors of explosives to be included in this entry, leaving behind the generic numbers such as UN 3139, since the precursors in suspension would fit in with SP 309;

c) the definition given for suspensions in the proposed SP 309 has the same capacity as the definition of emulsions currently in force, to ensure that only suspensions not likely to exhibit explosive properties be proposed as ANE candidates. The technical studies presented (UN/SCETDG/23/INF.12) show that this type of precursors in suspension passes the Test Series 1 and/or 2.

REFERENCES

(1) "Emulsion Explosives" in "Encyclopaedia of Emulsion Technology", Vol.3, H.A. Bampffield and J. Cooper, P. Becher, ed., Chapter 7, 1988.
