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Item 5 (b) of the provisional agenda:
Proposals for amendments to RID/ADR/ADN new proposals

Proposal for the use of a new designed flexible IBC for the transport of refined cobalt dihydroxide meeting the PG I criteria for inhalation toxicity

Transmitted by the Government of Belgium

Introduction

1. Cobalt dihydroxide ($Co(OH)_2$) is a key substance used throughout the world in a wide variety of applications including for example the production of batteries, the chemical plating of metals or as an additive in paint or fertilizer. This solid substance is currently being traded on the market in various forms or formulations that, depending on the level of refinement, may possess different chemical or physical properties such as purity, humidity, particle size distribution, etc..

2. For the purposes of this document, “refined cobalt dihydroxide” is considered to be the generally pure and refined substance with a low moisture content and fine powder form with at least 10% of its total mass likely to be dust in the respirable range, such as the aerodynamic diameter of that particle fraction is 10 microns or less.

3. It should be noted however, that other forms of cobalt dihydroxide are available on the market that, although referred to as a ‘refined’ material, do not fulfill the particle size requirements as specified in the paragraph above.

4. For the purpose of this paper “Non-refined cobalt dihydroxide” is therefore considered to be cobalt dihydroxide with a such a level of refinement, or no level of refinement i.e. the crude material, that it does not fulfill the particle size requirement for respirable powder as specified in paragraph 2, and therefore falls outside of the scope of this document.

5. In the case of “refined cobalt dihydroxide” as defined above in paragraph 2, testing for inhalation toxicity is required according to provisions in the definition of LC_{50} for acute toxicity by inhalation in paragraph 2.2.61.1.3 of the ADR.

Background

6. Cobalt dihydroxide, both refined and non-refined, has been transported and shipped around the world for multiple years. Cobalt dihydroxide was shipped initially as non-dangerous, then later (in 2005) when the UN 3077 entry was introduced to the Dangerous Goods list, it was shipped as a class 9 substance under the entry of UN3077, Environmentally hazardous solid, N.O.S. (cobalt dihydroxide) in flexible IBCs (fIBCs) of PG III. Reference for further information is made to document UN/SCETDG/55/INF.24.

7. As such, a vast and solid experience, in both the handling and the multimodal transport of this substance in fIBCs, was built up by industry. Technical development and process automation throughout the years has led to the customization of industry’s infrastructure in order to reduce exposure and minimalize any human interventions during processing. This is

achieved through automated handling of the substance during both filling and emptying operations. Dust extraction is added as a precaution, should there be any unexpected mechanical failure. By this means, the risk of exposure to any personnel involved has been reduced to an absolute minimum. Additional information related to the automated handling and the dust extraction mechanism are provided in annex 1.

8. Until present, no health issues related to transport or operational incidents have been reported during the widespread use of these fIBCs. Reference for further information is made to document UN/SCETDG/55/INF.24.

9. However, in vivo tests on rats following OECD guideline 436 by using a single four-hour exposure at different concentrations of cobalt dihydroxide highlighted the hazard of toxicity by inhalation for refined cobalt dihydroxide. These tests were performed by industry in cooperation with the Cobalt institute in the context of the REACH Regulation. Reference is made to document UN/SCETDG/55/INF.24.

10. In compliance with the testing method prescribed in 2.2.61.1.3 of the ADR, additional in vivo tests were performed following OECD guideline 436 by means of a single one-hour inhalation exposure to cobalt dihydroxide. The preliminary tests indicated that the criteria for packing group I for inhalation toxicity, as described in paragraph 2.2.61.1.7, were met since premature death of all male and female rats was observed within 3 days after exposure to a concentration of 0.22 mg cobalt hydroxide per liter air for one continuous hour.

11. On the basis of this test information, during the 55th meeting of the UNSCETDG, there was consensus that currently, in absence of a specific UN-number for solid, toxic by inhalation, the most appropriate class and entry in the dangerous goods list for the transport of refined cobalt dihydroxide, meeting the criteria for packing group I for inhalation toxicity by dusts, is class 6.1 and entry UN3288 , TOXIC SOLID, INORGANIC, N.O.S (cobalt dihydroxide), PG I.

Discussion

12. However, the packing instruction IBC07 assigned to UN3288, TOXIC SOLID, INORGANIC, N.O.S, PG I does not allow the use of flexible IBC's. As such, fIBCs would no longer be allowed to be used for the transport of refined cobalt dihydroxide that meets the criteria for PG I due to inhalation toxicity.

13. Prohibition of the use of fIBCs for the transport of refined cobalt dihydroxide meeting the criteria for packing group I for inhalation toxicity would impose the introduction and use of alternative packagings, such as drums or other small packagings, that are not compatible with current automated infrastructure. As a consequence, additional human interventions and handling would be required during processing, packaging, filling and emptying operations. This would result in an elevated level of dust at the workplace and hence a higher risk of exposure, whereas over the years, a lot of efforts has been made by industry to reduce the risks of exposure.

New technological developments

14. Improved technology and materials over the decades since fIBCs were first introduced have improved the containment of materials packed and reduced the potential for loss of any dust.

15. Since the primary hazard of class 6.1 'refined cobalt dihydroxide' is acute toxicity by inhalation, it is a prerequisite that no matter or dust in any form is allowed to escape the packaging during transport and create a hazardous environment.

16. Bearing this in mind a new design for a 13H3 flexible IBC was developed and further optimized in Belgium. This flexible IBC is a made from polypropylene and contains an inner liner of low density polyethylene (LDPE). The fIBC consists of a double layered filling spout at the top and a double layered discharge spout at the bottom. Additionally the discharge spout of the fIBC is coated and has a protective sleeve and a protective flap as supplementary safety measurements.

17. This fIBC was tested in accordance with the test provisions from chapter 6.5.6 of the ADR. A top lift test, a drop test, a topple test, a righting test and a tear test were performed. It should be noted that the tested fIBC meets the test criteria for PG I for the drop test and the topple test as specified in paragraphs 6.5.6.9.4 and 6.5.6.11.4 of the ADR. It should also be noted that the drop, topple and righting test were performed with the actual substance for which it is intended to be transported (i.e. refined cobalt dihydroxide). In this way, refined cobalt dihydroxide, with a purity of nearly 100% and a particle size distribution such that 85% of its total mass is in the respirable range of 10 µm or less, thus meeting the criteria in ADR in 2.2.61.1.3, was used as filling medium during the tests. For reference, the particle size distribution as well as a generic Safety Data Sheet (SDS) of refined cobalt dihydroxide are added in annexes 2 and 3 to this document.

18. Notwithstanding the fact that the criteria for passing the above mentioned tests in 6.5.6.9.5 and 6.5.6.11.5 for flexible IBC's allow for a 'slight discharge' at the closures or the stitch holes, no loss of content or egress of dust was observed during the final tests. Due to the toxic inhalation nature of this hazard any loss of content is unacceptable. In this way, this new and improved design of a 13H3 fIBC, that was approved by the competent authority for packaging in Belgium, exceeds the current criteria as specified in the ADR.

19. Upon request of interested competent authorities a copy of the certificate of approval and accompanying test report, as issued by the competent authority for packaging in Belgium, or other additional information related to the performed tests can be provided.

Proposal

20. The co-authors of this paper believe that the appropriate level of safety for the transport of 'refined cobalt dihydroxide', meeting the criteria for PG I for inhalation toxicity, can be attained:

- by the use of an improved flexible IBC meeting the requirements described in the provisions below in E.1;
- as well as by imposing specific handling and transport provisions for loading, unloading and transport as described in provisions below in E.2.

21. The proposed provisions in the paragraphs below will not only imply a significant improvement over the current way of transport, but will also allow to maintain and benefit from 'the good practices' that have been established throughout the years. These provisions serve as a basis for a multilateral agreement (MA) for the use of an improved fIBC for the transport of refined cobalt dihydroxide. During the time the discussions on this topic are ongoing at the UN Sub-Committee of Experts on the Transport of Dangerous Goods meetings, this MA can serve as a safe transitional solution in order to not impede the transport and processing of cobalt dihydroxide.

E.1 Improved flexible IBC

22. In order to provide a level playing field, the Belgian competent authorities are of the opinion that any optimized design for a fIBC of the type 13H3 or 13H4 may be used for the transport of refined cobalt dihydroxide meeting the criteria for packing group I for inhalation toxicity as long as the packaging has been tested and approved in accordance with the applicable provisions of chapter 6.5.6 of the ADR. In addition to these provisions, no egress of dust or loss of matter of any kind shall be observed during testing, and the drop, topple and righting test shall be performed with the actual refined cobalt dihydroxide for which it is intended to be used.

E.2 additional handling and transport requirements

23. In addition to the applicable provisions of the ADR, the European standard EN12195-1:2010 or the IMO/ILO/UNECE CTU Packing Code of Practice for Packing of Cargo Transport Units shall be respected /implemented for securing of the cargo.

24. The following additional provisions shall be implemented in order to reduce the physical hazards to which the cargo is exposed during transport and handling:

- Transport shall be done in closed cargo transport units (CTU). Alternatively, sheeted vehicles (SV) are allowed for road transport. The sheet shall be of an impermeable and non-combustible material.
- No other goods of any kind, dangerous or non-dangerous, shall be transported with refined cobalt dihydroxide meeting the criteria for PG I for inhalation toxicity in fIBCs in the same CTU or SV at the same time.
- Before loading, an interior and exterior inspection of the CTU or SV shall be performed by the consignor. During these inspections, special attention shall be given that:
    - The CTU or SV is free from major damage, with no broken flooring or protrusions such as nails, bolts, special fittings etc. which could cause injury to persons or damage to the cargo;
    - The interior and exterior of a CTU or SV shall be inspected prior to loading to ensure that there is no damage that could affect its integrity or that of the packages to be loaded in it.
- The cargo shall be loaded onto a full plastic load board. Alternatively, wooden pallets may be used but the fIBC shall be protected from direct contact with the timber from the pallets by means of a slip sheet or equivalent.
- The palletized load shall be sufficiently secured by means of either shrink-wrapping or stretch-wrapping of sufficient strength.
- The unit loads shall be tightly stowed so that void spaces are reduced to a minimum. In case of a full container load, any void spaces shall be filled by means of dunnage bags to avoid any shifting of the cargo.
- The unit loads shall be adequately protected from any direct contact with other securing materials that might harm the unit load during transport. By example the unit loads shall be protected from any transverse battens, intended to restrain the cargo in front of the door, by means of cardboard or plywood of sufficient strength.
- The use of nails, for example used for scantlings or timber battens, shall be reduced to an absolute minimum. Any direct contact with the unit load shall be avoided.
- If lashings are used for securing the cargo, it shall be observed that no unit loads are overstressed or are at risk of being damaged during transport.

25. Before and during loading, the packages containing the cargo shall be inspected. Any packages found to be damaged, leaking or sifting shall not be packed into a CTU or SV.

26. Particular attention shall be given to the handling of packages during their preparation for transport. The method of loading shall be such that accidental damage is not caused through dragging or mishandling.

27. Depending on the level of refinement and the particle size, refined cobalt dihydroxide may contain very fine particles. As a result of its natural flow and the settling of the product a significant reduction of the volume is observed after filling of the fIBC. For this reason the following requirements shall be taken into account:

- No stacking of unit loads within the CTU or SV is allowed under any circumstances. In compliance with 6.5.2.2.2 of the ADR, every fIBC shall accordingly be marked with the symbol for ‘IBCs NOT capable of being stacked’.
- In order to avoid inadequate securing, the cargo shall only be palletized, shrink-or stretch wrapped, loaded and secured in the CTU or SV with a delay after filling, allowing the product to sufficiently ‘settle’ and the reduction in volume to take place. It is up to the manufacturer/consignor to determine this delay, taking into account the unique physical properties of the refined cobalt dihydroxide.

28. The consignor shall, in addition to any other relevant and obligatory information concerning the consignment, inform any other parties involved in transport and the supply chain of the consignment that:

- The cargo is toxic by inhalation

- Before opening the doors of the CTU or SV, the nature of the contents and the possibility that leakages may have caused an unsafe condition and toxic environment, shall be considered.
- Suitable personal protective clothing shall be worn when opening the CTU or SV.
- After opening and before commencing unloading, the cargo shall be inspected for leakage or damage.
- After unloading it shall be ensured that there is no contamination of the CTU or SV.

Annexes

Annex 1: Big bag filling and discharge

Annex 2: Refined Cobaltdihydroxide particle size information

Annex 3: Generic draft SDS cobaltdihydroxide

Annex 1 - Big bag filling and discharge -

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Annex 3 - Generic draft SDS cobalt dihyc