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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

Forty-fifth session
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Item 4 (c) of the provisional agenda
Listing, classification and packing: miscellaneous

Provisions for insulation of packages containing dry ice

Submitted by the expert from the United States of America[1]

Background

1. In January 2010 research was initiated through the United States of America Transportation Research Board (TRB) to develop a decision tool(s) to assist passenger and cargo-only aircraft operators in determining the maximum quantity of dry ice that can be safely carried as cargo. As part of the research, the properties of dry ice and packaging were explored and, in particular, heat transfer analysis was conducted to determine the correlation between package (and unit load device) insulation and sublimation rates. The research is now complete and the final report is freely available on the web at the following URL: http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=2661

Discussion

2. A major finding in the above mentioned research is that the sublimation rate of dry ice is influenced by exposure to external heat (air convection) and the dimensional area of the package. As the sublimation rate increases the amount of Carbon Dioxide (CO2) that is ultimately released and vented from the package also increases. By limiting the amount of CO2 generation, the risk of exposure to asphyxient gases becomes reduced and, for air transport, more packages may be carried as cargo.

3. An observation was made during the research that no standards exist for a minimum amount of insulation for packages containing dry ice. Therefore sublimation rate calculations are often conservative to take into account the possibility of maximum heat

[1] In accordance with the programme of work of the Sub-Committee for 2013-2014 approved by the Committee at its sixth session (refer to ST/SG/AC.10/C.3/84, para. 86 and ST/SG/AC.10/40, para. 14).

transfer between the package and air. For example, most perishable non-dangerous goods are packed with dry ice in a fibreboard box lined with plastic. Such packages have little to no insulative value. The researchers suggest that fibreboard packages should be insulated with a minimum of 35mm of expanded polystyrene (EPS) foam or other materials provided that the heat transfer performance can be shown to be equivalent or better than the EPS foam. Heat transfer performance can be accessed using industry standards for evaluating heat transfer (e.g. ASTM D3103: Standard Method for Thermal Insulation Performance for Distribution Packages).

4. While the quantity of dry ice and resulting CO2 generation presents a greater concern in the air mode, the Sub-Committee is invited to consider the TRB report related to the recommended use of insulated packaging. Packages containing dry ice that include insulation to minimize the sublimation rate and subsequent release of CO2 might allow for different quantity limits and transport conditions in the air mode, and possibly surface modes of transport. Delegations interested in collaborating on work to develop a “dry ice” package for air and/or multimodal transport are invited to submit comments to the expert from the United States.