High Challenge Commodity Fire Protection; Aerosol Packaging per NFPA30B

Martin J. Pabich, P.E.
Underwriters Laboratories Inc.
333 Pfingsten Road,
Northbrook, IL 60062,USA

Abstract:

The information provided is compiled from data generated through work conducted by concerned companies seeking to provide updated packaging of their products. In the pursuit of all good research the eye is kept on safety and these companies are intent on making sure that the fire protection schemes needed to provide protection to their facilities is not compromised. The advancement of plastic packaging used in the aerosol industry is fraught with fire protection issues that need to be addressed in order to move forward in a safe fashion. This presentation has been prepared to show the paths that have been started and to foster discussion regarding those paths and feasible alternatives that could be taken to advance the knowledge and understanding of the plastic aerosol container hazards through research.

Presently the documents that control the manufacture and storage in the aerosol industry are very restrictive when it comes to using plastic containers. As we already know, aerosol products in metal containers can present a significant challenge to control resources in the case of fire. We could only imagine what fire hazards an aerosol product in plastic presented. Recent large scale testing has left some gobsmacked, as we begin to find out how these types of product and packaging combinations react under fire conditions. It is anticipated that there will be further research into the fire protection needs of manufacturers, distributors, and merchandisers on the route to safe production, storage, and use of these packaging advances.

Current methods of determining the hazard level presented by aerosol products is outlined in *NFPA30B Code for the Manufacture and Storage of Aerosol Products.* These methods involve one of two methods. Both methods were developed from research work conducted by a major insurance company in the late 1970s and early1980s along with research work sponsored by industry associations in the 1980s. All of those aerosol product fire tests were conducted with metal containers.

Initially there were ideas that the aerosols utilizing plastic containers could be analyzed in the same fashion. Product manufacturers stepped up to conduct fire testing to determine if this was the case. Initial work utilizing both of the methods, whether it was the 12-pallet fire test, or the constituent component energy breakdown suggested that the hazard level of some of the first products to be packaged in plastic were not very high.

It does not come as a surprise that lotions, creams, and gels that have significant amounts of water in the mixture may be considered as not being significantly hazardous, and when

all is said and done this may be the case for a number of products that will end up in plastic containers. But what of formulas that have less water and more alcohol in the mixture? How much is more? What if a different propellant is used? As you consider all of the products that could be delivered through aerosol, you soon see that there are different requirements on the amount and types of propellants, as well as the makeup of the product being forced out of the container. In addition to what is going in to the container, one needs to consider the can construction and valve configurations that will also impact how the aerosol product will react to fire exposure.

Over the years we have learned and studied how the heat-induced failure of aerosol product occurs and how the various components of construction such as the plastic valve, or fastening played a significant role in the failure process. This has led to having a pretty good idea where the weak points were. The introduction of plastic as the pressure containment vessel means we need to develop a better understanding of how the products can fail under fire conditions. We do not know where the strong point is, much less the weak point, or if those points even exist. The level of hazard present, as well as some indication of how strong the container is now of greater concern and consideration.

The manufacturers presented their test data to the NFPA30B committee at the ROC meeting that was held in October 2009. From the data presented and the meeting discussions it was clear that the plastic containers were different and further study with respect to their failure modes and required fire protection was yet to be determined. At the same time it became clear that the code needed to be changed to address the plastic container issue. The proposed changes in the NFPA30B code, that are associated with plastic containers, have provided wording in the appropriate sections of the document to increase the maximum size of plastic containers to be considered as aerosol containers from 118ml (4 fl.oz.) to 1000 ml (33.8 fl.oz.) and to make it clear that the protection criteria presented is specific to metal containers only.

The substantiation for the first change in the code is found in the fact that recent changes by the U.S. Department of Transportation regarding the regulation of the shipment of aerosols. The changes to the CFR provided the ability to legally move plastic aerosol containers in sizes up to 1000 ml (33.8 fl.oz.) from place to place. The size specified in the DOT rules match up to the UN size designations for aerosol products in plastic containers. Harmonization of the aerosol code with the DOT rules regarding the maximum size allowable provides for simpler handling procedures regarding aerosol product in plastic containers. The substantiation for the second part of the change was the data that was presented to the NFPA30B committee.

Additionally these changes were needed to advance the fire research. There are many different ways to develop test commodity, the simplest ways would be for the manufacturer to do what they do and then send the product to the test facility. Certain manufacturers were located in areas where they were able to get release from the code authority in order to do just that, other manufacturers were not able to get a release from their local code official and had to develop alternate means. This meant filling in Canada and shipping to the test facility: This method incurred additional costs with less control,

so the request was made to the NFPA30B committee to change the code so the local code authority could allow the filling of the plastic containers.

These types of containers are new actors on the stage of fire protection related to consumer products. In some productions they will be good actors, in other productions they will be bad actors. The supporting roles that will be played by fire protection systems will need to be designed with the thorough knowledge and understanding of the productions in order to provide for the expected levels of safety in the operation. It is expected that this will come from future fire research.

Keywords: plastic aerosol container