Insight: Storage of Aerosols

Recognizing the Risk

Aerosol products can represent a substantial risk and, unique challenges in the effective protection when stored. Some aerosol product risks include:

- **"Flaming Projectiles"** | Burning aerosol cans rocketing to other building areas and rapidly spreading a fire beyond the control of sprinkler systems and beyond the point most fire-fighting efforts are effective in loss reduction
- **Leaking Flammables** | Due to the composition of some aerosol produces, the added challenges of flammable product and propellants leaking from can damaged by puncture or dropping, etc. (and thus making ignition much more likely).
- **Heat Ruptures** | Containers rupturing (sometimes in an explosive nature) from common heat exposures such as sunlight, local heaters, hot equipment or, the heat of a fire (resulting in flaming projectiles)

It's important to understand first that not all aerosol products have the same risk. Understanding their classification is needed to understand the inherent danger and thus levels of recommended protection to lower risk.

The National Fire Protection Association (NFPA) Standard 30B* classifies aerosol products into one of three levels based on the product's "heat of combustion"[1]:

Level 3 | (**Highest Risk**)	**Level 2** | (**Medium Risk**)	**Level 1** | (**Lowest Risk**)
Mostly insoluble flammable and combustible liquids with flammable propellant. Examples include most spray lacquer and paint, auto engine cleaner and lubricant, insecticide, and some antiperspirant	Water miscible flammable and combustible liquids. Examples include most (not all) furniture polish spray, hairspray, antiseptic spray, deodorant, and windshield deicer.	Mostly water-based products. Examples include most shaving creams, oven cleaners, spray starch, carpet shampoo and window cleaner.

The material safety data sheets (MSDS) for each product contains information that can help determine the NFPA classification and Globally Harmonized System (GHS) of Classification and Labeling of Chemicals, hazard class.[2]

*For the purposes of this Insight, aerosol products are defined as a suspension of solid or liquid particles in a gas and contained in a non-reusable dispenser.

Related Losses

There have been several serious fires globally where aerosols have been involved:

- EXAMPLE 1: At a waste facility in Australia authorities believed a small explosion that led to a major blaze was sparked by aerosol cans being moved on a forklift. (2019)[3]

- EXAMPLE 2: A large distribution warehouse fire occurred in Pennsylvania, USA where petroleum and alcohol-based aerosol product was being stored. The fire started when a carton of aerosol stock was punctured after falling from a rack. The combustible product exploded into a fire that grew so fast that efforts to extinguish it manually had to be abandoned. The fire reached the roof of the storage warehouse in ~13 minutes and then, burned for ~8-hours. Aerosol containers were noted to rocket across adjacent areas in the warehouse causing multiple fires which then overwhelmed the building automatic sprinkler systems. The loss was reported to be USD$100M at the time. (1982)

Controlling the Hazard

Controlling the aerosol storage hazards can be very complex. Eliminating ignition sources is one of the first steps to consider. Additionally, there are basic steps you can take to help make storing them less risky.

PROVIDE PHYSICAL SEPARATION	PROVIDE TRAINING TO EMPLOYEES	DISCUSS WITH FIRE AUTHORITIES	PROVIDE FIRE PROTECTION
SEPARATE AREA, CUTOFF ROOM OR BUILDING	TRAIN EMPLOYEES ON HOW TO SPOT A LEAKING CAN	NOTIFY & PLAN WITH THE FIRE AUTHORITIES	ENSURE ADEQUACY OF DESIGNS
CAGE OFF AREA	TRAIN EMPLOYEES ON FORKLIFT SAFETY	MAINTAIN SAFETY DATA SHEETS	ENSURE ADEQUATE WATER SUPPLY
VENTILATE FOR SMOKE, HEAT & EXPLOSION	IMPLEMENT A HOT WORK PROGRAM	CONDUCT ANNUAL WALK-THROUGH VISIT	TEST<TEST>TEST THE SYSTEMS REGULARLY

Minimizing the potential for the aerosols to rocket is another step to take. All aerosols must be contained. For smaller quantities, such as in housekeeping and maintenance areas, when not in immediate use cans should be kept in approved flammable liquids cabinets or equivalent. For larger quantities, the use of cages and aerosol storage containers (not flammable liquids storage containers) along with the physical separation from other areas of the facility is a good method. Gates or entryways into the area should be self-closing.

The type of separation of the aerosols stored depends on the NFPA classification noted above.

Protection guidelines are outlined in NFPA 30B for your reference. Adequate protection is dependent on the building construction, fire walls & fire curtains along with ceiling height, storage height, number of aerosols stored, class of product stored, type of sprinkler and water supply. Country specific fire codes are also important to consider when looking at the appropriate level of protection needed for the goods stored. One example is the National Fire Code of Canada4 where NFPA 30B is generally followed, this publication also provides guidance for non-sprinklered buildings.

Level 1	Level 2 & 3
Any Location	Separate Building
	Cutoff Room
	Separate Area

Data Sheets

Safety Data can be invaluable. The following excerpt shows an example of the fire-fighting measures recommended by the manufacturer.

5 – Fire Fighting Measures

Extinguishing Media: Use water fog, dry chemical, carbon dioxide or foam. Do not use water jet or flooding amounts of water. Burning product will float on the surface and spread fire.
Special Fire Fighting Procedures: Firefighters should always wear positive pressure self-contained breathing apparatus and full protective clothing. Cool fire-exposed containers with water. Use shielding to protect against bursting containers.
Unusual Fire and Explosion Hazards: Contents under pressure. Extremely flammable aerosol. Keep away from ignition sources and open flames. Exposure of containers to extreme heat and flames can cause them to rupture often with violent force. Vapors can cause a flash fire. Vapors are heavier than air and may travel along surfaces to remote ignition sources and flash back. A vapor and air mixture can create an explosion hazard in confined spaces.

Another section on the Safety Data Sheet might include information about a sprinkler system. To ensure adequate protection is in place, an analysis should be completed, following NFPA 30B or local equivalent standards. AIG Risk Engineers are experienced in this type of analysis and are available to assist.

Human Element (Also known as The Human Factor)

The Human Factor covers both risk reduction management and individuals' actions (or inaction). It plays a very large role in whether a fire will occur as well as how large or small damage is should one occur.

A good human-element-focused risk management program can go a long way to reduce the risk of an incident occurring.

Relative to the storage of aerosols:

- Implement an emergency plan that covers site actions should a fire occur.
- Train staff on detecting and actions to be taken to limit and respond to leaking aerosol cans.
- Educate employees on storage do's and dont's- e.g., do not leave aerosols near hot equipment, and maintain in protected areas when not in use, etc.
- Educate employees on how to detect a leaking aerosol and what to do if found e.g., use flammable safe forklifts, use the shortest route to open air.
- Enforce "No Smoking" policies.
- Implement and communicate a hot work program (AIG offers a permitting program as part of your property policy).
- Train on forklift safety and separation of the forklift charging away from the aerosol storage.

References & Resources

[1] NFPA 30B: "Code for the Manufacture and Storage of Aerosol Products", 2019 Ed.

[2] GHS (Rev.8) (2019) | UNECE, https://unece.org/ghs-rev8-2019, accessed November 30, 2021

[3] Fire at waste management facility in Adelaide sparked by aerosol cans - ABC News, accessed November 30, 2021

National Fire Code - of Canada 2015, accessed November 30, 2021

FPA RC19 – Recommendations for the Storage of Aerosol Products

*While NFPA documents are the global standard used by AIG, international equivalents may be acceptable.

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For more information, contact your local AIG Risk Engineer.