Comments by American Pacific (through its Only Representative Labcorp) on the Proposal for Harmonised Classification and Labelling (CLH Report) by Ministry of Health, Madrid, Spain – Part 2

PUBLIC SUBSTANCE NAME: 2-BROMO-3,3,3-TRIFLUOROPROP-1-ENE

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1 Background

2-Bromo-3,3,3-trifluoroprop-1-ene (hereinafter referred to as 2-BTP) is an environmentally beneficial chemical used in portable fire extinguishers and total-flooding fixed systems in normally unoccupied areas. It was developed over an extended period of time, including more than 15 years of intensive research for performance, stability in steel containers, toxicological, and environmental properties, as a replacement for severe ozone depleting halon 1211 (CF_2ClBr) and halon 1301 (CF_3Br) which had filled an important role in fire protection for many years.

It is an extremely effective life and safety tool, measured on a volume and weight basis in comparison to halons. After 1993, new production of Halons was banned under the Montreal Protocol on Substances that Deplete the Ozone Layer (1987) due to their high ozone depleting potentials. The Ozone Depletion Potential (ODP) of halon 1301 is 15.9 (1, CFC-11=1.0) and halon 1211 is 7.9 (1). The ODP of 2-BTP is 0.0028 (2). 2-BTP is nearly as effective in putting out fires but does not have the detrimental environmental impacts as halons. Historically halons (and since 2017, 2-BTP) are used in firefighting applications where high-value assets must be protected using “clean” fire suppressants. As a “clean” fire extinguishing agent, 2-BTP is a volatile liquid (evaporating very rapidly) and, therefore, does not leave a residue after the fire is extinguished. The primary modes of extinguishment by BTP are to remove heat from the combustion zone and to interfere with the chemical reactions occurring in a combustion process (via the bromine atom), sometimes referred to as a “chain breaker.” The latter characteristic of 2-BTP distinguishes it from other halon 1211 substitutes and contributes to 2-BTP’s enhanced performance. This contrasts with conventional extinguishing agents such as dry chemical (mono ammonium phosphate, sodium bicarbonate, etc.) and foam, which are also effective, but leave damaging fine powders or other residues that can be corrosive and damaging to the environment after the fire is extinguished. Areas where there are sensitive electronics, motors, and other high-value assets, such as in aviation and other specific

commercial applications, require the use of a clean fire extinguishing agent. There are currently no other highly-effective, commercialized fire extinguishing agents that are drop-in replacements for halons.

2 Exposure Profile

Although fire extinguishers and systems containing 2-BTP are considered high performance and fulfill an important role in fire protection, they are infrequently discharged. The two primary cases for intentional discharge would be in the event of a fire that needs to be extinguished and for periodic training purposes by firefighting personnel. Therefore, exposure to 2-BTP for most users during firefighting scenarios or during training exercises would likely be a once-in-a-lifetime occurrence.

2-BTP extinguishers are designed for commercial, industrial and aerospace uses (non-residential, not for general consumer use). For portable extinguishers the discharge time is between 9 and 13 seconds. When there is a fire, the portable unit is operated according to the "PASS" System. The safety pin is Pulled, the operator Aims the extinguisher, the discharge valve is Squeezed and the action to be used is a Sweeping motion on the fire from a distance. 2-BTP is a rapidly evaporating liquid so that all traces of the agent typically disappear at the end of the fire event sequence. For example, that enhanced performance has enabled the use of the same size BTP extinguisher as halon 1211 in the same mounting bracket onboard commercial aircraft, which until 2-BTP was made available, was impossible.

Since 2017, the primary current end use in Europe is for aviation fire protection where discharge occurrences are very low, specifically onboard aircraft from approved hand-held (portable) fire extinguishers with net charge weights of 1.6-1.7 kg each. A commercial aircraft will typically contain one to five 2-BTP fire extinguishers. The likelihood of hand-held fire extinguisher discharge onboard commercial airplanes is estimated to be 1 in a million, 53% of which were on actual fires where the fire extinguishant would react with the fire to put it out. For inadvertent discharges not involving a fire, 2-BTP vapors are several times denser than air and typically stratify quickly, falling to the floor. Extensive evaluations of the typical aircraft cabin concluded that when used according to guidance, the 2-BTP agent is safe for passengers.

Where 2-BTP total-flooding systems might be used in non-occupied, confined spaces (enclosed areas without ventilation), a minimum volume for use must be established according to guidance based on the DNEL for systemic acute effects.

For possible occupational exposure during manufacture, installation and servicing of extinguishers and systems, good industrial hygiene practices and engineering controls are employed to include adequate ventilation systems and enclosed or confined operations to ensure exposure levels be keep within determine safe exposure limits. Extinguisher filling operations are conducted via a closed-loop system by selected authorized distributors (handlers) who utilize appropriate Personal Protective Equipment (PPE), such as protective gloves, tightly sealed goggles, protective work clothing, and suitable respiratory protection in case of accidental release or insufficient ventilation.

The life cycle for extinguishers containing 2-BTP is approximately 12 years from the time the agent is first dispensed in the fire extinguisher equipment. If the extinguisher is not discharged during this maximum useful life cycle, plans have been established for recovery and reclamation of that agent utilizing good practices into clean containers. Thereafter, the reclaimed 2-BTP can be tested against purity standards and used again in new equipment. All these processes are performed by a limited number of authorized handlers.

References

1. Scientific Assessment of Ozone Depletion, 2020, World Meteorological Organization, Global Ozone Research and Monitoring Report, Report No. 52.
2. Patten, K.O., et al, "Correction to 'OH reaction rate constant, IR absorption spectrum, ozone depletion potentials and global warming potentials of 2-bromo-3,3,3-trifluoropropene'," ," Journal of Geophysical Research, Vol. 117, 2012.