

(Techspray)

Updated Facts on 2015 HCFC-225 Usage Ban

On January 1, 2015, HCFC-225, or AK-225, will be banned for usage under the Clean Air Act per Montreal Protocol. Environmental Protection Agency (EPA) regulations surrounding this common precision solvent are more complex than they appear in the agency's seemingly straightforward statement. This white paper offers clarification in reference to the HCFC-225 phase-out and its impact on consumers.

Background

In 1974, Mario Molina and Sherwood Rowland discovered that chlorofluorocarbons cause depletion of the ozone layer (they would later receive the Nobel Prize in Chemistry for these findings in 1995). Their research led the United Nations Environment Programme (UNEP) to call an international conference regarding the issue, and shortly thereafter the United States banned all non-essential use of CFCs as propellants in aerosols. In 1987, 24 countries signed The Montreal Protocol on Substances That Deplete the Ozone Layer, which mandated that all developed countries would begin the phase-out of CFCs in 1993 and reduce usage to 50% by 1998. In the years to follow, more than 190 countries would sign the agreement. In 1997 a timeline for the phase-out of hydrochlorofluorocarbons (HCFCs) was created under the Montreal Amendment with a 90% reduction requirement for their usage by 2015. This protocol is enforced in the United States under the Clean Air Act, which was amended in 1990 to include Stratospheric Ozone Protection. The EPA has been appointed to enforce these regulations.^{1,2}

What is HCFC-225?

A mixture of HCFC-225ca and HCFC-225cb isomers, it is commonly found in solvents like AK-225 for precision cleaning. With good solvency and thermal stability, AK-225 is ideal for vapor degreasing applications. Non-flammable and exempt of smog-producing VOC compounds, it features low acute toxicity and low viscosity, high density, and low surface tension. AK-225 also has the ability to form azeotropes, or mixtures that act as a single chemical with physically unique and constant properties. While useful as a solvent, AK-225 must be phased out due to the presence of HCFC-225ca and HCFC-225cb.³

How is the HCFC-225 phase-out defined?

As defined in the Clean Air Act beneath section 605(a), restriction of use is summarized as the following:

Effective January 1, 2015, it shall be unlawful for any person to introduce into interstate commerce or use any class II substance unless such substance has been used, recovered, and recycled; is used and entirely consumed (except for trace quantities) in the production of other chemicals; or is used as a refrigerant in appliances manufactured prior to January 1, 2020.⁴

Whereas the term "use" is defined as the use of HCFC-225. The EPA defines a controlled substance in 40 CFR 82.3 as the following:

...any substance listed in appendix A or appendix B to this subpart [which lists both HCFC-225ca and HCFC-225cb], whether existing alone or in a mixture, *but excluding any such substance or mixture that is in a manufactured product other than a container used for the transportation or storage of the controlled substance.*⁵

It is the misinterpretation of the exclusions listed in italics above that creates a source of confusion. Without additives, neat HCFC-225 in bulk packaging such as gallon container increments meets the definition of controlled substance. Blends such as AK-225 ATMS, which is a Techspray mixture of HCFC-225, trans-1,2-dichloroethylene, methanol, and nitromethane is also considered a controlled substance. Conversely, an aerosol is a manufactured product containing the chemical blend, and therefore excluded from the definition.⁵

In other words, consumers may continue to purchase and use aerosols containing HCFC-225 that are manufactured prior to January 1, 2015. Following this date, products containing HCFC-225 can only be manufactured if the HCFC-225 has been used, recovered and recycled. The usage ban of non-reclaimed neat and blended HCFC-225 controlled substances will go into effect on January 1, 2015. Stockpiling of these materials is prohibited.

How will this phase-out impact Techspray products?

The following table summarizes the usage ban's effect on Techspray products.

<u>Products in use after 1/1/15</u>	<u>Made before 1/1/15</u>	<u>Made after 1/1/15</u>
Blend of virgin AK-225 in aerosol	YES	NO
Pure (neat) virgin AK-225 in aerosol	YES	NO
Blend of virgin AK-225 in bulk pkg	NO	NO
Pure (neat) virgin AK-225 in bulk pkg	NO	NO
Reclaimed AK-225 in any pkg	YES	YES

Replacements for HCFC-225

To aid in the transition to “safer, practical and economically reasonable alternatives across multiple industrial, consumer and military sectors” the EPA implemented the Significant New Alternatives Policy (SNAP) program in 1994. The purpose of SNAP is to identify potential substitutes based on manufacturer submissions. These substitutes are then reviewed for environmental and health effects such as ozone depletion and global warming potential, flammability and toxicity. Following this review, the EPA will issue a listing, and has already approved more than 300 substitutes for over 60 applications. Among these potential replacements are DuPont Vertrel Solvents, Techspray Precision-V Solvents, n-Propyl Bromide, Trichloroethylene, 3M HFEs and Honeywell Solstice Performance Fluid.^{2,6}

DuPont Vertrel Solvents

Although physically similar to HCFC-225, this solvent is far more environmentally friendly with no current usage restrictions. Vertrel solvent exposure limits range from 190 to 200 parts per million (ppm) 8 hour time-weighted average (TWA), whereas HCFC-225's limit is 100 ppm 8 hour TWA. Although the cleaning efficiency of Vertrel solvents is lower than AK-255, Vertrel/Trans blends offer comparable results. Like HCFC-225, Vertrel solvents feature a broad materials compatibility.⁷

Techspray Precision-V products contain Vertrel XF as a replacement for AK-255. The Precision-V line includes Precision-V Vapor-Degreaser Parts Cleaner and Precision-V Vapor-Degreaser Flux Remover. With a lower boiling point than comparable solvents, these products reduce heat stress on components as well as energy consumption for boil sump and chiller coils.

n-Propyl Bromide (nPB)

While this solvent works well for precision cleaning applications, environmental and health risks far outweigh the benefits of nPB. Hazards include reproductive system, liver and nervous system damage, and there is evidence that nPB is also harmful to the brain. Acceptable exposure to nPB is limited to 25 ppm 8 hour TWA, as health effects have been observed in animals at 400 ppm 8 hour TWA.⁸

Trichloroethylene (TCE)

A risky replacement for both health and environmental reasons, TCE is a suspected carcinogen with harmful side effects even after limited exposure including headaches, lung irritation, dizziness, poor coordination and difficulty concentrating.⁸ With an OSHA permissible exposure limit (PEL) of 100 ppm 8 hour TWA, the American Conference of Industrial Hygienists (ACGIH) has reduced the threshold limit value (TLV) from 25 ppm to 10 ppm following an EPA study citing that "...TCE poses a potential human health hazard for noncancerous toxicity to the central nervous system, kidney, liver, immune system, male reproductive system, and the developing fetus... The human evidence of carcinogenicity from epidemiologic studies of TCE exposure is strong for non-Hodgkin Lymphoma...".⁹ Though a low-cost alternative to other comparable chemistries, TCE is also an aggressive cleaner, making it incompatible with many plastics and elastomers.

3M HFEs (hydrofluoroethers)

Environmentally-friendly with VOC exemption, 3M HFEs are described by the company as having "no ozone-depleting components, a shorter atmospheric lifetime, and a lower global warming potential than CFCs."¹¹

Honeywell Solstice Performance Fluid

Accepted by the EPA as a suitable replacement for HCFC-225ca and HCFC-225cb and blends thereof as an aerosol solvent, Honeywell HFO-1233zd(E) is non-flammable with low global warming potential. While the cleaning effectiveness is lower than HCFC-225, HFO-1233zd(E) features a low boiling point that allows it to work well as an aerosol. It is not, however, an acceptable degreaser. This solvent will likely be VOC exempt, with low toxicity characteristics, making it a viable alternative to HCFC-225.

How will these changes affect consumers?

Use of HCFC-225 is restricted in the first section of the Clean Air Act 605(a), but not of manufactured products containing the substance. As bulk blends containing HCFC-225 meet the EPA's definition of controlled substance, their usage will be banned following the January 1, 2015 cutoff date. However, aerosols manufactured prior to that date may be sold and used by consumers indefinitely.

All Techspray products manufactured in bulk containing virgin HCFC-225 in either a neat or blended state (e.g. 1664-5G, 1663-G, etc.) will end December 31, 2014. Aerosol products containing HCFC-225 may continue to be sold after December 31, 2014. Beginning January 1, 2015, HCFC-225 can be used in

the manufacture of cleaning products only if it has been used, recovered and recycled, as stated in the Clean Air Act 605(a).

Update

The EPA published a proposed rule in the Federal Register on December 24, 2013 which would change usage rules for bulk or bulk blends of HCFC-225 that are onsite and inventoried before January 1, 2015. This rule would not pertain to import of manufacturing, but would rather allow consumers to use bulk or bulk blends of HCFC-225 held onsite prior to December 31, 2014 into 2015. A public hearing was held on January 23, 2014 at EPA headquarters in Washington D.C. and all written comments were required for submittal by March 10, 2014. Further updates may become available at <http://www.epa.gov/ozone/strathome.html>.

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