

Application for Exemption from REACH PFAS

for Refrigerants

Submitter□Shanghai Yanghong Trading Co.,Ltd.

Submitted on September 8, 2023

The development of refrigerants dates back to the 1830s, starting with the first generation of ammonia, CO₂ and other low-security natural refrigerants, followed by the second generation of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), and the currently widely used third generation refrigerants, hydrofluorocarbons (HFCs), and the fourth generation refrigerant, hydrofluoroolefins (HFOs), which are currently being developed and promoted. The process has taken about 200 years.

Refrigerants are a type of chemical called fluorocarbons, including chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, and hydrofluoroolefins. Due to ozone layer destruction, global warming, and climate protection, the Montreal Protocol, the Kyoto Protocol, and the Kigali Amendment have come into effect and implemented planned controls over the production and use of these compounds and mixtures. Therefore, the REACH PFAS regulation does not need to cover the use of these chemicals in gas states again.

These compounds can form trifluoroacetic acid (TFA) through atmospheric degradation pathways. For example, HFC-134a can form CF₃CFO and further form TFA; HFO-1234yf can form CF₃CFO and further form TFA; HCFO-1233zd (E) can form CF₃CHO and further form TFA. In general, after being used, fluorocarbon gas substances enter the atmosphere and undergo intermediate processes before being degraded to produce TFA.

TFA forms as an acid when it is formed in the atmosphere, and when it reaches

the surface (soil or water), it forms salts with alkali metals (such as sodium, potassium, and calcium). TFA salts lack reactivity and remain persistent in the environment with an estimated half-life ranging from hundreds to thousands of years. As it doesn't react with biomolecules, its persistence is not important. TFA and its salts are easily excreted by animals and do not bioaccumulate in the food chain. TFA salts are of low toxicity for animals and plants, therefore pose little risk. HFC-134a, or 1, 1, 1, 2-tetrafluoroethane, is a gaseous halocarbon that is considered a leading candidate for replacing other halocarbon materials such as Freon 12 (dichlorodifluoromethane) and Freon 22 in air conditioning and refrigeration systems, and may be used as an aerosol propellant or foam expansion agent. As the federal regulations require switching from CFCs to other suitable compounds, these compounds either do not damage the ozone layer or have less damage to the ozone layer than CFCs.

We sincerely put forward the above views and suggestions based on the actual production situation of the industry. Each refrigerant replacement has taken several decades of development and application to be updated. However, the proposed restrictions on PFAS under REACH have been put forward for discussion, and the various committees or councils have passed them, with an effective date after the buffer period, which is too short. Such a short time is simply not enough to meet the replacement of some or all of the existing refrigerants. We hereby apply for an exemption from the REACH PFAS control of refrigerants. The relevant refrigerant information is as follows:

Application for Exemption of Refrigerants

Classification	Refrigerant	Preferred IUPAC Name	CAS No.	Chemical Formula
HFCs	HFC-134a	1,1,1,2-tetrafluoroethane	811-97-2	CF ₃ CH ₂ F
	HFC-125	1,1,1,2,2-pentafluoroethane	354-33-6	CF ₃ CHF ₂

	HFC-143a	1,1,1-trifluoroethane	420-46-2	CF ₃ CH ₃
HFOs	HFO-1234yf	2,3,3,3-tetrafluoropropene	754-12-1	CF ₃ CF=CH ₂
	HFO-1234ze	1,3,3,3-tetrafluoropropene	29118-25-0	CF ₃ CH=CHF
	HCFO-1233zd	1-chloro-3,3,3-trifluoropropene	460-71-9	CF ₃ CH=CClH

References:

S. Madronich and etc., "Changes in tropospheric air quality related to the protection of stratospheric ozone in a changing climate". *Photochemical & Photobiological Sciences*, Published online: 13 June, 2023.