

Regulation 61 Notice – Part 6: Historic information related to releases of PFOA from the site.

Issued 20th December 2023

Environment Agency Request

We require you to provide total mass releases of PFOA to air, land, water and in products from first production (ICI period) on site to 03/10/2023.

PFOA Mass Balance

Ammonium perfluorooctanoate (APFO) is a perfluorinated anionic surfactant. It has a chemical formula of $C_8F_{15}O_2NH_4$.

APFO is referred to as PFOA (perfluorooctanoic acid; $C_8F_{15}O_2H$); this is a similar compound with the difference being that the ammonium counter ion in APFO is replaced by a hydrogen ion. However, in solution, they both dissociate to the same $C_8F_{15}O_2^-$ anion with APFO being significantly more soluble than PFOA.

APFO was used as a charge stabilising surfactant during the polymerisation of tetrafluoroethylene (TFE) in an aqueous medium to make polytetrafluoroethylene (PTFE) dispersions.

APFO was last used in Q1 2012 and was replaced with SAA-1000 (30% solution of EEA-NH₄).

Since first production at the Hillhouse site the total mass releases of PFOA to air, land, water and in product is approximately 178 tonnes. The approximate break down of these emissions is set out below:

- Emission to air 49.1 tonnes
- Emission to land (i.e. landfill) 6.2 tonnes
- Emission to water 54.3 tonnes
- Within product (sent to customers) 63.3 tonnes
- Captured and destroyed through incineration 5.1 tonnes

Table 1 provides a summary of PFOA mass release during period of PFOA use at the Hillhouse site.

Residual PFOA mass emissions from Q2 2012 onwards are already accounted for in the in the 178 tonnes total mass release from legacy PFTE production.

Since Q2 2012 PFOA emission from the Hillhouse site are typically:

- Emission to air <255g per year due to PFOA presence as an impurity in PTFE lubricant grades
- Emission to land approximately 1.2 kg per year to landfill (filter cake from effluent treatment process)
- Approximately 4 kg per year PFOA emission to water (residual effluent contamination from historic use of PFOA and environmental background levels)
- Within product <125g PFOA per year is inadvertently generated in the PTFE lubricant manufacturing process
- Approximately 750g per year PFOA captured in the atmospheric scrubber and then destroyed through high temperature incineration at an external site.

Table 2 provides a summary of PFOA mass release after period of PFOA use at Hillhouse (since Q2 2021 to October 2023).

Table 1: Summary of PFOA mass release during period of PFOA use at Hillhouse

Year	Notes	Air (t)	Land (t)	Water (t)	Product (t)	Captured and incinerated (t)	Total used (t)
1952-1953	Imperial Chemical Industries Ltd. (ICI) commenced TFE & PTFE manufacture at the Hillhouse site in 1952. These were granular products with no APFO use.	-	-	-	-	-	-
1954-1959	ICI development of dispersion polymerisation recipes from 1954 to 1958. 20tpa TFE pilot plant operational in 1955 with a 200tpa TFE plant operational from 1956.	0.7	0.1	0.7	0.9	-	2.4
1960-1969	-	5.0	0.5	5.1	6.0	-	16.5
1970-1979	-	6.6	0.6	6.8	7.9	-	22.0
1980-1989	In 1981 ICI established a joint venture with Asahi Glass Co., Ltd. (AGC) - "Asahi ICI Fluoropolymers Co., Ltd."	8.9	0.9	9.0	10.6	-	29.3
1990-1999	In 1999 AGC became the sole owner of the joint venture including the PTFE businesses – "Asahi Glass Fluoropolymers Co., Ltd."	13.2	1.4	14.2	17.7	-	46.4
2000-2009	Commencement of PFOA capture and destruction by incineration from 2005. In 2007 the UK Hillhouse site and Amsterdam offices merged & became "AGC Chemicals Europe, Ltd." (AGCCE) From 2007 emission to atmosphere reduced by atmospheric scrubber and effluent emission reduced by ion-exchange resin (IER) plant.	14.7	2.6	17.2	18.8	2.1	55.4
2010-2012	From 2011 further IER effluent treatment plant operational. PFOA not used after Q1 2012.	0.1	0.2	1.3	1.4	2.9	5.9
TOTAL (t)		49.1	6.2	54.3	63.3	5.1	178.0

Table 2: Summary of PFOA mass release after period of PFOA use at Hillhouse

Year	Notes	Air (t)	Land (t)	Water (t)	Product (t)	Captured and incinerated (t)	Total used (t)
Q2 2012 - October 2023	Residual PFOA emission from Q2 2012 onwards is already accounted for in the mass release total from legacy PFTE production emission and is not included in the Table 1 total. Residual PFOA emissions in effluent are from previous use of PFOA and environmental background levels.	0.0	0.0	0.2	0.0	0.0	-