AXOR

hansgrohe

Analysis of Alternatives

—

Socio-Economic Analysis

—

Chemical Safety Report

Provided as Comments to the Public Consultation on the REACH Restriction Proposal on Per- and Polyfluoroalkyl Substances (PFAS)

Public Version

Submitted by: Hansgrohe SE
Auestraße 5-9
77761 Schiltach
Germany

Date: 22.09.2023

Substance: Per- and polyfluoroalkyl substances (PFAS)

TABLE OF CONTENT

Declaration III

List of Abbreviations V

Summary VI

1. Introduction 1

2. Analysis of Alternatives 2

2.1. Explanation of an electroplating plant for the coating of sanitary engineering products 2

2.2. Electroplating 2

2.2.1. Input materials for electroplating plants 3

2.2.2. Conclusion 3

2.3. Use of materials containing PFAS in the electroplating plant 3

2.4. Potential Alternatives 6

3. Socio-Economic Analysis 8

3.1. PFAS ban scenario 9

3.2. Analysis of impact 10

3.2.1. Impact brass electroplating plant and production line based in Schiltach 11

3.2.2. Impact on the Offenburg plastic etching and electroplating plant 11

3.2.3. Impact on assembly lines 11

3.2.4. Impact on Hansgrohe workers in the EEA 11

3.2.5. Impact on region Schiltach, Offenburg, Wasselonne 11

3.3. Summary 12

4. Chemical Safety Report 13

4.1. Manufacturing 13

4.2. Use Phase 13

4.3. End of life stage 14

5. References 15

Hansgrohe SE • Auestraße 5 – 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

AXOR

hansgrohe

DECLARATION

Justification for confidentiality claims

Demonstration of Commercial Interest

1. Internal business information is included in the document which is concerning material consumptions, technologies and development and thus should be held away from competitors, therefore it shall be marked as confidential.

2. Internal economic information related to turnover, production costs, expected losses and implementation costs is confidential business information being part of the commercial strategies of Hansgrohe SE ("Hansgrohe"). This financial and commercial information meets all of the following requirements: (a) it is not publicly available or readily accessible to anybody except Hansgrohe's decision makers (b) it has commercial value and constitutes an economic asset of Hansgrohe.

Demonstration of Potential Harm

1. Should it be shared with competitors, this disclosure could prejudice the competitive position of Hansgrohe in the conduct of their business. Information could be used by competitors, in conjunction with what is already known, to advance their position in the marketplace. Competitors would benefit from the knowledge on the alternatives and also from the ones that failed in testing.

2. Disclosure of this information could prejudice the competitive position of Hansgrohe in the conduct of their business. Indeed, information on the production costs and future expenses/efforts to maintain production in Europe can be used by competitors in conjunction with what was already known, to advance their position in the marketplace. This could overall have a negative impact on Hansgrohe's competitiveness and endanger their market position.

Limitation to Validity of Confidentiality

1. As a consequence, these data should be protected indefinitely as confidential business information.

2. Information like investments required to implement alternative technologies or development of manufacturing costs after implementation of alternative technologies will not significantly change in future. Consequently, all data shall be protected indefinitely as confidential business information.

Hansgrohe SE • Auestraße 5 - 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

Overall, in the submitted document Hansgrohe provides dept information on its financial position in the market, as well as on core data about its products and production technologies. This information, which is blanked out in the "public version", cannot be made available to the public, as it would result in substantial competitive disadvantages for Hansgrohe.

Hansgrohe SE

ppa. ppa
Thorsten Pohl
Vice President Technical Engineering & Technology

i.V. i.V.
Christoph Heizmann
Manager Technical basics and applications

Hansgrohe SE • Auestraße 5 – 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

AXOR

hansgrohe

LIST OF ABBREVIATIONS

EBIT	Earnings before interest and taxes
ECHA	European chemicals agency
EEA	European economic area
ETFE	Ethylene tetrafluoroethylene
ESS	Easy Sanitary Solutions
FEP	Fluorinated ethylene propylene
FKM	Fluorine rubber material
FP	Fluorpolymer
H4-PFOS	6:2 fluorotelomer sulfonate
HGB	German Commercial Code
HSE	British Health and Safety Executive
OECD	Organisation for Economic Co-operation and Development
PE-HD	Polyethylene high density
PFA	Perfluoroalkoxy alkanes
PFAS	Per- and polyfluoroalkyl substances
PP	Polypropylene
PVC	Polyvinyl chloride
PTFE	Polytetrafluoroethylene
PVDF	Polyvinylidene fluoride
PVDF-*co*-HFP	Poly-(vinylidenfluorid-*co*-hexafluorpropylen)
RAC	The Committee for Risk Assessment
R&D	Research & Development
SDS	Sodium dodecyl sulfate
SEAC	Committee for Socio-economic Analysis
SVHC	Substances of very high concern

Hansgrohe SE • Auestraße 5 - 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

AXOR

hansgrohe

SUMMARY

The present document is part of the submissions of Hansgrohe for the public consultation on the PFAS restriction proposal. This document solely has its focus on the use of fluoropolymers (FPs) in electroplating plants for high quality chrome plated components for sanitary products. None of the herein discussed FPs remains in the finished products, but is necessary for the safe operation of an electroplating plant.

Hansgrohe operates three electroplating plants in Germany. One fully automated and one manual electroplating plant for brass parts in Schiltach and another electroplating plant for plastic parts in Offenburg. A third plant is in operation in China and a fourth electroplating plant is currently under construction in Serbia.

FPs are high-performance materials with exceptional properties, such as chemical resistance, thermal stability, fouling resistance, material flexibility and anti-friction / gliding properties. There is no other available material that combines this wide range of functions and therefore no suitable alternatives exist at this time for various use-case scenarios.

Many fluoropolymers have been scientifically evaluated as "polymers of low concern" (PTFE, ETFE, FEP, PFA, PVDF and PVDF-*co*-HFP). They have been proven to be chemically stable, non-toxic, non-bioavailable, non-water soluble and non-mobile. For these reasons, the fluoropolymers are also approved, for example, as food contact materials or in medical devices, including the use as implants. In addition, Henry et al. state that all fluoropolymers should be considered "polymers of low concern".[1]

Cross reference / Additional information

As an important side note, it should be noted that some FPs are also directly used in Hansgrohe products. A detailed statement on this subject was submitted in bundled form *via* the German "figawa e.V." association, together with other association members in cluster 2 (water supply).

Consequences of a ban on fluoropolymers for the operation of electroplating plants

A wide range of chemical substances are used in electroplating plants. Without the use of high-performance plastics, such as high-performance fluoroelastomers, PTFE, PVDF, etc., the safe operation of electroplating or chemical plants would no longer be possible. Possible substitutions must be carefully weighed up and checked in terms of operational safety when operating the plants. The replacement or the conversion to less dangerous process chemicals would no longer be possible, which would ultimately result in the decommissioning of the existing plants in the EEA. Such decommissioning would be associated, among other things, with the dismissal of direct and indirect employees.

Hansgrohe SE • Auestraße 5 - 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

Request: Exempt fluoropolymers from restriction projects

Hansgrohe therefore calls for the general exclusion of fluoropolymers, which are also considered "polymers of low concern" according to the OECD definition,[2] from the PFAS restriction project.

In addition, substances such as monomers and processing aids required for fluoropolymer manufacture and production should be exempted from the ban, provided that safe use is ensured. This is also envisaged by the study of the British Health and Safety Executive (HSE).[3] Therefore, groups with low risk (e.g. fluoroelastomers, fluoropolymers, evaluated as "polymers of low concern") or use-cases without relevant risk (e.g. in closed systems), should generally be excluded.

Hansgrohe SE • Auestraße 5 - 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

1. INTRODUCTION

Hansgrohe is a German manufacturer of high-quality sanitary products such as faucets, showers, and similar sanitary products – focusing on applications for bathrooms, showers, and kitchens. Products manufactured by Hansgrohe are known worldwide for their high quality and serve as an important high-functional design element for the sanitary industry. In Germany, there are production sites in Offenburg and Schiltach, the latter is also the headquarters of the Hansgrohe Group. Our Innovation Park in Alpirsbach is home to the trade fairs and exhibitions departments, as well as the prototyping and rapid prototyping departments. Shower hoses are produced in Willstätt near Offenburg. Shower channels are produced in Bad Bentheim with Easy Sanitary Solutions (ESS). There are international production sites located in France (Wasselonne), in the USA (Atlanta) and in China (Shanghai). Another production site is currently being built in Valjevo, Serbia.

With 33 subsidiaries and 20 sales offices supplying products in more than 152 countries, Hansgrohe, as a globally active company in the sanitary industry, is a reliable partner for its customers in all regions of the world.

In the manufacture of sanitary products, various coating methods are used to ensure the durability of the product or to guarantee this during use. The galvanic coating of sanitary products fulfills both a functional and a decorative aspect, such as abrasion resistance, resistance to cleaning and disinfectant agents, ease of care, etc. The decorative aspect, which customers expect, also plays an important role in the purchase process.

It is important to note that Hansgrohe is neither a manufacturer of per- and polyfluoroalkyl substances (PFAS) nor of fluoropolymer (FP) raw materials. Hansgrohe operates customized electroplating plants, which are assembled from many components. Hansgrohe is therefore not directly involved in the development process of PFAS-free alternative materials for electroplating plants, which need to fulfill the complex physicochemical requirements for a safe operation of such plants.

Hansgrohe SE • Auestraße 5 - 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

2. ANALYSIS OF ALTERNATIVES

2.1. Explanation of an electroplating plant for the coating of sanitary engineering products

In the manufacture of sanitary products, a wide variety of coating methods are used to establish the durability of the product or to ensure this during use.

The galvanic coating of sanitary products fulfills both a functional and a decorative aspect, such as abrasion resistance, resistance to cleaning agents and disinfectants, ease of maintenance, etc. The decorative aspect, which customers expect, plays an additional important role in the purchase process.

The following brief explanation will specifically address the need for using high-performance fluoroelastomers or high-performance plastics in an electroplating plant.

2.2. Electroplating

The surfaces produced in the sanitary sector from electroplating are metal surfaces deposited in individual and also very special electrolytes. The plating process consist of chemical as well as electrochemical steps. As a rule, electroplating is divided into several steps, starting with pretreatment, followed by between 2 and 3 metallic layers until the product is finished. Individual rinsing cycles with different rinsing systems complete the process.

The methodology depends on the specific substrate to be plated. Generally, electroplating can be operated manually or fully automatically. Electroplating is a precisely coordinated and highly complex system between software, electronics, electrical engineering, safety engineering, process tanks and the actual analytically monitored chemical process. The process chemistry is located in special plastic containers made of PP, PVC, PE-HD or PVDF, the actual chemistry used determines the correct material of the container. Metal tanks are mainly used in the area of pre-cleaning of the workpieces, here also the material of the tank depends on the chemistry used.

The tanks are built in series according to the specified process sequence and can range from 50 to over 70 process tanks.

As a rule, before the construction of an electroplating plant, all input materials, mainly plastics, are determined according to the resistance per chemistry used.

In order to ensure a stable process, the electroplating requires a lot of peripheral aggregates such as valves (of different types), filters, pumps, electrolyte movements, etc. These aggregates are exactly matched to the process chemistry, just like the plastics of the process tanks. The

Hansgrohe SE • Auestraße 5 – 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

main components are mainly sealing materials made of highly resistant plastics such as FKM, PVDF, etc. Without these materials the operation of an electroplating plant would not be possible. Sealing materials such as FKM are high performance fluoroelastomers, which show a wide temperature spectrum as well as chemical resistance. PVDF is used for particularly acidic, oxidative and highly concentrated chemicals.

2.2.1. Input materials for electroplating plants

A large number of chemical substances are used in electroplating. In electroplating, a distinction is made between inorganic and organic chemicals.

Examples of inorganic chemicals are nitric acid, sulfuric acid, hydrochloric acid, caustic soda, fluoride-based chemicals, metal salts (copper sulfate, nickel sulfate, nickel chloride, etc.), borate and silicate compounds, etc.

Organic chemicals are mainly the additives, these produce, for example, a homogeneous surface during deposition, as well as the resistance and texture. Organic compounds are e.g. benzene, naphthalene and alkyl sulfonic acids, sulfonamides and imides as primary additives. In parallel, secondary organic compounds are also used, such as coumarin, butandiol, etc. In copper electrolytes, for example, polyethylene glycol derivatives are used as brighteners, and sulfur-containing organic compounds with high surface affinity are used as brighteners. In addition, wetting agents are employed to improve the surface wettability of the materials which are plated. Here, PFAS containing (*e.g.* 6:2 fluorotelomer sulfonate (H4-PFOS)), as well as PFAS-free wetting agents (*e.g.* sodium dodecyl sulfate (SDS)) are available. It should be stressed out, that Hansgrohe has been working on the substitution of PFAS-free wetting agents since 2019 and will implement this soon (see also chapter 4).

Depending on the electrolyte or treatment step, these substances (inorganic and organic) are used in different pH ranges from strongly acidic to highly alkaline and in different concentrations. Temperatures between room temperature and 80 °C are required for the various treatment steps.

2.2.2. Conclusion

Without the use of high-performance plastics such as the above-mentioned high-performance fluoroelastomers, PVDF, etc., the safe operation of electroplating or chemical plants would no longer be possible. Possible substitutions must be carefully weighed up and examined from the point of view of operational safety when operating the plants.

2.3. Use of materials containing PFAS in the electroplating plant

As described in section 2.2, the material requirements for the components installed in the electroplating system are very high due to the chemistry used, as these must ensure the safe operation of the system. Without the use of these resistant fluoropolymers, electroplating operation is not possible.

Hansgrohe SE • Auestraße 5 - 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

Table 1 provides an overview of which FPs are commonly used in a typical electroplating system.

Table 1: Non-exhaustive overview on relevant FPs and their field of application in electroplating plants.

FP	Associated assemblies in which the FP is used	Related components in which the FP is used	Field of application(s) in the electroplating plant	Electroplating process step
FKM	Valve technology, piping	Sealing	Process tank	Decapitate
	Valve technology, piping	Sealing	Preparation tank	Decapitate
	Valve technology, piping	Sealing	Resharpening tank	Decapitate
	Valve technology, piping	Sealing	Process tank	Bright Ni
	Valve technology, piping	Sealing	Drain tank	Bright Ni
	Valve technology, piping	Sealing	Process tank	Chromium
	Valve technology, piping	Sealing	Drain tank	Chromium
	Valve technology, piping	Sealing	Reservoir	Chromium
	Valve technology, piping	Sealing	Process tank	Cu Ni strip
	Valve technology, piping	Sealing	Drain tank	Cu Ni strip
	Valve technology, piping	Sealing	Resharpening tank	Cu activation
	Valve technology, piping	Sealing	Process tank	Cu activation
	Valve technology, piping	Sealing	Process tank	Acidic Cu
	Valve technology, piping	Sealing	Drain tank	Acidic Cu
	Valve technology, piping	Sealing	Solvent tank	Acidic Cu
	Butterfly valve	Sealing	Valve technology	Bright Ni
	Butterfly valve	Sealing	Valve technology	Chromium

	Butterfly valve	Sealing	Valve technology	Cu Ni strip
	Butterfly valve	Sealing	Valve technology	Cyan Cu
	Butterfly valve	Sealing	Valve technology	Acidic Cu
	Activated carbon station	Sealing	Filtration	Bright Ni
	Activated carbon station	Sealing	Filtration	Chromium
	Pressure belt filters	Sealing	Filtration	Cu Ni strip
	Flow meter	Sealing	Measurement	Bright Ni
	Flow meter	Sealing	Measurement	Chromium
	Flow meter	Sealing	Measurement	Cu Ni strip
	Flow meter	Sealing	Measurement	Decapitate
	Flow meter	Sealing	Measurement	Cu activation
	Candle filter station	Sealing	Filtration	Decapitate
	Candle filter station	Sealing	Filtration	Cu activation
	Plate filter station	Sealing	Filtration	Chromium
	Ball valve	Sealing	Valve technology	Several
	Jet suction mixer	Sealing	Circulation, dosage	Cyan Cu
	Diaphragm valve	Sealing	Valve technology	Several
	Sump	Sealing	Pumping technology	Several
	Non-return valve	Sealing	Valve technology	Several
	Filter	Sealing	Filtration	Several
	Filter and Pumps	Sealing	Filtration	Several
	Heat exchanger	Seals	Heating / Cooling	Several
	Bag filter station	Sealing	Filtration	Ultrasonication, degreasing
	Bag filter station	Sealing	Filtration	Hydroson
FKM, PVDF	Ball valve	Sealings, socket	Valve technology	Several
PTFE	Plug-in resistance thermometer	Thermometer	Measurement	Several
	Level rod probe	Sealing	Measurement	Several
	Diaphragm pump	Sealing	Pumping technology	Several
	Movement	Support plate	Upheaval	Several
	Level rod probe	Level rod probe	Measurement	Several
	Sealing	Sealing	Sealing	Several

	UV disinfection	Case	Cleaning	Several
	Ball valve	Seals	Valve technology	Several
PVDF	Roof spraying	Flat jet nozzles	Dishwashing technology	Rinsing with deionized water
	Bath heat exchanger	Heat exchangers	Heating / Cooling	Several
	Agitator	Coating agitator	Upheaval	Several
	Dosage	Screw-in fitting	Hose Connection	Several
	Process tank			Several
PVDF / FKM	Dosing valve	Valve / Sealing	Dosage	Several
PVDF / FKM	Level switch	Level switch / sealing	Measurement	Several
PVDF, PTFE	Dosing pumps, flow meters, metering valves	Component, sealing	Valve technology	Several
PVDF, PTFE, FKM	Solenoid valves, cow taps, etc.	Sealing	Valve technology	Several

2.4. Potential Alternatives

Due to the chemicals used in electroplating plants, there are currently no suitable alternative materials that cover all process steps, as these would need to meet the special requirements to withstand all process chemicals in use in the different process steps. In this context, not only economic but also safety aspects play an important role in the selection of materials.

Due to its high costs, FPs are already only used in cases where other materials fail. As such, the amount of FP-containing materials in an electroplating plant has already been reduced to an absolute minimum. In Table 2, several electroplating process steps are listed, together with the main process chemicals, as well as pH values of the process solutions. For the FPs in use in these processes, there are currently no alternative FP-free materials available on the market.

It must be stressed at this point, that all potentially developed alternatives in the future have to be tried and validated to ensure the applicability in praxis. This validation has to be done in cooperation with the electroplating plant manufacturers and can only start, once such materials are available for purchasing on the market.

Table 2: Non-exhaustive overview of electroplating process steps, for which currently no substitution of the employed FPs is feasible.

Electroplating process step	Main process chemicals	pH	Currently used FP	Analysis of Alternatives
Cu Ni strip	Nitric acid	< 1	FKM	None, due to the high oxidative and acidic environment
Decapitate	Sulfuric acid	< 3	FKM	None, due to the high oxidative and acidic environment
Acidic Cu	$CuSO_4$, H_2SO_4, NaCl, methanol	< 3	FKM	None, due to the high corrosive solution, as well as the swelling capabilities of the present methanol, as well as other small organic components
Eching	$KMnO_4$, Cr(VI), H_2SO_4	< 1	PVDF	None, due to the high oxidative and acidic environment
Chromium (hexavalent based)	Cr(VI), H_2SO_4	< 1	PVDF	None, due to the high oxidative and acidic environment

As an example, upon transition from a Cr(VI) towards a Cr(III) process, substitution of the PVDF material in the chromium process towards PP is already possible. However, the necessity to employ PVDF in the etching process remains, regardless if the chromium step is based on Cr(III) or Cr(VI).

Finally, it has to be pointed out, that there is currently no economically or technically feasible alternative available, that would allow the complete removal of FP-containing components in electroplating plants for chrome plated brass and plastic parts. As such, an electroplating plant as a whole would not be operable upon a complete ban of FPs, since all process steps are required.

Hansgrohe SE • Auestraße 5 - 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

3. SOCIO-ECONOMIC ANALYSIS

In 2017, Hansgrohe submitted a comprehensive socio-economic study[4] on "the use of chromium trioxide for electroplating of different types of substrates with the purpose to create a long-lasting high durability surface with bright (shiny) or matte look (Functional plating with decorative character)" in the course of an application for authorization (ID 0114-01 and 0114-02).[5] This application resulted in a positive approval decision by the RAC and SEAC until February 14, 2031.[6,7] In the socio-economic study, a non-use scenario with a corresponding exit strategy and the associated consequences for the business capability and employees of Hansgrohe, as well as the far-reaching further effects that would be associated with a shutdown of the electroplating plants located in Schiltach and Offenburg, were extensively discussed.

Since an electroplating plant cannot be operated without components, some of which are made from fluoropolymers, the same effects and consequences as described in the socio-economic analysis at that time are also applicable in the current comment on the PFAS-restriction proposal. However, it should be noted that Hansgrohe has experienced very profitable growth since 2017, which again significantly increases the scope of an exit strategy. The business development in terms of revenue, EBIT and employees is shown in Table 3. These data were generated on the basis of the German Commercial Code (HGB). The share of sales, EBIT, and employees generated in production sites located in the EEA with respect to the worldwide sales, EBIT and employees, which are presented in Table 3approximately amount to [redacted].

Table 3: Business development of Hansgrohe (worldwide) according to German Commercial Code.

Year	Development of sales [mEUR]	Development of EBIT [mEUR]	Development of employees (per 31.12.)
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

Hansgrohe takes the safety of their workers and the sustainability of the company as a whole, combined with the applied processes very serious. Therefore, Hansgrohe continuously invests in the substitution of SVHC substances. Hansgrohe has a clear growth strategy and a commitment to the German production sites in Offenburg und Schiltach. The existing plastic etching and plating line in Offenburg (build in 1990) had nearly reached the end of its economic and technical lifetime, as well as its capacity limit after 25 years. Therefore, in 2015, Hansgrohe has decided to invest 30 Mio € in a new electroplating line for the plating of plastic products at the Offenburg plant, which went operable in 2019.

With this investment, Hansgrohe has further improved the operational safety, and reduced the environmental impact of the etching and plating process by applying state-of-the-art industrial hygiene and safety technology standards and also taking into account future requirements.

At this point, it has to be mentioned, that electroplating plants typically have a life-time of approximately 30-40 years.

3.1. PFAS ban scenario

A complete ban on PFAS would mean that the existing electroplating plants located in Schiltach and Offenburg could no longer be operated in the future. In addition, a relocation of electroplating plants outside of the EEA would most probably also not lead to a solution, as such plants are currently supplied with a high degree of customization from companies with many parts being produced in the EEA.

Hansgrohe currently has a high vertical range of production depth, especially in the German plants. As such, there is currently a complex interaction between the various production steps, starting from the raw material up to the finished product. As an example a simplified process for electroplated die casted brass parts includes the following steps:

- Purchase of brass raw materials
- Low pressure die casting
- Machining
- Grinding and polishing
- Electroplating
- Assembly

These complex interactions during the manufacturing process would be disrupted through a PFAS ban. This process as described for the brass parts, is also valid for chrome plated plastic parts. For the plastic parts, Hansgrohe currently operates an injection molding facility with [redacted] molding machines directly next to the electroplating plant. Currently, the production capacity between decorative and technical plastic parts is [redacted], related to the plastic raw material consumption, with only the decorative plastic parts undergoing the electroplating step.

It remains uncertain, if the up- and downstream processes would still be economically feasible in such a scenario, when the central manufacturing step, *i.e.* the electroplating process, would be relocated outside of the EEA.

As many of the necessary spare parts of the existing electroplating plants are made from FPs, such parts could also no longer be procured. As a result, the operational lifetime of the existing electroplating plants will be limited to the lifetime of the FP parts, which are currently installed.

Currently, the transition to chromium-free pretreatment and coating that would be required in 2031 is investigated at Hansgrohe.[6,7] This complete R&D project would be rendered obsolete, as both pretreatment steps require process materials out of FPs.

Another possibility, beside building up new electroplating plants outside of the EEA, is the purchasing of electroplated components from non-EEA job shop platers, which can achieve the required product quality. Such job shop platers can request a maximum of a [redacted] mark up, which Hansgrohe cannot fully pass on to the customers. As a result, such outsourcing of the plating process would result in a significant reduction of the achievable profit margin of Hansgrohe, as well as higher prices for the customer. Such an outsourcing scenario, however, is only feasible with the assumption, that the reputational impact associated with the use of job shop platers outside of the EEA remains acceptable by the customer. The reduction in Hansgrohe's EEA electroplating costs would therefore provide the business with a financial saving. However, such savings would not offset the loss of EEA profit margins associated with the outsourcing to non-EEA job shop platers.

3.2. Analysis of impact

Most of the former socio-economic analysis for *Chromium trioxide*,[4] which was based on the values available in the year 2017 (see section/page XX), are also applicable for this discussion regarding the PFAS-restriction proposal. This is due to the fact, that in both cases, a complete shutdown including the disassembly of all electroplating plants in the EEA would be the unavoidable consequence.

Since 2017, certain changes with potential impact on the values from 2017 need to be considered. In the following, a non-exhaustive list of changes with major impact on the transferability of the values from 2017 are listed:

- Inflation rate
- Energy costs
- Material costs
- Labor costs
- Taxes for municipalities
- Turnover and EBIT
- Number of employees

However, the consequences for the Hansgrohe company, as well as e.g. the economic and social impact for the local region around the plants in Schiltach and Offenburg are comparable. In all cases, the above mentioned points can be scaled to the current situation. As all resulting costs for Hansgrohe from the above listed points increased since 2017, even the best-case scenario for the current situation would result in values higher than those presented in the former socio-economic analysis for *Chromium trioxide*.[4]

The following subsections are only summarizing the individual parts, which need to be considered in an impact assessment. For a detailed description, the reader is referred to the socio-economic analysis for *Chromium trioxide*.[4]

3.2.1. Impact brass electroplating plant and production line based in Schiltach

The electroplating plants in the EEA would continue at full capacity until the sunset date. Then, the brass electroplating plant in Schiltach will be disassembled and permanently closed. The equipment would be too specialized to sell in the EEA, especially if, as result of a complete FP ban, all EEA electroplating plants would not be operable any more.

The recently built electroplating plant, which went operational in 2019, has not yet been depreciated. As a result, the investment of Hansgrohe in (back then) future proof and more sustainable production technology would be completely rendered obsolete.

3.2.2. Impact on the Offenburg plastic etching and electroplating plant

The etching and plastic electroplating plant in Offenburg will be disassembled and permanently closed.

3.2.3. Impact on assembly lines

Brass- and plastic-plated parts need to be shipped from outside the EEA to Offenburg, Schiltach or Wasselonne for an assembly inside the EEA.

3.2.4. Impact on Hansgrohe workers in the EEA

Both the directly employed staff necessary for the operation of the electroplating plants and the employed staff in the adjacent specialist departments would lose their jobs as a result of the closure of the electroplating plant. The reason is that a predetermined process chain is necessary to ensure economical and competitive production.

Impacts (number of employees and associated unemployment costs) can be provided upon request. However, it can be assumed that this affects over approx. [redacted] employees in the EEA.

3.2.5. Impact on region Schiltach, Offenburg, Wasselonne

Loss of local taxes resulting in a significant social impact.

3.3. Summary

For the exit-scenario the costs are dominated by the disassembling of the plants in Schiltach and Offenburg and the investment and relocation of the production to non-EEA. The social impact, quantified as the loss of EEA wages, does not have a significant impact on the overall results. By comparison, the monetized human health impact is negligible.

The economic and social benefit of Hansgrohe products on the EEA market, as well as on the international market, is very high. The benefits were explicitly confirmed during the Corona crisis, as Hansgrohe products were classified as systemically relevant. The products are indispensable for personal hygiene, e.g. in private environments, hospitals, clinics, kindergartens or retirement homes.

For the unlimited use of fluoropolymers in electroplating equipment, it is therefore concluded that the net benefit of Hansgrohe's business to the European economy far outweighs the potential risk of exposure to fluoropolymers.

Hansgrohe SE • Auestraße 5 - 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

4. CHEMICAL SAFETY REPORT

At the outset, it must be emphasized that in the near future, Hansgrohe does not use any chemicals containing PFAS in the baths in its electroplating plant (see also section 2.1). As such, in the near future the PFAS usage in the electroplating plants relates exclusively to the installed components.

4.1. Manufacturing

Hansgrohe require FPs for the safe and durable operation of their electroplating plants (refer to sections 2.3 and 2.4). All components are purchased on the open market. In addition, Hansgrohe is only involved to a limited extent in the design of the used components as the main task conducted at their sites is the operation of the electroplating plants. As such, emissions from the manufacturing phase of products are considered to be controlled and negligible.

4.2. Use Phase

FPs have remarkable properties and are chemically stable.[8] As an example, little effect on PVDF is expected by acid exposure, because PVDF is considered to be stable in acidic environments.[9] Based on market experience and longevity of products, degradation due to chemical exposure of PVDF has not been recognized as an issue of concern. In addition, it has to be attributed to Hansgrohe, that expert knowledge on the applicability of their products – not only containing PVDF – but also other FP-based components – is extensive. Based on the market experience and customer satisfaction no significant degradation has been described under standard operation conditions.

It cannot be excluded that wear- and tear-effects may contribute to emissions of FPs. For example, O-rings or sealings may be exposed to friction or pressure during use. While no quantitative data is available, it is important to note that the service-life of components used in electroplating plants is long and a high durability is required for correct and safe functionality. Considering the very low coefficient of friction and high mechanical stability, which leads to minimal wear and extended service life, the environmental impact of PFAS-based O-rings, valves, pumps or sealings is rated very low.

Furthermore, not all components come into contact with water, which is emitted to wastewater and has a higher potential for release into the environment. In this regard, it is expected that wear- and tear-effects will to a lesser or no proportion contribute to environmental emissions if industrial solutions or air/gases are processed by end-products.

In general, it hast to be mentioned, that electroplating plants have a life-time of approximately 30–40 years.

Hansgrohe SE • Auestraße 5 - 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

4.3. End of life stage

For the end-of-life phase, data regarding emissions from waste treatment are scarce. It is acknowledged that during incineration the generation of by-products may occur. Incineration is nonetheless considered a valid treatment option as complete degradation of FPs is possible. It is assumed that new information regarding waste treatment will be published in near future, driven by the restriction proposal by ECHA. A solidified understanding of the emission potential may correlate in an improvement of abatement technologies, if required. While regulation of emissions is endorsed by Hansgrohe, it is emphasized that more data are required for an appropriate regulatory approach.

Hansgrohe SE • Auestraße 5 - 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandro Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke

5. REFERENCES

[1] B. J. Henry, J. P. Carlin, J. A. Hammerschmidt, R. C. Buck, L. W. Buxton, H. Fiedler, J. Seed, O. Hernandez, *Integrated environmental assessment and management* **2018**, *14*, 316.

[2] OECD, "Data analysis of the identification of correlations between polymer characteristics and potential for health or ecotoxicological concern", can be found under https://www.oecd.org/env/ehs/risk-assessment/42081261.pdf.

[3] "Analysis of the most appropriate regulatory management options (RMOA)", can be found under https://www.hse.gov.uk/reach/assets/docs/pfas-rmoa.pdf, **2023**.

[4] Hansgrohe SE, "Socio-Economic Analysis. Chromium trioxide", can be found under https://echa.europa.eu/documents/10162/98d59f67-5b87-a287-856e-5cf0bbbfc9fb.

[5] ECHA, "Adopted opinions and previous consultations on applications for authorisation. Chromium trioxide", can be found under https://echa.europa.eu/de/applications-for-authorisation-previous-consultations/-/substance-rev/26304/term?_viewsubstances_WAR_echarevsubstanceportlet_SEARCH_CRITERIA_EC_NUMBER=215-607-8&_viewsubstances_WAR_echarevsubstanceportlet_DISS=true.

[6] Committee for Risk Assessment (RAC) and Committee for Socio-economic Analysis (SEAC), "Opinion on an Application for Authorisation for the use of Chromium Trioxide for electroplating of different types of substrates with the purpose to create a long-lasting high durability surface with bright (shiny) or matte look (Functional electroplating with decorative character)", can be found under https://echa.europa.eu/documents/10162/d3611bfa-03df-32e7-ad1f-e25c6f024e0a, **2017**.

[7] European Commission, "Zusammenfassung von Beschlüssen der Europäischen Kommission über Zulassungen für das Inverkehrbringen zur Verwendung und/oder für eine Verwendung von Stoffen, die in Anhang XIV der Verordnung (EG) Nr. 1907/2006 des Europäischen Parlaments und des Rates zur Registrierung, Bewertung, Zulassung und Beschränkung chemischer Stoffe (REACH) aufgeführt sind", can be found under https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52019XC0221(01), **2019**.

[8] S. H. Korzeniowski, R. C. Buck, R. M. Newkold, A. E. Kassmi, E. Laganis, Y. Matsuoka, B. Dinelli, S. Beauchet, F. Adamsky, K. Weilandt et al., *Integrated environmental assessment and management* **2023**, *19*, 326.

[9] J. E. Marshall, A. Zhenova, S. Roberts, T. Petchey, P. Zhu, C. E. J. Dancer, C. R. McElroy, E. Kendrick, V. Goodship, *Polymers* **2021**, *13*.

Hansgrohe SE • Auestraße 5 - 9 • 77761 Schiltach • Germany • T +49 78 36 51 0 • F +49 78 36 51 1300 • info@hansgrohe-group.com • hansgrohe-group.com
Handelsregister Amtsgericht Stuttgart HRB 740779 • USt-IdNr.: DE 812782725 • Vorstand: Hans Jürgen Kalmbach (Vorsitzender), Frank Semling (Stellvertretender Vorsitzender), Christophe Gourlan, Sandra Richter, André Wehrhahn • Vorsitzender des Aufsichtsrats: Klaus F. Jaenecke