

Comments for Annex XV restriction report

Substance name

Per- and polyfluoroalkyl substances (PFAS)

EC Number

-

CAS Number

-

Scope

Restriction on the manufacture, placing on the market and use of PFASs.

Before you fill in the form, read the **Consultation Guidance** and the specific **Information Note** as they explain both the process and the proposal itself.

[Link to the Consultation Guidance](#)

[Link to the Information Note](#)

Compulsory fields/tick boxes are marked with an asterisk (*)

* ☒ I have read the Consultation Guidance and Information Note

All non-confidential comments will be made publicly available once a month during the duration of the consultation.

The Consultation is intended to provide ECHA's Committees with scientific and technical information to assist them in the development of their opinions. Although other information can be submitted, any abusive comments will not be published monthly and only published at the end of the process without any response from the Dossier Submitter or the Rapporteurs.

Where did you learn about this consultation? (please select all that apply):*

☒ ECHA

☐ European Commission

☒ National Authorities

☒ Social media

☒ Industry organisation

☒ NGOs and trade unions

☐ Press

☐ Other (please specify)

SECTION I. Personal information

We may contact you about your comment and to request additional information.

* First Name

* Family Name

Email: *

* Country

Phone

Any personal data submitted is subject to [ECHA's data privacy rules](#)

SECTION II. Organisation

I am submitting information: *

- ☐ On behalf of a Member State Competent Authority
- ☐ As an Individual
- ☒ On behalf of an organisation or institution

Type of organisation/institution:

Country where the organisation or institution is legally established: Japan

Name of organisation / institution: Japan Fluid Power Association

Select one of the following options : *

- ☒ I agree to the disclosure of the name of my organisation/institution to the public
- ☐ I want to keep the name of my organisation/institution confidential

Note: the type and country of your organisation/institution will always be disclosed.

SECTION III. Non-confidential comments

It is possible to provide both general comments on the Annex XV restriction report subject to this Consultation and answers to the specific questions posed. In both cases, it is necessary to provide supporting evidence to allow ECHA's Committees to take your comments into account. It is

important not to leave the submission of any socio-economic information until the consultation on SEACs opinion but already submit relevant comments at this stage.

General Comments

Select the relevant boxes that cover the content of your comments and provide your non-confidential comments below, (maximum 63 999 characters)

- ☒ Scope or restriction option analysis
- ☒ Hazard or exposure
- ☒ Environmental emissions
- ☐ Baseline
- ☐ Description of analytical methods
- ☐ Information on alternatives
- ☒ Information on benefits
- ☒ Other socio economic analysis (SEA) issues
- ☒ Transitional period
- ☒ Request for exemption

* ☒ I understand that it is my responsibility not to include confidential information in responses to general comments and in any responses to requests for specific information (e.g. company name, email addresses, phone numbers, signatures etc.). ECHA will not be held liable for any damages caused by making non confidential responses publicly available.

Please provide your general comments in the box below

The Japan Fluid Power Association (JFPA) is a general incorporated association comprising a total of 120 regular and supporting members from companies manufacturing and selling hydraulic, pneumatic and hydraulic equipment and related parts in Japan. The association's activities are aimed at contributing to the sound development of hydraulic, pneumatic and hydraulic equipment, etc., and to the improvement of people's lives, while contributing to higher performance of this equipment used in production, construction, transport, etc., through quality improvement of hydraulic, pneumatic and hydraulic equipment, etc.

The hydraulic and pneumatic equipment manufactured and sold by JFPA member companies is used for many purposes such as automation, power transmission and motion control in production facilities for various industrial products and in various applications such as automobiles, aircraft,

construction machinery, industrial vehicles as well as medical and nursing care equipment (hereinafter referred to as 'industrial equipment'). The JFPA member companies manufacture and sell a number of REACH-compliant products within the European Union.

JFPA proposes that a permanent exemption be granted from the proposed PFAS restrictions issued on 7 February 2022 and amended on 22 March of the same year, based on various studies on hydraulic, pneumatic and industrial equipment manufactured and sold by JFPA member companies, in view of the following.

The scope of the proposed limits is very broad and we do not believe adequately categorises the very wide range of PFAS according to their nature and potential effects on human health and the environment, regardless of whether those effects have been proven or not.

For many users of such materials who are not familiar with the details of the chemical structure, this task is particularly difficult to manage. Publishing a list of substances identified, for example, by EC /List No or CAS No would make the task much easier and eliminate the possibility of misidentification and confusion. Even if that were done, six months is still far too short a timeframe due to the sheer number of materials to be investigated. At present, it appears that over 10,000 materials are involved, and a 10-year investigation would require the evaluation of 20 materials per week, which is not possible even for the largest companies.

Given the very low PFAS content limits proposed, the issue of PFAS contamination in non-PFAS materials has also arisen and will require a thorough, and detailed investigation of all other materials used in the industry.

Our view is that it is more appropriate to classify the various ranges of substances based on a risk-based approach to address the most hazardous substances first, followed by a phased review of the entire range of PFAS from a risk perspective over a period of several years. The simple use of the persistence property cannot be a conclusive and sufficient reason.

According to our understanding, a substance can only be restricted under Article 68(1) of the REACH Directive 'where there is an unacceptable risk to human health or the environment', which does not seem to have been demonstrated for the whole range of substances covered by the proposed restriction.

Most importantly, there are crucial missing uses in the proposed restrictions if they are to go ahead. There is a wide range of industrial automation components and equipment in use across the European Union, which are used to create industrial machinery. These industrial machines are then used to create almost all the essential items needed to support everyday life in the modern world. Food, medical equipment, pharmaceuticals, computers, telephones, ground vehicles, furniture, housing, appliances, transport, entertainment facilities, ships - the list is endless. All manufactured goods, materials and substances that are not handmade, are created by industrial machinery; in which case the raw materials may also be produced by industrial machinery.

'Industrial Automation Components and Equipment' uses a variety of pneumatic, hydraulic, electrical and electronic technologies. Each technology makes extensive use of materials that meet the broad definition of 'PFAS' as used in the draft limit. Manufacturers of 'industrial automation components and equipment' must use materials that are available for the specific required purpose. They are completely dependent on the material supplier and can only use what is currently available on the market. Until material suppliers develop PFAS-free alternatives, there is no alternative but to continue using existing materials. It is therefore proposed that a permanent derogation or a permanent exemption be granted for this use case, referred to as 'industrial automation components and equipment'.

Specific Information Requests

1:

Sectors and (sub-)uses: Please specify the sectors and (sub-)uses to which your comment applies according to the sectors and (sub-)uses identified in the Annex XV restriction report (Table 9). If your comment applies to several sectors and (sub-)uses, please make sure to specify all of them.

* Compulsory Fields



I have information on this topic



I don't have information on this topic

Our comments apply to the use of PFAS in the field of 'industrial automation equipment'. The global industrial controls and industrial automation market is estimated to be €134.5 billion in 2022 and €199 billion by 2027. Hydraulic and pneumatic equipment alone is estimated to be worth €6.47 billion worldwide and €1.01 billion in The European Union.

By 2030, this is expected to grow to EUR 19.48 billion worldwide and EUR 3.04 billion in The European Union.

The European Union countries are working to localise industrial production in The European Union, thus ensuring the supply of equipment for industrial automation to support The European Union industry. Automation is of paramount importance. Restricting or inhibiting the supply of equipment for industrial automation in The European Union alone, without doing so in other regions, could have a negative impact on The European Union manufacturing and process industries.

The use cases for 'industrial automation components and equipment' include an endless list of sub-uses, which cannot be clearly defined as they will increase over time as new technologies emerge. Industrial automation components and equipment are also integral to green technologies such as solar, wind, storage batteries and hydrogen.

In the Industrial Automation Components & Equipment use area, the PFAS materials are mainly perfluoropolyethers (PFPE) and fluoropolymers such as PFA, FEP, PTFE, PVDF and ETFE, which are used for component bodies, housings, casings, filter elements, gaskets, O-rings, seals, greases and surface treatments, etc.

The typical lifetime of industrial equipment is approximately 10 to 20 years, sometimes longer. When the items produced change or are redesigned, industrial equipment is often reconfigured and put back into service. For example, when a vehicle model is updated, the equipment is reconfigured to suit the new model, sometimes several times over.

At the end of their useful life, when industrial equipment is finally decommissioned, the equipment is disposed of as industrial waste, which is well regulated in The European Union countries. Valuable materials are separated for re-use and problematic materials are separated for proper disposal. As a result, there is little room for elements containing PFAS to enter the environment. This is in marked contrast to PFAS in consumer market items, many of which may be disposed of in the environment, despite recycling and safe disposal plans in most The European Union countries.

As the likelihood of these PFAS-containing elements entering the environment is very low, we request that all components and equipment for industrial automation are exempted from the restriction.

2:

Emissions in the end-of-life phase: The environmental impact assessment does not cover emissions resulting from the end-of-life phase. To get a better understanding of the extent of the resulting underestimation, (sub-)use-specific information is requested on emissions across the different stages of the lifecycle of products, i.e. the manufacture phase, the use phase and the end-of-life phase. Please provide justifications for the representativeness of the provided information. In particular:

- a. Please provide, at the (sub-)use level, an indication of the share of emissions (as percentages) attributable to these three different stages. An indication of annual emission volumes in the end-of-life phase at sector or sub-sector level would also be appreciated.
- b. If possible, please provide for each (sub-)use what share of the waste (as percentages) is treated through incineration, landfilling and recycling. Please provide information to justify the estimates as well as information on the form of recycling referred to.

* Compulsory Fields



I have information on this topic



I don't have information on this topic

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The typical lifetime of industrial equipment is approximately 10 to 20 years, sometimes longer. When the items produced are updated or changed, industrial equipment is often reconfigured and put back into service. For example, when a vehicle model is updated, the equipment is reconfigured to suit the new model, sometimes several times over.

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As the likelihood of these PFAS-containing elements entering the environment is very low, we request that all components and equipment for industrial automation are exempted from the restriction.

3:

Emissions in the end-of-life phase: With respect to waste management options, additional information is requested on the effectiveness of incineration under normal operational conditions (for different waste types, e.g. hazardous, municipal) with respect to the destruction of PFAS and the prevention of PFAS emissions.

* Compulsory Fields



I have information on this topic



I don't have information on this topic

This is a special area of expertise for regulated industrial waste recycling companies worldwide. How the necessary regulations are met is the domain of that sector alone, not the wider industry. According to figures from 'Statista' (statistical market research platform), the global value of the PFAS waste management market is expected to be worth EUR 1.63 billion by 2022. In other words, there is a considerable sizeable industry capable of performing this task. It is therefore advisable to discuss this matter directly with the waste recycling industry.

4:

Impacts on the recycling industry: To get an understanding of the impacts of the proposed restriction on the recycling industry, information is requested on:

- a. The impacts that the concentration limits proposed in paragraph 2 of the proposed restriction entry text (see table starting on page 4 of the summary of the Annex XV restriction report) have on the technical and economic feasibility of recycling processes (together with a clear indication on the waste streams to which the described impacts relate).
- b. The measures that recyclers would need to take to achieve the proposed concentration limits.
- c. The costs associated with these measures.

* Compulsory Fields



I have information on this topic



I don't have information on this topic

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5:

Proposed derogations – Tonnage and emissions: Paragraphs 5 and 6 of the proposed restriction entry text (see table starting on page 4 of the summary of the Annex XV restriction report) include several proposed derogations. For these proposed derogations, information is requested on the tonnage of PFAS used per year and the resulting emissions to the environment for the relevant use. Please provide justifications for the representativeness of the provided information.

* Compulsory Fields



I have information on this topic



I don't have information on this topic

6:

Missing uses – Analysis of alternatives and socio-economic analysis: Several PFAS uses have not been covered in detail in the Annex XV restriction report (see uses highlighted in blue and orange in Table A.1 of Annex A of the Annex XV restriction report). In addition, some relevant uses may not have been identified yet. For such uses, specific information is requested on alternatives and socio-economic impacts, covering the following elements:

- a. The annual tonnage and emissions (at sub-sector level) and type of PFAS associated with the relevant use.
- b. The key functionalities provided by PFAS for the relevant use.
- c. The number of companies in the sector estimated to be affected by the restriction.
- d. The availability, technical and economic feasibility, hazards and risks of alternatives for the relevant use, including information on the extent (in terms of market shares) to which alternative-based products are already offered on the EU market and whether any shortages in the supply of relevant alternatives are expected.
- e. For cases in which **alternatives are not yet available**, information on the status of R&D processes for finding suitable alternatives, including the extent of R&D initiatives in terms of time and/or financial investments, the likelihood of successful completion, the time expected to be required for substitution (including any relevant certification or regulatory approvals) and the major challenges encountered with alternatives which were considered but subsequently disregarded.
- f. For cases in which **substitution is technically and economically feasible** but more time is required to substitute:
 - i. the type and magnitude of costs (at company level and, if available, at sector level) associated with substitution (e.g. costs for new equipment or changes in operating costs);
 - ii. the time required for completing the substitution process (including any relevant certification or regulatory approvals);

- iii. information on possible differences in functionality and the consequences for downstream users and consumers (e.g. estimations of expected early replacement needs or expected additional energy consumption);
- iv. information on the benefits for alternative providers.
- g. For cases in which **substitution is not technically or economically feasible**, information on what the socio-economic impacts would be for companies, consumers, and other affected actors. If available, please provide the annual value of EU sales and profits of the relevant sector, and employment numbers for the sector.

*** Compulsory Fields**



I have information on this topic



I don't have information on this topic

The missing use for PFAS is 'industrial automation components and equipment'. Sub-uses are almost unlimited. The global industrial controls and automation market is estimated to be worth EUR 134.5 billion in 2022 and EUR 199 billion by 2027. The European Union countries are working to localise industrial production in The European Union, thus ensuring a supply of industrial automation components and equipment to support it is of paramount importance. Restricting or inhibiting the supply of industrial automation components and equipment in The European Union alone, without doing so in other regions, would have a negative impact on The European Union manufacturing and process industries.

Fluoropolymers are often used in industrial applications such as the automotive, machinery and semiconductor industries. These polymers have been assessed as being of low concern (PTFE, FEP, PFA, and ETFE). These polymers have proven to be chemically stable, non-toxic, non-bioavailable, non-water soluble and non-migratory. For these reasons, in addition to factors such as safety, energy consumption and service life, fluoropolymers are also approved as materials for food contact and medical technology. Additionally, to the fluoropolymers, PFPE widely used in greases often in conjunction with PTFE is according to the manufacturers data is not considered a hazardous substance.

The use of fluoropolymers is highly relevant to the whole industry, as a wide range of components and equipment are used to manufacture industrial machinery across the European Union. This machinery is used in the manufacture of almost all the essentials needed to support the daily lives of modern society. Food, medical equipment, pharmaceuticals, computers, telephones, ground vehicles, furniture, housing, appliances, transport, recreational facilities, ships - the list is endless. Any manufactured item, material, substance etc. that is not hand-made, is made by industrial machinery.

PFAS are constantly used in machines and systems where extreme conditions (high or low temperatures, high frictional resistance, aggressive chemical conditions or a combination of these) are prevalent. Therefore, most existing industrial plants and applications often have no alternative to PFAS-containing materials, including in future technological fields (e.g. fuel cells, hydrogen electrolysis, heat pumps, photovoltaic systems).

a.

According to a market data report by the Fluoropolymer Products Group of Plastics Europe, the total tonnage of fluoropolymers sold in the 28 EU/EEA countries in 2020 was 40,000 tonnes. This is spread across a number of sectors, including chemical and industrial automation components and equipment. Power, food and pharmaceuticals, electronics, transport and renewable energy were included, amounting to some 35,500 tonnes. Most of this use is in end products rather than in the machinery used to produce them. We estimate that between 5% and 10% (1,725-3,550 tonnes) of this may represent industrial automation hardware.

Please refer to the attachment “JFPA01”, Table 0 Tonnage of parts in PFAS materials for industrial automation components.

Emissions at the end of life are under the control of the waste disposal Companies. In respect of emissions during the life of the product this varies slightly by type of use and type of PFAS.

- The component body/housing/casing is very stable and does not wear out during use, resulting in zero emissions during use.
- The filter element is stable and does not release particles as it is responsible for trapping particles present in the fluid. Therefore, there is no release during the lifetime of the element. At the time of disposal, they are disposed of in a suitable industrial waste stream.
- Wire cables and connectors are stable and there will be no emissions during the lifetime of the product.
- Due to its nature, grease is released from the lubricated product over time. Some of the grease remains inside, while some is lost to the outside of the product and can leak into the environment. One example is the lubrication of pneumatic cylinders. Much of it is lubricated over its lifetime, so there is little loss. Where grease needs to be replaced, this will be in the region of 10g to 100g over the lifetime of the product (approx. 10-20 years), so a rough figure would be 1-10g per year.
- Gaskets/O-rings/immovable seals are stable and contained within the respective component body/housing and therefore have zero emissions in use.
- Movable seals are subject to some wear during the life of the product. This is a very small amount compared to the actual volume of the seal, but may result in the release of particulate matter, which is contained in the product in the case of internal seals and released into the environment in the case of external seals.
- The surface treatment of moving parts may cause a very small amount of wear. However, the amount is very small as the treatment is very thin and significant wear is not expected. The lower sliding resistance also reduces the energy used and increases the service life.

b.

The main features of the PFAS materials used are their physical properties. Chemical resistance, temperature resistance and general mechanical properties uniquely provide the functionality required for many industrial automation components and equipment. Many applications in components and equipment cannot be satisfied by alternative materials, making corresponding industrial machinery and processes impossible.

1. Resin

Fluoropolymers combine a number of high-performance properties and provide the functionality required for components used in hydraulic and pneumatic equipment (see the attachment “JFPA01”, Table 1 Uses of Fluoropolymers).

In these applications, the performance of fluoropolymers is exploited in different ways. PTFE is the highest-performance fluoropolymer. This is due to the strong polar carbon-fluorine bonding which provides a layer of reactive, highly hydrophobic fluorine molecules around the carbon-carbon main chain. Due to this structure, it is the main material of choice because of its greater heat and chemical resistance than other materials.

Fluoropolymer materials are particularly essential for semiconductor manufacturing equipment amongst many other types of manufacturing equipment.

(1) Valves, regulators, pump bodies/diaphragms and piping (wetted parts) for chemicals

Valve devices are used to control chemicals in processes such as wafer cleaning and developing solution application, and in chemical supply facilities. Various types of chemical solutions flow, including acids, alkalis, organic solvents, ultrapure water and developer solutions. High levels of purity (metal elution, anion elution, particles), chemical resistance and heat resistance are essential for the wetted parts of valves and piping through which chemicals flow, and fluoroplastic materials are used. With metallic materials, there are concerns about corrosion and metal elution, making this part of the material irreplaceable. The presence of even the slightest impurity or microscopic debris (particles) can have a very significant impact on device yields, making semiconductors unmanufacturable.

(2) Actuators for chemical valves.

The actuators used to drive the chemical valves are made of fluorocarbon resin. If chemicals flow into the wetted parts, their gases can permeate and create a chemical gas atmosphere in the surrounding area. Only fluoropolymers offer the combination of mechanical strength, chemical resistance and heat resistance. If other alternative materials are used, different materials need to be used depending on the chemical and operating temperature, which increases the number of valve types, complicating the manufacturing equipment and incurring extra costs.

(3) Coating of metal parts of valves for chemical solutions.

The bolts used to fasten the valve body to the actuator and the springs for operation are made of metal, but cannot be used as they are. Valves used with highly permeable chemicals, such as hydrochloric acid in particular, must be coated with fluorocarbon resin to increase their chemical resistance. Without a fluoropolymer coating, the bolts will corrode, the valve will break and hazardous chemicals will be released. This results in reduced operator work safety and an increased risk of contamination due to chemical leakage into the environment. In addition, the product life is shortened and the amount of waste increases.

Please refer to the attachment “JFPA01” Image 1 Example of valves for chemical solutions

(4) Seals.

Hydraulic and pneumatic equipment uses a variety of fluids, such as air and other gases, lubricating oils, fuels and cooling water, etc. Sealing technologies such as O-rings and gaskets prevent fluid leakage caused by water, dirt, dust, etc. and protect equipment from ingress of water, dirt, dust and debris. PFAS is the only material known to offer the combination of heat resistance, chemical resistance, low-friction properties and sealing functionality required for operation in harsh mechanical environments.

Some PFAS materials, widely known as fluoropolymers such as polytetrafluoroethylene (PTFE) and Fluororubbers such as FKM, have become essential for hydraulic and pneumatic equipment because they possess many of these important chemical properties and have no alternatives. PFAS materials are used when they exceed the performance requirements of other resin and rubber. Replacing PFAS with unsuitable alternatives will compromise the functionality of the corresponding parts and components, causing increased failure rates, leaks, safety issues and shortened equipment life.

Three examples of the properties requiring the use of PFAS materials in seals are given below.

(a) heat-resisting property

The ability of PFAS materials to maintain their most important performance characteristics over the widest temperature range of any polymer is a key factor in sealing applications. This is due to the strength of the carbon-fluorine bond, which exceeds the carbon-hydrogen bond strength of hydrocarbon-based polymers by more than 20%. This allows PTFE, one of the PFAS materials, for example, to be used over a wide temperature range, with a heat resistance temperature of 260°C and a cold resistance temperature of -250°C.

(b) chemical resistance

The chemical resistance of seals is important in the use of various fluids such as air and other gases, lubricants, fuels and coolants, whereas PFAS materials have unmatched chemical resistance, whereas other materials would fail due to degradation. Semiconductor manufacturing processes require the use of chemicals such as acids, alkalis, organic solvents and gases, and PFAS materials are responsible for preventing these leaks, protecting human health and preventing contamination of the environment.

(c) cleanliness

Material cleanliness is a performance requirement to prevent contamination of fluids used in the process. In semiconductor manufacturing processes, medical equipment and food equipment, chemical substances from materials can make it impossible to manufacture products or affect human health. PTFE, for example, does not contain additives such as plasticisers, stabilisers, lubricants and antioxidants that can cause contamination. PFAS materials are thus essential in processes where cleanliness is required, as the amount of chemicals generated by the material itself is low.

(5) Hoses and tubes

Hoses and tubes transfer fluids and prevent leaks while maintaining the cleanliness of various components and systems, and are selected for their resistance to all chemicals and heat resistance of PFAS materials (see Table 1 below). Fluoropolymer hoses and tubes are used under high temperatures and high pressures to ensure durability and long-term reliability of components. The use of PFAS materials also helps to ensure operator safety and prevent leaks into the environment. Improper material selection can lead to fluid leakage, reduced efficiency and equipment damage.

Please refer to the attachment “JFPA01” for Table 2 Materials commonly used for hoses and tubes and their chemical and heat resistance properties.

(6) Electronics

Hydraulic and pneumatic equipment uses electronics to maximise functionality and increase the efficiency of industrial processes. The electronics in hydraulic and pneumatic equipment may be exposed to high temperatures and the electronics cannot be protected within the enclosure. In such cases, fluoropolymers are required for their thermal and inherent flame resistance.

PTFE, one of the PFAS materials, also has excellent electrical, i.e. high-frequency properties such as low dielectric constant and dielectric loss tangent, and is used in insulating layers such as printed circuit boards. It is stable over a wide range of frequencies and is a rare material that combines several functions at the same time, making it difficult to replace.

(7) Adsorption plates

Fluoropolymers have many excellent properties and play an important role in the semiconductor and industrial machinery sectors. Adsorption plates with porous fluoropolymers are used in processes such as fixing, bonding and transporting wafers, films and glass substrates for inspection.

Porous materials include metals and ceramics. However, porous fluoropolymers are superior to other materials, because they are lightweight, soft and can adsorb products without damaging them. Furthermore, fluoropolymers have non-adhesive and release properties due to minimal surface energy, making them easy to peel products off. It also has excellent chemical resistance

and can therefore be used in semi-conductor manufacturing processes where chemicals are used. It is difficult to produce an adsorption plate with all of these characteristics, except for porous fluoropolymers.

Please refer to the attachment “JFPA01” for Image 2 Example of precision suction plate.

2. Greases

Please refer to the attachment “JFPA01” for Table 3 Uses of greases.

Grease and other lubricants are used to reduce friction, wear, seizure, oxidation and heat in sliding parts of industrial automation equipment.

In severe applications, the base oil requires low and high temperature stability, affinity with mating materials and non-water soluble properties, while the additive agent requires properties such as oxidation, wear, anti-seizing, solid lubrication, rust prevention and clean dispersion, depending on the application, and as a thickening agent, high and low temperature resistance, water resistance, mechanical stability, etc. are required.

PTFE, used as an additive and thickener, has a heat resistance of 260°C and lubricating properties that give it an advantage over other materials (e.g. silicone) in stable operation at high temperatures.

Please refer to the attachment “JFPA01” for Table 4 Base Oil and to Table 5 Thickener

Examples of the properties requiring the use of PFAS materials in greases are given below.

(1) Low wear, low friction and long life.

Grease containing PTFE applied between sliding parts improves the sliding properties of the parts due to its anti-oxidation, anti-wear and anti-seizing properties, low friction, solid lubrication and heat resistance, resulting in service life improved several times. At the same time, the energy required for operation can be reduced. With other greases, the occurrence of fluid or gas leakage and sticking due to wear of sliding parts will shorten the life of the equipment and increase waste. Above all, shutting down the production line is a major loss for the manufacturer.

Please refer to the attachment “JFPA01” for Image 3 Sectional view of cylinder grease.

(2) Heat and flame resistant

When using hydraulic and pneumatic equipment in hot and humid environments, grease is used in the sliding parts of each piece of equipment because the physical properties of the components and external dispersal can cause seizure, welding and wear, resulting in malfunctions and leaks of the operating fluid. Fluorine-based grease has good affinity with the material to which it is applied and has properties such as heat resistance, low friction, flame resistance and oxidation resistance, making it possible to use pneumatic equipment at temperatures of up to 100-150°C by using fluorine-based materials for the components, compared to the usual 50-60°C. The above characteristics allow energy consumption during use to be kept to a minimum.

(3) High speed, high frequency, heat and water resistant.

Solenoid valves that control the direction of the fluid that operates the hydraulic-pneumatic actuator are mostly made of metal and rubber that maintains the seal in the switching section. To operate at high frequency, they must be heat resistant and have low friction at high temperatures. In addition, grease leakage due to moisture from the fluid affects the service life.

Only fluorinated greases have comprehensive properties and high temperature resistant silicone greases are not a substitute as they dissolve in water. Greases other than fluorinated greases will fail to operate within a short period of time and will directly lead to an increase in waste.

Please refer to the attachment “JFPA01” Image 4 Section view of directional control valve grease.

(4) Cleanliness (low dust emissions)

When used in highly clean environments with low levels of dust and suspended solids, such as in medical and semiconductor applications, wear from sliding parts during production has a negative impact on the product. Outgassing at high temperatures also contaminates the production environment. In fluorinated greases, the base oil is compatible with high temperatures, and the additives provide solid lubrication, low wear and compatibility with the sliding part materials metal, resin and rubber to aid sliding without spillage. There is no alternative to other greases due to environmental dispersal of wear debris from sliding parts and reduced service life due to fluid or gas leakage. The use of other greases will shorten the life of the equipment and increase waste.

(5) Low dew-point environment

In secondary battery production lines, where production facilities are expected to increase in the European Union, product operation is required in a low dew point (-50 to 80°C) fluid and environment where moisture is eliminated as much as possible, as moisture has a negative impact on product quality. Current products using soap-based thickeners are depleted due to moisture in the grease and material compatibility of sliding parts, resulting in a short product life, whereas fluorine-based grease can maintain the same performance and life as normal specification products.

(6) Use in food equipment

In food and pharmaceutical manufacturing processes, it is necessary to minimise the effect on human health in case of contamination at the same time as normal operation. In addition, fluoropolymer containing grease is used as a safe grease in high cleanliness processes, free from foreign matter. No grease with the same performance is available.

Goods from contaminated manufacturing processes will result in increased waste.

(7) Low outgassing

Outgassing from grease in drive machines used in vacuum environments can significantly reduce the performance of production products. Fluorine grease has negligible adverse effects due to its low outgassing, heat resistance and flame-retardant properties. There are no alternative materials that can replace this performance.

**The above fluorinated greases can be used as low-friction, low-wear, low-sliding and low-flammability grease with a more synergistic effect if the sliding parts are fluorinated.*

3. Rubber, seal

Please refer to the attachment “JFPA01” Table 6 use of rubber and seals

Hydraulic and pneumatic equipment uses fluid (liquid or gas) to perform its function, and seals are used to prevent external leakage.

These seals are available as moving seals and fixed seals (gaskets). Fluoroelastomer and polytetrafluoroethylene seals are selected, especially in conditions of use where heat and chemical resistance are required.

Fluorine rubber is also used as a sliding packing material for use under high temperature conditions. Silicone rubber is a rubber material that can be used under the same high temperature conditions as fluoroelastomer, but its mechanical strength and wear resistance are inferior to those of fluoroelastomer (less than half those of fluoroelastomer), so there is currently no alternative material to fluoroelastomer.

Furthermore, sliding packings used under high-pressure conditions are prone to damage of the packing material from overhang gap areas, so using a back-up ring (PTFE) in conjunction with a back-up ring can extend the life of the seal. In back-up ring applications, heat resistance, flexibility and low-friction properties are required, and PTFE is a material with all of these. If other resin materials, e.g. polyethylene and nylon, are considered for back-up ring applications, they do not meet all the properties required for back-up rings and can only be used in limited applications, for example, polyethylene has an operating temperature range of around 80°C and nylon is not suitable for high-speed sliding. Hence, at present, existing sealing systems would not be viable without PTFE back-up rings.

Composite seals combining PTFE and rubber materials such as fluoroelastomer may also be used to meet more demanding operating conditions.

(1) Heat resistance

Fluoropolymers have the widest temperature range of all polymers. This is due to the molecular structure of fluoropolymers, where the C-F bonds (bond energy: 568 KJ/mol) that make up fluoroelastomers have a bond energy about 20% higher than the C-H bonds (bond energy: 416 KJ/mol) of diene polymers such as NBR. This makes it resistant to decomposition and degradation even when subjected to external heat energy, etc.

The heat resistance limit temperature of fluoroelastomer is 230°C and the continuous service temperature of PTFE is 260°C, making it difficult for other sealing materials to be used under such temperature conditions.

(2) Chemical resistance.

Fluoroelastomer and PTFE have a bond between a carbon atom and a fluorine atom (C-F), the bond energy of which is very strong among chemical bonds, and the bond between carbon atoms (C-C bond) is covered with fluorine atoms in a spiral shape without gaps, making it difficult to be attacked from the outside and making the C-C molecules difficult to break. The C-C bond has excellent chemical resistance.

4. Surface treatment

Please refer to the attachment “JFPA01” Table 7 Use of surface treatment.

Surface treatments with fluoropolymers play many roles in the field of hydraulics and pneumatics. One example is composite plating with a homogeneous dispersion of PTFE co-deposited in the plating film. This plating is an extremely high performance composite plating with the following features. The performance of the most important features, such as contact angle, static friction coefficient, dynamic friction coefficient and wear properties, are shown in the Table 8 of the attachment.

Please refer to the attachment “JFPA01” Table 8 Fluorine lubricant plating film characteristics (PFOA free).

This section describes the features and applications of high-performance composite plating.

(1) Self-lubricating properties.

The inclusion of PTFE particles in the plating film is highly effective in preventing galling and burning.

Use: Mating and threaded parts of pistons, valves, actuators, fittings, etc.

Gears and rolls driven at high speeds

(2) Low friction

Lubricating PTFE particles are uniformly dispersed not only on the film surface but also in the direction of the film thickness. Low friction improves energy efficiency. In environments where grease cannot be used, high-performance composite plating is highly effective in creating low-friction conditions.

Use: mating parts of pistons, valves, actuators, fittings, etc.

Sliding parts with sealing elements

(3) Abrasion and damage resistance

PTFE composite plating is more scratch-resistant and will not peel off compared to resin or PTFE coatings.

Use: mating parts of pistons, valves, actuators, fittings, etc.

(4) Adhesion.

The matrix holds the individual PTFE particles firmly in place. As the matrix is metallic, the adhesion between the substrate and the PTFE composite plating is strong.

Use: Mating and threaded parts of pistons, valves, actuators, fittings, etc.

Sliding parts with sealing elements

(5) Sound dampening effect.

In sliding between high-performance composite plating and contact with other metals, the buffering effect of PTFE and its lubricating properties have a sound dampening effect.

Use: mating parts of pistons, valves, actuators, fittings, etc.

Gears and rolls driven at high speeds

(6) Water and oil repellent.

The affinity (ease of adhesion) of liquids to solid surfaces can be controlled. Water and oil repellent functions can be enhanced by increasing the contact angle.

Use: Substrates, external surfaces of products. Conductivity and anti-static effect.

The matrix holds the individual PTFE particles firmly in place. As the matrix is metallic (Ni-P), it can be used in semiconductors and precision equipment where static electricity and dust are not permitted.

Use: Substrates, external surfaces of products.

In addition to high-performance composite plating, almost all coatings and linings made from fluoropolymers also have similar functions to high-performance composite plating.

Fluoropolymers are essential for surface treatment with the above high-performance properties, for which there are no alternatives.

The above suggests that surface treatments using high-performance composite plating and fluoropolymers have a significant impact on the fluid power industry.

C.

Manufacturers of industrial automation components and equipment comprise a small number of large global companies and a large number of smaller, locally-based manufacturers, estimated to number in the hundreds. The corresponding machine builders are estimated to number in the thousands, while

the end users of the manufactured industrial automation equipment at plant level are estimated to number in the tens of thousands, and in some cases hundreds of thousands. This restriction prevents the construction of new production facilities and, unless all PFAS, including spare parts, are exempted, will result in the closure of existing production facilities, with consequent very serious consequences for society.

d.

Manufacturers of components and equipment for industrial automation use materials supplied by material manufacturers. At present, there are no known alternatives to the fluoropolymers used in the industry.

If we focus on heat resistance among the many aforementioned excellent properties of PFAS, comparable non-PFAS organic compounds are silicone, PI and PEEK as available alternatives. However, all of these are clearly inferior in terms of coefficient of friction, dielectric constant, electrical transmission losses, chemical resistance and purity (high cleanliness). In addition, silicone has elasticity but poor strength & high water absorption. PI and PEEK have high strength but no elasticity and poor release properties. Therefore, there is only one fluoropolymer that has these multiple properties simultaneously and cannot be replaced by non-PFAS materials.

If a material manufacturer develops a 'drop-in' alternative material that has the same physical properties and does not contain PFAS, it will be possible to change. However, a long series of events will occur.

Material scientists from material manufacturers need to invent alternative materials where possible.

New materials should be tested to ensure that their performance is sufficiently comparable, especially over a long lifetime under certain conditions.

Manufacturers of basic components used in industrial components and equipment, such as seals, gaskets and O-rings, need to start manufacturing with new materials.

Finally, manufacturers of components and equipment for industrial automation need to ensure that the new materials will perform well over the lifetime of the product.

It is difficult to set a timescale for this, but it will require an adjustment of 20+ years or more. Each replacement costs approximately several hundred thousand to several million euros.

Exceptions are required for spare parts and used parts. For sustainability and cost-effectiveness purposes, exceptions to restrictions are required for spare parts, wear parts and used parts on the market. These should be granted indefinitely, or at least for a much longer period than the currently envisaged transition period.

e.

It is not known whether there are suitable alternatives at the present time or will be in the near future

f.

We do not know the alternatives and therefore cannot assess whether the alternatives are technically or economically feasible.

g.

Hydraulic and pneumatic equipment used in industrial automation components and equipment is expected to become a EUR 1.01 billion industry in The European Union in 2022, growing to EUR 3.04 billion by 2030.

All companies producing industrial automation components and equipment will be affected by this restriction. We estimate that there are approximately 271,259 companies in the European Union. In addition, the industry has more than 881,079 customers worldwide.

For the machinery manufacturing for industrial automation businesses, this means that machinery cannot be manufactured and sold for supply in the European Union. However, they may be sold outside the European Union to other countries if production facilities may be relocated in the future to replace facilities within the European Union.

As mentioned above, unless there is an exemption for replacement parts, including PFAS, production facilities within the European Union must cease operations and be supplied from production facilities outside the European Union.

The economic impact could be devastating, as all relevant economic activity and jobs would be lost from The European Union to the benefit of the non-European Union countries to which they are relocated.

However, if transfers are properly managed and planned, customers within The European Union should not notice the impact. Indeed, certain countries outside The European Union may benefit from lower prices due to lower labour costs.

7:

Potential derogations marked for reconsideration – Analysis of alternatives and socio-economic analysis: Paragraphs 5 and 6 of the proposed restriction entry text (see table starting on page 4 of the summary of the Annex XV restriction report) include several potential derogations for reconsideration after the consultation (in [square brackets]). These are uses of PFAS where the evidence underlying the assessment of the substitution potential was weak. The substitution potential is determined on the basis of i) whether technically and economically feasible alternatives have already been identified or alternative-based products are available on the market at the assumed entry into force of the proposed restriction, ii) whether known alternatives can be implemented before the transition period ends (taking into account time requirements for substitution and certification or regulatory approval), and iii) whether known alternatives are available in sufficient quantities on the market at the assumed entry into force to allow affected companies to substitute.

A summary of the available evidence as well as the key aspects based on which a derogation is potentially warranted are presented in Table 8 in the Annex XV restriction report, with further details being provided in the respective sections in Annex E.

To strengthen the justifications for a derogation for these uses, additional specific information is requested on alternatives and socio-economic impacts covering the elements described in points a) to g) in question 6 above.

* Compulsory Fields

- ☐ I have information on this topic
- ☒ I don't have information on this topic

8:

Other identified uses – Analysis of alternatives and socio-economic analysis: Table 8 in the Annex XV restriction report provides a summary of the identified sectors and (sub-)uses of PFAS, their alternatives and the costs expected from a ban of PFAS. More details on the available evidence are provided in the respective sections in Annex E.

For many of the (sub-)uses, the information on alternatives and socio-economic impacts was generic and mainly qualitative. In particular, evidence on alternatives was inconclusive for some applications falling under the following (sub-)uses: technical textiles, electronics, the energy sector, PTFE thread sealing tape, non-polymeric PFAS processing aids for production of acrylic foam tape, window film manufacturing, and lubricants not used under harsh conditions.

More information is needed on alternatives and socio-economic impacts to conclude on substitution potential, proportionality, and the need for specific time-limited derogations. Therefore, specific information (if not already included in the Annex XV restriction report or covered in the questions above) is requested on alternatives and socio-economic impacts covering the elements listed in points a) to g) in question 6 above.

* Compulsory Fields

- ☐ I have information on this topic
- ☒ I don't have information on this topic

9:

Degradation potential of specific PFAS sub-groups: A few specific PFAS sub-groups are excluded from the scope of the restriction proposal because of a combination of key structural elements for which it can be expected that they will ultimately mineralize in the environment. RAC would appreciate to receive any further information that may be available regarding the potential degradation pathways, kinetics or produced metabolites in relevant environmental conditions and compartments for trifluoromethoxy, trifluoromethylamino- and difluoromethanedioxy-derivatives.

* Compulsory Fields

- ☐ I have information on this topic
- ☒ I don't have information on this topic

10:

Analytical methods: Annex E of the Annex XV restriction report contains an assessment of the availability of analytical methods for PFAS. Analytical methods are rapidly evolving. Please provide any new or additional information on new developments in analytics not yet considered in the Annex XV restriction report.

* Compulsory Fields

- ☐ I have information on this topic
- ☒ I don't have information on this topic

SECTION IV. Non-confidential attachment

If needed, attach additional non-confidential information (data available in excel format, reports, etc.) below. Do not attach the same information already provided in section III here. If part of the information is confidential, please use section V to share it

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