JRAIA

31st August, 2023

Second Submission of JRAIA's Comments on the Proposed Restriction of PFAS

The Japan Refrigeration and Air Conditioning Industry Association (JRAIA) representing manufacturers of refrigeration and air conditioning equipment in Japan, and its member companies are committed to maintaining and improving living standards by providing environmentally sustainable refrigeration and air conditioning products/services for human comfort and industrial processes.

As major downstream users of fluoropolymers and F-gases (HFCs / HFOs) in refrigeration, air-conditioners and heat pumps, JRAIA welcomes this opportunity to submit feedback regarding the ECHA's consultation on the PFAS restriction proposal prepared by five Member States. Following the submission of JRAIA's comments dated 25th May, 2023 (see attachment A), we would like to submit additional comments supported by data and evidence. We would appreciate it if ECHA can consider our opinion during the consultation.

Summary of JRAIA's position is as follows:

Refrigeration, Air Conditioning and Heat Pump (RACHP) products play an essential role in ensuring not only the safety, security and health of users in extreme climate conditions, but also maintaining food sustainability, while also supporting the Fit for 55 and REPowerEU policies for reducing CO_2 emissions and achieving carbon neutrality. In RACHP products, PFAS is an essential material used in various applications such as refrigerants (F-gas applications), electrical and electronic components (electronics applications), surface coatings, metal plating (plating applications, etc.), as well as in functional components such as refrigerant/water circuit components and structural materials used in the chassis (other applications). Therefore, we would like to strongly request an exemption from the restrictions on the use of PFAS for socially necessary RACHP products.

As mentioned in our comments dated 25th May (reference no.4292), we have explained that substantial time is required to survey and determine the presence or absence of over 10,000 chemical substances that fall under the definition of PFAS in RACHP products including materials, parts, and final products.

JRAIA's member companies have initiated a survey regarding the use of PFAS and possible alternative options. This process began with us, the manufacturers responsible for the final products as downstream users of components and was simultaneously extended to the midstream component manufacturers. Furthermore, the survey has been extended from the midstream component manufacturers to the upstream material suppliers. It takes a significant amount of time to analyze the findings for the entire supply chain of RACHP products.

In this paper, we would like to offer supplementary comments and evidence concerning the refrigerants, refrigerant circuit parts, and water circuit parts that have undergone investigation up to this point.

For other materials and components used in electrical and electronics equipment (EEE), JRAIA supports the views of Japan 4EE comments submitted by JEITA (reference no.4543).

About JRAIA

The Japan Refrigeration and Air Conditioning Industry Association (JRAIA) was originally established in February 1949 as the Japan Refrigerating Machine Manufacturers Association which was thereafter reorganized in February 1969 to become an incorporated association and renamed as it is at present.
JRAIA is the industry association representing over 160 manufacturers of refrigeration and air conditioning equipment in Japan. We, the members of JRAIA, have so far been dedicated to offering quality products to the markets of EU. JRAIA aims to promote and improve production, distribution and consumption of refrigeration and air conditioning equipment and their applied products, as well as auxiliary devices and components, automatic controls and accessories and thereby contribute to the steady development of Japanese industry and the improvement in people's standard of living.

For more information, please see JRAIA's website: www.jraia.or.jp
Email: [redacted]@jraia.or.jp
EU Transparency Register: 857375848714-69

JRAIA

【Refrigerants】

Refrigerants (F-gases) are indispensable components for RACHP products which play an essential role in ensuring not only the safety, security and health of users, while also supporting the EU policies including the Fit for 55 and REPowerEU for reducing CO_2 emissions and achieving carbon neutrality by 2050. In particular, Refrigeration is essential for food sustainability, Air Conditioning is vitally important for the health of users in extreme climate (global overheating!) conditions, and Heat Pumps are critical to accomplishing the EU policies.

JRAIA also agrees the views of the Conference of Fluoro-Chemical Product Japan (FCJ) 's position paper (reference no.4149, page 9):

> *Fluorinated gas is a highly safe compound in terms of toxicity and combustibility, and it is used in many applications in terms of efficiency and cost. In addition, fluorinated gas itself is not persistent in the persistent properties proposed in the PFAS restriction proposal. In addition, trifluoroacetic acid, which is a degradable product of fluorinated gas itself and is a concern in the proposed restriction, has also been shown to pose a low risk of toxicity to living organisms and human bodies in the reports of the Environment Agency of Germany and Norway, who actually submitted this restriction proposal[3,4]. These results indicate that fluorinated gas should not be considered for regulation as a group with PFOA and PFOS.*
>
> *3: German Environment Agency, Reducing chemical input into water bodies – trifluoroacetate (TFA) as a persistent and mobile substance from many sources, 2021*
>
> *4: Norwegian Environment Agency, Study on environmental and health effects of HFO refrigerants, 2017*

Considering the lack of established toxicity evaluation for TFA, a degradation product of F-gases, the proposition to prohibit the use of F-gas, an essential product for people's lives, solely based on the assumption of available alternatives, is deemed unreasonable.

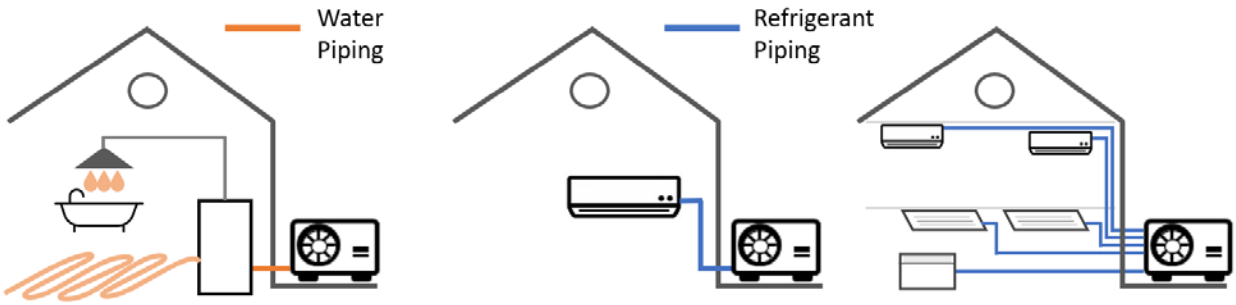
F-gases are already regulated by the F-gas Regulation (EU) No517/2014 for phase down, market bans dependent on Global Warming Potential (GWP) value of refrigerants used in RACHP products, as well as the provisions to prevent leakage and disposal requirements. Moreover, F-gas Regulation is currently under review for further restriction. Therefore, we strongly believe that there is no need for double regulation by REACH.

(i) Air Conditioners (ACs) and Heat Pumps(HPs)

In the Annex XV report, Hydrocarbons(HCs) are proposed as an alternative refrigerant for residential and commercial ACs, CO_2 and cascade system of CO_2/ammonia for commercial ACs, and ammonia for industrial application.

However, as JRAIA has pointed out in our previous position paper, not all refrigerants can be easily replaced, and the "S+3Es" concept (which is considering not only Safety, but also Environmental performance, Energy efficiency and Economic feasibility) is crucial for successful transition to alternative refrigerants.

Air Conditioners and Heat Pumps can be categorized into two main product types; direct expansion system (or direct system) and indirect expansion system (or indirect system). Direct system can be sub-categorized to Single-split and Multi-split. Diverse types of ACs and HPs are provided to the EU market to cater to specific building requirements, making it impractical to uniformly implement alternatives.



Indirect system　　Direct system (Single-split)　　Direct system (Mult-split)

JRAIA

Next, we would like to focus on one of the HC alternatives; R290 (Propane)

R290, classified as flammability class 3 (Highest flammability) in ISO 817: 2014, has limitation in maximum charge amount in the system. The maximum charge amount of R290 is up to approx. 1kg as specified in EN 60335-2-40. In order to attain heating/cooling capacities and system efficiencies equivalent to the current (efficiency class A) single-split ACs and HPs using HFC refrigerants, the maximum capacity that can be achieved with R290 is up to 6kW for the direct system, and up to 12kW for the indirect system.

In cases where safety measures such as an installation of mechanical ventilation and/or a limit of human access to the installation area can be implemented, charge amount of up to approx. 5kg of R290 are permitted according to the EN standard. However, this does not imply that substitution by R290 can fulfill the requirements of the EN standard for all installation cases in the market.

Moreover, even if the product can be developed in compliance with the safety standards, installing R290-based products in densely populated residential zones within urban areas or apartment complexes, which house approximately 65% of the EU population (source: Eurostat, 2019), might not be viable according to the installation guideline published by Germany's Bundesverband Wärmepumpe e.V. (BWP) (for further detail, see URL below). In other words, in the absence of the ability to implement supplementary safety measures and/or limitations on human access, the product cannot be considered as a genuine substitute for the incumbents if it cannot be effectively installed.
BWP installation guideline:
https://www.waermepumpe.de/fileadmin/user_upload/waermepumpe/08_Sonstige/Filedump/BWP_LF_Kaeltemittel_WEB.pdf

This implies that direct systems over 6kW with advantages including high efficiency and easy installation (i.e., low installation cost) have to be replaced by indirect systems, which means that they can no longer exist in the EU market.

Furthermore, we would like to focus on our claim regarding the limitations of R290 explained earlier; "*to attain heating/cooling capacities and system efficiencies equivalent to the current (efficiency class A) single-split ACs and HPs using HFC refrigerants, the maximum capacity that can be achieved with R290 is up to 6kW for direct systems, and up to 12kW for indirect systems.*"

Direct systems have higher efficiency compared to indirect systems, as the direct system can transfer the heat from refrigerant to indoor air through a single heat exchanger (evaporator), whereas the indirect system requires two heat exchangers of refrigerant to water/brine (evaporator) and water/brine to indoor air (emitter).

Taking into account of efficiency loss on heat exchangers and power consumption of water pump for indirect system, the efficiency of direct system is approx. 30% higher in cooling, and 20% higher in heating using high temperature emitters or 10% higher using low temperature emitters.

Next, we would like to point out how this transition to indirect system will impact EU's electricity consumption and CO_2 emission.

According to JRAIA's world air conditioner demand survey (for further detail, see URL below; page 5-6), the number of sales of direct system in 2021 in the EU is 5.18 million units for residential ACs and 0.56 million units for commercial ACs, a total of 5.74 million units.
https: //www.jraia.or.jp/english/statistics/file/World_AC_Demand.pdf

ACs with rated capacity below 12kW are generally classified as residential ACs. According to the Final version of "Task 2 report of Review of Regulation 206/2012 and 626/2011, Air conditioners and comfort fans" (page 17, Fig.7) published in May 2018 for studies of Ecodesign ENER-Lot 10, residential ACs over 6kW account for 20% of all residential ACs (with rated capacity below 12kW). If we assume product life as 10 years, the EU's market stock of residential ACs over 6kW is approx.10.36 million units. This estimate is based on current demand without taking into account the market growth.

The variations in the rated capacity of residential ACs differs by each manufacturer, but 7.1kW can be considered as a representative model for rated capacities above 6kW.

If 7.1kW direct system is replaced by indirect system, power consumption per unit will increase 30% in cooling and 20% in heating, respectively, resulting approx. 630 kWh/year increase annually (heating and

JRAIA

cooling total). In the case assuming 7.1kW model represents all residential direct system over 6kW, which is equivalent to a smaller estimate, the annual power consumption of market stock (10.36 million units) will increase 6.5TWh/year.

In 2021, as EU's CO_2 emission intensity (for further detail, see URL below) was 0.238 kg-CO2e/kWh, the above case means additional 1.5 Mton-CO_2e/year increase in annual CO_2 emission.

We should also take in account that the above assumption excludes direct system of 12kW above categorized as commercial ACs, of which annual market size is 560,000 units. Estimated EU market stock of the commercial ACs will be 5.6 million units if the product life is the same as residential ACs although commercial ACs should have longer product life, which also is equivalent to a smaller estimate. It is easy to assume that these figures will be several times over the estimate of the increase of power consumption and CO_2 emission.

https: //www.eea.europa.eu/ims/greenhouse-gas-emission-intensity-of-1]

In addition, installation cost of indirect system will be few thousand to ten thousand US dollars higher compared to direct system (for further detail, see URL below, page 87, comparison of air-to-air heat pumps and air-to-water heat pumps). The lower installation cost is one of the reasons why direct system is favoured by the market.

https: //iea.blob.core.windows.net/assets/4713780d-c0ae-4686-8c9b-29e782452695/TheFutureofHeatPumps.pdf

An efficient and cost-effective direct system is imperative to align with EU policy objectives and fulfill customer requirements. If the transition to an indirect system becomes unavoidable due to PFAS regulation, it will result in higher electricity consumption and, consequently, CO_2 emission increase. This outcome contradicts the principles of the EU's environmental policies. We would like to emphasize that proposed HC alternative (R290) has limitation to its application.

CO_2 and ammonia proposed as alternatives for commercial and industrial use ACs, also have limitations in their applications. CO_2 efficiency is significantly lower due to high pressure refrigerant operating in supercritical condition, and ammonia has safety concerns due to its toxicity level categorized as "B2L" in ISO 817: 2014.

Therefore, JRAIA requests that all refrigerants (F-gases) for Air Conditioners and Heat Pumps to be exempted from the proposed restriction of PFAS.

(ii) Refrigeration

The Annex XV report states that there are technically and economically feasible alternatives for residential refrigeration, and natural refrigerants including HC, CO_2 and ammonia as alternatives for commercial and industrial refrigeration.

As we have pointed out earlier in the case of air-conditioning, refrigeration should take various factors including application, capacity, temperature range, and above all "S+3Es" concept (which is considering not only Safety, but also Environmental performance, Energy efficiency and Economic feasibility), and proposed alternative refrigerant has limitation to its application.

Therefore, JRAIA requests that all refrigerants (F-gases) for refrigeration product to be exempted from the proposed PFAS restrictions.

(iii) Other systems

The Annex XV report proposes two applications for ACs and refrigeration. However, heat pump technology (vapor compression refrigeration cycle) is considered to take a crucial role as substitutes for boilers, including water heaters and process heating applications.

Therefore, JRAIA requests that all refrigerants (F-gases) for these applications be exempted from the proposed PFAS restrictions.

JRAIA

【Parts in refrigerant circuit and water circuit】

As emphasized in the earlier chapter, RACHP products play an essential role in ensuring the safety, security and health of users. RACHP products consist of a refrigerant circuit and/or a water circuit, the former consisting of various parts such as compressors and valves, and the latter consisting of various parts such as pumps and valves. All parts are essential components of RACHP products.

Each part has extensive performance requirements including flame resistance, heat resistance, oil resistance, chemical resistance, electrical insulation, lubricity, slide properties (friction coefficient ratio), robustness, and sealing property.

In order to achieve the product life duration expected by end users, PFAS material is selected and widely used in various parts, and as of today, there are no alternatives that fulfil its extensive performance requirements.

JRAIA agrees with the views of FCJ (reference no.4149, page 1):

> *The proposed restriction lists persistent chemicals (which may remain in the environment longer than any other man-made chemical), bioconcentration, mobility, the possibility of long-distance transport, accumulation in plants, the possibility of global warming, and toxicological effects as concerns and reasons for the restriction. Of these, persistent is applicable to all targeted organofluorine compounds (PFAS), but other concerns are related to some compounds.*

To ban the use of PFAS products assuming that there may be alternatives is totally unacceptable without substantial evaluation of each PFAS material such as bioconcentration, mobility, the possibility of long-distance transport, accumulation in plants, the possibility of global warming, and toxicological effects and the restriction proposal.

JRAIA requests that all parts used in refrigerant circuits including compressors and in water circuits for RACHP products be exempted from the proposed PFAS restrictions.

Next, we will explain the function and PFAS used in each component:

- **Compressor:**
  Functions as a pump in a refrigerant circuit, and consists of gas compression mechanism and electric motor. The compression mechanism uses PFAS (e.g., PTFE/FEP etc.) in sliding parts material and sealing material. The electric motor uses PFAS (e.g., PTFE etc.) in insulating material.
- **Refrigerant circuit (excluding compressor)**:
  Consists of refrigerant switching channel, valves to adjust circulation volume (four-way valves, expansion valves, alternate valves, shut-off valves). PFAS (e.g., PTFE/FEP/FKM etc.) is used in valves as a sealing material of refrigerant circuit.
- **Water circuit:**
  PFAS (e.g., FKM, PTFE etc.) is used in sealing material of hot water/brine (with anti-freezing agent). In addition, PFAS (fluorine oil) is used in the water pressure sensors as an anti-corrosive agent.

(i) Sliding parts

The representative example of sliding parts is the bearings used in a compressor. The slide bearings have a bimetallic structure in which sintered metal and resin are joined to a metal backing, and PTFE is used for the resin layer. PTFE's maximum operating temperature is 280℃, requires heat resistance, thus resin materials are essential in sliding parts.

Table E.113 of ECHA's "Annex to the Annex XV Restriction Report Proposal for Restriction Annex E Impact Assessment" lists PA, PBT, PP, Silicone as non-PFAS alternatives for lubricant free bearings in relation to transportation products and supplies, but contradictorily concludes that these alternatives are not potential substitutes. JRAIA also believes that these proposed non-PFAS alternatives cannot substitute as sliding parts material for compressors.

On the other hand, in addition to the current PTFE, resin materials such as PEEK and PAI are suggested as alternatives for the bearings. Although PEEK and PAI's maximum operating temperature that defines heat resistance performance is equivalent to that of PTFE, the friction coefficient ratio that defines slide properties is 3 to 5 times larger than PTFE. PEEK and PAI cannot fulfill the requirement for sliding parts

JRAIA

material, and are thus inappropriate as substitutes for PTFE (see Table A).

Table A. Comparison of performance of materials used in sliding parts

Material	PTFE	PEEK	PAI
Maximum operating temperature [℃]	280	290	260
Friction coefficient ratio [%] (relative to PTFE)	100	330	500

For the transition to alternatives, production technologies for creating resin layers ranging from tens to hundreds of micrometers in thickness on the top surface of sintered metal are necessary. Even if alternatives with appropriate characteristics for sliding components have been identified, their practical implementation in actual parts and products, such as bearings, has not yet been technically established.

Therefore, from the point of heat resistance, slide properties (friction coefficient ratio), mass productivity (production technologies), there are no alternatives available for sliding parts material of compressor, and further consideration is not possible.

Therefore, JRAIA requests that sliding parts materials be exempted from the proposed PFAS restrictions.

(ii) Insulating material

The electric motor in the compressor uses PFAS as an essential insulating material for coating of lead wires and sleeves. The lead wires and sleeves are used in the limited space within the compressor vessel, and require soft and moldable properties that can be molded as a tube shape.

These materials require electrical insulating properties, low dielectric properties, and moldability, in addition to oil resistance and chemical resistance in the over 150℃ temperature to prevent refrigerants and refrigeration oil from contamination within the refrigerant circuit of the compressor. These properties can only be achieved by stability of PFAS.

If these criteria for the material properties are not fulfilled, it can lead to compressor failure, rendering the RACHP products inoperable.

PVC, PE, EPDM are proposed as non-PFAS alternatives, but none of these can withstand temperatures up to 150℃ which is required for real-life use of RACHP products. Another non-PFAS alternative silicon rubber can does have sufficient heat resistance, but it does not fulfil the criteria for chemical resistance and oil resistance. Furthermore, PEEK is considered to be a possible insulating material, but further research and development will be required before it can be used in commercial products.

The PFAS used in the insulating material exhibits several outstanding properties including high oil resistance and chemical resistance, preventing refrigerants and lubricant oils from contamination. Any newly developed alternative materials should possess equivalent stability as current PFAS.

As of today, various studies are needed to consider PFAS alternatives to be used in the insulating materials of compressor, and we believe that there are no appropriate alternatives to replace PFAS.

Therefore, JRAIA requests that all insulating materials be exempted from the proposed PFAS restrictions.

Supplement on the temperature and stability (chemical and oil resistance) requirements in the compressor:

- In the compressor, during the compression process, the refrigerant on the low-pressure side is adiabatically compressed, becoming high-pressure and high-temperature gas which is then discharged into the high-pressure section in the compressor vessel. The discharged gas temperature varies based on the operating condition of RACHP products.
- The gas temperature reaches to 150℃ under operating condition of the real-life use of RACHP products. Also, refrigerant and refrigerant oil for lubrication are contained in the vessel, therefore compatibility and resistance properties of the parts and materials under those conditions are essential.

JRAIA

(iii) Sealing material in refrigerant circuit

The parts of compressor and valves use PFAS (e.g., PTFE, FEP etc.) as sealing material.

Essential property of sealing material is to retain sealing property to shut off high-pressure part and low-pressure part within the refrigerant circuit. Sealing material prevent leakage of refrigerant from high-pressure part to low-pressure part. In addition, piston seals of four-way valve (see Diagram A-1) act as sliding parts of the valve to reverse the refrigerant flow when switching the operation mode from cooling to heating and vice versa.

Some of the examples of parts of compressor are; diaphragm, seal-ring, disk., and some of the examples of parts of four-way valve are piston seal, slipper (see Diagram A-2).

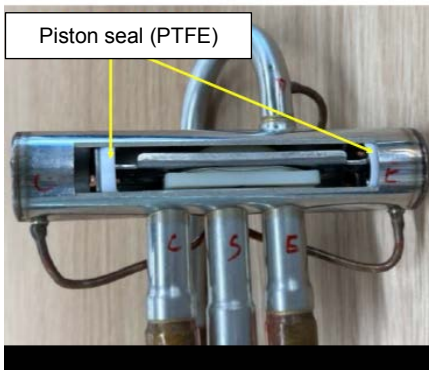


Diagram A-1. Piston seal of four-way valve

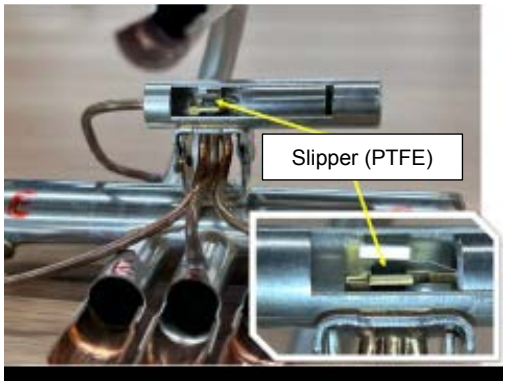


Diagram A-2. Four-way valve slipper

The compressor parts require a sealing property as well as heat resistance, oil resistance, and flexibility. The heat resistance property is essential as the temperature requirement is -20 ℃ to 150 ℃ for compressor, and -30 ℃ to 120 ℃ for four-way valves. In addition, oil resistance (chemical resistance) to prevent contamination and imbibition of various refrigerants (R410A, R32, R290 etc.) and refrigerant oils (e.g., mineral oil, ether oil and ester oil).

If these criteria for the sealing properties are not fulfilled, it will result in considerable degradation of product life and low energy performance which will lead to the increase in CO_2 emissions.

Table E.114(P351) of ECHA's "Annex to the ANNEX XV Restriction Report Proposal for a Restriction Annex E Impact Assessment" states alternatives for sealing applications in transportation vehicles:

> *Non-fluorinated polymers (e.g., nitrile butadiene rubber (NBR or HNBR), acrylate rubber (ACM or AEM), silicone rubber, mechanical seals (ceramics), Tribo-modified Polyurethane, NBR or neoprene rubber (CR)*

JRAIA

Next, we will explain the possibility of non-PFAS alternatives.

Table B shows the comparison of the properties of sealing materials including PTFE and its non-PFAS alternatives. Both PTFE and non-PFAS fulfill the requirement level for sealing property of parts used in the refrigerant circuit.

Table B. Comparison of the properties of sealing materials

Properties		PTFE	NBR	HNBR	ACM	AEM	CR	silicone rubber	polyurethane
sealing property	Remark	G	G	G	G	G	G	G	G
heat resistance		-200～+260℃	-40～+110℃	-35～+140℃	-30～+160℃	-40～+175℃	-40～+120℃	-70～+200℃	-40～+80℃
	Remark	G	N	N	N	G	N	G	N
oil resistance	refrigeration oil (mineral oil)	G	G	G	G	N	N	N	G
	refrigeration oil (ester oil)	G	N	N	N	N	N	N	N
	Remark	G	N	N	N	N	N	N	N
acid resistance	sulfuric acid	G	G	G	N	G	G	G	N
	hydrochloric acid	G	N	N	N	G	N	N	N
	nitric acid	G	N	N	N	G	N	N	N
	Remark	G	N	N	N	N	N	N	N
slide properties	Remark	G	N	N	N	N	N	N	N
Total Remark		G	N	N	N	N	N	N	N

Remark G=Good、F=Fair、N=Not recommended

For heat resistance property, some of NBR, HNBR, ACM, AEM, CR, and polyurethane can be used in the temperature of over 150℃, but there are very low margins for the condition. Thus, those sealing materials cannot be practically used for parts used in refrigerant circuit.

For oil resistance (resistance to lubricant oil in refrigerant circuit) property, AEM and silicone that have heat resistance, cannot meet the requirement level for oil resistance. As a result, these materials are not appropriate for PTFE alternatives.

The PFAS used in the sealing material and insulating material exhibits several outstanding properties including high oil resistance and chemical resistance, preventing refrigerants and refrigerant oils from contamination. Any newly developed alternative materials should possess equivalent stability as current PFAS.

As of today, various studies are needed to consider PFAS alternatives to be used in the sealing material of refrigerant circuit parts, and we believe that there are no appropriate alternatives to replace PFAS.

Therefore, JRAIA requests that all sealing material (for refrigerant circuit) to be exempted from the proposed PFAS restrictions.

(iv) Sealing material in water circuit

Due to the increase of fossil fuel prices and to accomplish carbon neutrality target of the EU, the transition of space heater and water heater that uses fossil fuel to air-to-water(ATW) heat pump that uses electricity is underway.

In the water circuit, sealing materials (see Diagram B, C) used for hot water of 80℃ and above, use PFAS (e.g. FKM, PTFE etc.).

The function and PFAS used in various parts are as follows:

- **Combined water relief valve:** The diaphragm used in the combined water relief valve is the membrane to activate by pressure, coating heat resistance rubber on both side of the foundation to maintain flexibility as well as hermetic sealing. Used as the pressure regulating valve to control diaphragm during positive and negative pressure.
- **Check valve:** Used in the backflow prevention valve to open during positive pressure and shut off during negative pressure. Sealing property is essential to retain heat resistance and elastic property.
- **Over-pressure relief valve:** Used in the valve body to release excessive pressure of the piping to outside of the product. Sealing property is essential to retain heat resistance and elastic property.
- **Connecting parts of water circuit:** Used as the seal to prevent leakage of hot water/brine (with anti-freezing agent) from water circuit.

JRAIA

- **Ball valve:** Used as a seal to prevent leakage of hot water/brine from the valve.

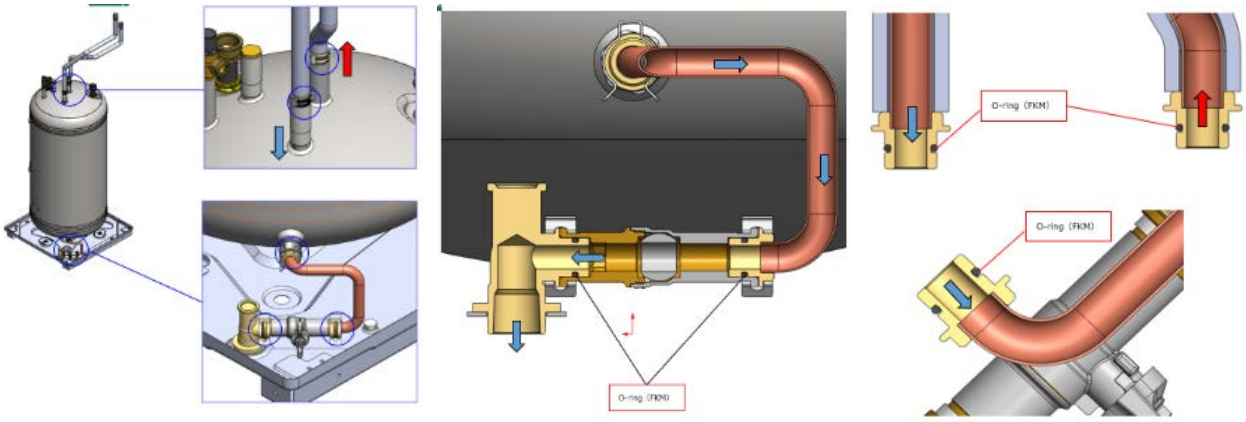


Diagram B. Example of water seal in water circuit connection parts

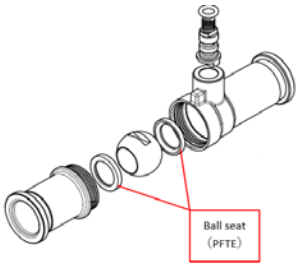


Diagram C. Example of seal in ball valve

These materials require chemical resistance(chlorine resistance) to prevent corrosion during use of high temperature water of 80 ℃ and above, heat resistance in extreme temperature conditions, and long material life to maintain durability.

If these criteria for the sealing materials are not fulfilled, it will cause contamination and imbibition of each material due to chlorine of the tap water, locking the ball valve and short-term water leakage. As a result, the product will be inoperable, degrading the product life time and/or damaging property by leakage of water/brine.

Next, we will explain the possibility of non-PFAS alternatives.

non-PFAS materials including nitrile butadiene rubber (NBR), vinyl methyl silicone rubber (VMQ) lack chemical resistance (chlorine resistance), cause corrosion due to chlorine of the tap water. On the other hand, EPDM lacks durability in hot water of 80 ℃ condition, and cannot maintain appropriate sealing property.

As of today, FKM and PTFE are the only options that fulfils the above criteria of various properties, while maintaining long-term stability.

Any newly developed alternative materials should fulfil criteria of the various properties mentioned above. As of today, various studies are needed to consider PFAS alternatives to be used in the sealing material of water circuit parts, and we believe that there are no appropriate alternatives to replace PFAS.

Therefore, JRAIA requests that all sealing materials (for water circuit) to be exempted from the proposed PFAS restrictions.

JRAIA

(v) Anti-corrosive / protecting material

Sensors and electric devices used in the water circuit use PFAS (fluorine oil, fluorine-based coating agents). Anti-corrosive material is used to prevent corrosion by hot water/brine (anti-freezing agent) in pressure sensor (Silicone-based, see Diagram D). Protecting material is used to prevent moisture absorption of electric circuit board equipped with water circuit parts.

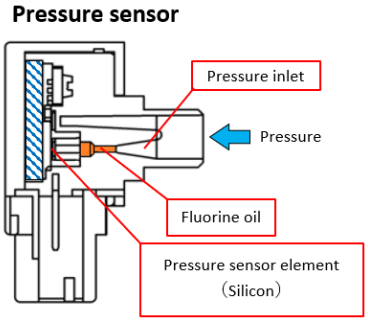


Diagram D. Example of pressure sensor

Chemical resistance (chlorine resistance) and heat resistance are essential properties for these materials to prevent corrosion of the structure by hot water/brine.

If these criteria for these properties are not fulfilled, it will result in substantial degradation of anti-corrosive property due to hot water/brine. As a result, corrosion of various parts in pressure sensor and electric circuit board will be inoperable, and degrade product life time.

Other non-PFAS alternatives, mineral oil, synthetic hydrocarbon oils lack chemical resistance and heat resistance for hot water/brine of over 80℃.

As of today, fluorine oil and fluorine-based coating materials are the only options that fulfil the above criteria of various properties, while maintaining long-term stability.

Therefore, JRAIA requests that all anti-corrosive protecting agents to be exempted from the proposed PFAS restrictions.

【Attachment A】

JRAIA

25th May, 2023

JRAIA's comments on the Proposed Restriction of PFAS

The Japan Refrigeration and Air Conditioning Industry Association (JRAIA) representing manufacturers of refrigeration and air conditioning equipment in Japan, and its member companies are committed to maintaining and improving living standards by providing environmentally sustainable refrigeration and air conditioning products/services for human comfort and industrial processes.

As major downstream users of fluoropolymers and F-gases (HFCs / HFOs) in refrigeration, air-conditioners and heat pumps, JRAIA welcomes this opportunity to submit feedback regarding the ECHA's consultation on the PFAS restriction proposal prepared by five Member States. We would appreciate it if you can consider our opinion during the ECHA's consultation.

Refrigeration, Air Conditioning and Heat Pump (RACHP) products play an essential role in ensuring not only the safety, security and health of users in extreme climate conditions, but also maintaining food sustainability, while also supporting the Fit for 55 and REPowerEU policies for reducing CO_2 emissions and achieving carbon neutrality.

Therefore, we would like to request an exemption from the restrictions on the use of PFAS for socially necessary RACHP products. In addition, we also kindly request to take into consideration the extensive research time required to trace back the components and materials used in RACHP products. We urge you to carefully consider the legislation regarding this matter.

In RACHP products, PFAS is an essential material used in various applications such as refrigerants (F-gas applications), electrical and electronic components (electronics applications), surface coatings, metal plating (plating applications, etc.), as well as in functional components such as refrigerant circuit components and structural materials that make up the chassis (other applications).

The unique properties※1 of PFAS make them a popular choice in RACHP products, where they provide the necessary durability that consumers demand. In summary, materials using PFAS are vital in RACHP products that are essential to people's everyday lives. Thus, an exemption for RACHP products is necessary to ensure their continued use.

Regarding the disposal of electrical and electronic products including RACHP products, the WEEE Directive enforces the collection and disposal of these products, as well as the provision of information to recycling facilities, specifically problematic components. We kindly ask Member States to enhance guidance on the proper operation of recycling facilities.

In addition, when considering the circular economy and efficient use of resources, use of all maintenance related items required for product maintenance and repair should be permitted with no expiration date.

JRAIA intends to submit additional comments and evidence. However, the number of chemical substances that fall under the definition of PFAS is enormous. We are currently conducting surveys with our suppliers to determine the presence or absence of these substances and their applications in each part. This process requires time to investigate the possibility of substitution and to evaluate their applications. It is imperative to conduct investigations that cover not only risk assessment and socioeconomic impact of substances but also span from upstream to downstream, starting from materials, components, and final products, which make up the final RACHP product. We recommend including the time frame for such a study in the legislative review process.

Lastly, we would like to bring attention to refrigerants and refrigerant circuit components:

Refrigerants:

Not all refrigerants can be easily replaced, and the "S+3Es" concept (which is considering not only Safety, but also Environmental performance, Energy efficiency and Economic feasibility) is crucial for successful transition to alternative refrigerants. In this context, "environmental performance" refers specifically to a refrigerant's low global warming potential (GWP), which may have a negative impact on the environment.

JRAIA

In addition, we would like to point out the impact on the two types of Air Conditioning and Heat Pump as shown below:

1. **Direct expansion**
   The market favors direct expansion systems due to their high efficiency and ease of installation. However, the use of R290 (Hydrocarbon), a potent refrigerant, in such systems is premature and is not feasible yet. This is mainly due to concerns about product safety, as well as a lack of social systems such as qualification programs for installers and maintenance / repair technicians handling higher flammability refrigerants.

2. **Indirect expansion**
   Among indirect expansion systems, large size equipment charged with large amount of refrigerant such as centrifugal chillers have a safety issue when converting to higher flammability refrigerants such as R290. While the transition of refrigerants in small-capacity centrifugal chillers is making progress, applying R290 to all indirect expansion systems is difficult due to installation restrictions and safety regulations.

Refrigerant Circuit Components:

PFAS materials are used for components that make up the refrigerant circuit of RACHP products, such as compressors, four-way valves and shut-off valves, because they are required to have long-term reliability (durability) as a maintenance-free feature, which is considered essential for the design of hermetic systems. Therefore, transition to alternatives is not easy.

※1 Flame resistance, heat resistance, chemical resistance, electrical insulation, water and oil repellency, weather resistance, dielectric properties, lubricity, sliding properties, sealing properties, etc.

About JRAIA

The Japan Refrigeration and Air Conditioning Industry Association (JRAIA) was originally established in February 1949 as the Japan Refrigerating Machine Manufacturers Association which was thereafter reorganized in February 1969 to become an incorporated association and renamed as it is at present.
JRAIA is the industry association representing over 160 manufacturers of refrigeration and air conditioning equipment in Japan. We, the members of JRAIA, have so far been dedicated to offering quality products to the markets of EU. JRAIA aims to promote and improve production, distribution and consumption of refrigeration and air conditioning equipment and their applied products, as well as auxiliary devices and components, automatic controls and accessories and thereby contribute to the steady development of Japanese industry and the improvement in people's standard of living.

For more information, please see JRAIA's website: www.jraia.or.jp
Email: [redacted]@jraia.or.jp
EU Transparency Register: 857375848714-69