ABB Marine & Ports contribution to the ECHA consultation on PFAS

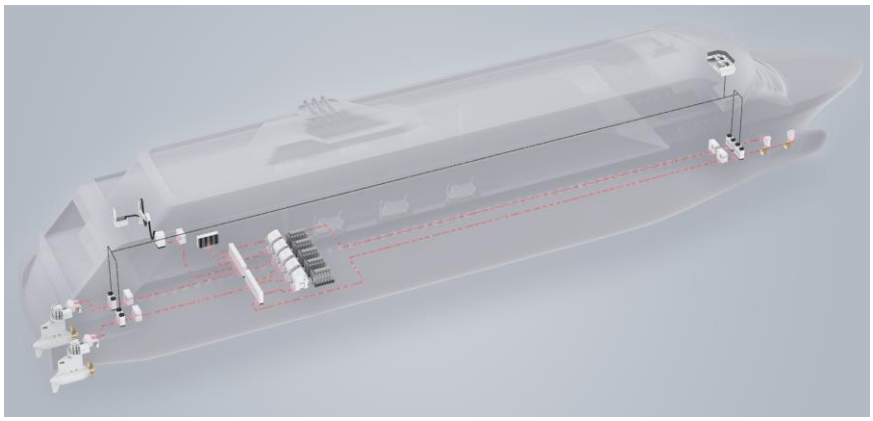
About ABB Marine and Ports (PAMP)

ABB PAMP is a division of the ABB group serving the marine and ports customer segments. ABB PAMP is a market leader in azimuthing propulsion systems and large container crane automation. ABB PAMP operates in 26 countries and has approximately 2,000 employees. ABB PAMP serves the EU, as well as the global market with systems and products produced in the EU. For a wide range of products and systems the engineering centers are located in Europe. Factories of ABB PAMP in Europe are located in Finland and Norway. In addition to the direct jobs at ABB, we are connected to a wide supplier base in the EU, serving ABB with components and material, also linked to many employees. ABB headquarters is located in Switzerland. ABB has in total approximately 105,000 employees.

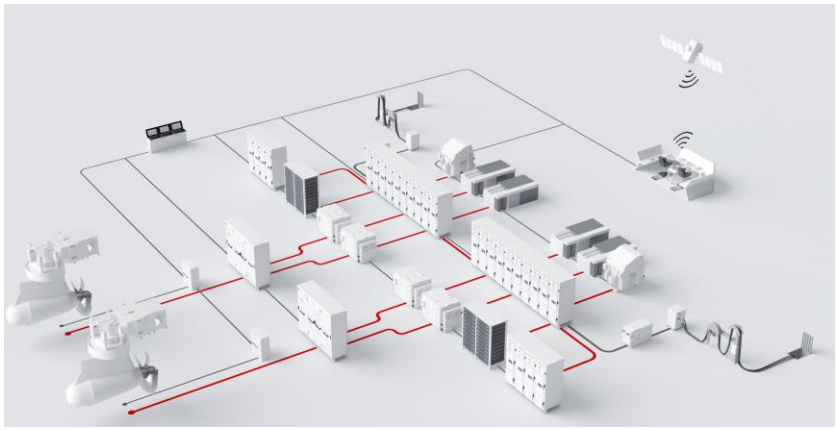
PAMP consist of five Business Lines, each focusing on their own product portfolio:

- **Marine Systems** delivers systems for automation, vessel control, electrical power distribution and propulsion (including diesel electric-, fully electric- and hybrid power systems) for wind turbine installation vessels, cruise vessels, ferries, offshore drilling, offshore supply and support vessels, offshore construction vessels, FPSOs, tankers, LNG carriers, dry and wet bulk carriers, container vessels, and several other vessel types.
- **Coast guard and Navy** delivers same systems as Marine systems specifically for coast guard and navy vessels.
- **Marine Propulsion** delivers propulsion systems in power range 1-25 MW for cruise vessels, high ice class vessels, ferries, research vessels, yachts, wind turbine installation vessels and several other vessel types.
- **Ports** delivers automation and electrical systems for container and bulk cargo handling from ship to gate.
- **Marine Service** & Digital delivers life cycle services for PAMP delivered systems, digital services and decarbonization services (including shore connections, hybrid retrofits, energy efficiency solutions).

Ca. 80% of the world's goods are shipped on sea. ABB PAMP portfolio covers a wide range of products and systems required for sea transport. These products and systems are driving the evolution of sustainable shipping and are paving the way to a zero-emission marine industry, providing greater efficiency and reliability to shipowners, and preparing vessels to meet the demands of tomorrow. Our automation and electrical solutions are making port and terminal operations safer, greener, and more productive.

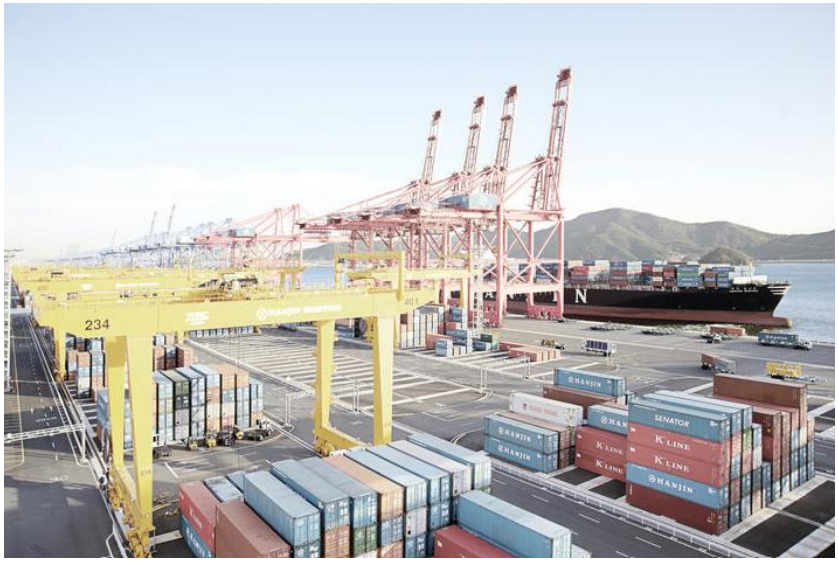


- *Schematic overview of an integrated system on a vessel*

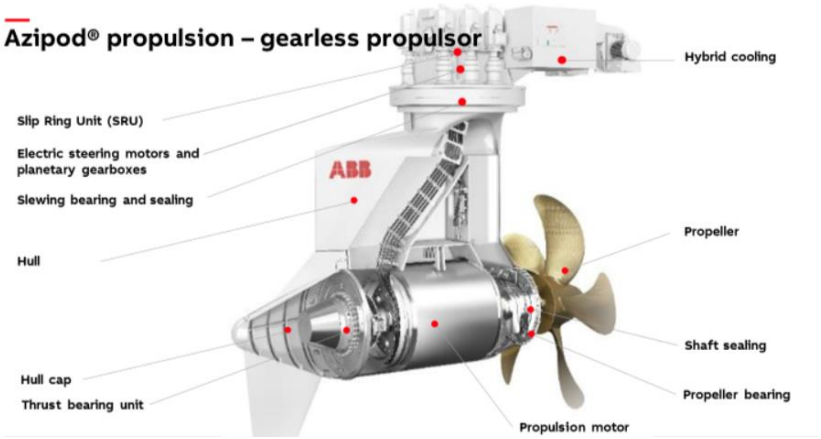


System applications contain:

- *Propulsion*
- *Drives*
- *Transformers*
- *Switchgear*
- *Motor Control Center*
- *Generators*
- *Bridge controls*
- *Shore connection*



- *Loading cranes*
- *Stacking cranes*



- *Overview of Azipod® propulsion*

ABB PAMP integrates products and materials from other ABB units and from external suppliers as a functional system or product. These products include e.g., generators, transformers, switchboards, Uninterruptible power supply (UPS), frequency converters, electric motors, programmable logic controllers (PLCs), breakers, cables, capacitor banks, levers, button panels, control and junction boxes, automation cabinets, sensors, computers, video cameras and battery systems.

The main requirement for the complete product and system portfolio is a high level of quality and reliability . The market expects a lifetime of 25 years with systems operated up to 40 years. Maintenance effort for the customer shall be low. Failure rates of the products and systems are expected to be extremely low as failure could lead to safety risk or environmental hazard risk. Marine products and systems are regulated e.g. by International Convention for the Safety of Life at Sea (SOLAS) and classification society rules. This requires the use of top-quality materials with outstanding performance and reliability. All these requirements are very much supported by PFAS materials or PFAS additives in materials.

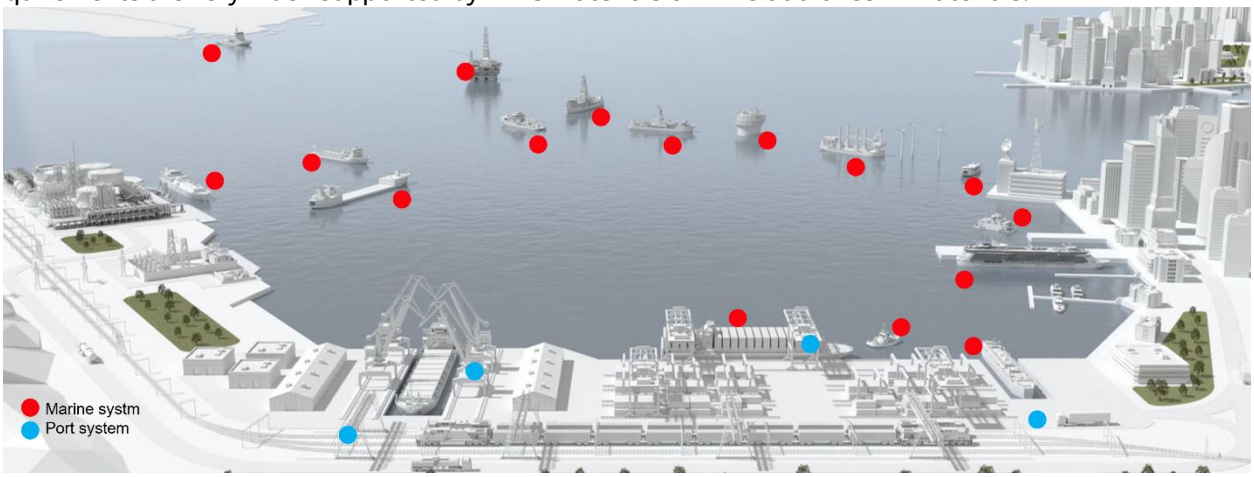


Figure 1: Typical location of ABB PAMP products and systems.

System		Product
Propulsion drives	●	▪ Frequency converters ▪ Electric motors ▪ Interconnection cables ▪ Breaking resistor
Vessel control & automation	●	▪ PLC (800xA, B&R) ▪ Bridge control equipment (levers, button panels) ▪ Sensors ▪ Cabinets (wires) ▪ Interconnection cables
Power plant and distribution	●	▪ Generators ▪ Transformers (dry, liquid, resin) ▪ Switchboards, MCC's ▪ UPS ▪ Battery systems ▪ Fuel cells ▪ Cabinets (wires) ▪ Interconnection cables ▪ Breaking resistor
Propulsion	●	▪ Bearings ▪ Sealings, hoses, pipes ▪ Lubricants, hydraulics ▪ Cabinets (wires) ▪ Interconnection cables ▪ Frequency converters ▪ Electric motors ▪ Breaking resistor
Shore connection	●	▪ Plug system ▪ Cabinets (wires)

		▪ Interconnection cables
Ports electrification	●	▪ Switchboards, MCC's ▪ UPS ▪ Electric motors ▪ Cabinets (wires) ▪ Interconnection cables ▪ Transformers ▪ Frequency converters ▪ Breaking resistor
Ports automation	●	▪ Medium voltage switchgear ▪ Transformers ▪ Frequency converters ▪ Electric motors ▪ PLC (AC500) ▪ Low voltage switchgear ▪ Sensors ▪ Cameras ▪ Cabinets (wires) ▪ Interconnection cables
Gate systems	●	▪ Cameras ▪ Cabinets (wires) ▪ Interconnection cables

Why is ABB contributing to the ECHA consultation on PFAS?

As PFAS are widely used in electrical equipment, with the proposed restrictions for PFAS, including the broad ban of use at very low concentration levels, ABB PAMP will be strongly affected, as all other electrical and automation system integrators. Without a derogation to cover those applications this could result in prohibition of production and sales of large a number of marine and ports systems and products for ABB and other system integrators.

ABB acknowledges the concerns surrounding the high persistence, mobility, bioaccumulation potential, long-distance transport potential, global warming potential, and ecotoxicity of certain PFAS substances and the various environmental and health issues and risks it poses to society. ABB is interested and willing to find a compromise to replace PFAS in a realistic time frame, where it is technically possible, where it is advantageous for human safety, environment, and society. For this we have prepared and uploaded specific contributions, this is one of them.

We ask the ECHA technical experts to review these contributions carefully and consider them in the preparation of the final regulation, especially regarding the exemptions we are asking for. In case of additional questions, required background information or direct request for discussion, please feel free to contact us, using the contact details at the end of this document.

PFAS substances are highly regarded for their technical characteristics of stability under many different operating conditions and environments. The strength of the C-F bond is particularly favourable in terms of resistance to harsh conditions such as temperature cycling, chemical compatibility with highly concentrated chemicals, UV resistance, electrical resistance, and insulation properties only to name a few. Moreover, the majority of applications would require a combination of characteristics that are unique of PFAS substances. There are currently no known alternative substances that would have appropriate characteristics to provide suitable alternatives to the use of PFAS.

Electrical equipment for marine and ports systems and products are highly complex with extreme durability and a long lifetime up to 40 years. To allow this, in combination with appropriate maintenance frequency or even maintenance free design, high grade materials are used. The materials used in electrical equipment are divided in the following groups:

1) Material, that has been selected based on technical parameters. PFAS has not been specified by the equipment manufacturer but might be contained as ingredient of a material mixture based on the definition of the manufacturer of the material.

2) Components or assemblies, which are supplied from 3rd party suppliers, who have designed them on their own. PFAS has not been specified by the equipment manufacturer but might be contained as ingredient of a material mixture or as material based on the definition of the component manufacturer or of the material manufacturer for materials used in the component.

3) PFAS is a contaminant from the production process, e.g., as release agent used in a cast moulding process to allow easy demoulding. Also surface treatment using PFAS or PFAS containing substances can result in such an effect. ABB is not a chemical manufacturer and therefore relies on its supplier to ensure that contamination, where present, is below the permitted limit. Due to the extremely low threshold level of 25 ppb, contamination is hard to control, especially if the manufacturing of parts or components are outside the EU, where no restrictions on PFAS exist.

For 1) it is already more complex, as materials are used in many applications and changes of a material recipe might have impact on the technical parameters. A change in the material manufacturing process might result in the material no longer being appropriate for the application. Then another material must be qualified. Alternatively, the supplier might decide to stop the production of the material. Then a new supplier for a similar, PFAS free material needs to be identified.
At 2) it becomes even more complex and time consuming, as the process is not under control and can barely be influenced by the electrical and automation system integrator (e.g., ABB). The responsibility is on the supplier. An example for this group could be electronic equipment as PLC and UPS requested from our customer to be used from 3rd party. They contain semiconductors or other electronics, where `the industry has announced that it is almost impossible to offer PFAS free solution in short to mid-term.

The identification processes 1) to 3) have one problem in common: The vast majority of the about 10,000 individual substances covered by the restriction proposal are currently not classified as hazardous in accordance with the CLP Regulation (EC) No. 1272/2008 nor identified as substances of very high concern (SVHCs) under REACH Regulation (EC) No 1907/2006. Thus, information on PFAS contained in mixtures and articles is usually not communicated along the supply chain. In addition, the extremely low threshold level of 25 ppb is not only limiting the identification process to intended ingredients, but extends it to contaminants during the production process, which can result in that concentration. Analytical processes to proof prove if an article is PFAS-free will be extremely challenging taking the huge number of related articles into account, especially for polymers. Without a preceding, sufficiently long mandatory information phase based on legal requirements, during which information on PFAS in articles and mixtures had to be communicated in the supply chain, e. g. via safety data sheets or according to REACH Art. 33, it is not possible to determine all PFAS uses.

ABB targets to replace PFAS in products wherever possible by PFAS-free materials. There might be some applications where this is not possible, which will be addressed separately. In all other cases, where a replacement is possible, the complex way of identification, finding a replacement, implementing them in products and systems and finally testing of related products will by far exceed the given transition time of 18 months considering that only the time required for reliable testing of products can be minimum 5 years. As this would not only affect ABB but all system integrators and manufacturers of electrical equipment, due to the limited number of accredited test laboratories, this will create a bottleneck in type testing, which could cause shortage of electrical equipment with huge financial impact and a delay of the green deal.

For this ABB PAMP asks for an extended transition time of additional 13,5 years to complete the transition to PFAS-free solutions. As the investigation along the whole ABB PAMP supply chain is still ongoing, we still see the risk that this might be challenging, especially if the low threshold level is kept and the identification is not limited to intentionally added PFAS. For this the possibility of a further exemption after 13,5 years should be offered, if it is proven that the replacement projects are not completed due to missing alternative solutions.

1. PFAS uses

Due to the complexity of sourcing information from sub-suppliers information related to the presence of restricted substances might be identified very late in the process. The lack of a list of CAS numbers makes it even harder for suppliers to identify PFAS in a timely manner. Identifying all PFAS applications within a global supply chain of 10'000 suppliers and assess possible alternatives will take years. ABB's applications have sophisticated and complex designs with more than 9'000 components in each product. Alternatives cannot be tested until the PFAS, and potential substitutes have been identified. ABB is implementing an internal procedure to request PFAS information from their supplier as part of their internal compliance procedure.

The most common uses of PFAS are as fluoropolymers, mainly as flame-resistant polymers used for cable assemblies and in various types of components, including lubricants, and sealing materials and elastomers. Currently no substitutes are available that have the same performance.

PFAS are used because they provide unique combinations of essential performance, such as flexibility, low coefficient of friction, suitability at high and low temperature, dielectric properties, fire resistance, etc.

PFAS substance liely in use	Application	Technical requirement
PTFE, FKM, FFKM	Sealings, hoses, pipes	Chemical compatibility, temperature resistance.
PTFE	Cables	Flame retardancy, temperature resistance
PTFE	Lubricants	Chemical compatibility, temperature resistance. Flame retardancy, low friction coefficient.

ABB's applications must be able to withstand temperatures of up to 200°C as an embedded safety feature for their applications. Although normal operating conditions might not reach those temperatures, it is part of the design of the system that in case a unit was to fail a manual override enables the captain to be able to continue to operate the system for at least 10 minutes before complete breakdown. To allow for this additional operating time, the components of the system are required to withstand high temperatures. This safety feature is critical to ensure safety of passengers and personnel in case of an unexpected failure.

Contribution 1:
Topic: Electrical systems

ABB's applications of electrification require connection between the engine room, the propulsors and the deck. In some instances, this distance might be as lengthy as 100m between the engine room and the propulsor with 3 propulsion systems with each having at least six cables connections that feed into the switchboards. According to our estimate more than 1.5km of cables are necessary for the connection of a vessel in an appropriate way. Moreover, the cables must withstand not only the conditions of the controlled environment of temperature and humidity of the deck but also the conditions of the engine room and the lower decks. Therefore, there are stringent requirements of fire retardancy and resistance to explosive atmospheres. Moreover, vessels are required to use halogen-free cables in proximity of escape routes for safety reasons. As halogen cables' combustion process in a fire would produce toxic gases for humans ABB is implementing a stringent requirement of using halogen-free cable in the entirety of their applications to prevent possible health and safety repercussions in case of an accident. Due to the restriction on the material selection PFAS materials are currently the only viable materials that would withstand the technical requirements for cables applications as well as providing the appropriate fire retardancy to ensure safety of personnel and passengers in case of unforeseeable accidents.

Cables

PTFE is used in the cabling in multiple ABB applications due to its excellent electrical impedance as well as outstanding resistance against contact with chemical substances, oils, high abrasion resistance, water ingress and UV- radiation. In addition, these cables have also high dielectric strength and flame retardancy.

Cables and electrical insulation used in ABB applications utilise PFAS substances in three key ways: stranded wire insulation, wrapping of wires and cable protection. Most cables consist of several wires which must be isolated against each other and thus use an insulation layer (stranded wire isolation). Cables in ABB's applications must withstand exposure to high temperatures, up to 200°C including temperature cycling such as in arctic environments where temperatures can go as low as -0°C, so the insulation layer needs to withstand these temperatures and hot exhaust gases. They also need to have low water vapor permeability due to the high humidity experienced in certain operating scenarios. In addition, they need high insulation resistance and non-flammable characteristics whilst maintaining a small diameter due to the size constraints of many devices.

Silicone, polyvinyl chloride (PVC), and polyurethane may be suggested as alternatives to the PTFE isolation layer for wires. However, these do not meet the same flammability requirements and PVC have the potential to become brittle when the plasticizers migrate. Also, none of these can withstand the very low or very high temperatures that PTFE can operate in. Silicone is vapour permeable which means that water can accumulate between the single strands potentially leading to corrosion and malfunction of the device, as well as reducing the lifetime of the product. Silicone also has a lower insulation strength compared with currently used PFAS such as FEP, which would require the insulation wall thickness of each wire to be increased.

IEC 61439-1: Low-voltage switchgear and control gear assemblies

Contribution 2:
Topic: Mechanical systems

Chemical resistance

Sealing materials, mostly consisting of PTFE, FKM or FFKM, are necessary to ensure appropriate connection without leakage between the different parts of a system. O-rings and sealing tape are amongst the most common applications. Many of the seals used in ABB's analytical equipment require chemical resistance against aggressive chemicals such as fuels, engine oils and hydraulic fluid with a maximum swelling rate (< 25% in the "worst case"). Higher swelling rates would result in a decreased tensile strength that will induce the formation of cracks due to mechanical stress and result in the failure of the seal. Marine applications require the use of a double seal system to prevent the ingress of water on one side and the leakage of lubricant oil on the other side. The two seals are divided by a chamber in the middle where a mixture of water and oil is collected and removed to be stored and appropriately disposed when docking. The seal must be compatible to lubricant oil as well as water permeation and high pressure for at least 5 years, which is the time intercurrent between dry docking maintenance processes. There is currently no PFAS-free alternative that are suitable for these applications.
Moreover, lubricant oils used in those applications have combustion as a by-product sulphur oxide, which is toxic if inhaled. PFAS sealing materials ensure fire retardancy and gas tight seals to prevent exposure of operators to toxic gases.
Other non-PFAS alternative elastomer materials are commercially available as seals, the most known of which are nitrile rubber (NBR), nitrile-butadiene rubber (HNBR) or carboxylate nitrile rubber (XNBR). However, the alternatives do not offer the same technical performance when compared to FFKM and as such could potentially result in the failure of the seal if it was exposed to the full range of intended operating environments and substances. In addition to this NBR, HNBR or XNBR are not suitable as they are not resistant to the presence of ozone, it is known that even trace levels of ozone in air will attack the double bond of the rubber chain resulting in its degradation by ozone cracking. Moreover, these rubbers are not resistant chemical media inducing higher friction in the system resulting in higher variance in efficiency and higher carbon dioxide emissions.

Temperature resistance

ABB's systems are used in a variety of different climates, from artic environments with temperatures that can reach many degrees below zero, to hot and humid tropical climates with air temperatures reaching temperatures higher than 50°C. Therefore, most ABB's applications will have to withstand cycles of high and low temperatures during operations as they could be started in a cold climate and reach high spikes of operating temperatures. Applications must withstand cycles of temperatures ranges as large as -40°C to +200°C, while retaining the same materials properties. For example, in port applications, the systems will be exposed to the harsh climate conditions and most PFAS-free polymers are too brittle at -40°C and decompose at the high temperature ranges experienced during operation.

PFAS substances have high thermal resistance over the long period ABB's products operate. Vibration environment in an engine or alternative power train poses an additional challenge in the investigation of a suitable substitute. Engines will vibrate for very long periods, and this can cause high frequency fatigue to components due to the repeated strain imposed. The mechanical alternating stress between joint components will make joints undergo cyclic tension and pressure, which may cause the generation, expansion, and extension of cracks. Those requirements need to be considered when seeking a PFAS-free material to ensure reliability of the device. Sealing is achieved using a combination of metal seals and polymeric o-rings to ensure appropriate resistance to those conditions. The use of only metal sealing is not a suitable option as the pressure to which the system is subjected can reach up to 10 bars and the temperature cycling would not allow for the necessary flexibility of the sealing material to ensure water tightness.

PFASs are the only substances that can maintain elastic properties at temperatures near 200°C. Other materials could lose their elastic properties and become brittle at higher temperatures resulting in failure of the seal.

Moreover, PFAS materials provides insulation against noise and vibration due to their unique characteristic of store energy elastically and the ability of the material to dissipate stress through heat, above 175°C. As PFAS-free materials are not able to withstand such temperatures before being thermally oxidised and becoming brittle, PFAS substances are the only materials to ensure those requirements.

Dust ingress protection

Due to the complexity of ABB's systems and their fundamental role in enabling the interconnection of different components of the systems, ABB's products are operated in a variety of environments, spacing from the room temperature conditions with temperature and humidity control are exercised, as would be the case for parts of the system placed on the deck., to harsh and dirty environments such as the case that would be experienced in the engine room. Engine rooms usually have a barometric pressure of 1000 millibars, and room temperature of 45°C, and relative humidity of 60% for ships with unrestricted service. Moreover, it is likely that high concentration of dust is present as well as exhaustion fumes that contain very small particles sizes, particulate matter PM10, that can easily contaminate electronic systems leading to premature failure due to contamination build up that could result in short circuiting. To ensure safe operation of the system ABB enclosures need to comply to standards certifying for prevention of water and dust ingress based on IEC60529. PFAS materials present the appropriate sealing conditions.

Timeframe for substitution

At ABB we have engaged extensively with our supply chain and concluded that PFAS-free alternatives for ABB applications are not available from suppliers at this time. Predicting a timeline for assessing the transition to a PFAS-free alternative is difficult and ABB is reliant on our supply chain to develop alternatives with suitable characteristics. PFAS-free components can only be tested and integrated into new designs once they have been developed and are available from suppliers.

- ABB is constantly developing more sustainable products and the industry is continuously researching alternatives. The timescales for the testing to be undertaken by ABB takes more than 11 years, with the exact time period depending on the type of component substitution, type of application and its end-uses.
- ABB would have to redesign the entire product range simultaneously which would result in dispersion of personnel and funds that would otherwise be focused on one application at a time. Due to the extremely large number of components and materials utilising PFAS, a timeframe cannot be estimated. In combination with the capacity and resourcing issues mentioned above it is more likely that more than 11 years are required to integrate PFAS-free alternatives in all applications, as outlined in the table below.

Propulsion & Marine Systems

Qualification stage	Estimated time to complete
Alternative solution development with supplier	3 years
Lead time for re-design and finding suitable project to test	1 year
Testing of in-situ performance	5+ years
Roll-out of the solution for the entire portfolio	2 years
Total time to develop	Up to 11 years before validated and from when PFAS free alternative is made available on the market

Ports

Qualification stage	Estimated time to complete
Alternative solution development with supplier	5 years
Lead time for re-design and finding suitable project to test	3 years
Testing of in-situ performance	2 years
Roll-out of the solution for the entire portfolio	2 years

Total time to develop	Up to 12 years before validated and from when PFAS free alternative is made available on the market

As is outlined in this report ABB are reliant upon their suppliers in many cases identifying PFAS-free alternatives before they are then able to undertake systems level qualifications. Due to the early stages of their development, there is a significant degree of uncertainty in estimating an accurate timeline and additional time may be required. The timeline extension could be triggered by one or more of the following assumptions not proving to be valid, or there being unforeseen challenges yet to be identified.
The necessary technical attributes will be identified in the first round of testing and will not require tests to be recompleted or for the testing to move back a stage as an untenable characteristic has been identified, and that the necessary resources are available to complete the testing. Considering that the elimination or substitution of a whole class of chemicals, like PFAS, is unprecedented, this has the potential to add a significant amount of time to identify and implement each alternative as ABB will be facing the need for the concurrent qualification of many thousands of parts.
Although ABB and our supply chain is actively engaged in gathering information on the uses of PFAS within their products, yet not all have been identified. In part this is due to the challenges in their identification, as many PFAS used in mixtures have not been classified as hazardous per the Globally Harmonised System for classification and labelling. In addition, they have not been listed as SVHC or included on the Candidate List of SVHC for Authorisation. Therefore, many PFAS are not shown on material data sheets even though the substance is present. Moreover, when PFAS are used as articles or articles in complex objects, the parts suppliers are currently under no regulatory obligation to highlight the presence of PFAS.

Contribution 3:
Topic: Environmental consideration

ABB is not a chemical manufacturer and therefore does not have impact of PFAS exposure during manufacturing process. Moreover, ABB uses PFAS in polymeric form which are mostly assembly lines and in products at temperatures where emissions will not be expected to occur, polymeric form PFAS are low risk substances form an environmental impact standpoint. Where PFAS lubricants are used they are recirculated in a close loop and there is no likelihood of leakage of the lubricant as demonstrated by the lack of need to refill the lubricant periodically during operation. Moreover, PFAS substances are used in components deeply embedded within the systems and there are no components of ABB applications and / or systems containing PFAS substances that are in direct contact with the marine environment or that present a risk of leaking PFAS substances. Therefore, the risk of leaking of PFAS during normal operating conditions is minimal.

End of life

ABB are downstream users of PFAS substances and as such are not manufacturers and have limited use of PFAS during manufacturing processes, as such there are no expected emissions during the manufacturing process. The PFAS used within ABB's products generally are in locations with no user access and if parts are accessed for maintenance purposes all users would be wearing personal protective equipment and the risk of exposure negligible.

During the lifetime of the system, it is possible that minimal amounts of wear of the components could occur, including PFAS containing components, however this would be retained in the system which is handled and disposed of as per EU legal requirements. Moreover, there are studies investigating the decomposition of PFAS substances during waste incineration processes. A noticeable example is the

complete thermal decomposition of PTFE at temperatures above 800°C resulting in safe incineration in municipal waste incineration facilities.[1]

All lubricants are run in closed loops, and are collected and appropriately disposed of at the equipment's end of life or at dry docking scheduled maintenance. Systems are designed to avoid the losses of such substances and no losses are expected to occur during normal operation conditions as fluid loss will lead to shut-down due to failure of the system.

Contribution 4:
Topic: Spare and Repairs – lifetime

It is important to note that PFAS are not only needed to manufacture new systems but also for servicing and maintaining existing products already placed on the market. ABB devices generally have a long service life with devices often having lifespans of up to 40 years. It is likely that in many applications there will not be a drop-in replacement for the PFAS on a 1:1 basis due to different properties such as chemical inertness, tightness, and functionality. Systems will therefore need to be redesigned to permit the use of PFAS-free alternatives. Without the general consideration to permit the use of PFAS in these applications this will cause the premature end-of-life and scrap of the systems which otherwise could be kept in service until the end of its expected lifetime. The restriction as proposed would also affect already produced products subjected to periodic maintenance and have an impact on the lifetime of devices already in operation.

Service, maintenance, and repairs are crucial for the success of the European Green Deal when it comes to better resource efficiency and therefore it is important that this is reflected in the derogation request. This is particularly relevance for ABB applications that are fundamental for the efficient operation of vessels in a resource efficient manner. We have a key role in green energy transition in marine as being the leading system integrator for diesel electric, hybrid electric and fully electric vessels.

ABB PAMP has currently in operation over 10 000 different systems installed on over 5000 vessels and 200 terminals globally, where many of the vessels trading or visiting European ports. The key customer segments are Cruise, Ferries, Offshore drilling, Offshore supply and support vessels, Offshore construction vessels, floating production storage and off loadings (FPSOs), Tankers, liquid natural gas (LNG) carriers, Dry and Wet Bulk carriers, Container vessels and several other vessel types.

Socioeconomic impact

ABB's purpose is to enable a more sustainable and resource-efficient future with our technology leadership in electrification and automation. As pioneers in electrification and automation, we help to address the world's energy challenges. Our solutions make marine transport more energy efficient, safer, and greener. Our solutions reduce harmful emissions and preserve natural resources.
We are committed to support our customers in reducing annual CO_2 emissions in shipping and to help reach the international marine organisation (IMO) greenhouse gas (GHG) emission target.
We target for 80% of our offering to be covered by the circularity approach.
The cruise industry generates revenue to the tourism industry including transport services, museums, attractions, guides, restaurants, gift shops etc.

[1] 5 Aleksando, K., Gehrmann, H-J., Hauser, M., Matzing, H., Pigeon, D., Stapf, D., Wexler, M. (2019). Waste Incineration of Polytetraluoroethylene (PTFE) to Evaluate Potential Formation of per- and Poly-Fluorinated Alkyl Substances (PFAS) in Flue Gas. https://reader.elsevier.com/reader/sd/pii/S0045653519306435?token=C28A68B6BA19186C7EB4F1E09BCDA2C9C84A214D3983E5D75466538CB7B1B878A8DE1A4EF7A7849515099480AECD99AB&originRegion=us-east1&originCreation=2023050914012

Sea transport of materials and end products is critical for other industries e.g., pharma, car manufacturing, energy sector, food.
From energy perspective, the shipping of LNG but also energy production and vessels needed to service and further expand offshore wind power may be affected.
ABB Ports are a critical link in road-sea transport which contributes appr. 80 % of world goods transportation. Impact of ports stopping operating would have a remarkable impact on the European economy and would disturb the global supply chain. ABB Ports crane automation customer project delivery would be stopped if needed components are not available, the complete system would not work. The world's largest ports, including main ports in Europe (Hamburg, Rotterdam, etc.) operate with automated cranes, majority of them automated by ABB Marine and Ports. The largest volume of export/import takes place via these ports.

The direct impact of a PFAS restriction without derogation is likely to result in severe impact on the entirety of ABB's operation activities which would result in the loss of 2000 jobs. Moreover, indirect impact will be visible on ABB's supply chain as well.
ABB Marine and Ports has roughly 1700 active suppliers, with ca ~€520M worth purchases made. Most of the key suppliers are from EU.
ABB Marine and Ports extend the impact across the entire supply chain. We have targeted at least 80 % of supply spend covered by a supplier sustainability framework.

Derogation recommended

Due to the critical PFAS uses within ABB systems and the need for a suitable length of time to develop and qualify PFAS-free alternatives. ABB proposes the following wording to be included in the derogation 6o, with points of alternation highlighted in bold:

6o: Applications affecting the proper functioning related to the safety, reliability and durability of **means of transport, non-road equipment, and alternative Powertrain systems,** and affecting the safety of humans or reliability of equipment until 13.5 years after EiF.

Alter the scope to 'transport vehicles to **means of transport, non-road equipment, and alternative Powertrain systems',** due to the similarity in the technical requirements. The proposed wording would clearly communicate that means of transport, non-road equipment, and alternative Powertrain systems which are the primary means of moving a system is permitted under the derogation. Given ABB's reliance on its supply chains development, this would also ensure that essential components associated to the **system**, such as piping, tubing, cables, electronics, aftertreatments are also covered ensuring reliability of the system against disastrous failures.

In addition to the modification of 6o, the requirement of the following derogations is also supported:

- 5s. lubricants where the use takes place under harsh conditions, or the use is needed for safe functioning and safety of equipment until 13.5 years after EIF.
- 5ee. the semiconductor manufacturing process until 13.5 years after EIF.
- Battery and battery manufacturers for at least 13.5 years after EIF.

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