Derogation request and response regarding the public consultation on the proposed restriction on per- and polyfluoroalkyl compounds (PFAS)

To Whom It May Concern,

IBM appreciates the opportunity to provide the enclosed comments on the proposed amendments to Annex XV of the REACH regulation pertaining to the restriction of per- and polyfluoroalkyl substances (PFAS). Specifically, IBM is requesting a derogation of 12 years for the use of polytetrafluoroethylene (PTFE), a subgroup of PFAS under the ECHA proposed PFAS definition, in tape libraries and tape drives with the ability to extend the derogation in case no suitable alternative has been invented based on technical limitations within those 12 years.

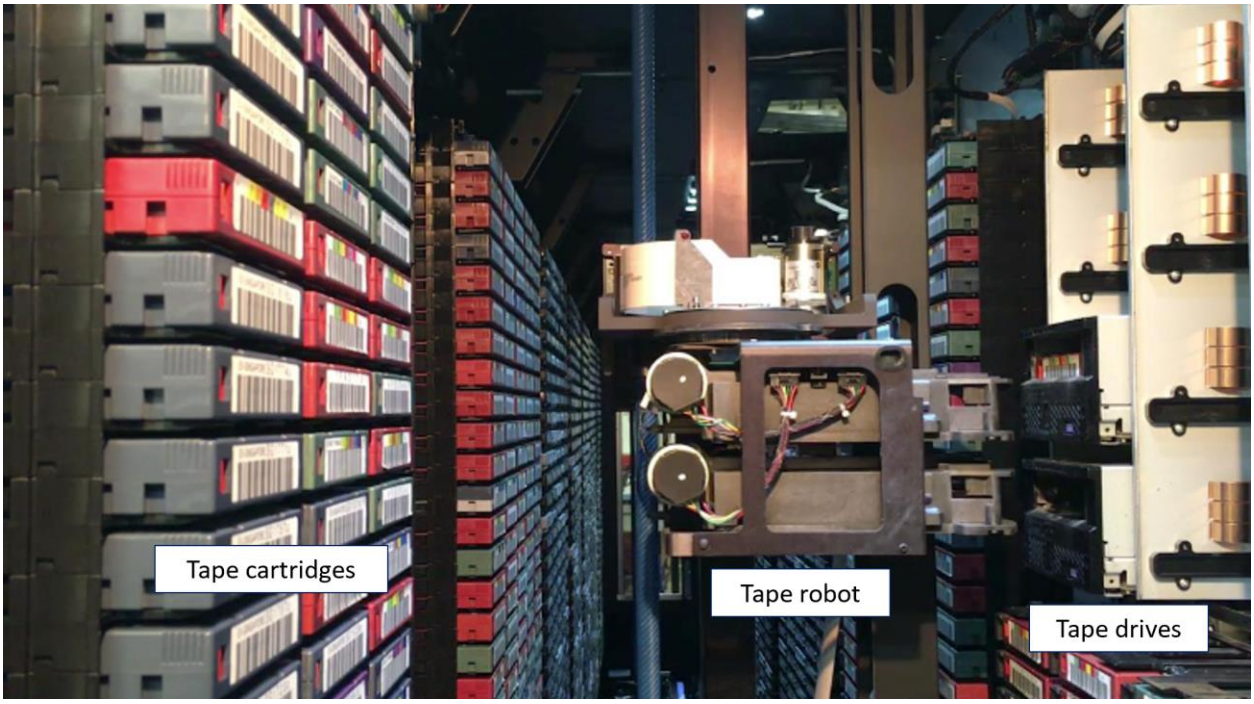
A tape library consists of **tape drives** to read and write data, **tape cartridges** to hold data, **tape cells** to hold tape cartridges in the library, and **robotics** to move the tape cartridges inside the tape library. If/when an alternative is identified for PTFE use within tape libraries, a timeline of approximately 10-15 years would likely be required to deploy a solution at scale. As discussed in more detail below, the time and resources associated with a re-design and viability/qualification process requires a multi-year transition period. In addition, viability depends on supply chain aspects such as multiple sources with consistent products, and cost. After product release, current products deployed at customer data centers would require an additional 10 years at minimum to replace current products with a PFAS free alternative. IBM supports the ITI position regarding spare parts for repair of finished electronic equipment already placed on the market and re-supply of articles already placed on the market (pre-owned products). Restricting the use of PTFE without an appropriate time derogation may dramatically impact the useful life of tape libraries currently running in data centers. An important tenant of the Circular Economy is to extend the useful life of equipment for as long as possible. Additionally, as further described below, tape libraries can decrease the greenhouse gas (GHG) emissions associated with long term data storage as compared to other electronic storage options.

Finally, we would also like to request the introduction of a system that allows extensions to be requested for specific use derogations before expiration.

PTFE use in tape libraries and tape drives:

PTFE (commonly known as Teflon) is a type of fluoropolymer used as a lubricant to minimize friction and debris and dust generation in the tape library. Unique properties of PTFE include nonreactivity, hydrophobicity, a low coefficient of friction, non-stick properties, and good insulating properties. Many parts and components in a tape library, including robotic parts, contain PTFE.

The picture below shows an IBM 3584 tape library. The robot is in the middle of the picture and has two grippers to move tape cartridges. The robotics are an essential part of a tape library. The left side of the picture shows a wall of tape cartridges inside of tape cells. The right side of the picture has two tape drives in bays, along with two empty bays above them. A video of the robot in action can be found here.



Tape cartridges hold the customer data that is the heart of any tape solution. The tape cartridges need to be moved around quickly without generating excess debris that could clog parts of the robotics or end up inside of the tape drives. In addition, a tape drive can have a plastic bezel on the front of it. This bezel contains PTFE and helps guide tape cartridges in and out of the throat of the drive. Moving parts inside the tape drive use PTFE as a lubricant to reduce friction and debris generation.

The pictures below show a tape drive and tape cartridges outside of the tape library. The tape drive on the left has a tape cartridge loaded inside it.

Tape drives read and write data on tape cartridges. They are an essential part of a tape library but can also be used outside of a library in a desktop unit or mounted in a rack. Tape drives come in different forms and containers, with the most common tape drive being a Linear Tape Open (LTO) tape drive. Information on LTO can be found at https://www.lto.org.

At a high level, the following are examples of parts of a tape library that are known to contain PTFE (this is not a complete list):

- Robotic gripper
- Robot tray
- Tape drive
- Tape cells
- Tape cartridges**

**Tape cartridges contain PFAS, but the exact PFAS has not been disclosed to IBM.

The following are examples of robotic parts known to contain PTFE:

- The y-axis assembly which enables the robot to move from the floor of the library to the top of the library and back. The robot moves up and down this part.
- The robot tray which is used in some tape libraries contains the grippers for the library. The robot moves horizontally on the tray. The whole tray moves up and down in the library, from the floor to the ceiling and back.

Please see the confidential attachment for a more detailed list of parts and components within a tape library that are known to contain PTFE. The list may increase as we continue to work with our supply chain to identify parts and components that may contain PTFE or other PFAS.

Printed Circuit Boards (PCBs) & Electronics

While this derogation request focuses specifically on the use of PTFE in tape libraries, it is important to note that tape libraries contain many different types of electronics, including PCBs, that are essential for proper functioning of the tape systems. PCBs contain passive components such as resistors, capacitors and connectors which have been reported to IBM to contain PFAS. The use of PFAS in electronics and semiconductor devices will be covered under separate derogation requests but these derogations are essential to the operation of IBM tape systems.

Environmental Considerations:

As the world becomes increasingly digital, the total amount of data created, captured, copied and stored continues to grow at an unprecedented rate. Further, more data is being required to be retained for long-term storage for compliance and business reasons. Tape libraries offer an energy efficient way to store data that does not need to be accessed daily as tape libraries consume very little to no energy unless data is being read or written. This in turn also reduces requirements for heat dissipation or cooling which collectively then can decrease the greenhouse gas (GHG) emissions associated with long term data storage. For example, a recent life cycle assessment using Product Attribute to Impact Algorithm (PAIA) and comparing tape storage to hard disk drives (HDD) and Flash solutions found that

tape solutions have the potential to reduce GHG emissions associated with long term data storage by approximately 87% (https://www.ibm.com/downloads/cas/YE5WAQ0B). Tape libraries offer an important solution to help reduce the environmental impact of long-term data storage.

Alternatives:

Due to the unique characteristics of PTFE-containing materials, and based on the current state of the art, there are no known alternatives available for tape systems. Tape libraries contain many moving parts. To minimize friction as well as debris and dust generation in the tape library, PTFE is used as a lubricant. Without this lubricant the parts will not function. For tape cells in particular, there have been years of engineering and experimentation to find the right amount of PTFE. Please see the attached confidential document for a brief discussion on previous work done to assess alternative lubricants that did not contain PTFE. Tape cartridges move inside of tape cells, rubbing against the plastic tops and bottoms, which can generate debris and dust. The particles from the debris and dust can cause issues with the movement of the robot, and can also get into the tape drives, potentially causing problems with reading and writing of data.

There are no known alternatives to the PTFE that can provide the lubrication necessary for sliding plastic parts. If or when an alternative was identified, it would require a multi-year research and development effort with extensive qualification and implementation process before introducing this change to customers. As mentioned above, PTFE has unique properties that make substitution technically difficult. Additionally, substitutes would need to be evaluated for unintended adverse effects. A reliable supply chain of the new material would be required. Understanding the environmental, health and safety implications of any possible alternatives will also be necessary to avoid regrettable substitutions.

Timeframe for substitution

It is not known if PTFE-free alternatives will be viable for all applications in a tape system. The timelines to qualify and implement alternatives once identified are lengthy and would need to happen in the following stages:

1. The first stage in substitution is reviewing all potential alternatives currently marketed to determine if they offer suitable performance. Sources can vary between commercial off-the-shelf products to specialized alternatives developed specifically for tape storage systems. The technical needs of the tape storage system determine viability. Currently, we are unaware of any PTFE replacements.
2. Investment in fundamental research and development is needed to identify a PTFE free alternative. This can start from fundamental external research undertaken by universities or research laboratories.
3. Once a possible alternative is identified, the potential alternative needs to be researched and developed by the material supply chain and then the tape system manufacturer to assess the impact on the product. Considerations include:
    a. Integration

b. Demonstration including re-qualification to standards and safety evaluations
c. Ramp to production and release to market
d. Impact on the market

Components and substances in tape systems often require bespoke parts to be developed and qualified, with solutions potentially only being suitable for certain applications in the system and not a one-for-all total solution. The redesign and testing requirements can be significant and need to be taken part by part, with consideration of impacts to the whole design. It is anticipated that significant prototypes and experiments will need to take place with suppliers in feasibility testing of new innovations for replacement chemicals.

4. Suitable time to complete supplier change management, including changes to part numbers / drawings / technical and safety information is required. Consumption of current stock parts in multiple levels of the supply chain need to be worked. A small change can cause a large impact on a tape system, so the change control process and mixing & matching of parts needs to be understood.
5. Assessment of unintended consequences, such as an alternative causing damage or an increase in defects present, needs to be evaluated. This is a lengthy process, usually ~1 year with many machines running, to determine viability. When the PTFE alternative is not viable, the process must start over to find a different chemistry or technology that does not have the same issues.
6. A stringent qualification must take place to ensure the resulting product guarantees the same function (or better) as prior products.

This is only an overview and potential alternatives must be evaluated on a case-by-case basis, considering technical, regulatory, and economic aspects. By its nature, the invention of an alternative has no estimated timeline, and for some applications there may be no known alternative.

Factors that increase the uncertainty of any timeline include:

- Technical: the alternative may not be a drop-in replacement and require changes in other parts of the tape system; multiple iterations of test and development may be required as new problems are found; problems may only be found in long-term life tests; the alternative chemical may need to be qualified by a certified body.
- Suppliers: identifying and qualifying a new supplier can add months of additional time.
- Environmental: the proposed alternative needs to be vetted against hazardous substances and other environmental requirements.

The general information outlined in this section is based on past experiences with materials changes, including changing the weights of materials in specific components. Long term effects and scale effects can be significant. For example, finding the right balance of PTFE in tape cells and latches on the cells has been balanced through years of test and customer experience. IBM has done replacement actions on parts using the wrong mixture of PTFE, so we know this is a sensitive area of the tape solution, and potentially a costly area if done wrong.

Industry Impact

The amount of data created and stored keeps growing. Tape is the current technology of choice to store archival data at a low cost with reduced energy consumption. Without tape libraries, there is no feasible way to store cold data at scale. For example, the cost to store a zettabyte for a year in 2020 was estimated at $250 billion for flash, $16.5 billion using hard disk drives, $4 billion on optical and $1.9 billion using tape[1].

Further, tape provides protection to industry in the form of an air gap. There are numerous examples of ransomware infecting servers and encrypting HDDs and SSDs to hold customer data hostage[2]. The information held on tape is not connected directly to a server – it is offline storage. Data held on tape has the ability to be recovered and restored, even if the backup software database on other systems are corrupted. A number of industries rely on tape for secure data storage. For example, the financial systems in the EU rely on tape libraries for a secure, low-cost data storage option; cloud companies use tape to store data in-country; scientific facilities such as CERN utilize tape libraries for data gathering and storage; as well numerous other EU businesses. Quantifying the impact would require a collaboration among all the industry players and would take significant time. However, we know that tape storage is pervasive among large businesses and loss of tape storage would have a significant impact.

In conclusion, restricting PTFE use in tape systems would impact a number of industries that rely on tape for data storage to meet regulatory requirements, including but not limited to the finance, insurance, cloud, automotive and other industry sectors.

[1] https://www.youtube.com/watch?v=4hoc7tjwtu8
[2] Ransomware infection wipes all CloudNordic servers • The Register