COMMSCOPE®

CommScope's Input to the Public Consultation Comments for Annex XV restriction Proposal.

Missing uses: fluoropolymers in printed circuit boards (PCBs) used for telecommunication applications.

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1. INTRODUCTION TO COMMSCOPE AND THE RELEVANT EQUIPMENT

CommScope is a manufacturer of communications technology. We design, manufacture, install and support the hardware infrastructure and software intelligence that enable our digital society to interact and thrive. Working with customers, CommScope advances broadband, enterprise and wireless networks to power progress and create lasting connections.

Printed Circuit Boards (PCBs) are crucial in base station antennas, active distributed antenna systems, and small cell solutions for indoor and outdoor use. They are all critical components of wireless communication systems like cellular networks. PCBs are used in these antenna systems for various purposes, contributing to the functionality, efficiency, and performance.

2. KEY FUNCTIONALITIES OF FLUOROPOLYMERS IN PCBS

Fluoropolymers are used in printed circuit boards (PCBs) for a variety of reasons due to their unique properties. Some common uses of fluoropolymers in PCBs include:

1. Dielectric Materials: Fluoropolymers such as polytetrafluoroethylene (PTFE) and perfluoro alkoxy (PFA) are excellent dielectric materials with high electrical insulation properties. They are used as insulating layers between conductive traces and layers in multilayer PCBs. Their low dielectric constant and low dissipation factor help maintain signal integrity and reduce signal loss at high frequencies.

2. Thermal Stability: Fluoropolymers have remarkable thermal stability and can withstand high temperatures without undergoing significant degradation. This property is essential in PCBs,

especially those used in high-power applications where components might generate a lot of heat.

3. Chemical Resistance: Fluoropolymers exhibit exceptional chemical resistance, making them suitable for use in harsh environments where exposure to corrosive chemicals or moisture is a concern. This is crucial in protecting PCBs from environmental factors that could lead to deterioration or failure.

4. RF and Microwave Applications: The high-frequency performance of fluoropolymers, coupled with their low signal loss characteristics, makes them valuable for RF (radio frequency) and microwave applications in PCBs. These applications include antennas, RF filters, and other components used in wireless communication systems.

5. Impedance Control: Fluoropolymers' consistent electrical properties make them useful in maintaining controlled impedance in transmission lines on PCBs. Impedance control is crucial for high-speed digital and RF circuits to minimize signal reflections and maintain signal integrity.

6. Environmental Sealing: Some fluoropolymers are used for environmental sealing and encapsulation of sensitive components on PCBs. This helps protect these components from moisture, dust, and other contaminants that could lead to performance degradation or failure.

The unique combination of electrical, thermal, chemical, and mechanical properties exhibited by fluoropolymers makes them versatile materials for various aspects of PCB design and manufacturing, especially in applications that demand high-performance characteristics.

3. APPLICATIONS IN TELECOMMUNICATION EQUIPMENT

Base station antennas, active distributed antenna systems (DAS), and small cell solutions serve crucial roles in indoor and outdoor wireless communication networks. Some essential uses for these technologies:

Base station antennas facilitate high-speed data transmission, enabling users to connect to the network for voice, data, and messaging services. They help in increasing the capacity of a cellular network by serving as access points for many mobile devices, allowing for more simultaneous connections in a given area. Base station antennas are essential for emergency services, providing reliable communication for first responders and emergency personnel during critical situations.

Active Distributed Antenna Systems (DAS) are used to improve cellular coverage and capacity in large indoor spaces like stadiums, shopping malls, airports, and office buildings, where signal penetration can be challenging. They can support multiple carriers, making them suitable for venues where different wireless providers need to provide coverage. In critical environments like hospitals, active DAS ensures reliable wireless communication for medical staff and patients, supporting emergency response and patient care. DAS systems can be scaled up or down to accommodate changes in the number of users or the layout of a venue, making them flexible for various applications.

Small Cell Solutions are deployed in densely populated urban areas to boost capacity and improve network performance where traditional macrocells may be insufficient. They are used indoors to provide reliable cellular coverage in places like shopping centers, airports, hotels, and corporate offices where indoor signal penetration may be weak. Small cells play a critical role in the rollout of 5G networks, as they provide the necessary capacity and low latency required for high-speed 5G data services. In rural and underserved areas, small cell solutions can extend network coverage to provide connectivity in locations where traditional infrastructure is limited. Small cells can be deployed for private cellular networks in various industries, including manufacturing, logistics, and healthcare, to support IoT devices and mission-critical applications.

These technologies collectively contribute to ensuring reliable and high-quality wireless communication services for both indoor and outdoor environments, addressing the growing demand for mobile connectivity in a wide range of scenarios.

4. ALTERNATIVE MATERIALS

Currently, alternative materials that can match the performance and reliability of our existing materials are not available in the market. In our pursuit of alternatives, we rely on the expertise of our suppliers to develop innovative materials. However, the process of creating a viable substitute for even a single application demands substantial investments of time and resources. A minimum of 5 years is required to research and develop a replacement material, and an additional 5-10 years are needed to scale up production to meet commercial demand and establish its reliability.

Beyond the time and resource investment, the financial implications are considerable. Developing alternatives for each specific application requires substantial capital, with costs starting at a minimum of €50,000 per customer, per application, just to assess the viability of the alternative. And there is no certainty that a viable replacement can be identified at all.

The complexity of the challenge is heightened by the fact that the existing material is widely employed across diverse electronic applications. This complicates the search for a universal solution and makes it less likely that a single replacement material can effectively replace the current fluoropolymer across all applications. There is no certainty that a viable replacement can be identified at all.

5. JUSTIFICATION FOR A DEROGATION REQUEST

Industrialization is a long and complex step-by-step methodology followed to implement a qualified material or process throughout the manufacturing, supply chain and maintenance operations, leading to the items' final certification. This includes renegotiation with suppliers, investment in process implementation and the final audit to qualify the new process throughout the supply chain. Any change in the process or in the components concerned can take several years to requalify and ensure that the level of performance achieved is as good as the previous one. To allow industrial deployment, the following milestones must be applied:

1. Literature search and prioritization of alternatives (3 – 6 months)
2. Manufacture of prototypes (6 months - 3 years)
3. Test of prototypes, this usually includes several iteration steps to adjust the prototype according to the test results (2 year)
4. Standardization of the new coax cable and test methods (3 years, can be partially parallel to 5: for 4 and 5 together 5 years)
5. Approval test: Sample production, test at customer site, inhouse test, third party certification (3 years, included in the 5 years for 4 and 5)
6. Change of production from fluoropolymer to an alternative material first in pre-series and then in series-production (3 years)
7. Market acceptance of the new coax cable and complete change to cables without fluoropolymer (3 years)

A ban on the use of fluoropolymers in Printed Circuit Boards (PCBs) will have economic and ecological implications for the telecommunications industry.

Economic Implications:
Without the use of fluoropolymers, PCB manufacturers will need to find alternative materials that can provide equivalent properties. These alternatives will require changes in manufacturing processes, which will lead to increased production costs. The telecommunications industry will need to invest significantly in research and development to identify and develop suitable alternative materials for PCBs. This investment will involve both time and financial resources. A ban on fluoropolymers will disrupt the existing supply chain for PCB manufacturing. Manufacturers will need to find new suppliers or develop alternative materials internally, which will lead to delays and increased costs.
The performance of PCBs may be affected if suitable alternatives do not match the electrical and thermal properties of fluoropolymers. This can impact the reliability and longevity of telecommunications equipment. There will be a transition period during which both traditional and alternative materials are used in PCB manufacturing. This will create logistical challenges and additional costs.

Ecological Implications:
Depending on the alternatives chosen, there may be ecological implications related to the production and disposal of these materials. For example, some alternative materials may have a

larger environmental footprint in terms of resource extraction, energy use, or waste generation. A comprehensive life cycle analysis of both the current and proposed materials will be necessary to assess the full ecological impact of the ban.
The recyclability and biodegradability of alternative materials must be considered. Fluoropolymers, while challenging to recycle, are known for their durability. Replacing them with less durable materials will result in increased waste in the long run.
In summary, a ban on the use of fluoropolymers in PCBs will have economic and ecological implications for the telecommunications industry. These implications will depend on factors such as the availability and cost of alternative materials, the industry's ability to adapt, and the ecological footprint of the new materials. Careful planning and assessment are essential to mitigate negative consequences and promote sustainable practices in the industry.

A ban on PFAS in printed circuit boards (PCBs) used for telecommunication applications without derogation would have severe negative impacts on basic societal requirements. Improvements intended by major EU legislation like the EU Green Deal, or the EU Chips Act would be hindered or even get impossible.

6. PROPOSED DEROGATION

As illustrated by us, technically and economically feasible alternatives will not be available within a five-year derogation window. Even when they can be identified, these alternatives will require regulatory approval or certification that cannot be completed within the five-year timeframe.

CommScope, supplying EU critical sectors, have identified the need for the following **13.5-year** derogations:

Use of PTFE, FEP and other fluoropolymers in printed circuit boards (PCBs) used for telecommunication applications until 13.5 years after EiF.