

## Factsheet "PFAS in Cables"



### Product(s):

- Cables, fillers, tapes, etc. for the supply of electricity and for control and communication purposes/ data transmission
- PFAS are used in the form of fluoropolymers in cables. Cables and conductors with these PFAS are indispensable for the implementation of the energy transition, expansion of sustainable energies, electromobility, production areas including food production, pharmaceutical and chemical industries, medical technology and plastics processing, as well as plant safety.



### Market Information:

- ZVEI e. V., the German Electro and Digital Industry Association, represents an industry with an annual turnover of about 225 bn. Euro and 906 thousand employees in 2022.
- The German cable industry accounted an annual turnover of more than 8 bn Euro in 2022 and about 15.000 employees.
- Cables are the base for an increasingly electrified and digitalized world. They are the key to the possibility of connecting networks and provide electrical and electronic connections. They are used in various electrical and electronic areas. The variety goes from miniature to large, heavy cables (e.g. ethernet cables, charging power cables, industrial cables for harsh conditions).
- Basically, a cable is a physical connection component device / component in order to transmit electrical power, signals and data. Especially in harsh environments with different kinds of dirt, shock and vibration the physical connection is used and needed. Cables are required for various use cases such as power transmission from 5V up to more than 800V and several hundred Amps. As well as data and sensor cables for various connection issues.
- Depending on the place of use and the required transmission quality, cables are designed in such a way that they fulfil the intended purpose or the targeted application in the best possible way. This is in view of technical conditions and economic requirements, rational manufacturing and processing methods, adaptations to existing and future technologies, environmental and economic conditions, permanently increasing data transmission rates as well as higher performance and reliability. To ensure that these demands are met, the cables are designed for a wide range of requirements and applications.
- The market for cables has developed continuously for years. Growth rates have risen moderately but consistently in established use cases and increasing strongly in new application field like e-mobility, renewable energies and data operations. Weaker economic developments have also affected the cable industry but have been well absorbed due to the structurally solid basis and the strategic-technological orientation. In addition, the trends of electrification and digitalization with the result of increasing use of sensors and their coupling to systems are inevitably resulting in increased use of various types of electrical cables.

## German cable market

Year	Turnover / Mio.€
2016	6.617
2017	7.246
2018	7.536
2019	6.960
2020	6.492
2021	7.727
2022	8.355

Table: Development of the market for cables (ZVEI/ Statistisches Bundesamt)



## Requirements Profile

Cables have to be insulated to meet the requirements of a technically safe product (e.g. compliance with the Low Voltage Directive). In particularly aggressive environments and critical applications, material components out of the group of fluoropolymers are used. According to the OECD, fluoropolymers are considered as "polymers of low concern"/PLC.

Other components of a cable, such as fillers and tapes, are also made of fluoropolymers in order to achieve certain required properties in the overall product.

## Applications/ fields of use

The required properties result from the area of application of the respective cable type. For cables, containing Fluoropolymers such areas of application are:

- Automotive industry
- aerospace industry
- pharmaceutical and chemical industry
- food production
- plastics processing
- wind power plants
- medical technology
- others

## Fluoropolymers used

The following fluoropolymers, among others, are used in the cable industry:

- PTFE
- FEP
- ETFE
- PFA
- PVDF
- FKM /FFKM / FPM
- MFA
- ECTFE
- PCTFE
- and others

# Properties of fluoropolymers/ reasons for their use in the cable industry

Fluoropolymers are selected for their particular combination of properties when no other alternatives are possible. These requirements are:

- Flexibility
- wide temperature range (-30 to +200 °C)
- resistance to different organic solvents, acids and bases
- UV and Ozon resistance
- non-flammable property
- low permittivity value (electric parameter for data communication)
- very low friction (bending performance)
- very thin wall thicknesses (processing - extrusion)
- Durability and Longevity over lifetime



## Identified PFAS Uses

<p><b>1. Name/Description of the use</b></p> <p>Cables</p>	<p>Fluoropolymers in cables for installation in harsh environments</p>
<p><b>PFAS substance/substance group:</b></p> <ul style="list-style-type: none"> <li>• PTFE</li> <li>• FEP</li> <li>• ETFE</li> <li>• PFA</li> <li>• PVDF</li> <li>• FKM /FFKM / FPM</li> <li>• MFA</li> <li>• ECTFE</li> <li>• PCTFE</li> <li>• and others</li> </ul>	<p><b>PFAS-containing material/component:</b></p> <ul style="list-style-type: none"> <li>• insulations</li> <li>• cable sheath</li> <li>• tapes</li> <li>• fillers</li> <li>• tubes</li> <li>• hoses</li> <li>• closures</li> <li>• Bus bar protections</li> </ul>
<p><b>Reason for PFAS Use/ Requirements Profile:</b></p> <ul style="list-style-type: none"> <li>• Flexibility</li> <li>• wide temperature range (-30 to +200 °C)</li> <li>• resistance to different organic solvents, acids and bases</li> <li>• UV and Ozon resistance</li> <li>• non-flammable property</li> <li>• low permittivity value (electric parameter for data communication)</li> <li>• very low friction (bending performance)</li> <li>• very thin wall thicknesses (processing - extrusion)</li> <li>• Durability and Longevity over lifetime</li> </ul>	

## Substitution

In the cable industry, various insulation materials are used, depending on the application, the area of use of the cable or the product in which they are installed. The fluoropolymer variants are used in particularly aggressive environments where alternative insulation materials for example the below listed cannot be used:

Potential alternative	Technical feasibility (performance, technical characteristics, etc.)
Polypropylene/Polyethylene	service temperature to low, this material can be used for low bis mid temperature ranges
PVC	service temperature to low, this material can be used for low bis mid temperature ranges
Polyether sulphone	not flexible, stiff, not easy to process, only up to 200°C usable
Polyimide	not flexible, stiff, not easy to process
EPDM rubber	service temperature to low, this material can be used for low bis mid temperature ranges
Nitrile rubber (NBR)	service temperature to low, this material can be used for low bis mid temperature ranges
Hydrogenated NBR	service temperature to low, this material can be used for low bis mid temperature ranges
Acrylic rubber	service temperature to low, this material can be used for low bis mid temperature ranges
Ethylene-acrylic (AEM) rubber	service temperature to low, this material can be used for low bis mid temperature ranges
PEEK	not flexible, stiff, not easy to process

- Even if alternative materials for the design of such cables would be available, which is not the case today, several years (>5 years) of development and multiple steps up to series production would be necessary.
- All efforts made to identify alternatives have so far failed. The complex property profile could so far only be achieved with fluoropolymers. Other insulation materials such as silicone, PEEK, polyolefins and rubber can fulfill individual properties but not the overall properties required for the applications.
- We're not able to provide a cost estimation. Nevertheless, we have to highlight that alternative material evaluations have indicated that, when available, they frequently fail to match the required performance characteristics of PFAS and lack the range of properties required for electronic and semiconductor applications, such as high chemical and thermal resistance.



## Safe Use: Prevention and Reduction of Emissions and Exposure

### Emissions

- Cables don't show emissions under intended use nor during the manufacturing phase.
- Cables also don't require service under intended usage and remain in products over lifetime if included in such.

### Waste treatment

- The typical process of end of life treatment depends on the related use sector. In e.g. automotive related applications, the first step is dismantling of specific parts of interest or as defined by specific regulations e.g. End of life vehicle directive -ELV (2000/53/EC). EEE typically remains because of their small size and mounting position in the car.
- Cables are typically part of electrical goods in scope of the WEEE directive (2012/19/EC) or other regulated markets. Hence the transition from the use phase to waste is well defined in a way that uncontrolled disposal is unlikely.

## **Socio-economic Impact** Consequences of the Proposed Restriction

- The proposed restriction will result in increased costs and reduced productivity, both in the performance of the product applications and in their use, creating an additional burden on customers, potentially limiting their choices, and reducing the incentives for technological advancement.
- Products manufactured with alternatives having lower durability and reliability would also result in higher maintenance and replacement frequency and eventually increased waste.
- Assuming that alternatives are already available, which is not the case will undoubtedly lead to sudden supply disruptions.



## **Request for Derogation**

We therefore request long-term and unlimited exemptions for fluoropolymer applications in the cable industry. This also implies the raw materials used for our products, such as granules, powders, suspensions. Alternatively, an indefinite exemption for this group of PFAS is essential for cable applications.

### **Contact**

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