Question 6 – Missing Use - Industrial filtration is not considered yet in the review – Public Items and References to Confidential Items

Introduction

PFAS primarily in use in industrial and process filtration is PTFE. PTFE is the filter media of choice when operating conditions with respect to temperature and chemistry cause rapid degradation and thus short and uneconomical service life of any other polymer. It is used in the production of needle-felts and woven materials, for membranes, coatings and immersion bath impregnations.

As a long-chain polymer, PTFE does not pose a risk to human health as it cannot dissolve in water or enter/accumulate in the human bloodstream. Repeated tests according to EU Regulation 10/2011 with respect to migration of PFAS oligomers or process chemicals have demonstrated that no such substances are released even when the filter media is exposed to temperatures up to 175 °C.

As a B2B product, the PTFE materials Kayser handles are within a tightly controlled supply chain and final disposal is in a waste incineration plant.

A complete ban of PFAS would be such a disruptive force that it would render certain aspects of environmental protection as well as the production of various food, pharmaceutical, medical and chemical products no longer feasible. It would lead to an economic downturn with increased unemployment and a relocation of many large and mid-sized companies to sites not affected by the ban.

Realistically, it is no longer probable that all sources of PFAS can be eliminated due to the fact that they are ubiquitous. However, by limiting uses to those that are essential and installing safeguards at production facilities, it is possible to reduce the overall quantity produced and to limit emissions at point sources. This will protect humans and the natural environment.

With respect to bioaccumulation, the change from PFOA to shorter chain alternatives such as PFHxA leads to half-times in humans being reduced from several years for PFOA to a few days or weeks for PFHxA. Thus, one of the major concerns is reduced by several orders of magnitude.

We fully support the “concept of essential use” and find it reasonable for the sake of health, safety and environmental protection to limit the use of PFAS to those applications that are deemed essential by society and for which there is no feasible alternative.

In literature, medical devices and occupational protective clothing as well as some food contact materials are cited as examples of essential use products.

This, however, is a very limited approach to that which is truly essential for life in a 21st century society with its requirements for reliable protection of the environment and the manufacture of life-saving medications such as cytostatic drugs.

We would like to provide additional information concerning applications, which are most certainly considered essential by society and for which presently there are no technical alternatives.

Most Western countries rely upon the fact that municipal and industrial waste are no longer disposed of in landfills with unknown long-term consequences, but are incinerated, thus using the inherent energy of the waste, reducing the volume of the waste disposed and generating an inert ash with no further chemical reactions.

However, to ensure reliable removal of solid and liquid aerosols generated during incineration, PTFE filter media are used either as a stand-alone material or as a mixture with PTFE scrims and filtration fibers providing the backbone of a long service life.

During incineration, reactive species of elements are formed, such as atomic bromine. Strong acids like sulfuric and hydrochloric acid are generated and they contribute to a chemically very aggressive flue gas. Filtration upstream of other cleaning steps such as NOx-removal is preferred to ensure that particles do not contaminate catalysts or other functional components. Therefore, filtration occurs at elevated temperatures of up to 250 °C, which are not conducive to a large number of other polymers or obsolete technologies such as electrostatic precipitators.

An additional advantage of using PTFE in filtration applications is that particulate layer (the so-called “filter cake”) release is improved, which means that a system runs with lower energy consumption contributing to the reduction of CO_2.

A number of chemicals, e. g. fumed silica, which are used as foodstuffs and/or adjuvants in medicines are produced at elevated temperatures in an aggressive environment caused by very high or low pH as well as oxidizing or reducing conditions. These operating conditions are so aggressive that a large number of polymers would be attacked and degrade. Degradation could also be partial, causing the generation of reactive sites such as alcohol or carboxylic groups. Reactive sites may be responsible for unintended chemical reactions, which must be avoided to ensure product integrity. PTFE remains inert and is thus the material of choice in such critical applications.

After several decades of widespread use of PFAS-based products, the residuals are ubiquitous. They will remain is soils and waterways for many decades, if not centuries.

Rather than attempting to control all possible sources of PFAS, we propose concentrating on point sources – e.g. production facilities, military bases and landfills.

By preventing discharge into the environment, the concentration of PFASs in the environment (including food, water and air) will be reduced. The effects of measures already being implemented are considerable. Literature sources cite a drop in PFAS-concentrations over the past ten years. These measures must be intensified and controlled with regards to efficacy.

We fully concur with the assumption that non-fluorinated alternatives are not necessarily less harmful to human health and the environment.

As briefly described above, many processes are feasible only because PTFE exists. Replacing it with another polymer may lead to unintended consequences such as increased energy consumption, reduction in service life or lack of product integrity of critical substances for the food and pharmaceutical industries.

We strongly urge not to attempt a general phase-out or prohibition of PFAS, but to consider their necessity under present operational conditions and desired product integrity. The use of PFAS can be viewed from the “concept of essential use” perspective, which should lead to “nice to have” uses being banned and truly vital applications being allowed until technically and commercially viable alternatives have been established.

In short, a PFAS ban would have such a large scope of unintended consequences as to render the European Union no longer competitive in the world market for a large scope of essential products.

Brief Description of State of the Art Filtration Technologies

The Conversion of Electrostatic Precipitators to Fabric Filters starting from the 1990’s

Electrostatic precipitators (ESP’) remove particles from gases by means of electrical charge and dominated industrial filtration processes for a long period of time. They are easier to maintain in comparison to bag filters, which consist of textile filter media, and they are more flexible in terms of temperature excursions. They have limitations in their ability to reduce the dust load as their efficiency strongly depends on the ability of the dust to accumulate sufficient electric charge. The trend towards fabric filters (= bag filter) started with the tightening of dust emission limits for the industry. The trend started in the coal fired boiler industry in the early 1990’s the cement industry followed from the mid 90’s consequently. The fast developing waste to energy sector also switched to bag filters in the 90’s. New plants were exclusively erected with fabric filters. The driver for this development were tightening emission limits, which were set in force by several European and national laws. This is shown in table 1 outlining past and current versions of the German TA Luft and the 17.BImschV.

	Former Limits		New Regulations	
	Year	Emission limit [mg/m³]	Year	Emission limit [mg/m³]
TA Luft	1986	50	2002	20
17. BImSchV	1990	10	2013	5

Table 1: Comparison of former and current dust emission regulations of Germany

Furthermore, we like to point out that the above-mentioned limits are the mildest applicable regulations for filter plants. Depending on local conditions, e.g. overall emissions in the area of the site more stringent rules can be applied. This often includes limits for PM (particulate matter) relevant emissions, namely PM 2.5 (microns).

Alternative Methods to reduce particle loads in flue gases

Cyclones

A cyclone using centrifugal force is also an obsolete apparatus to reduce dust emissions. The performance is limited and it is not able to deal with today's dust emission requirements. Especially a typical minimum of the collection efficiency of cyclone with PM2.5 emissions. No cyclone can cope with current dust emission requirements.

Wet scrubbing processes

Wet scrubbing processes introduce a liquid phase as highly dispersed fine droplets in the gas stream. They can reduce the dust load but they cannot be a significant barrier for dust particles as there are always strains and canals in such systems. Further, the evaporation creates temperature drop and humidity increase of the gas stream, which is counterproductive in most cases. For this reason, wet scrubbers cannot be considered as an alternative to fabric filters.

Materials Suitable for High Temperature Filtration

General Aspects of Filtration Fibres

Fibre materials used for filtration purposes have diameters of 10-30 µm. They show a high surface to volume ratio, which is the physical base for the effective collection of dust particles. On the other hand, the specific surface makes them sensitive to all potential substances in the flue gas, creating an ageing of the material, such as NOx, SOx, sulphuric acid, O_2, H_2O. As ageing is dominated by diffusion processes within the fibre material, it will reach the core of the fibre rapidly due to the small diameter causing a degradation of the material. In other words, the same material in the shape of a solid cube would hardly show degradation whereas the same mass of this material in the shape of small diameter filtration fibres would already be degraded completely during the same exposure time.

Furthermore, it has to be considered that the operating time of the polymer fibre based material in the specific environment of the filtration process is extraordinary long. Considering an operating time of 8000 hrs per year and an expected lifetime of 5 years or even more the exposure of the fibres in the harsh environments sums up to 40000 hrs and more during the lifetime. According to the demanded longevity of the fibres operating time a clear compromise has to be made in terms of operating temperature. For this reason the average operating temperature must be chosen well below the maximum applicable operating temperature of the material.

High Temperature Filtration Materials

Glass (Fabrics or Fibres) - Temperature suitability up to 280°C

Glass fibres, though used in other applications in huge volumes, are not commonly used as single fibres in the industrial filtration. Their main use is a fabric. This limits the use to applications with low demand in emission, as the performance of pure fabrics no longer meet European requirements with regards to particulate emission. Increasing the performance of a glass fabric to today’s demand requires the lamination of a PTFE membrane on it. By doing so, the ban would also be applied to this type of filter material. Furthermore, despite the thermal resistance, glass has significant limitations when exposed to alkaline and acidic operating conditions.

Polyimide (PI) fibres - up to 260°C peak temperature, average temperature below 200°C

Polyimides (Fibers, fabric) are widely spread in the filtration industry, showing similar thermal resistance as PTFE fibres. Despite some favorable properties they cannot match the chemical resistance of PTFE fibres. This limits their use to applications with lower operating temperatures compared to PTFE and more moderate chemical environments. Nevertheless, PI fibres are also used in composite blends with PTFE, which could be a suitable material combination to minimize but not to substitute the use of PTFE in filtration processes.

para-Aramide fibres - peak temperature resistance higher than 280°C

Despite their thermal capabilities and high temperature resistance, the sensitivity against alkaline and acidic substances excludes this material for the use in those applications where PTFE demonstrated the best performance. Ageing is shown in the data provided by the Kevlar producer Dupont. An important aspect for reading the laboratory data is the fact that all these data are created in environments, which are relatively moderate for a high temperature filter material such as PTFE. Also the exposure time of hours or max. several hundred hours is far from the life-span of a filter material, which is 40,000 hrs. So even a moderate performance decrease in the lab test will result in a complete failure of the filter material in less than 4000 hrs.

PBI Fibres, PBO fibres - peak temperature resistance beyond 300°C

Mostly known in the application field of fire fighters this material shows a serious weakness in chemically demanding environments. These materials are also known to degrade upon exposure to UV.

Ceramic Fibres

Ceramic fibres are based on molten and spun alumina silicate fibres. Their characteristics are completely different to organic textile fibres as they have to be manufactured into rigid filter cartridges, which require additional effort in cleaning. These elements have proven their use in high temperature applications beyond the operating range of textile based materials. On the other hand, they show a significant weakness in the presence of HF, a common by-product of incineration processes. Further weaknesses occur at lower temperatures whenever condensation takes place or a significant amount of HCl and SOx are present. These chemical environments are exactly the operation field of PTFE based filter materials, which indicates that ceramic elements cannot be used as a supplement for PTFE based filter materials.

Metal Fibres

Similar to ceramic fibres, filter elements based on metal fibres or porous metals are rigid and require different technical approaches when installed as filter material. Furthermore, they can withstand operating temperatures way beyond the limitations of textile based filter material. Though based on fibrous metals they have significant weaknesses when exposed to corrosive environments especially at temperatures that are applicable for most industrial filter applications. The same methodology as for polymer-based fibres must be applied here. Their extremely high surface makes them vulnerable to corrosion. For example, a stainless steel block might show some surface corrosion in an environment containing SOx, the stainless steel fibres will be completely disintegrated when exposed to the same environment.

PTFE (fabric, fibres, membranes) temperature stability up to 280 °C, 250 °C for continuous operation), chemically resistant in almost all environments

PTFE is the only material known by now that is inert in most environments, showing almost unlimited resistance in acidic, alkaline, highly corrosive, highly oxidizing environments. The transformation of this material into filtration fibres and expanded–PTFE membranes enabled filtration processes in critical processes which ensure the basic functionality of our today's industry and consequently environmental protection processes, they are the key to protect our health and the entire environment from dust, cancerogenic fine dust and poisonous substances e.g. dioxins, furans, HF, HCl, SOx. A detailed description of an excerpt of processes will be addressed later in this document.

Summary

Today the filtration of dust-loaded gases has become a highly sophisticated process where the dust in the gas stream with initial dust loads of up to 1,000,000 mg/m³ has to be reduced to sometimes less than 3 mg/m³. This corresponds to a filtration efficiency of 99.9997%. This has to be ensured over a lifetime of 40,000 hrs in an environment that contains highly reactive components causing a severe mechanical, thermal and chemical stress on the filter material that only has a thickness of 1.5-2.5mm. PTFE is an essential fibre material that survives these operating conditions and therefore either the only material of a filter fabric or at least the chemical and thermal backbone of a compound with a few other materials like PI, that are limited in their chemical resistance.

Furthermore, there is no trend foreseeable that particle relevant emissions will be set to a level that would allow other obsolete technologies like ESP's to be used again. Today's trend tends to limit PM relevant emissions (PM 2.5), which creates a demand to use e-PTFE membranes even in applications that do not require the use of PTFE as a base material for filter fabrics.

The developments in the last 3 decades have proven the reliability of PTFE-based filter materials and a potential ban of PTFE material for filtration products would cause a severe setback and threat to processes designed to protect the environment from being contaminated with harmful substances.

We further have to draw attention to the fact that the claimed persistence of PTFE, as defined by REACH, also pertains to alternative materials e.g. polyimides and p-aramide in like manner.

In terms of readability - our comments with regards to the end of life cycle would fit here

Application Example – Waste to Energy Treatment Plant

Waste to Energy Plants (WTE) have been used over decades to reduce the amount of landfilled waste in urban areas. Driven by the European landfill directive, the entire waste will have to be treated before its residues can be deposited. In Germany, the ban of landfill of untreated waste became active in 2005.

The most adequate way to process unsorted remaining household waste is a waste to energy plant. The waste is incinerated on a grate boiler and thus heat and electricity ~~is~~ are produced. Ashes and the flue gas ~~is~~ are treated downstream the boiler section.

Per definition, household waste is rather unspecified in its composition. For this reason, the flue gas treatment system has to be overdesigned and it must be capable of dealing with quantities of poisonous substances which are orders of magnitude higher than their expected average values.

The substances that have to be removed from the off gases are shown in the table below.

	Peak	Average	Emission limit
Dust [mg/Nm³]	50	20	3-10
NOx [mg/Nm³]	500	400	150-200
SOx [mg/Nm³]	1500	500	50
HCl [mg/Nm³]	3000	800	10
HF [mg/Nm³]		50	1

The method is a combined dry sorption of acidic components (SOx, HCl, HF) with an adsorption of Hg, dioxins and furans. This means that all these substances are transferred into a solid state, which are collected in a fabric filter. This filter process is crucial as a failure not only results in an increased dust emission, furthermore, all other pollutants will be released into the environment - exceeding emission limits create danger to human health and the environment.

The filter material needs to withstand a wide range of potential operating conditions, the temperature varies between 140 °C and 240 °C during peaks, the pH level can vary between 1 and 12,5. As a consequence, the construction of the filter material must contain a significant amount of PTFE, depending on the most likely operating conditions the content of PTFE can vary between 20 and 100%. Most applications are equipped with a compound of PTFE and PI with a PTFE content of 80%.

The ban of PTFE for filter materials in this application is not acceptable as the material is intrinsic for the function of the media. It is the only physical barrier in the entire system that prevents harmful substances of being released into the environment. Without PTFE as part of the filter material, a waste to energy plant cannot be operated. Establishing such a ban would lead to an immediate collapse of waste treatment in Europe, as thermal treatment can no longer be provided and landfilling is forbidden.

Applications similar to waste-to-energy such as the incineration of sewage sludge, treated wood, paper sludge and hazardous waste would be affected in similar fashion, as their design and function of the flue gas treatment are comparable to WTE plants.

As an example given to underline the a. m. facts is the performance of a filter material being a composite of PTFE and P84(PI) installed in the paper waste facility Langerbrügge (Belgium)

Substance	Inlet	Emission
Dust [mg/m³]	20-50000	1-5

SOx [mg/Nm³]	2000	<50
HCl [mg/Nm³]	1600	<10
HF [mg/Nm³]	50	<1

The flow rate in this application is 269,000 [m³/h]. The filter material installed, based on PTFE, achieved a lifetime of 75,000 hrs. without damage.

According to the study of the Austrian Umweltbundesamt (Rep 0771 page 40ff), the above sample represents the expected performance that can be achieved in waste incineration plants. The study concluded that 75 % of the monthly average values for dust are below 1 mg/Nm³. All Austrian WTE facilities are equipped with filter bags containing PTFE fibres or membranes.

The same study also refers to the emission of other toxic substances such as mercury (page 65), cadmium and thallium (page 66). The technology to reduce these components in the flue gas is adsorption, based on fine dispersed activated carbon particles. Consequently, the activated carbon including the adsorbed heavy metals are collected in the bag filter. Particle emissions would lead to an emission of heavy metals.

Assuming an ESP was used instead of a fabric filter in this plant, the emission of particles would be in the range of 30 [mg/Nm³]. Taking into account an average dust emission of 3 mg/m³ through the bag filter the difference in dust emission is 27 mg/m³, multiplied by the flow rate of 269,000m³/h. This is a surplus of 7,263 kg/h of dust that an ESP would emit compared to a bag filter. At a total operating time of 8,000 hrs/year this sums up to 58.1 t/year of fine dust including the entire PM 2.5 fraction and adsorbed heavy metals.

Application Example - Cement Plant – Alkali Bypass system

Cite of Cementnet.com Article (Bypassing challenges By ICR Research Published 30 April 2012)

The introduction of preheater kilns in the cement industry has certainly contributed to significant energy savings in clinker production. However, compared to long wet or long dry kiln processing this fundamental change of technology and production equipment had strong effects on various process parameters, especially on the formation of internal cycles. As soon as the solidified salts of these chlorine, sulphur and alkali compounds, which are highly volatile, reach the sintering zone, they partially evaporate and are transported with the combustion gases back to the kiln inlet. At the temperature level which prevails in the calciner and lower cyclone stages of the preheater, the condensation points of the vaporised salts are reached so that liquid and solid phases start to form. Depending on the overall intake of these components into the kiln, build-ups can develop which can have significant and disturbing impacts on the production process, even causing unplanned kiln stops.

To overcome this burden, a significant fraction of the off gases have to be separated from the main gas flow of the cement system and this fraction has to be cooled quickly to temperatures between 210 and 250 °C in order to condensate the alkaline substances. The process is described in detail e.g. on the website of the leading OEM, KHD Humboldt (**https://www.khd.com/products/pyro/preheater/bypass/#how-it-works**).

The main apparatus to clean the gas from the chlorine and sulphur rich particles is a bag filter. Due to the high temperature and harsh chemical environment, the material must be based on PTFE. This can be seen by the technical article of Intensiv Filter, a major OEM for cement dedusting equipment.

“Energy efficient Bag Filter for Bypass Dedusting, AUCBM Conference, Cement and Building Materials Review, No. 44, June 2011)

Application Example - Schwenk Cement Mergelstetten

In order to achieve a steady operation, approx. 5-10 % of the gas volume has to be extracted from the main gas flow and treated in the alkaline bypass system. In accordance to the given process demands, the high chlorine content of the dust requires filtration at temperatures above 210 °C. In the first years of operation, a lower temperature of just 180 °C was selected leading to an increase of the operating pressure drop, which was reported to be 22 mbar in 2010. The optimization of the plant including the use of an optimized filter material based on PTFE led to a stable process and a pressure drop (Dp), which is reportedly in the range of 15 mbar (2020). In this particular plant the achieved power saving is 36 kW, which is equivalent to saving 121 t of CO_2 per year just for this single filter unit in this particular plant. Here again the use of PTFE is essential, and any other alternative filter material would force the plant to operate at unstable operating conditions affecting the entire cement production process.

In the last 2 decades, the European cement industry was forced to reduce the energy demand and CO_2 footprint. This led to the massive increase of the incineration of alternative fuels to substitute the fossile fuels used in the past. The higher alkaline content of these fuels led to the installation of alkali bypass systems. Traditionally equipped with electrostatic precipitators (ESP), latest regulations and tightening limits of dust emissions eliminated the ESP as a suitable apparatus for this crucial operation in a cement plant. Consequently, almost all existing bypass systems within the EU are equipped with fabric filters today. As described above the only suitable material is a filter fabric based on PTFE.

A ban of PTFE for filter fabrics would consequently lead to an inability to operate the crucial process of the alkali bypass in the cement industry. As a further consequence, production facilities will have to stop to produce cement. This will further lead to a complete collapse of the building industry within the EU.

Application Example – Steel Industry – Sinter Band Dedusting

Sinter plants are important facilities in the production chain of ironmaking. They not only produce sinter as ironbearing burden for the blast furnace, but also recycle a large quantity of valuable secondary materials to avoid their landfilling.

In principle, all iron containing small scale components are dispersed on a belt including a ratio of coal. The ignition leads to a partial reduction and the formation of solidified bricks that can be placed in the furnace. The entire system is vented by air, which is sucked through the band top to bottom. The dedusting was performed by means of ESP’s in the past. However, the environmental legislation has been continuously and strictly tightened by the environmental authorities concerning the emissions of pollutants in waste gases. Today not only dust is a concern. Furthermore, the SO_2 content needs to be minimized and dioxins as well as furans have to be removed. This requires flue gas treatment systems that contain a dry scrubbing process for the SOx, an adsorption process for dioxins and furans as well as a highly efficient filtration process. Today the state-of-the-art technology is a highly efficient fabric filter mainly equipped with materials that normally overachieve the task.

Stringent requirements, especially in urban areas, lead to performance requirements below the current demand of the TA Luft. In this case ePTFE-membranes need to be used in order to ensure the max. applicable particle emission.

A ban of PTFE as a filter material would also have a significant impact on the European steel production. Although PTFE is not used in all fabric filters of sinter bands, a significant share of these plants require the use of PTFE either as fabric or as membrane. A serious threat for filter materials in this application is the operation below the acid dew point. The condensing sulphuric acid damages almost all other known filter materials. This is the main driver for the use of PTFE in this particular application.

Furthermore, the high dust recycling rate leads to very fine particles that require a very efficient filtration media. In industrial filtration, this can only be provided by using an e-PTFE membrane, as membranes based on other polymers such as polyurethane or polyester would not withstand the chemical environment.

One application example is the Dillinger Hütte located in Saarland. The dedusting of the sinter plant is done by using a filter material containing an e-PTFE membrane. This media was selected, as all other conventional filter materials that were used before were not able to achieve the emission limits and a frequent change was required leading to a disruption of the production.

By using this sophisticated media, the process was stabilized and the production could be operated in a continuous way.

Such highly efficient filter materials are not only required to fulfill dust emission targets. As stated by the operator of the plant the implementation of a new cooling system in combination with a highly efficient filtration are enabling significant improvement of the CO_2 footprint. In case of the Dillinger Hütte this is 25,000 t of CO_2 per year. (https://www.stahleisen.de/2021/03/19/dillinger-und-saarstahl-neue-rundkuehlerentstaubung-bei-rogesa/)

Applications in the Chemical Industry

As stated above, life in the 21st century heavily relies upon the products of the chemical industry.

Many processes such as polymerization, oxidation, reduction, grinding, drying etc. involve conditions of elevated temperatures and, of necessity to achieve the desired products, aggressive chemical environments.

For example, when drying substances, implementing any condensation polymers such as polyesters or polyamides as filter media leads to a rapid degradation of the material due to depolymerization by opening the ester or amide bonds and shortening the chain lengths. This can occur within days to weeks. PTFE, on the other hand, is entirely resistant to degradation in the presence of steam.

Under certain operational conditions, it is technically and economically feasible to use condensation polymers when they have been treated to withstand aggressive chemicals and/or elevated temperatures, however, this is only possible by using PFAS-based treatments.

When very fine particles of submicron size are produced, e. g. titanium dioxide, pyrogenic silica etc., PTFE membranes are used to ensure that the particles are not released to the environment, which not only protects the environment but also increases process efficiency.

One prime example where nanometer size particles are produced under aggressive operation conditions is pyrogenic silica. It is produced in a flame and the by-product of this process is hydrochloric acid. No other material than PTFE can withstand these harsh conditions. Pyrogenic silica is used, i. a., as a thickening agent, desiccant, abrasive and filler in paints and coatings. Limiting production would cause major disruptions in the supply chain of many products used for commercial and technical applications.

Applications in the Pharmaceutical Industry

The Position Paper on PFAS of the European Federation of Pharmaceutical Industries states very clearly that PFAS are essential as filter media, adjuvants and productions materials. PFAS-based filters are also required in medical devices due to their inertness. The position paper warns of the unintended consequences of a PFAS-ban.

To ensure the viability of pharmaceutical production in the European Union, the products manufactured here must have high value-added to justify elevated labor, energy and regulatory costs.

One such group of products are cytostatic agents used in chemotherapy to treat cancer. Some are produced under such chemically aggressive conditions, i. e. when oxidizing platinum or other precious metals, that high alloy stainless steels are corroded and only nickel-based ones are sufficiently resistant. With respect to synthetic polymers used for the filter media, only PTFE (or other PFAS) are sufficiently stable to withstand degradation.

New concepts of cytostatic agents under development include a combination with nano-materials for a targeted delivery of the medication to the neoplastic cells.

Thus, there is a need for high temperature and chemical resistance as well as exceptional particulate retention properties of the filter media, to ensure reliable production of these vital medications.

Banning the use of PFAS in filter media during the production of vital medications would force the pharmaceutical industry to relocate large production facilities outside of the European Union with the ensuing loss of high-paying jobs and reduction of GDP as well as a knowledge transfer that could cause strategic damage to the EU.

Applications in the Food Industry

Food supplements and additives are at times produced under demanding operating conditions. This could include elevated temperatures, high or low pH, oxidizing or reducing environments and due to that PTFE is frequently the only option for use as a filter media.

Additionally, during drying, grinding and transportation processes fine sub-micron particles are generated that require a filter media with a very high particle retention rate. This is often achieved by using PTFE membranes with retention rates of over 99 %.

When producing milk powder, baby foods etc. by means of spray-drying, filter media are exposed to high humidity at elevated temperatures and frequently the products are not completely dry and thus adhere easily to any surface.

Materials of choice normally involve PFAS-based filter media, either as fiber, membrane, coating or impregnation. Additionally to the chemical inertness, the non-stick property of PTFE enables better filter cake release and thus reduced energy consumption. Fine particles require retention by a PTFE membrane, which also includes the advantage of a non-stick surface.

With respect to overall and specific migration (cf. EU Regulations 1935/2004 and 10/2011), PTFE repeatedly displays the lowest values when compared to other synthetic polymers such as polyesters, which are also used for food contact materials. Repeated examinations by external test institutes have demonstrated that there is no release of PFAS monomers, oligomers or production aids. (ISEGA report 17211/28 report will be classified as confidential)

Banning PFAS in the production of foods and foodstuffs would cause a major disruption in the manufacture of products vital for daily use, including for particularly vulnerable consumers such as infants and small children.

Again, the immediate unintended consequence would be the relocation of production facilities to non-EU countries with the resulting loss of jobs and GDP.

Environmental Impact Caused by the Potential Ban of PTFE

In order to illustrate the environmental impact of the potential ban of PTFE for the filtration industry, we have calculated the additional dust emissions as a governing parameter. As described in the application examples above in addition to dust also other harmful substances such as poisonous heavy metals, dioxins and furans are emitted with the dust as they are adsorbed on the surface of the dust particles.

The calculation is based on average emission rates, which are selected in favor of the alternatives to PTFE based materials. For the comparison between an e-PTFE membrane and conventional material, it is assumed that the emission of the membrane is 3 mg/m³ and the emission of the conventional material is 15 mg/m³ and thus just not good enough to fulfill the requirements.

Also for the comparison between PTFE fabrics and the ESP the emission for the PTFE fabric is assumed to be 10 mg/m³, which is in most cases maximum allowed emission. Referring to the study of the Austrian Umweltbundesamt it can clearly be proven that PTFE based filter materials can operate at emission rates in the range of 1 mg/m³.

Confidential Table 1 and Confidential Table 2 fit in this place of the text

The additional emitted dust is equivalent to 7334 t/a. The major portion of this dust is PM relevant and known to have a negative impact on human health. Further heavy metals, dioxins and furans are in many cases adsorbed by the fine dust particles. The related filter areas are based on the annual sales of the PTFE based filter materials of the Kayser-Filtertech Group and represent only a fraction of the affected dust collection systems within the EU.

PTFE Based Fibre Coatings

Purpose

PTFE based coatings are widely used in industrial filter applications. Due to the nature of filtration processes and the changing temperatures in those systems it is obvious that almost every filter is operated below the dew point of water or even acids from time to time. This mainly occurs during startup and shutdowns of a plant. In these operating periods, dust tends to become very sticky and could in the worst-case form a crusty cake on the filter element, which can no longer be removed. The consequence is a high differential pressure. In the final consequence, the plant can no longer operate and filter elements have to be replaced.

PTFE Impregnation Details

The impregnation of the filter material with water repellent, oil repellent, and dust repellent coatings is an established process to overcome these issues. One crucial component of coatings is PTFE. The amount of coating required for the impregnation is in the range of 20-30 g per m^2 of filter material. As the material in total has a fabric weight of 400-750 g/m^2 the impregnation content on the felt is between 2.6 and 7 %.

Benefits of a PTFE Coating

As described above the first objective to use a coating is to prevent a high pressure drop and a failure of the filter material related to crusty dust on it. A further aspect is the fact that these coatings ease the dust release during cleaning in general and this leads to a lower pressure drop of the entire filter system over the entire operating time. In order to illustrate this fact we will provide the example of a cement kiln filter, which has an average size of 10,000 m^2 filter area. The air flow in such an application is normally roughly 600,000 m^3 per hour. The lower differential pressure due to the use of a coating leads to lower energy demand of the suction fan.

Bag Type		**PTFE Coating**	**Without Coating**
Average Pressure Drop (ΔP)	kPa	1.2	1.4
Actual Volume Flow	m^3/s	167	167
Fan efficiency (typical)	%	80	80
Motor efficiency (typical)	%	94	94
Drive efficiency (typical)	%	85	85
Power consumption	kW	312.9	365.0

Based on the application data above, a power saving of 52 kW can be achieved. This saving accumulates to a total saving of 417188 [kWh] in one year. Furthermore, this figure can be set in correlation with a CO_2 saving of 175 t/year (based on the German figure for CO_2 equivalent of electric energy in 2020).

Confidential Paragraph 1 fits in this position of the statement.

In terms of readability confidential socio economical effects fit in this section of the statement

Conclusions

The development and status of today's state-of-the-art and BAT (Best Available Technology) technologies are based on highly durable and highly efficient filter materials. PTFE is the only material that can deal with demanding environments in terms of chemistry and temperature.

The discussion of alternative processes as well as materials made it clear that an alternative to PTFE does not exist. The reason is simple. The chemical resistance of PTFE is unique and there is no substance available in today's chemistry that can match this performance in all the described conditions. Options might be capable to deal with a single parameter (e.g. the temperature) but they would fail due to the chemical ageing of the alternative material. To achieve the required performance, the filter material must be resistant against all deteriorating parameters, a weakness in just one ageing criteria will lead to a quick failure of the filter process.

The comparison of emissions between PTFE based materials and the alternatives does provide clear evidence that the dust emission is increased dramatically with a significant health impact due to fine dust (PM 2.5) which is a proven medical fact. On the other hand, a potential health impact was stated by the authors of the ECHA report, which is highly doubtful as PTFE is also used in human medicine. A potential exposure and accumulation in biological systems is also improbable as the used filter fabrics have to be treated accordingly. It is obvious that the impact of the ban of PTFE in the filtration industry would create a severe health and environmental issue. A prevention of negative health impacts cannot be determined for the filtration industry.

The processes described in the application examples are just 3 out of many crucial processes that are the backbone of our society.

The purpose of a filter material is to protect the environment. It is our commitment as a fabric producer and supplier to provide the best available technology to fulfil this task. By eliminating the option to select PTFE based materials, severe consequences for our entire industrialized society would follow immediately. It is therefore absolutely necessary to make a permanent derogation for PTFE based filter materials in the planned ban of PFAS.