The Unique Role of Fluoropolymers in Sealing Devices

European Sealing Association e.V.

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Who are the ESA?

The European Sealing Association (ESA) is an association of European (+ UK) based companies which manufacture Sealing Devices.

- Established in 1992, Registered in Germany & UK
- Non profit Organisation
- 50 Members, 2 Research Organisations, Amtec (Germany) and Cetim (France)
- Sealing Device Groups; Mechanical Seals, Packings, Gaskets, Elastomeric & Polymeric Seals and Expansion Joints.

Typical Sealing Applications

Domestic.

Home, schools, hospitals, office, domestic other:

Applications.
Washing machine, dishwasher, taps, central heating pumps, underfloor heating manifolds, cut off valves and ball valves, gas controls/cutoffs, solar pumps, pure oxygen supplies (hospital)

Performance requirements of Sealing Devices: Low temp range, low pressure, low dynamic loads, none hostile chemicals (water, gas, waste water) Fluoropolymers widely used in pump and valve applications above. Chemical resilience, mouldability, low friction, machineability, dynamic and static loads.

Typical Sealing Applications

Industry:

Drinking water and water treatment plants, chemical, Oil & Gas, Automotive, Nuclear, Aerospace, Food, Hydrogen, Semiconductor, Oxygen service, Space, Pharmaceutical

Example: Cryogenic Applications.
Air separation plants, hydrogen development, chemical and LNG plants

Typical Equipment, control valves, pumps, compressors, flanges, expansion joints.

Wide temp capability (-162 deg C), High pressure, chemical resistance, safety critical. Widespread use of Fluoropolymer Sealing devices.

Typical Applications

Example: Onshore Gas treatment:
500 to 1,000 sealing applications.
High pressure, wide temperature,
critical application.
Fluoropolymers widely used in mechanical seals,
flange gaskets, packing sets. Critical applications where chemical resistance and the ability to withstand thermal cycling conditions are necessary.

Example: Refinery
>20, 000 Application specific seals.
High/low temp, high pressure, wide Ph range, high mechanical loads, safety critical.

Fluoropolymers used in flange gaskets, expansion joints, packing sets, mechanical seals. Mainly because of chemical resistance properties combined with durability under fluctuating thermal and mechanical loads.

Approval Programmes and Design Standards

- **Everyone of the 50 Members has a Technical Department and/or Research functions engaged in assessing the suitability of Sealing materials to meet the conditions and approval requirements. The Sealing Materials chosen are very application specific, heavily researched and understood.**

- **International and National Standards.**

  Fluoropolymers in sealing devices approved for food, water, oxygen etc Numerous technical standards, ISO, EN, BSI for leak rates and tightness calculations.

- **Customer Specific Standards:**

  Military, Aerospace, Petrochemical, Nuclear, Original Equipment such as pumps, valves, compressors.
  Application Specific but 5 to 25 years wouldn't be unusual.

Fluoropolymers in Sealing Devices?

Fluoropolymers are Very Application Specific.

Wide variety of Sealing Materials available for use in Domestic through to Industrial and OEM applications.

Why **Fluoropolymers in Sealing Devices:**

- No Alternative, the only material suitable:
  Chemical resistance, thermal capability (high/low), mechanical integrity, low coefficient of friction. Critical use environments.
- Mouldability, machineability.
- Downside, High Cost.
- Cannot be Reused. Contamination, purity requirements, wear, risk of failure too costly (monetary and human cost)

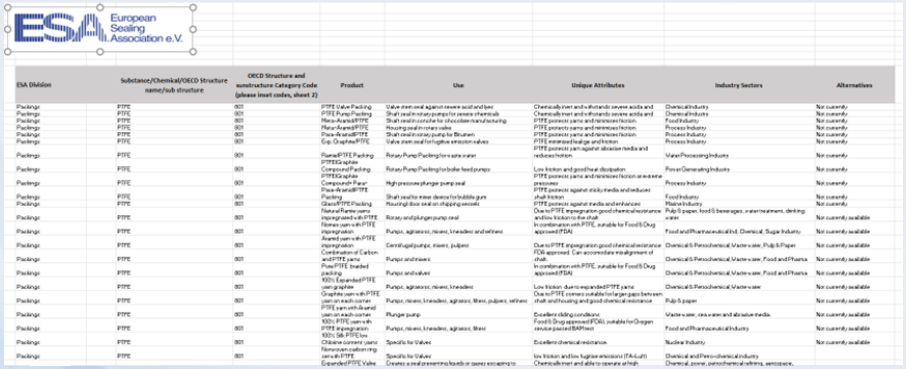
Industry Sectors and Uses

A spreadsheet has been compiled with references to Fluoropolymers used in sealing applications.

The spreadsheet is publicly available and updated periodically.

It can be used by local and National authorities.

A Position Paper is circulated in conjunction with this data.



ESA Division	Substance/Chemical/OECD Structure name/sub structure	OECD Structure and sunstructure Category Code (please insert codes, sheet 2)	Product	Use	Unique Attributes	Industry Sectors	Alternatives
Packings	PTFE	801	PTFE Valve Packing	Valve stem seal against severe acid and lyes	Chemically inert and withstands severe acidity and	Chemical Industry	Not currently
Packings	PTFE	801	PTFE Pump Packing	Shaft seal in rotary pumps for severe chemicals	Chemically inert and withstands severe acidity and	Chemical Industry	Not currently
Packings	PTFE	801	Resa-Aramid/PTFE	Shaft seal in conche for chocolate manufacturing	PTFE protects yarns and minimises friction	Food Industry	Not currently
Packings	PTFE	801	Resa-Aramid/PTFE	Rotating seal in rotary valve	PTFE protects yarns and minimises friction	Process Industry	Not currently
Packings	PTFE	801	Resa-Aramid/PTFE	Shaft seal in rotary pump for Bitumen	PTFE protects yarns and minimises friction	Process Industry	Not currently
Packings	PTFE	801	Exp. Graphite/PTFE	Valve stem seal for fugitive emission valves	PTFE minimises leakage and friction	Process Industry	Not currently
Packings	PTFE	901	Resin/PTFE Packing	Rotary Pump Packing for warm water	PTFE protects yarn against abrasion media and reduces friction.	Water Processing Industry	Not currently
Packings	PTFE	901	PTFE/Graphite Composite Packing	Rotary Pump Packing for boiler feed pumps	Low friction and good heat dissipation	Power Generating Industry	Not currently
Packings	PTFE	901	PTFE/Graphite Composite Resin/Aramid/PTFE	High pressure plunger pump seal	PTFE protects yarns and minimises friction at extreme pressures	Process Industry	Not currently
Packings	PTFE	801	Resin/PTFE	Shaft seal for mixer device for bubble gum	PTFE protects against sticky media and reduces shaft friction	Food Industry	Not currently
Packings	PTFE	801	Glass/PTFE Packing	Round gl door seal on shipping vessels	PTFE protects against media and oil and reduces	Marine Industry	Not currently
Packings	PTFE	801	Natural flame resin impregnated with PTFE	Rotary and plunger pump seal	Due to PTFE impregnation good chemical resistance and low friction in the shaft	Pulp & paper, food & beverages, water treatment, drinking water	Not currently available
Packings	PTFE	801	Aramid yarn impregnated with PTFE	Pumps, agitators, mixers, kneaders and refiners	In combination with PTFE, suitable for Food & Drug approved (FDA)	Food and Pharmaceutical Ind, Chemical, Sugar Industry	Not currently available
Packings	PTFE	801	Aramid yarn with PTFE impregnation	Centrifugal pumps, mixers, pulpers	Due to PTFE impregnation good chemical resistance	Chemical & Petrochemical, Waste water, Pulp & Paper	Not currently available
Packings	PTFE	801	Combination of Carbon and PTFE yarns	Pumps and mixers	FDA approved. Can accomodate misalignment of shaft	Chemical & Petrochemical, Waste water, Food and Pharma	Not currently available
Packings	PTFE	801	Pure PTFE braided packing	Pumps and valves	In combination with PTFE, suitable for Food & Drug approved (FDA)	Chemical & Petrochemical, Waste water, Food and Pharma	Not currently available
Packings	PTFE	801	100% Expanded PTFE yarn/graphite	Pumps, agitators, mixers, kneaders	Low friction, due to expanded PTFE yarns	Chemical & Petrochemical, Waste water	Not currently available
Packings	PTFE	801	Graphite yarn with PTFE yarn on each corner. PTFE yarn with Aramid yarn on each corner.	Pumps, mixers, kneaders, agitators, filters, pulpers, refiners	Due to PTFE corners suitable for larger gaps between shaft and housing and good chemical resistance	Pulp & paper	Not currently available
Packings	PTFE	801	Pure PTFE	Plunger pump	Excellent sliding conditions	Waste water, sea water and abrasive media.	Not currently available
Packings	PTFE	801	100% PTFE yarn with PTFE impregnation.	Pumps, mixers, kneaders, agitators, filters	Food & Drug approved (FDA), suitable for Oxygen service packed BAM test	Food and Pharmaceutical Industry	Not currently available
Packings	PTFE	801	100% Silk PTFE low Chlorine content yarns	Specific for Valves	Excellent chemical resistance	Nuclear Industry	Not currently available
Packings	PTFE	801	Nomex yarn cushion ring on silk PTFE	Specific for Valves	low friction and low fugitive emissions (TA-Luft)	Chemical and Petro-chemical industry	
Packings	PTFE	801	Expanded PTFE Valve	Creates a seal preventing liquids or gases escaping to	Chemically inert and able to operate at high	Chemical, power, petrochemical refining, aerospace,	

- **Main Fluoropolymers used in Sealing Devices:**

  PTFE, FKM, FFKM, PVDF, FEP, PFA, PCTFE, FEPM,

- **Dynamic and Static Applications**

- **Incredible number of very specific applications, impossible to catalogue everything.**

  Eg Control valves, size, pressure rating, temp capability, chemical resistance

ESA's analysis of the current PFAS Restriction Proposal

✓ Restricting PFAS is necessary to protect human health and the environment

NO Recognition of the crucial role of Fluoropolymers in the PFAS Restriction Proposal.

NO reference to Sealing Devices = Sealing Devices utilising Fluoropolymers would be banned as of 2026.

NO Reference to Maintenance and Repair requirements. Sealing Devices are part of maintenance and repair schedules in numerous industry sectors.

Interlink between Sectors not clear: eg - some sealing devices contain electronics. Electronics don't have any derogation = some sealing devices containing FP could not be placed on the market, even where there is a derogation.

⊗ **An ESA Sealing Device SEA will be submitted.**

Conclusion: The ESA is;

- **Seeking a Proportionate Response.**

- **Asking that Fluoropolymers in Sealing Devices are recoginised. Without them all of society will stop.** They are selected because of their ability to withstand hostile, aggressive and/or are reliable in critical environments.

  Essential Use, seeking an exemption.

- **Seeking Recognition that there is no Alternative in Sealing Devices. An Alternative would need to be;**
  - Tested and approved for all known chemicals, leak rates understood, seating stresses would need to be calculated and temperature/pressure limits understood.
  - Meet/exceed existing EU/ISO Standards, extensive timeline.
  - Require application testing. Nuclear, Aerospace, Military, Petrochemical > 5 years to 25 years
  - Resilient. Unfortunately, persistence is a necessary attribute. The cost of failure is too high.

Thankyou.