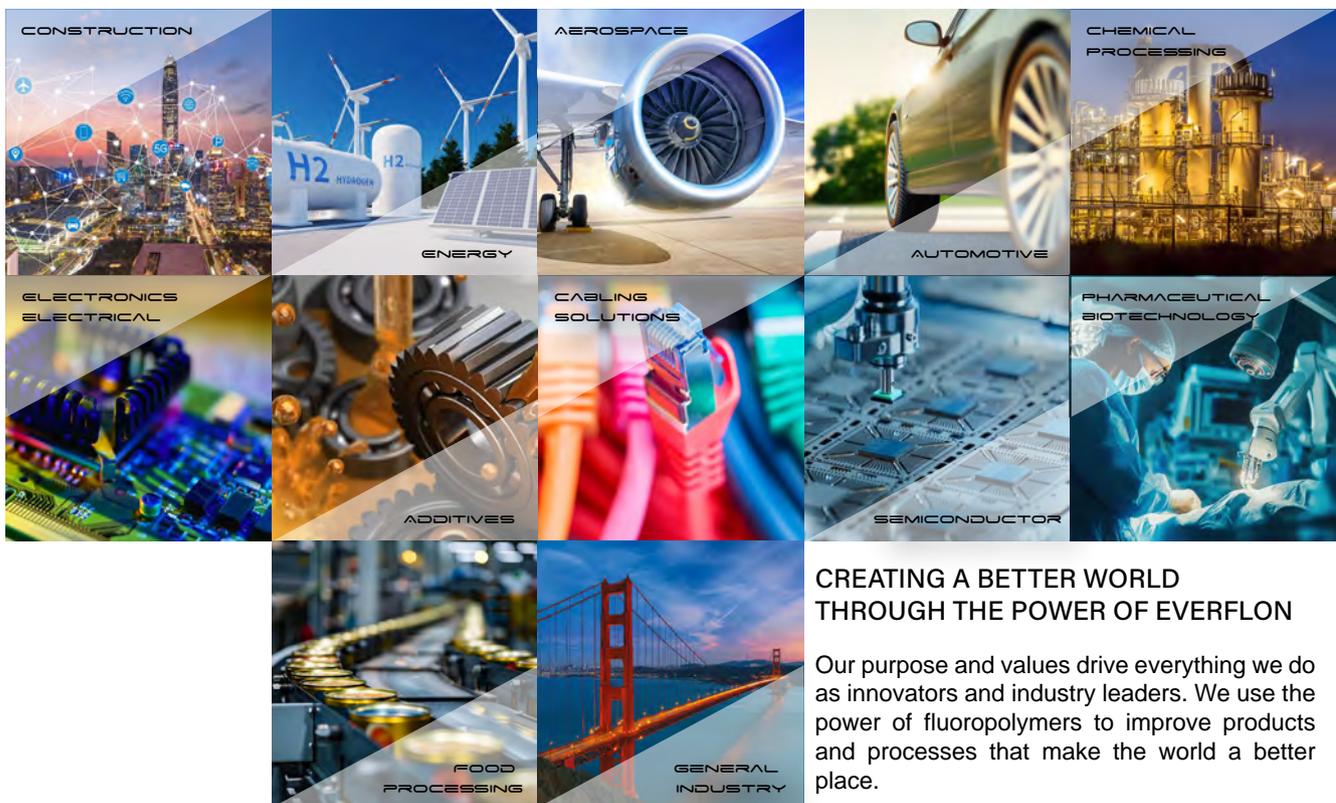




# Major End-Use Industry Segments of Fluoropolymers

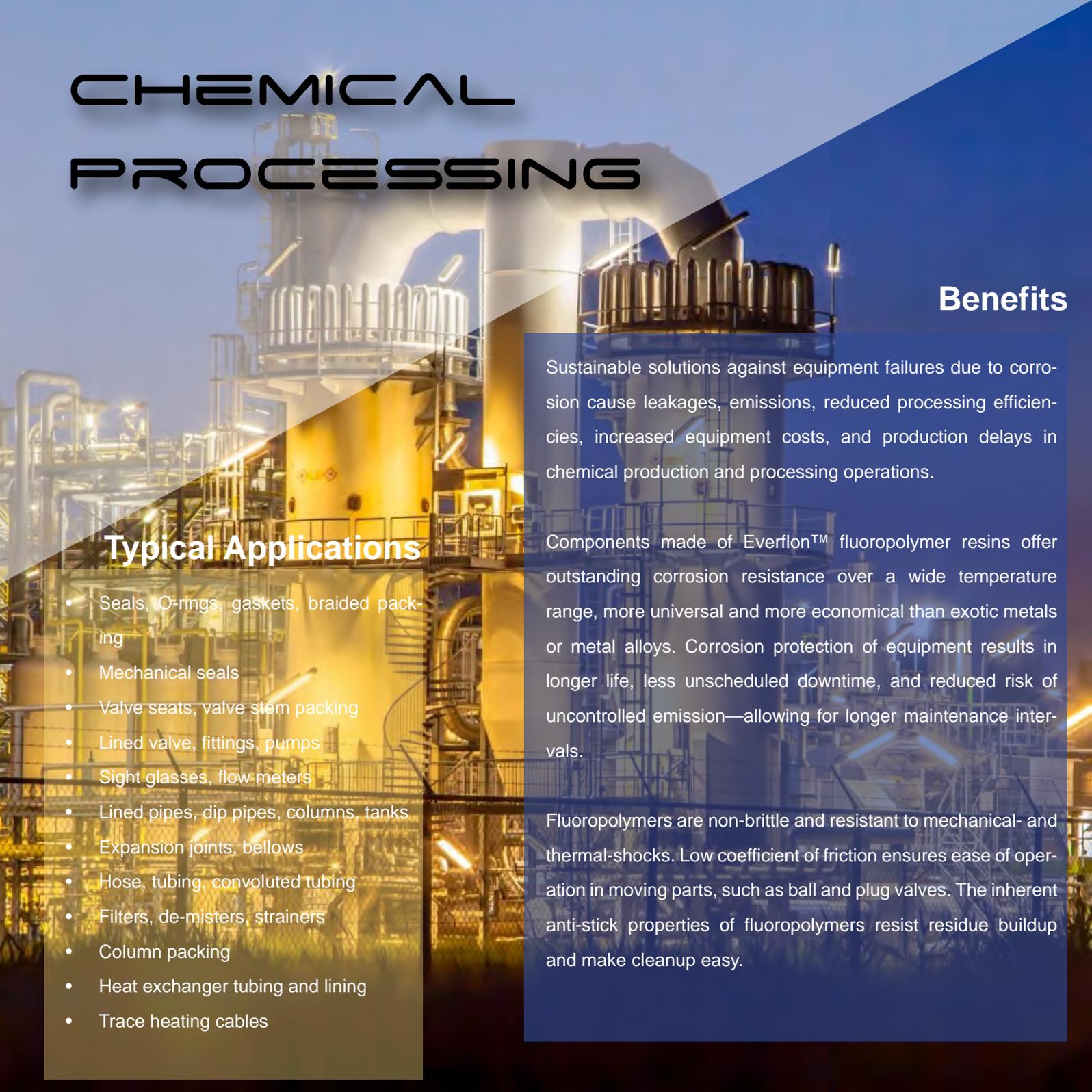


CREATING A BETTER WORLD  
THROUGH THE POWER OF EVERFLON

Our purpose and values drive everything we do as innovators and industry leaders. We use the power of fluoropolymers to improve products and processes that make the world a better place.

EVERFLON ACADEMIC

# CHEMICAL PROCESSING



## Benefits

Sustainable solutions against equipment failures due to corrosion cause leakages, emissions, reduced processing efficiencies, increased equipment costs, and production delays in chemical production and processing operations.

Components made of Everflon™ fluoropolymer resins offer outstanding corrosion resistance over a wide temperature range, more universal and more economical than exotic metals or metal alloys. Corrosion protection of equipment results in longer life, less unscheduled downtime, and reduced risk of uncontrolled emission—allowing for longer maintenance intervals.

Fluoropolymers are non-brittle and resistant to mechanical- and thermal-shocks. Low coefficient of friction ensures ease of operation in moving parts, such as ball and plug valves. The inherent anti-stick properties of fluoropolymers resist residue buildup and make cleanup easy.

## Typical Applications

- Seals, O-rings, gaskets, braided packing
- Mechanical seals
- Valve seats, valve stem packing
- Lined valve, fittings, pumps
- Sight glasses, flow meters
- Lined pipes, dip pipes, columns, tanks
- Expansion joints, bellows
- Hose, tubing, convoluted tubing
- Filters, de-misters, strainers
- Column packing
- Heat exchanger tubing and lining
- Trace heating cables

## Benefits

- Corrosion resistance over a wide temperature range, more universal and more economical than exotic metal alloys
- High purity, extremely low extractable level, no leaching out of substances that could contaminate ultrahigh purity process fluids
- Everflon™ PFA offers improved system reliability and reduced cost of ownership (longer lifetime, less maintenance), while maintaining the same level of purity
  - Longer life under dynamic loads (flex life)
  - More resistance to stress cracking by specialty fluorosurfactants, such as aggressive developers
  - Smoother surfaces for resistance to microbial contamination
  - Inert non-polar polymer chain end groups for unsurpassed protection against ionic and metallic contamination, even from ozonated fluids
  - Unmatched HCl permeation resistance

## Typical Applications

- Shipping containers
- Pipes, fittings
- Tubing
- Filters
- Wet bench tanks, sinks
- Valves, pumps
- Level indicators
- Wafer carriers

SEMICONDUCTOR

# CONSTRUCTION

## Typical Applications

- Architectural membranes of fiberglass coated with Everflon™
- Architectural fabric woven of PTFE fibers
- Transparent architectural film
- Enhanced fire performance data cables
- Under-tile heating cables
- Shatterproof lamps
- Slide bearings
- Valve seats for central heating systems

## Benefits

Architectural films and membranes made of glassfiber woven fabric coated with Everflon™ fluoropolymers offer many advantages as a construction material over traditional materials:

- **Aesthetics.** Architectural membranes allow structures with graceful, complex curves. Wide-span possibilities with obstruction-free view
- **Safety.** Fluoropolymers are exceptionally resistant to ignition, flame spread, and heat and smoke release. Classifies as “non-combustible” roofing material
- **Non-stick.** Architectural membranes coated with Everflon™ PTFE are self-cleaning.
- **Durability.** Over 30 years of proven performance, chemically inert Everflon™ PTFE endows architectural fabric with UV resistance and resistance to moisture and microorganisms.
- **Economics.** Multi-functional, translucent. Full spectrum light transmission (except for harmful infrared and UV rays) allows for natural illumination during daylight hours.

This helps reduce lighting costs and promote grass and plant growth. Acts as barrier to external heat and noise, while enhancing internal acoustics and preserving desired level of temperature and humidity

- **Cost-effective.** Fabric structures offer attractive cost saving and energy efficient alternatives to traditional buildings. An architectural membrane roof can be a fraction of the weight of conventional roof structures, allowing substantial savings in floor assemblies, walls, and foundations.

## Benefits

Working in oil and gas refineries, pipelines, and downhole environments can prove environmentally challenging. Products made with Everflon™ fluoropolymers have exceptional resistance to high temperatures, chemical reaction, corrosion, and stress-cracking that results in higher mean time between failures (MTBF). Chemical resistance offered by fluoropolymers is more universal and economical than most exotic metal alloys.

- Non-stick, easy cleaning. Very few solid substances will permanently adhere to surfaces of Everflon™ coatings, reducing significantly buildup of asphaltenes, paraffins, and scale— thus yielding enhanced flow of liquids and gases. Although tacky materials may show some adhesion, almost all substances release easily.

- Low coefficient of friction. The coefficient of friction of Everflon™ PTFE is among the lowest of any solid material. This combined with chemical and temperature resistance makes it the product of choice for slide bearings, seals, and gaskets.
- Unique electrical properties over a wide service temperature range allow for downsizing of cables used under extreme conditions (e.g., down-hole).

Based on these properties, fluoropolymers bring solutions to the oil and gas industry that allow maximizing productivity by minimizing production interruptions due to shutdowns for cleanup or for repair or replacement.

## Typical Applications

- Electric submersible pump insulation
- ESP power cable
- Data logging cable
- Trace heating cables
- Gaskets, seals, packing, valve seats
- Slide bearings
- Bellows, expansion joints
- Hose, tubing, down-hole tubing

ENERGY

# AEROSPACE

## Benefits

The aerospace industry requires products with a complex combination of properties: strength and durability, lightweight, resistance to harsh environments, and ease of use in manufacturing. Safety considerations, such as flame resistance, are also of paramount importance.

Fluoropolymers have played a key role in the space programs, development of new defense systems, and creation of commercial jet aircraft and engines.

Reasons for the use of fluoropolymers in the aerospace industry are:

- Low smoke and flame
- Weight and space savings
- Operability over broad temperature range and good aging resistance
- Self-lubricating, low friction
- Flexibility, high fatigue resistance
- Excellent dielectric properties over a wide frequency range
- Withstands exposure to hydraulic fluids, solvent, and cleaning solutions
- Resistance to high soldering temperatures
- Good release properties for epoxy resins
- UV resistance
- No degassing of any byproducts

## Typical Applications

- Rings, seals, gaskets for hydraulic systems
- Satellite propulsion systems
- Hose, tubing for hydraulic and fuel systems
- Electrical insulation for high frequency cables
- Airframe wire insulation
- Insulation for internal wire and cable in avionics
- Engine wire insulation and jacketing
- Heating cable
- Circuit boards for microwave equipment
- Wire conduits
- Wire and cable sleeves, heat-shrinkable tubing

## Benefits

The automotive industry has to deliver better performance against ever increasing and sometimes conflicting requirements, such as:

- Lower emissions (including evaporative emissions)
- Better fuel economy
- Increased warranty period
- Lower maintenance costs
- Higher comfort level

Fluoropolymers play an important role in meeting these requirements by offering:

- Maximum durability under extreme temperatures and harsh chemicals. Everflon™ PTFE and PFA meet ISO 6722 Class H (−40 to 250 °C), FEP meets Class G (−40 to 225 °C), and ETFE meets Class F (−40 to 200 °C).
- Extremely low permeability and outstanding resistance to chemicals like biofuels, flex fuels, hydraulic oils, etc.
- Lowest coefficient of friction of any solid material for use in non- and minimally lubricated mechanical systems (to improve wear resistance special technologies are available, such as the incorporation of fillers).

## Typical Applications

- Lambda oxygen sensor wiring, seal, and conduit
- Engine wiring
- Seat heating wires
- Headlight wiring
- Wire conduits, harness covers, cable ties
- Static and dynamic seals, O-rings, head gaskets
- Valve stem seals
- Crank shaft rotary lip seals
- Fuel hose and tubing
- ABS interconnect hose
- Hydraulics hose
- Brake pad wear indicator
- Push-pull cable liner

**AUTOMOTIVE**

# ELECTRONICS

# ELECTRICAL

## Benefits

Everflonn™ PTFE, PFA, FEP, and ETFE fluoropolymer resins offer a unique combination of properties under extreme ambient conditions where most other polymers or elastomers would fail. Those properties that are most important for the electronics/electrical industry are:

- Superior insulation properties, especially at high frequencies. Dielectric constant of Everflon™ is lower than any other solid polymer and changes little with frequency and humidity. Low dissipation factor at radio frequencies
- High volume and surface resistivity unaffected by heat-aging or temperatures
- High dielectric strength
- High surface arc-resistance
- Thermal stability at high temperatures (no cracking or embrittlement)
- Low coefficient of friction
- Solder-iron resistant

## Typical Applications

- Wire connectors, insulators
- Printed wiring boards, flexible circuits
- High voltage circuit breakers
- Appliances, consumer electronics
- Battery binder, separator, caps
- Fuel cells
- Generator cooling hose
- Electrical motor sleeving, electrical conduits
- Electrical grade tape
- Heat shrinkable tubing
- Cable ties, protective conduits

## Benefits

The non-stick performance, chemical inertness, and exceptional purity of fluoropolymers are the best ways to keep food processing equipment running smoothly and profitably.

Components and linings made with Everflon™ PTFE help to cut maintenance costs, increase uptime, increase throughput, safeguard product purity, and allow use of same equipment over a wide range of food products (multipurpose plant operation). The key properties of fluoropolymers in the food processing industry are:

- Corrosion resistance over a wide temperature range, more universal, and more economical than exotic metal alloys
- No chemical interaction or corrosion with foods to compromise taste or create contamination. No absorption of common food preservatives
- Extremely low extractables and reactivity plus high purity
- FDA/European Directive compliant
- Approved for potable drinking water applications
- Non-stick, easy release. Equipment surfaces are easy to clean and remain clean longer.
- Faster, easier cleaning (meets EHEDG Cleanability requirements), cuts downtime for cleaning
- Resists onset of biological film formation
- Reduces chemical usage for cleaning
- Excellent steam and chemical sterilization performance
- The use of fluoropolymers in shatterproof coatings for fluorescent light tubes reduces the risk of glass contamination in food chain.

## Typical Applications

- Conveyor belts
- Baking liners
- Industrial bakeware
- Non-stick metal coatings
- Seals, gaskets, packing, valve seats
- Valves, fittings, pumps
- Sight glasses, flow meters
- Pipes, columns, tanks, vessels
- Expansion joints, bellows
- Hose, tubing
- Filters, strainers
- Dispensers, containers
- Shatterproof lamps

FOOD  
PROCESSING

# CABLING SOLUTIONS

## Typical Applications

- Insulated and sheathed data communication cable
- Coaxial cables for high-frequency antenna systems
- Automotive cable
- Oil well data logging cable
- Heating cable
- Engine connection cable
- Household appliance wiring
- Aircraft wiring
- Security system wiring

## Benefits

Everflon™ PTFE, PFA, FEP, and ETFE fluoropolymer resins are ideal choices for insulation and jacketing applications where low flammability, exceptional dielectric properties over a wide frequency range, high stress-crack resistance, chemical inertness, high service temperature, and thermal cycling capabilities are required.

Everflon™ fluoropolymers offer remarkable resistance to high temperature and flames because they have very high melting points and auto-ignition temperatures, as well as exceptional thermal degradation thresholds.

Moreover, their flame characteristics, such as rate of propagation, heat release, and smoke generation, are very low—enhancing the fire protection for instance in high-speed data communication cables used in concealed spaces (plenum).

Everflon™ fluoropolymers offer:

- Low dielectric constant for high speed signal transmission
- Low dissipation factor over a broad range of frequencies gives reduced capacitance and attenuation
- Resistance to high soldering temperatures

## Benefits

Everflon™ fluoroadditives are designed to impart the unique properties of fluoropolymers to a base material, such as a thermoplastic, elastomer, lubricant or coating.

Depending on the host material, Everflon™ fluoroadditives:

- Enhance abrasion and wear resistance
- Lower maintenance costs
- Enhance surface and bulk properties
- Reduce friction and stick-slip response
- Reduce mechanical wear
- Reduce surface contamination
- Improve rub and scuff resistance and surface smoothness

## Typical Applications

- Additive to thermoplastic hosts, such as acetals, polycarbonates, polyamides, and other highperformance engineering resins
- High gloss inks
- Self-polishing anti-fouling marine paint
- Lubricating oils, greases, and sealants

ADDITIVES

# PHARMACEUTICAL BIOTECHNOLOGY

## Benefits

The broad chemical compatibility and resistance to biofilm buildup of Everflon™ PTFE allows the protection of product quality and higher productivity to meet demands for increased product purity, easier cleanability, improved durability, and low maintenance costs by offering the following:

- Corrosion resistance over a wide temperature range, more universal and more economical than exotic metal alloys—allowing equipment to make a wider range of products
- No byproducts of corrosion to contaminate products or processes
- No need for passivation or electro-polishing
- Non-stick, smooth surface, resistance to bio-film buildup
- Faster, easier cleaning, in-place cleaning and steaming
- Minimize drug adhesion
- Negligible absorption of chemicals
- Seamless weldability
- Non-brittle, resistant to mechanical- and thermalshocks, flexible, and long-term resistant to vibrations
- Biocompatible (USP Class VI)
- Compliant with FDA and EU requirements
- High purity, extremely low extractable level, prevents contamination of critical chemicals and biological fluids
- Meets drinking water requirements
- UV resistance

## Typical Applications

- Pipes, fittings, couplings, expansion joints, bellows
- Labware, trace analyzers, dispensers, bottles, screwcapsSeals, O-rings, gaskets, valve seats
- Sight glasses, flow meters
- Tanks, containers
- Transfer hose, tubing, convoluted tubing
- Small diameter tubing, multi-lumen tubing
- Filters, strainers
- Valves, pumps,beakers, chromatography tubing
- Sterilization units, virus inactivation systems

## Benefits

Industrial products made with Everflon™ fluoropolymer resins have exceptional resistance to low as well as high temperatures, chemical reaction, corrosion, and stresscracking.

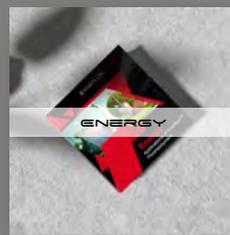
The properties of fluoropolymer make it the preferred plastic for a host of industrial applications for the following reasons:

- Lowest coefficient of friction of any solid material
- Static coefficient of friction is lower than dynamic coefficient of friction (no stick-slip effect)
- Ability to operate without lubrication or in marginally lubricated conditions
- Long-term thermal stability at high temperatures (no cracking or embrittlement)
- Avoiding sticking, buildup, or corrosion
- Fragment retention
- Approved for use in pure oxygen, gaseous and liquid

## Typical Applications

- Roll covers, heat-shrinkable tubing
- Shatterproof lamps
- Piston rings/shaft seals for non-lubricated compressors, hydraulics, and seal rings for construction machinery
- Hydraulics hose
- Tubing, hose: Hose for high pressure gases, oxygen hose, hose for breathing apparatus, generator hose, paint hose
- Consumer products: Sliding pads for furniture, sporting equipment, iron sole plates, textile treatment, and car care products

GENERAL  
INDUSTRY



Through sound science, passion, creativity, and transformative partnerships, Everflon deliver high-performing, sustainable, and safe products, while building a more vibrant, resilient future for all.



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