

Industrial Reliance on FluoroTechnology, Fluorochemicals & Fluoropolymers

Industry	Application	Property	Benefit	FluoroTechnology Used
Aerospace (include firefighting)	Brake fluid	Anti-corrosion, lubrication	Increased useful life and increased reliability of braking systems.	Fluoropolymer
	Hydraulic operation fluid	Anti-corrosion, lubrication	Increased useful life and increased reliability of hydraulic systems, such as aircraft control systems.	Fluoropolymer
	Braided tubing	Anti-corrosion, flexible, wide temperature operating range, and light-weight	High reliability tubing, preventing leaks, improving useful life and aircraft safety.	Fluoroelastomer
	Engines	High efficiency cleaning	Ability to clean oxygen burning engines and parts.	Fluorochemical
	Insulation for wire and cable (in engines, cockpit, cabin)	Lightweight, chemically inert, excellent insulator, low-fire, low-smoke, long-life, severe environment, low dielectric, wide temperature operating range	Allows for safe, reliable operation of aircraft in a broad range of environmental conditions encountered during operation and saves fuel. Ability to use high frequency communications equipment and computer control in aircraft, improving air traffic safety, in flight safety, and aircraft controllability.	Fluoropolymer
	Commercial aircraft interior	Oil/water, stain and soil protection	Improved cleanability for aircraft interiors, resulting in both more hygienic aircraft interiors and lower maintenance costs. Longer fabric life lowering overall replacement costs.	Fluorinated polymer
	Aircraft ground firefighting foam concentrate (mobile and fixed systems)	High efficiency oxygen starvation, faster extinguishment times and better burnback resistance	Quicker extinguishing of aircraft fires, resulting in saved lives, property and ordinance protection (reduced asset losses), and firefighter protection.	Fluorinated surfactant

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Alternative Energy	Lithium batteries	Efficient electrolytic ionic migration	Smaller, more efficient batteries for all types of electronics from automobiles to cell phones.	Fluorinated polymer
	Fuel cells	Chemical resistance in membranes and dividers	Enables renewable, off grid energy.	Fluoropolymer
	Photovoltaic cells	High vapor barrier, high transparency, superior weather ability, flexibility	Front and back sheet films provide durable weather protection, long-product life, and enables renewable, off grid energy.	Fluoropolymer
Automotive (Transportation)	Fuel lines	Low weight, high vapor barrier	Increased fuel economy from using light weight alternatives to copper and steel tubing, and a large reduction of fugitive gasoline emissions to the atmosphere from other polymer tubing.	Fluoropolymer
	Turbo charger hosing	Low weight, high vapor barrier	Increases performance of Turbo charger, which provides increased fuel economy.	Fluoropolymer
	Oil pan and head gaskets	Heat and chemical resistance	Increased service interval, therefore reduction of wasted and released hydrocarbon chemicals, increase in automobile useful lifetime and reduced automobile ownership costs.	Fluoroelastomer
	Oil seal	Heat and chemical resistance	Increased service interval and reliability.	Fluoroelastomer
	Cylinder head coating	Lower friction for effective combustion	Better fuel efficiency.	Fluoropolymer
	O-ring	Heat and chemical resistance	Increased service interval and reliability.	Fluoroelastomer
	Insulation for wiring	High temperature range; heat and chemical resistance	Increased reliability of engine compartment wiring, improving auto-safety (reduction of engine compartment fires, increased reliability of gauges) and improvement of automobile useful lifetime.	Fluoropolymer

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Automotive (Transportation) Continued	Interior carpeting and seats	Oil/water, stain and soil protection	Easy clean and increased carpet/fabric life resulting in reduced carpet/fabric replacement and waste.	Fluorinated polymer
Building and Construction	Infrastructure (bridges and towers)	Anti-corrosion, high weatherability/durability	Prevents infrastructure failures caused by corrosion and weather. Lower maintenance costs. Worker safety.	Fluorinated surfactant and Fluoropolymer
	High-rise building, façade and sash protection	High durability, weatherability, UV resistance, anti-corrosion	Longer building useful lifetime, lower repainting interval in high rise, hazardous recoating job, reduced paint waste from recoat preparation. Better selection of materials for buildings and bridges in high sunlight geographies. Improved protection and aesthetics.	Fluorinated surfactant and Fluoropolymer
	Concrete, stone + tile, grout	Oil/water, stain and soil protection	Easy clean and stain protection of concrete, natural stone and grout for longer life and clean aesthetics. Prevention of secondary efflorescence.	Fluorinated polymer
	Exterior and interior architectural paints	Low VOC and oil/water, stain and soil protection	Enables reduction of VOC in paint formulations, easy clean and extended beauty aesthetics.	Fluoropolymer
	Adhesives, sealants, caulks	Improved wetting and pore penetration	Strengthening of the bond between surfaces.	Fluorinated surfactant
	Plenum (data) cable	Superior electrical insulation, low-fire, low-smoke	Superior electrical and fire performance insulation for data cables. Fire protection. Low installation costs. Ease of maintenance.	Fluoropolymer

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Chemical/ Pharmaceutical Manufacturing	Pipe, tank, valve lining, packing/gaskets (sealing), braided hoses	Resistance to high heat and chemical insult	Safe operation of manufacturing processes. Reduced maintenance cost, durable equipment, improved environmental safety.	Fluoropolymers
	Premium lubricants	Resistance to high heat and chemical insult and also water resistance	Increases energy efficiency and lubricant lifetime, especially in harsh conditions. Chemical and thermal stability allows use in high temperature reactions with aggressive liquids and solvents without product contamination or reaction interference.	Fluoropolymer
	Firefighting foams	High efficiency oxygen starvation, faster extinguishment times and better burnback resistance	Quicker extinguishing of solvent fires, resulting in saved lives, property protection (reduced asset losses), and firefighter protection.	Fluorinated surfactants
Fluoropolymer Manufacturing	Polymerization aid	Nucleation aid and molecular weight control; efficient surfactant	Unique fluoropolymer properties enabling the applications referenced herein.	Fluorinated surfactants
Food Processing Equipment	Commercial baking	Non-stick	Reduced costs, reduced use of cooking release agents, easy clean, healthier food.	Fluoropolymers
	Pipe lining	Cleanability, corrosion resistance	Reduces potential for food-borne illness through better cleaning ability.	Fluoropolymers
	Gaskets	Chemical and heat resistance	Safety in high heat and oil contact food processing equipment. Preservation of hygiene in food processing.	Fluoropolymers

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Healthcare/ Hospitals	Hospital gown and surgical gown/drape	Barrier protection	Life-saving protection against transmission of fluid and blood-borne pathogens and nosocomial infections.	Fluorinated polymer
	Divider curtain	Barrier protection	Life-saving protection against transmission of blood and fluid born communicable diseases and hospital infection.	Fluorinated polymer
	Catheter coatings	Low friction, clot resistant coating	Patient comfort and safety in catheter applications.	Fluoropolymer
	Needle coatings	Low friction	Patient comfort and safety in deep needle operations including certain drug injections and biopsies.	Fluoropolymer
Housewares	Cookware	Non-stick	Reduced use of cooking oils/fats, better health. Easy clean.	Fluoropolymer
	Carpet	Water, oil, stain, soil protection	Easy clean, looks new longer, enables light colors and longer useful life of carpet.	Fluorinated polymer
	Home textiles	Water, oil, stain, soil protection, reduced dirt pickup	Easy clean, looks new longer, and longer useful life of upholstery fabrics, table cloths, and mattress protectors.	Fluorinated polymer
Industrial and Institutional Floor Care	Floor waxes and floor strippers	Wetting and leveling	Smooth, glossy surface. Easier cleaning/maintenance. Outstanding floor aesthetics.	Fluorinated surfactant
Leather	Apparel, footwear and furniture	Water, oil, stain, soil protection	Easy clean and longer useful life by better preserving the aesthetics of the article.	Fluorinated polymer
Metal Plating	Plating Baths	Wetting	Increased quality (lower defect rate), reduction of waste due to defects, and lowered production costs.	Fluorinated surfactant

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Metal Plating Continued	Plating Baths	Low surface tension – Mist suppression	Worker and environmental safety from exposure to mist of hazardous chemicals and environmental releases of pollutants such as hexavalent chrome.	Fluorinated surfactant
Military	Apparel and equipment	Durable oil/water, soil and stain repellency	Life protection in severe environments.	Fluorinated polymer
	Additives for ordinance propellant	Combustion regulation	Increased safety of battlefield ordinance and long range ordinance.	Fluorinated polymer
	Skin Protection	High barrier skin protection	Life protection from chemical/biological warfare.	Fluoropolymer
	Firefighting foam	High efficiency oxygen starvation, faster extinguishment times, better burnback resistance	Only effective way to extinguish polar solvent fires onboard ships, at airfields or in other military applications saving lives.	Fluorinated surfactant
Oil Field	Drilling mud additive	Lubrication	Affordable energy.	Fluoroelastomer
	Downhole and field equipment gaskets	Heat and chemical resistance	Affordable energy, improved oil field safety.	Fluoroelastomer
	O-ring	Chemical, heat and steam resistance	Safer, reliable operation.	Fluoroelastomer
	Piping for crude oil transfer	Acid-resistance	Improved safety of oil-field and oil-pipeline operations.	Fluoropolymer
	Firefighting foam	High efficiency oxygen starvation, faster extinguishment times, better burnback resistance	Oil field and fuel storage (tank farms) safety. Lifesaving ability to extinguish oil field and tank farm fires quicker; longer burnback times; protect and/or salvage assets; better firefighter protection.	Fluorinated surfactant

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Outdoor Apparel/ Equipment	Outdoor Gear (e.g., tents, sleeping bags, backpacks, footwear)	Water, Oil, Stain, Soil Protection	Lifesaving protection in severe environments; looks new longer, longer useful garment life.	Fluoropolymer, Fluorinated polymer
	Apparel	Water, Oil, Stain, Soil Protection	Lifesaving protection in severe environments; looks new longer. Longer useful garment life; lower global use of fresh water for washing; reduced carbon footprint from colder wash temperature and faster drying times; durable protection.	Fluoropolymer, Fluorinated polymer
	Membranes	Breathable barrier against wind and rain	Lifesaving protection in severe environments, comfort, longer useful garment life.	Fluoropolymer
Paper/ Paperboard/ Molded Pulp	(Pet) Food packaging	Oil and grease resistance	Enabling paper packaging for pet food, microwave popcorn, quick service restaurant meals, soups and single serve food containers. Reduces potential for burns from hot oil migration through the packaging or wrap. Maintains aesthetics and integrity of packaging material.	Fluorinated polymer
Personal Protection and Worker Safety	Bullet-proof vests	Durable, high water repellency	Retains bullet-proof properties. Improved protection in wet environments.	Fluorinated polymer
	Firefighter turn-out gear	Durable, high water and oil (solvent) repellency	Protection against water and liquids in a (fuel) fire.	Fluorinated polymer
	Chemical resistance suits	Durable, high water and oil (solvent) repellency. Chemical resistance.	Protection against hazardous liquids.	Fluorinated polymer

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Semiconductors and Electronics	Linings in Tanks, valves, pumps, and piping	Inert, corrosion resistance, high purity	Increases process purity and reduces potential for leaks therefore increasing the ability to manufacture semiconductors, and therefore to remain competitive in global industry. Improving safety and environmental compliance of the industry. Safe chemical waste containment.	Fluoropolymer
	Processing equipment	High chemical resistance trays and carriers	Provides corrosion protection and prevents metal contamination.	Fluoropolymer
	Etching and resist materials	High purity etchants, high corrosion resistant, wetting of processed wafers	Ability to manufacture semiconductors, and therefore to remain competitive in global industry.	Fluorinated surfactant
	Surfactants for chemical etchants and other process chemicals	Wetting and leveling to control and improved chemical etching	Ability to manufacture semiconductors, and therefore to remain competitive in global industry.	Fluorinated surfactant
	Cleaning fluids	High purity, pure drying cleaners. Wetting of process chemicals to semiconductor wafers, etched circuits	Ability to manufacture semiconductors, and therefore to remain competitive in global industry.	Fluorinated surfactant

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Semiconductors and Electronics Continued	Gaskets and “O” rings for plasma and vapor deposition machinery	High chemical resistance, high thermal stability	Provides long service life for semiconductor manufacturing equipment, enables low cost and reliable manufacturing of semiconductors.	Fluoroelastomer
	Hard disk drive	Lubrication	Ability to manufacture high capacity and smaller hard disk drives with long service life.	Fluoropolymer
	Mobile (Smart) Phones, Tablets	Miniaturization	Dielectric properties allow for high-speed data transfer and good insulation.	Fluoropolymer
Water Filtration	Membranes	Resistance to high heat and bacteria killing cleaning agents	Improved hygiene in drinking water purification and increased quality of process water purification.	Fluoropolymer