

# Fluoropolymers in Daily Living

Fluoropolymers are special plastics that are used in virtually every manufacturing industry, in many service industries, in the military, and in many medical applications. They are critical parts of our daily lives, often in invisible ways.

They have **extraordinary properties**, and are woven into our way of life from fluoropolymer coated cookware, sports clothing, extreme weather military uniforms, food handling equipment, medical equipment, silicon chip manufacturing, pharmaceutical manufacturing, commercial bakeries, motor oil additives, fabric-covered sports stadiums, house and car air conditioning, laptop computer/cell phone wiring, aircraft wire, fire alarm wire, data communications cabling, under-hood car wire, and down-hole oil well wire to high temperature filters for coal plants.

## EXTRAORDINARY PROPERTIES

Chemically inert  
Non-wetting  
Very slippery  
Nontoxic  
Nonstick  
Highly fire resistant  
Very High temperature ratings  
Highly weather resistant

**Fluoropolymers solve extremely difficult problems, facilitate technical developments, improve safety, save lives, and reduce cost!!** Industrial users and manufacturers are well aware of the benefits of fluorinated products to reduce cost, improve safety, and in development of new technology where nothing else works well or at all. **FLUOROPOLYMERS PROVIDE SOLUTIONS WHERE NOTHING ELSE WORKS!!!**

This unrivalled combination of properties frequently makes fluoropolymers the product of choice when metals and other plastics fail, where extraordinary purity is required, or where long-term reliability and very long service life is required for both cost and safety reasons. For example, fluoropolymer insulated wire reduces weight in airplane wiring and extends durability and reliability. High span bridges are frequently painted with fluoropolymer-based paints with a service life of up to 30 years. Fluoropolymer plenum cabling reduces smoke from fires up to 20 times over other plastic cabling, reducing danger to lives and damage to buildings and equipment. Fluoropolymers are frequently a critical part of new technology in medicine, environmental conservation, energy solutions, space exploration, and civilian and military safety. **But Fluoropolymers are also woven into our daily lives!!!**

## Share a day with John and Jane Smith in Tucson, AZ

**John Smith begins the day** shaving with a razor with a slippery strip of polytetrafluoroethylene (PTFE) fluoropolymer. Taking eggs out of a refrigerator with a fluorocarbon coolant, John sprays a *non-stick fluoropolymer coated fry pan* with non-fat spray and makes a heart healthy breakfast with a whole wheat bagel topped with jelly, orange juice, grape tomatoes, and coffee. Jane does much of her cooking in fluoropolymer coated cookware to minimize or eliminate fat. It is the rainy season in Tucson, so Jane Smith dresses the children in waterproof coats that have a breathable special fluoropolymer ePTFE fabric inside of them.

### For our Teeth

Jane makes sure her family uses fluorinated toothpaste to reduce tooth decay. Her family has little tooth decay, because they live in an area where water is fluorinated. Everyone in the family flosses using fluoropolymer fiber floss that slides easily between the teeth and does not cut the gums. Jane, a well informed mother, knows that pain, loss of teeth, and gum disease associated with tooth decay have been reduced by about half since the introduction of fluoridation almost 60 years ago.

### In Cell Phones and Laptop Computers

John and Jane don't worry about food spilled on their new beige carpet because it is treated with a fluoropolymer stain repellent. They pick up their cell phones and laptop computers on their way out of the house. Every one of these devices contains fluoropolymer insulated wiring and components which depend on the fluoropolymers unique electrical properties. Jane is vaguely aware that the *modern electronics age is critically dependent on fluoropolymers*. Fluoropolymers meet the increasingly stringent standards for ultra-reliable, ultra high purity fluid handling systems for semicon manufacturing.

### **In the House**

John Smith is the last to leave the house, turns off the fluorine-containing LCD display on his desktop computer and TV, and sets the thermostat to reduce the air conditioning. The central air unit coolant in his house is a fluorocarbon, which is safe and efficient. John knows that his mother's life could be endangered with no air conditioning in hot weather. He still recalls the tragic events in France in the summer of 2003, when nearly 15,000 died because of the heat.

John Smith's house is partially powered by *photovoltaic cells (solar panels)* that the family installed several years ago. After paying for the installation of the cells, they have been enjoying free power. Fluoropolymer films are used as the top layer of the photovoltaic modules, protecting them from damage and increasing their useful life. The coal-based power plants that supply the rest of the house's electricity have *fluoropolymer coated bag-filters that remove harmful particles (fly ash) from the hot smoke discharge*.

### **At Work**

As John drives to work, he crosses a ravine on a bridge painted with fluoropolymer-based paint. His brother Joe paints bridges, which is dangerous work, and John is glad Joe only has to paint this bridge every thirty years.

John arrives at his workplace, a tall building where data transmission is handled by fluoropolymer plenum cable, which substantially reduces smoke, a hazard to people and equipment, during fires. Computer rooms and other key areas of the building are protected with fire protection systems, using fluorocarbon extinguishing agents which are electrically non-conductive, non-corrosive, residue free, and safe to use in areas where people are present. They have zero ozone depletion potential.

Later in the day, John will travel on an aircraft built with *miles of wire and cable insulated by fluoropolymers* and composite materials containing fluoropolymers. They reduce weight and allow safe and reliable performance of the electrical and signal systems of the aircraft over its lifetime. The interior of the aircraft is surfaced by a composite of a fluoropolymer, which is fire safe, durable, and stands up to the harsh cleaning chemicals and disinfectants.

### **At the Hospital**

Jane Smith's 76-year old mother is recovering quickly from an operation in which several *arteries were partly replaced by vascular grafts made from a fluoropolymer material*. She suffered no pain during the operation and had a normal anesthetic experience thanks to the use of a fluorocarbon gas. Jane Smith's mother has been given an excellent prognosis for recovering from the surgery and is adapting well to her new fluoropolymer veins. She will go on with her active life and enjoy her grandchildren for a long time. In 2002, 42.5 million procedures were performed in the US, almost all requiring general inhalation anesthetic. Fluorocarbon compounds such as Sevoflurane®, Enflurane® and Isoflurane® have reduced the number of deaths attributed to anesthesia by more than 25-fold.

*Fluoropolymers have been part of the solution for complex medical problems for decades.* Tens of millions of innovative fluoropolymers-based medical devices have been implanted, saving and improving many lives worldwide. For example expanded fluoropolymer membranes are routinely used to repair hernias which have allowed patients to retain to normal life. Everyone is familiar with pacemakers. The more recent devices (Implantable Cardioverter Defibrillator or ICD) adjust both slow and fast heart rhythm. The insulation material for the lead assembly in some of these devices is made from fluoropolymers. The simple epidural administered during child delivery utilizes fluoropolymers in the drug delivery device. Nearly every catheter used in surgical procedures has a coating of fluoropolymer. **These advances and many more may save or enrich your life or someone in your immediate family!!!**

**In our Daily Lives as Well as in Manufacturing, the Service Industries, and the Military**

Fluorinated products are used in virtually every manufacturing industry, in many service industries, in the military, and in medical applications. They not only save money, improve safety, reduce emissions, and extend durability and reliability, but, in many cases, *“Are Used Where Nothing Else Works.”* As this story illustrates, **fluoropolymers are also woven into our daily lives. FOR PEOPLE WORLDWIDE, THEY NOT ONLY ENRICH LIVES, BUT ALSO SAVE AND EXTEND THEM. ■**

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