

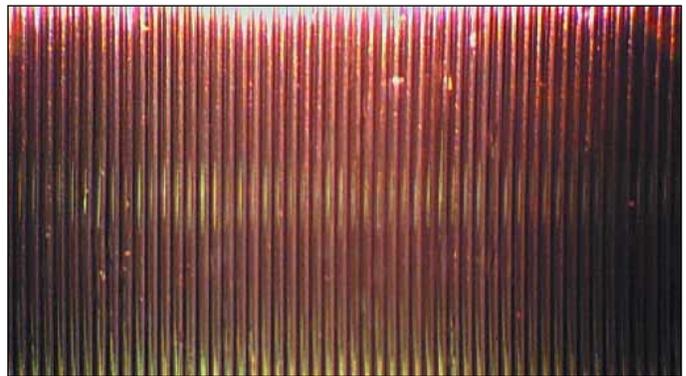
# PTFE-Coated Wire Applications Continue to Enable Industry Advances

By Michael Greenelsh  
California Fine Wire

The many exceptional properties of polytetrafluoroethylene (PTFE) have spawned new products and technologies since the late 1930s, and PTFE is likely to continue providing vital new solutions well into the future. Known best as DuPont's Teflon® brand, PTFE was initially used in applications such as frying pans, which took advantage of the substance's heat resistance and non-stick properties. Today, however, PTFE has become indispensable throughout science and industry, with crucial applications in aerospace, communications, electronics, industrial processes and medicine.

PTFE's uses are based on its unique physical properties. It is biologically inert, a property that can be transferred to other substances by coating them with PTFE. The most slippery material in existence, this waxy fluoropolymer resin is the largest known molecule; is chemically safe and waterproof; and is extremely durable within a wide range of temperatures.

Many fields are dependent on products containing fine wire of various shapes and sizes. For example, medical science requires the use of fine wire to make catheters for microsurgery, and fine bonding wire is essential to the production of computer chips. Until recently, however, incorporating fine wire coated with materials possessing PTFE or Teflon-like qualities meant using the substance paralene. Although paralene is accepted for many applications, it is severely limited when applied to fine wire, because it can only be coated in short lengths, due to the size limitations of the type of vacuum chamber used in depositing paralene on wire.



▲ Polytetrafluoroethylene (PTFE) possesses unique physical properties that make it valuable in many applications.

California Fine Wire recently announced the enhancement of its custom wire fabrication offerings with PTFE coatings that can be enameled to virtually any of the company's 1,000 metals and alloys. The availability of this process means that for the first time, the many desirable properties of PTFE coatings are obtainable in continuous lengths of wire manufactured by customer specifications, with materials and coatings guaranteed.

PTFE-coated wire is appropriate for environments where wire-related products, including microprocessor-controlled equipment, are exposed to corrosive chemicals, such as refineries. PTFE functions well as a protective coating in extremely cold and extremely hot environments, such as cryogenically-protected equipment used in space vehicles.

PTFE also has the ability to cold flow, which means it can be pushed out and squeezed into a variety of configurations and still retain its basic integrity. California Fine Wire has put

PTFE-coated wire inside tubing and drawn it to a smaller diameter, creating a coaxial cable. The cold flow property allows the cable to be forced down and stretched out without cracking while the deformation is taking place.

Through a proprietary process, California Fine Wire is able to apply liquefied PTFE to fine wires in continuous lengths of up to 10,000 feet. After the PTFE is applied, the wire is then run through a furnace to set the new coating. This process can be repeated to develop a thicker PTFE cover and can even be applied on top of other types of coatings if the customer so specifies.

The flexibility of PTFE makes it suitable for coating wires used in dynamic environments. The search head on a computer drive is a good example of how a thin application of PTFE provides the necessary durability and still permits a very high frequency of movement.

Because PTFE is inert to almost any biochemical substance, the human body will not normally reject prosthetic devices that are PTFE coated. That could include

the type of wire products that are used to make bone and tissue staples, or the wire that is sometimes used to support implants such as hip joints and bone plates.

PTFE is also considered a safe product for household use, as well as disposal. Composed of fluorine atoms surrounding and protecting carbon atoms, it has no toxicological effects. PTFE can be disposed of with normal waste as long as it is not incinerated. PTFE can become harmful if heated above 400 degrees C, at which point it gives off some toxic fumes.

California Fine Wire will offer PTFE on any type of wire specified by the customer. The cost of the new coating process is approximately the same as that of the paralene process.

The development and implementation of the new PTFE capability is a valuable contribution by California Fine Wire and for the industry. PTFE coating is now available in continuous lengths, and the results and material are guaranteed. ■