What's New with Ultra High Melt Viscosity Polymers?

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The two most common UHMV polymers are PTFE (best known as TEFLON®) and Ultra High Molecular Weight Polyethylene (UHMW PE). What makes these polymers so different from other plastics is their molecular weight is so high that it is impossible to process them by conventional plastic processing, but processes adopted from ceramic, powder metallurgy and other technologies such as skiving plywood to make sheet.

These polymers offer properties superior to other plastics. TEFLON has a lower coefficient of friction and better chemical resistance than any other solid material. It has higher use temperature, better dielectric properties and better release characteristics than any other plastic except for the polyimide such as Dupont's Kapton® and Vespel®.

UHMW PE is the best wearing of all plastics. The abrasion resistance of this polymer is equally impressive. In tests where specimens are rotated at 1,750 rpm (revolutions per minute) for 8 hours in 50% sand slurry, UHMW PE exhibits 10 times the abrasion resistance of carbon steel. This is more than double that of 6/6 polyamide and polyurethane and 80 times that of hard neoprene rubber. It is 3 times more abrasion resistant than the toughest elastomer, polyurethane.

What I am reporting here is little known facts about technology in processing and fabricating capabilities these UHMV polymers that are not generally known.

There is no commercially available equipment that can butt seam sheets .010" to .125" in thickness. However, some companies have built their own butt sealing equipment and routinely are sealing UHMW PE and PTFE.

They are using this technology to make large sheets suitable for linings where they need the chemical resistance or wear resistance of these polymers. They can seal long lengths to make thin wall tubes of very large diameter. Tubes in lengths over 30' are being made from sheets that are .020" and .060" thickness. There is no other economically sound process to accomplish such a thin wall tube other that the fabrication from sheet. The same technique can be used to make a conical or any shape where a sheet can be welded with a linear seam or series of linear seams. These seams are so strong that the sheet yields and elongates without breaking at the seam.

These tubes can be made heat shrinkable and can be shrunk at temperatures as low as 200 F. See U. S. Patent # 6,471,627 B2. These heat shrinkable tubes are used as covers with the extreme corrosion resistance, low friction and anti-stick properties of PTFE for round rolls and rectangular cross section beams as well. Thicknesses of .090" and lengths over 30' are not uncommon.

In the case of UHMW PE, a unique application is shrinking them over marine pilings. In

the case of wood pilings, it prevents the deteriotation of the piling by worms, weather and ice. With steel pilings it prevents corrosion, eliminating painting maintenance and provides an attractive clean appearance.

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Frank Chapman is chairman of Fluoron Inc. He is a pioneer in the fluoropolymer industry and in the development of fluoropolymer technologies and applications for the pulp and paper, aerospace, and chemical industries. In 1979, he was elected chairman of the Fluoropolymer Division of The Society of the Plastics Industry (SPI). Frank was born and raised in a small town in Vermont and graduated from the University of Vermont with a degree in chemistry. For further information, contact Frank Chapman at fchapman@fluoron.com or call (410) 392 0220