Materials Should be Used to their Full Potential

The unique mechanical properties of PTFE enable the material to be specified for an extremely wide diversity of applications. PTFE is not a straight swap for other materials to gain a few chemical advantages but must be considered in terms of its own material properties. In almost all categories of material specifications PTFE exceeds the limits of properties defined: chemical resistance, electrical stress, mechanical strength, service life, friction and wear, aging, bio-degradation, corrosion, contamination, light, humidity, adhesion, fire, vibration etc.

PTFE's Intrinsic Qualities Enable Reproduction of Fine Detail

PTFE components begin life as compounds of premium grade granular resin. In this way the quality of the finished component can be determined at a very early stage by controlling the processes involved in converting the resin to a finished component. The pure material produced can be made into complex shapes without concern regarding grain structures, voids, stresses, density, or other manufacturing considerations.

PTFE has some outstanding properties, belonging as it does, to a group of materials consisting almost entirely of Carbon and Fluorine. The structure is essentially a Carbon core shielded by a layer of Fluorine atoms held together by super-strong Carbon-Fluorine inter-atomic bonds. The effect makes the material almost totally chemically inert. The same molecular structure makes the material almost totally insoluble and the extreme rigidity of the Fluorocarbon chain yields a high melting point.

One of the Most Versatile Engineering Materials Known

PTFE can be turned, milled, drilled, pierced, broached, ground and polished. By special processes it can be isostatic and compression molded. In general, parts can be designed in the same manner as parts made of other materials. Even the same formula may be applied if careful attention is paid to the special characteristics of the resin.

Three Stages to the Perfect PTFE Component

Stage 1 - Resin in Granular Form

PTFE resins are supplied in granular form of uniform density, particle distribution and grade. This ensures continuity for all material. The resin is stored in protective containers right up to the point of use and only the required volume of material is handled at any time. The grade of material is checked at the point of receipt and on any further material movement to maintain high purity.

Stage 2 - Molding and Sintering PTFE

Resin is compression molded to either a simple or complex geometric shape. In many cases this is the final product since PTFE readily molds to shape and may only require final sintering and polishing.

The molded part may then be subjected to high-pressure isostatic compression which distributes the stresses evenly within the component. The compressed molding is sintered using a controlled thermal regime to produce a solid, homogeneous component. Controlled variations in the sintering process can alter the final characteristics of the material to suit the application.

Stage 3 - Finishing

The molding can now be converted to the finished product by almost any known machine shop technique. PTFE is readily ground and polished to an extremely fine finish.

Extended Performance from Modified Variants of PTFE

An enhanced form of PTFE is TFM that uses a very low addition of PPVE (0.1%) that increases the coalescence of the resin during the sintering process. The resulting material has exceptional surface properties and is especially suited to the manufacture of components for semi-conductor applications.

PTFE resins can be tailored to a wide variety of applications by the addition of fillers. Such modifications permit resin/filler compositions to fit the exact requirements of a range of applications. In general, PTFE resins can be compounded to increase:

- Resistance to initial deformation under load by approximately 25%.
- Resistance to rotating shaft wear by as much as 500 times.
- Stiffness by a factor of 5.
- Thermal conductivity by a factor of 5.
- Resistance to creep by approximately twofold.
- Thermal dimensional stability by a factor of 2.
- Hardness by approximately 10%.

Components manufactured by Mastco may be machined on a multiplicity of CNC machines with capabilities to operate in multiple axes. Our isostatic molding of components and the one time programming of CNC machines has a marked effect on the volume costs and these savings are passed directly to the client.

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