Are PTFE Elastomer Membranes Still State-of-the-Art?

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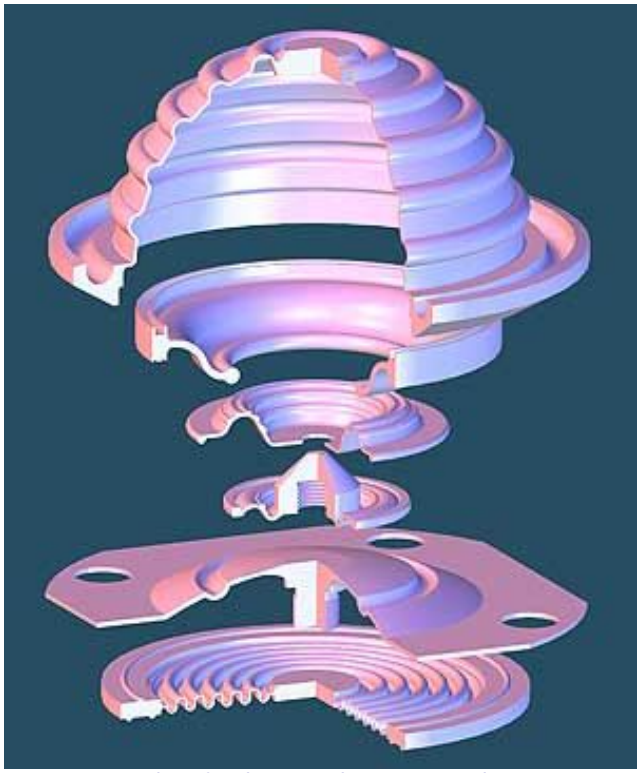

3-D representation of various Membrane geometries

Membranes serve as a hermetic seal to separate media in moving systems in many different fields of application: pumps, compensators, valves, pressure transmitters, pressure reservoirs, drives, etc. Almost all of the compounds used in such applications are members of the elastomer compound family. To be able to absorb tensile stress resulting from pressure loads, these assembly components usually require fabric reinforcements. For chemical, pharmaceutical and food industry applications, PTFE-lined rubber membranes have been the state-of-the-art solution so far. In most cases, the film lining is intended to protect the component from chemical influences, while the physiological harmlessness of the fluoro-plastic compound is usually valued as well. However, multi-layer membranes present disadvantages, too, due to long development cycles resulting from required tooling modifications. For smaller and medium-sized volumes, it is desirable to avoid the requirement of producing complex injection-molds and the related costs. Also, the manufacturing process involving manifold processing parameters is frequently prone to surprises, while the industrial user is confronted with other types of weaknesses: in case of highly aggressive media, the elastomer finish may be damaged despite the PTFE lining, as such media may migrate through the (usually thin) film.

Separation of layers

Separation of the layers is frequently observed even under normal operating conditions. This is due to differences of the E- and G-modules of the materials used, resulting in an inhomogeneous distribution of

tension, which stresses the boundary layers. In almost all cases, this specific characteristic limits the lifetime of a composite membrane.

New Freedom for the Design Engineer


a selection of PTFE-membranes

In the version described above, PTFE is merely used as a boundary surface. The possibility of producing the complete membrane from this material, though, has not become widely spread yet. Taking advantage of PTFE's alternate bending resistance, which is unique among fluoro-plastics, allows components to be designed that are fully up to par with the mechanical and dynamic properties of elastomer composites. In addition, the fact that these components are produced by a machining process opens up a vast array of opportunities to the design engineer. In almost all cases, it is possible to adapt the new solution to existing assembly spaces when substituting a previously used composite membrane, for example. For medium-sized volumes, even spare parts may be replaced by this solution in a cost-effective manner. ElringKlinger Kunststofftechnik specializes in the development and manufacture of special seals and engineering design elements made of PTFE, offering engineering, compound know-how as well as the requisite manufacturing technology from a single source. In-house test rigs, using real-world operating parameters like pressure, temperature, stroke and frequency, serve to test the life cycles of membranes. This allows individual elements meeting a host of different requirements to be developed within very short periods of time. Depending on the respective application, diameters from 5 to 800 mm and wall thickness ranging from a few tenths up to several millimeters can be realized. As with bellows, other functional features, like flange areas, O-ring grooves, threads, pressure plates, reinforcement rings or shafts, may be integrated as needed. Thread bolts or inserts are either welded or threaded into the component.

The suitable PTFE Compound for Every Application

Material modifications or combinations make sense whenever the properties of "regular" PTFE no longer suffice to meet the needs of a particular application. Industrial users can choose from a wide range of different types of PTFE. In addition to FDA-compliant compounds for the food processing industry and particularly pure versions for the semi-conductor industry, ElringKlinger Kunststofftechnik's product portfolio has recently been expanded to include conductive materials conforming to Atex 1OOa (94/9 EG) standards. These compounds can now be used for producing bellows – a particularly wide-spread product - as well.

DIPL-ING (FH), DIPL-WIRT-ING (FH) STEFAN BOCK
ElringKlinger Kunststofftechnik GmbH, Bietigheim-Bissingen, Germany

ElringKlinger Kunststofftechnik GmbH
Etzelstraße 10
D-74321 Bietigheim - Bissingen, Germany

Tel: +49-(0)7142-583-0
Fax: +49-(0)7142-583-200
Email: info@elringklinger-kunststoff.de