

PVP2022

Pressure Vessels & Piping Conference 2022

July 17-22, 2022, Las Vegas, Nevada, USA

PTFE GASKET MATERIAL PERFORMANCE VARIATION WITH THICKNESS

Anita Bausman
VSP Technologies
Kingsport, TN

Jeffery Wilson
VSP Technologies
Prince George, VA

ABSTRACT

Polytetrafluoroethylene (PTFE) is an excellent gasket material, chemically, but it has relatively poor mechanical performance. As a result, much effort has gone into improving the mechanical performance of PTFE-based gasket materials. Methods to improve mechanical performance include the addition of fillers (glass fibers, glass microspheres, silica, barium sulfate, carbon, etc.) and the manipulation of the microstructure (micro-cellular, expanded, restructured, etc.). These various forms of PTFE materials can have widely varying mechanical performance. PTFE materials that are chemically the same will have significantly different mechanical performance if the manufacturing process and microstructure are different. An example is the performance of amorphous, virgin PTFE sheet compared to fibrillated, expanded PTFE (ePTFE) sheet. The thickness of a gasket material is another structural difference that results in different mechanical performance.

This paper explores the difference in the mechanical performance of two common filled PTFE (fPTFE) materials that end-users often consider functionally the same at several industrially important thicknesses. The gasket materials are both barium sulfate-filled, restructured PTFE sheet materials. The mechanical performance of each material is compared for three thicknesses using the Hot Blowout Thermal Cycling test (HOBTC, ASTM WK61856 Rev 10-9-2020). [1] The thicknesses are 0.79 mm (0.031 inch), 1.60 mm (0.063 inch), and 3.18 mm (0.125 inch). The authors selected these thicknesses for performance review because of their usage in the industry. The thinnest, 0.79 mm (0.031 inch), is commonly used for instrument service. Very little performance data is publicly available on this thickness. The medium thickness, 1.60 mm (0.063 inch), is most commonly used in piping flanges. The thickest reviewed for this paper, 3.18 mm (0.125 inch), is commonly used for pressure vessels but also shows up in piping. Leakage testing according to the Room Temperature Tightness test (ROTT or ASTM F2836 Standard Practice for Gasket Constants for Bolted Joint Design) [2] was performed on the thinner 0.79 mm (0.031 inch) materials. HOBTC and ROTT testing was performed on an amtec TEMES fl.ai1 test fixture over the latter half of 2021 at the authors' company. This data will demonstrate to the end-user how different the mechanical behavior can be of the same gasket material differing only in how thick it is.

Keywords: Gaskets, mechanical properties, Elevated Temperature

