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STRESS MULTIPLIER FOR SEGMENTED GASKETS

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ABSTRACT

The use of segmented joint technology allows gasket manufacturers to fabricate and supply gaskets in discrete segments, rather than the conventional one-piece construction. Segmented gaskets are required when using sheet type gaskets for flange diameters larger than the available sheet size. Typical gasket sheets are 60" x 60" or 70" x 70" square, for instance. Flanges designed for these lower stress sheet gaskets that are larger than the available sheet size to fabricate the gaskets are typically fabricated as segmented gaskets. Segmented gaskets are also utilized in smaller flange applications to facilitate maintenance activities. When replacing the tube sheet gasket in a shell and tube exchanger the entire tube sheet must be removed in order to utilize a solid, one-piece ring gasket. In some cases this is not practical or desired, so a segmented gasket is utilized which only requires the tube sheet to be removed a short distance to allow access to the sealing surface. This same scenario exists with other common process piping and vessel flanges including thermowells, lance tubes, agitator or mixer shafts, etc. Valid concerns exist when using segmented gaskets as potential leak paths are created at every joint. If the gasket material and joint design are not correctly specified and fabricated the segmented gasket may not provide the same sealing performance and reliability as the solid, un-segmented gasket. This paper will discuss the research and data found that identifies the stress multiplier for segmented/jointed gaskets to achieve the same (similar) leak rate as their solid, unsegmented gasket counterpart. This assembly or design stress multiplier will be a dynamic number that will vary based upon the gasket material and the joining technology used. Two jointing methods are evaluated in this research; the industry standard "dovetail" and the Engineered Interference Tortuous Path (EITP) joint. In practice there is currently no guidance available to guide the design or assembly of these segmented gasket applications. The purpose of this paper is to provide guidance for both design and assembly purposes.

INTRODUCTION

Segmented gaskets are common for shell-and-tube heat exchangers, vessels with a mixer or agitator connections, thermowells, lance tubes, etc., to negate the need to fully remove the internals during gasket replacement. With the different styles of joint technology on the market and in the absence of any design or fabrication standards or guidance on the topic of the assembly stresses and torques required to create and maintain the same seal as their ring counterpart, it was decided to dive deeper into the subject. With the knowledge presented from the research in this paper, stress multipliers are proposed for jointed gaskets which allow the designer or plant engineer to determine the necessary gasket stress required to develop a tight, reliable seal with segmented sheet-type gaskets in a wide variety of applications.

This research and testing focuses on a dovetail joint (currently the industry standard joint) and the Engineered Interference Tortuous Path (EITP) joint (a new, engineered controlled interference/tortuous path jointed gasket designs)[1]. These two (2) styles of joining can be seen below in Figure 1.

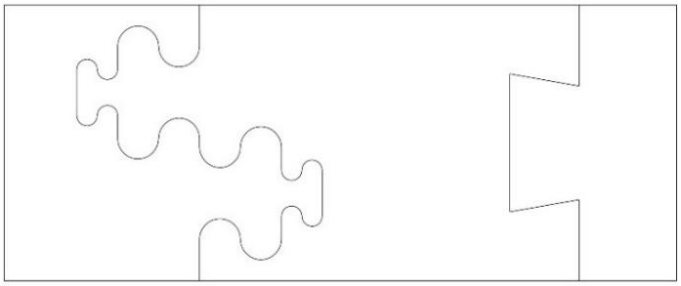

Figure 1 Engineered Interference Tortuous Path (EITP) joint on the left and the industry standard Dovetail joint in the right.