



Contents lists available at SciVerse ScienceDirect

International Journal of Pressure Vessels and Piping

journal homepage: www.elsevier.com/locate/ijpvp



Short communication

Influence of surface roughness on leakage of new metal gasket



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ARTICLE INFO

Article history:

Received 30 December 2012

Received in revised form

12 June 2013

Accepted 21 June 2013

Keywords:

Surface roughness

Flange

Metal gasket

Minimize

Leakage

ABSTRACT

Previous studies of new metal gaskets have established that the contact width, contact stress, and simulation process are important design parameters for optimizing the metal gasket performance. Optimum designs are thus realized based on the elastic and plastic contact stress. However, the influence of the flange surface roughness has not been investigated thoroughly. In this study, we developed a gasket model that includes the flange surface roughness effect. A flange can have different surface roughness levels. A finite element method was employed to develop the simulation solution. The contact width, contact stress, and force per unit length for gasket in contact with a flange having different surface roughness levels were obtained through the simulation. The leakage performance improved with an increase in the contact width and contact stress. The slope of the force per unit length increased with a decrease in the surface roughness level. Furthermore, the slope of the force per unit length for a gasket in 400-MPa mode was higher than that for one in 0-MPa mode. The higher slope suggests that the gasket and flange are pressed together strongly. Finally, the helium leakage quantity was determined to evaluate the leakage performance. The experimental result shows that the gasket in 400-MPa mode shows better sealing performance than the gasket in 0-MPa mode. For a low axial force, changes in the surface roughness caused significant changes in the leakage; the same was not observed for a high axial force.

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