*Applied Mechanics and Materials Vol. 392 (2013) pp 3-8*
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*doi:10.4028/www.scientific.net/AMM.392.3*

# Deformation Characteristic of Thin Stainless Gasket Material

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**Keywords:** Thin stainless, Gasket material, FEM, Deformation, Mode, Contact width

**Abstract.** Previous studies on corrugated metal gaskets have established that the contact width, contact stress, and surface roughness are important design parameters for optimizing gasket performance. However, the metal gaskets studied previously required a high axial force for the tightening process; in addition that metal gaskets tend to corrode easily. In this study, we examined the deformation mode of a thin stainless gasket using a finite element method (FEM) analysis. A final evaluation was made using a compression examination. The analysis based on the dimension of flat and convex portion. The load, deformation mode, and contact stress were obtained through a simulation. Based on the deformation of the flat and convex portions, the deformation modes were divided into three types. The deformation mode of the thin stainless gasket material has a higher probability of deformation in mode I when the aspect ratio of the length of the flat portion to the length of the convex portion, $L/D$, increases.

## Introduction

As a replacement for gaskets containing asbestos material, many researchers have studied the use of metal gasket materials. Saeed *et al.* studied a new 25A-size corrugated metal gasket that was developed as an asbestos gasket substitute. The gasket had ametal spring effect and produced high local contact stress to create a sealing line with a flange. The results showed that the contact stress and contact width were important design parameters for optimizing the gasket performance [1]. Haruyama *et al.* [2] continued this research. The size limit of the contact width as a gasket design parameter was investigated. Comparing the results of FEM analysis of the relationship between the clamping load of the flange and the contact width with experimental results for the clamping load and leakage clarified the contact width with no leak for the new 25A-size metal gasket. Based on this result, the contact width can be used as a main parameter to optimize the gasket design. The leakage can be reduced by increasing the contact width. Choiron *et al.* [3] studied a validity method for contact width measurement using simulation analysis, and the result was compared with the result of an experiment using pressure-sensitive paper. Similar trends were seen in the simulation and experimental results. Nurhadiyanto *et al.* [4] used FEM to study a gasket design optimization method based on an elastic and plastic contact stress analysis that considered the forming effect. A helium leakage test showed that a gasket based on a plastic contact stress design was better than a gasket based on an elastic stress design. However, both types of gaskets could be used for seals because they did not leak in the helium leak test.