A SIMPLE EVALUATION OF STATIC SEALING PERFORMANCE
OF ROUGH SURFACE USING WATERSHED CONCEPT

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ABSTRACT

Static sealing, an important function of the real contact area, is obtained by collapsing the non-contacting channels. One of criterion of static sealing is percolation of contact area. To predict the percolation threshold of contacting area, multi-asperity contact models (ex. Greenwood-Williamson model [1]) are not suitable for existing interfered deformation. Conversely, full numerical analysis needs huge resources for calculation [2].

A new evaluation method about static sealing is proposed using watershed concept [3] (see Fig.1) for detection of clusterization of contact area. It is assumed that contact area expand along the watershed line as increasing contact pressure. According to this assumption, percolated contact area could be connected on watershed line. So percolated contact area could be predicted using truncation of original surface.

For verification of this hypothesis, predicted percolation threshold and truncated percolation depth are compared with percolation threshold and penetration depth of roughness (not including bulk deformation) that are calculated numerically (FEM calculation) for numerical generated rough surface by Hu-Tonder method[4], shown as Fig.2 and Fig. 3. Predicted values are almost agreement with the FEM results, whereas proposed method using watershed concept is a promising method for evaluation of sealing performance of static seal.
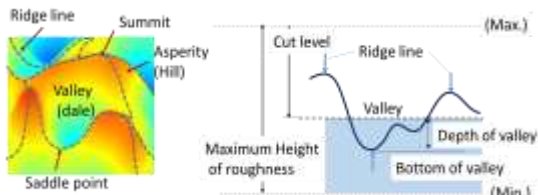
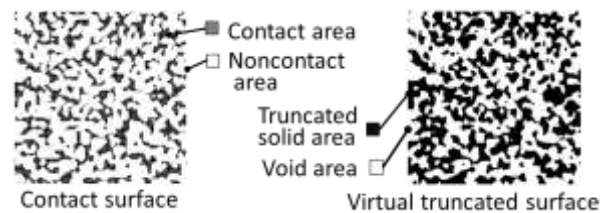Fig.1 3D motif and watershed detection

Fig.2 Comparison between numerical calculation of contact surface (left) and virtual truncated surface (right)
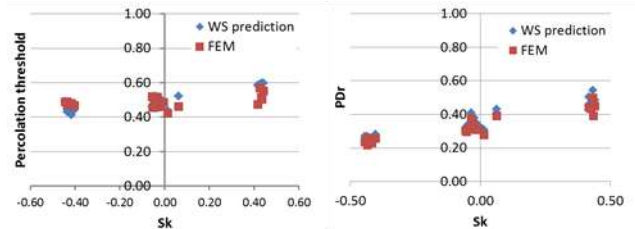

Fig.3 Comparison between percolation threshold of contact area and watershed percolation

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