Analisa Maksimum Force Pada Ring dengan Beban Tekan = Analysis of Maximum Force on Rings with Compression Loading

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Abstrak

Terjadinya crack pada outer ring dari suatu bearing pada proses produksi menjadikan perhatian lebih karena menyebabkan potensi kegagalan dalam proses pembuatan bearing. Masalah crack disebabkan adanya force yang mengenai outer ring dan melebihi force maksimum material outer ring. Oleh karena itu, perlu adanya alat untuk mendeteksi force maksimum dari outer ring. Load cell pada mesin hydraulic press digunakan untuk melihat besarnya force yang mengenai outer ring dengan beban tekan. Kemudian dilakukan perhitungan numerik menggunakan LS-Dyna dengan elemen meshing hexahedral dan tetrahedral pada outer ring. Dari penghitungan maksimum force menggunakan load cell didapatkan maksimum force pada outer ring sampai terjanya crack, yaitu sebesar 2,2 kN dan 2,4 kN. Dari perhitungan numerik LS-Dyna didapatkan maksimum force sebesar 2,5 kN pada element hexahedral 0,25 mm dan 2 kN pada ukuran 0,5 mm. Sedangkan, pada elemen tetrahedral 0,5 mm didapatkan force 1,44 kN dan pada elemen 0,25 mm didapatkan force sebesar 1,18 kN. Dari analisis energy balance, didapatkan bahwa dengan elemen meshing hexahedral di dapatkan nilai internal energy yang steady state dan convergence setelah 90 ms. Sedangkan, pada elemen meshing tetrahedral nilai internal energy tidak convergence. Jadi, dapat disimpulkan bahwa simulasi beban tekan pada outer ring lebih sesuai jika memakai elemen meshing hexahedral.

.....The problem of cracks in the outer ring of a bearing during the production process is of greater concern because it causes potential failure in the bearing manufacturing process. The crack problem is caused by a large force hitting the outer ring and exceeding the maximum force of the outer ring material. Therefore, it is necessary to have a tool to detect the maximum force from the outer ring. The load cell on a hydraulic press machine is used to see the amount of force that hits the outer ring with a compression loading. Then numerical calculations were carried out using LS-Dyna using hexahedral and tetrahedral meshing elements on the outer ring. From calculating the maximum force using a load cell, the maximum force on the outer ring until the crack occurs is 2.2 kN and 2.4 kN. From the LS-Dyna numerical calculations, it was found that the maximum force was 2.5 kN on the hexahedral element 0.25 mm and 2 kN on the 0.5 mm size. Meanwhile, on a tetrahedral element 0.5 mm a force of 1.44 kN is obtained and on a 0.25 mm element a force of 1.18 kN is obtained. From the energy balance analysis, it was found that with hexahedral meshing elements, steady state and convergence internal energy values were obtained after 90 ms. Meanwhile, in the tetrahedral meshing element, the internal energy value does not converge. So, it can be concluded that simulating the compressive load on the outer ring is more suitable if using hexahedral meshing elements.