World Academy of Science, Engineering and Technology
International Journal of Electrical and Computer Engineering
Vol:11, No:09, 2017

Life Time Improvement of Clamp Structural by Using Fatigue Analysis

Authors : Pisut Boonkaew, Jatuporn Thongsri

Abstract : In hard disk drive manufacturing industry, the process of reducing an unnecessary part and qualifying the quality of part before assembling is important. Thus, clamp was designed and fabricated as a fixture for holding in testing process. Basically, testing by trial and error consumes a long time to improve. Consequently, the simulation was brought to improve the part and reduce the time taken. The problem is the present clamp has a low life expectancy because of the critical stress that occurred. Hence, the simulation was brought to study the behavior of stress and compressive force to improve the clamp expectancy with all probability of designs which are present up to 27 designs, which excluding the repeated designs. The probability was calculated followed by the full fractional rules of six sigma methodology which was provided correctly. The six sigma methodology is a well-structured method for improving quality level by detecting and reducing the variability of the process. Therefore, the defective will be decreased while the process capability increasing. This research focuses on the methodology of stress and fatigue reduction while compressive force still remains in the acceptable range that has been set by the company. In the simulation, ANSYS simulates the 3D CAD with the same condition during the experiment. Then the force at each distance started from 0.01 to 0.1 mm will be recorded. The setting in ANSYS was verified by mesh convergence methodology and compared the percentage error with the experimental result; the error must not exceed the acceptable range. Therefore, the improved process focuses on degree, radius, and length that will reduce stress and still remain in the acceptable force number. Therefore, the fatigue analysis will be brought as the next process in order to guarantee that the lifetime will be extended by simulating through ANSYS simulation program. Not only to simulate it, but also to confirm the setting by comparing with the actual clamp in order to observe the different of fatigue between both designs. This brings the life time improvement up to 57% compared with the actual clamp in the manufacturing. This study provides a precise and trustable setting enough to be set as a reference methodology for the future design. Because of the combination and adaptation from the six sigma method, finite element, fatigue and linear regressive analysis that lead to accurate calculation, this project will able to save up to 60 million dollars annually.

Keywords : clamp, finite element analysis, structural, six sigma, linear regressive analysis, fatigue analysis, probability
Conference Title : ICCAR 2017 : International Conference on Control, Automation and Robotics
Conference Location : Singapore, Singapore
Conference Dates : September 11-12, 2017