International Journal of Mechanical Engineering (IJME)
ISSN (P): 2319-2240; ISSN (E): 2319-2259
Vol. 4, Issue 5, Aug- Sep 2015, 17-24

International Academy of Science, Engineering and Technology
Connecting Researchers; Nurturing Innovations

STUDY OF THE DYNAMIC CHARACTERISTICS OF MICRO-ASSEMBLIES FOR INSTRUMENT DEVICES UNDER VIBRATION

ALEXANDER NIKOLAEVICH LITVINOV[1] & AUDAY SHAKER HADI[2]

[1]Professor, Department of Theoretical and Applied Mechanics, PSU, Penza, Russia

[2] Research Scholar, Department of Mechanical Engineering, University of Technology, Baghdad, Iraq

ABSTRACT

Mathematical simulation of dynamic processes of micro-assemblies instrument devices elements is an actual issue, allowing accept design and technological solutions to ensure the required level of vibration strength and vibration stability of micro-assemblies in operating conditions in the early stages of design. The aim of the work is to increase reliability and provide tactical and technical characteristics of the instrument devices through the design and technological methods. Micro assembly is considered as a spatial heterogeneous structure subjected to the vibration loading. Modeling of dynamic processes in micro assembly elements with the fulfillment of numerical methods using finite element software package ANSYS. There was developed a modeling software complex and numerical study of the spectrum of natural frequencies and the stress-strain state of the micro assemblies' elements under the vibration loading was carried out. The effect of different typical sizes of micro assemblies on the wave shapes and spectrum of natural frequencies was studied, as well as the position of the most loaded zone of the micro assemblies' elements where emergence and development of latent defects is possible. Numerical studies which have been carried out showed that in order to provide vibration resistance and stability of metrological characteristics of micro assemblies it is necessary to carry out mathematical modeling of micro assemblies elements state under real operational effects at the design stage.

KEYWORDS: Instrument Devices, Micro Assembly, Heterogeneous Structure, Natural Frequencies, Wave Shape, The Stress-Strain State, Vibration Resistance, Vibration Strength