THE 7TH INTERNATIONAL CONFERENCE RESEARCH AND DEVELOPMENT OF MECHANICAL ELEMENTS AND SYSTEMS

INFLUENCE KIND OF THE MATERIAL AND ANGLE OF FIBRES ORIENTATION ON STRESS AND STRAIN ANALYSIS OF COMPOSITE SHAFT

Nenad KOSTIĆ
Zorica ĐORĐEVIĆ
Mirko BLAGOJEVIĆ
Nenad MARJANOVIĆ

Abstract: *Characteristics of composites (stiffness, resistance, thermal expansion and other) can vary depending on the type of the material used, quantity, angle of fibre orientation, etc. The selection of material depends on the life required, number of items, product shape complexity, accuracy of computation of optimal characteristics of composites and other. In some cases, the best results may be achieved by using a combination of composite and traditional metal materials. In this paper is developed the method of calculation composite shafts and the numerical model for that shaft is applied using numerical programs FEMAP i NXNASTRAN.*
Based on the recent researches, the conclusion is that the stress and strained state of the shaft has been reached and that all the information given in this papers recommends a numerous appliance of composite materials as it is already an increasing trend in the world.

Key words: *composite materials, composite shaft, stress, strain*

1. INTRODUCTION

Composite materials are obtained by combining two or more materials in order to get a new material with controlled properties, along with more favorable characteristics. These materials have significantly better properties than their component parts. They are mainly *mechanical*, such as strength, stiffness, toughness, etc.., *resistance to external influences*, such as temperature, humidity, chemical agents, abrasive action, etc.., *Longer service life* and the like.
Replacement of steel shaft by composite shaft is a novelty in the world, especially in our country. Composite materials were in the beginning of its implementation, as mentioned earlier, applied in aviation, while nowdays more is done on the analysis of their automotive industry usage.
The above paper overview relates to some, the most characteristic, work in this field.
Naveen Rastogi in his paper [5] presented the method for calculating the drive shaft which is applied to cars. He gave two important aspects calculation drive shaft: calculation of the composite shaft and calculation of joints between fittings and shafts, as well as discussion of the solution. Chih-Yung Chang, together with a group of authors in paper [6] described the vibration behavior of rotating composite shafts containing randomly oriented fibers. Mori-Tanaka's theory of "middle area" is adopted here to analyze the effect of arming fiber within composite material.. Effective elastic modules for composite materials have a function of the characteristics of individual parts, fiber volume and fiber orientation angle. D.G. Lee and other authors in [7] explained the new production methods of one-part, combined AL / composite drive shafts for cars with rear-wheel drive. Composite material consists of several layers which are made by the inner surface of the aluminum tubes. In paper [8], T. Rangaswamy and others gave a realistic calculation and an analysis of the composite drive shaft for power transmission, optimal calculation of one-part car drive shaft with rear-wheel drive using E-glass/epoksy and a highly modular and (NM) carbon / epoxy composite.

2. PORPERTIES OF COMPOSITE MATERIAL

Composite materials present strong, inseparable link of two or more component parts, united in the macroscopic size, non-destructive, all in order to obtain better mechanical and other characteristics, than possessed by constituent elements. Composite materials are macromechanic mixture of two or more materials with different physico-chemical and mechanical properties, mutually insoluble. The greatest advantage of composite materials is reflected in the fact that most of them use the best features of building materials and features that often receive such materials by themselves do not possess individually.

Composite materials consist of:

- discontinuous phase, ie. reinforcement (particles, beads, fibers), and
- continuous phase, ie. matrix.