AN INVESTIGATION OF GEOMETRICAL CONCENTRATORS IN DETAILS DESIGN IN CAD MEDIUM

Georgy Dinev-Technical University of Sofia,
Bulgaria, 1576 Sofia, Bvld. Kl. Ohridski 8, blok 4

Abstract: We analyses influence geometrical tension concentrators in details design. Methods for prevention of possible destructions of details caused by fatigue are proposed. They are based on geometrically strength calculations expert systems and the method of end elements. This methodic is useful for designers and students training in magister educational degree in works for courses and diploma design CAD medium.

Key words: CAD, design, geometrical, concentrators, tension, investigation, influence

1. INTRODUCTION

Physico-mechanical characteristics change of loading causes influence on working capacity of details [1]. These are the hardness of hardened layer of material, roughness of the surface, internal tension and geometrical concentrators of tension [2,11]. Sometimes are visual and structural concentrators of tension [10]. The quality of treatment surfaces influence from tolerance of linear size and tolerance of assembling and combine the details in mechanical product [6]. Under the circumstance details by changes loading, for example the mechanical transmissions systems. For insurance the necessary reliability in exploitation for work the details is necessary to use additional methods [8,9]. This questions are from important meaning in teaching the students from educational master degree designed the mechanical products with CAD. They learning the expert systems in automatization projection in finish term they make diploma project graphical stem SolidWorks.

In view of this work the base tasks are about to made the 3D geometrical models of details and simulation modeling for developed influence of tension from possibilities geometrical concentrators on the reability.

2. INVESTIGATION OF DETAILS WITH CONCENTRATORS TENSION

In non standard details assembly units the mechanical products –transmission systems and etc. more often have geometrical concentrate of tension [3]. They are usually standard elements for example: canals, stage-curve and etc. Which the designer determined the dimension about standard methods. This elements give rise to internal tension. On account of is possibilities to make fatigue destruction in this zone of details. Some characteristic examples are shown on Fig.1.
Most rational approach for search from designer is to use production rule from expert system [4]. This may be illustrate with investigation of radius of curve by design the details trough following algorithm:

**If:**
1) The radius of roundness is 0,5 mm ;
2) The tension $\sigma >$ ....Mpa;

**Then:** To change the radius to 1,5 mm;

**If:** The tension $\sigma >$ ....Mpa;

**Then:** To chose the steel grade 41Cr4;

**If:** The tension $\sigma <$ ....Mpa;

**Then:** The concentrator of tension is lack.

From the indicated algorithm is clear that for determine of tension in investigated zone of detail is necessary to use the Finite Elements Method (FEM). The most largely in the country is package for contact analysis ANSYS [3]. Because in this case are presented the elements from shaft with kayway which is shown on Fig.2. The results from made simulation modeling (Fig.3) and determine distribution of tension in the kayway trough FEM is shown on Fig. 5. From the made investigation of tooth wells (Fig.1) with package for contact analysis ANSIS and programme product for determine of profil geometric of tooth and fillet radius [5] to make improvement the geometric and indexes of toothing [3]. The geometrically form of tooth profil is shown on Fig. 5.
The image such obtain of tooth profil with spline may be use for prepare the 3D geometrical model of tooth wheel. For generate of the tooting may be added or removed material as a result is formed the tooting. On the other side this model may be use in other modules of CAD/CAM system which is confirmed from shown in [7'12].
3. CONCLUSION

On the base of own investigation by design and constructive documentation of details with geometrically concentrators of tension are grounded methodological use of suitable methodic. It is base on Finite Elements Method, production rule from expert system and geometrical modeling of details in CAD medium. The developed methodic may be use from designers and students from master degree in study of expert systems and diploma project.

4. REFERENCES


ADDRESS FOR CORESPONDENCE

BULGARIA
Assoc. Professor Georgy DINEV, Ph.D
BG-1606 Sofia
Blvd. Makedonja-17, ap. 13
Bulgaria
e-mail:gdinev@tu-sofia.bg