

# **<sup>1</sup>THE INFLUENCE OF VARIATION IN POSITION OF OUTPUT SHAFT TO LOAD ON THE CARDAN JOINT CROSS SHAFT**

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## **Summary**

In this paper, the analysis of the influence of variation in position of output shaft to load on the Cardan joint cross shaft in power transmitters is shown. Cardan shafts are the systems that provide alterations of angles between axes of the shafts, which are involved in the power transmission, so as their relative translations. Those properties make Cardan shafts very suitable for using in power transmitters, especially at motor vehicles. The kinematic of power transmitters with Cardan joints is highly specific in relation to variation in position of the axis of the output and input shafts. Those variations in positions cause the alterations of the maximal stresses at the branches of the Cardan joint cross shaft and, also, at its bases. The analysis of the motions at this power transmitter is presented in the first part of the paper and also, the diagrams of relations between the specific kinematic values are given. The analytical calculation of the stresses at the cross shaft of the Cardan joint, as function of the angular position of the shaft is done. The second part of the paper deals with forming of the analytic, so as with numeric calculation of stresses in the critical section of the cross shaft. The results obtained by numeric and analytic method are evaluated and the conclusions about stress concentration and stress distribution for different positions of Cardan joints are done.

**Key words:** Cardan joint, cross shaft, kinematic analysis, critical stress level, numeric method

## **UTICAJ PROMENE POLOŽAJA GONJENOG VRATILA NA OPTEREĆENJE KRSTASTE OSOVINE KARDANSKOG PRENOSNIKA**

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## **Rezime**

U radu je prikazana analiza uticaja promene položaja gonjenog vratila na opterećenje krstaste osovine kardanskog prenosnika. Kardansko vratilo je sistem koji omogućava naginjanje, a i translaciju ose vratila kojim se prenosi snaga, što ga čini veoma pogodnim za prenos snage, pre svega kod motornih vozila. Kinematika kardanskih prenosnika je vrlo specifična s obzirom na promenu položaja ose gonjenog u odnosu na osu pogonskog vratila, što se odražava na promenu maksimalnih napona na rukavcu krstaste osovine i u njegovom korenu. U prvom delu radu analizirano je kretanje ovog prenosnika i dat je dijagramski prikaz međusobnih zavisnosti pojedinih kinematskih veličina. Izveden je analitički proračun napona na krstastoj osovini u zavisnosti od ugaonog položaja vratila. Drugi deo rada se

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odnosi na formiranje numeričkog modela, kao i numeričkog proračuna napona u kritičnom preseku krstaste osovine. Analizirani su rezultati dobijeni numeričkom i analitičkom metodom i izvedeni zaključci o koncentraciji i raspodeli napona u različitim položajima kardanskog vratila.

**Ključne reči:** Kardansko vratilo, krstasta osovina, kinematska analiza, kritični napon, numerička metoda