PROPOSED METHOD FOR UNDERCUTTING FPHENOMENON IDENTIFICATION IN CAM MECHANISMS

Stelian Alaci[1], Florina Carmen Ciornei[1], Dumitru Amarandei[1]

[1] *Faculty of Mechanical Engineering, Mechatronics and Management, "Stefan cel Mare" University of Suceava,[1]alaci@fim.usv.ro.*

Abstract: *The undercutting phenomenon is an unwanted incident occurring when the profile of a part is obtained as envelope of successive positions of a moving curve. It is present in the cases of cam profiles and toothed gears and, in general, in the case of cam mechanism, the occurrence is identified in the final stage of designing method. The present paper shows a manner of undercutting phenomenon detection when the law of motion and the constructive parameters of the mechanism are known.*

Keywords: *cam mechanism, undercutting identification*

1. Introduction

Cam mechanisms [1] are one of the three broad classes of common mechanisms, next to the linkage mechanisms and toothed gear mechanisms. The design of a cam mechanism is well established [2]-[4] and assumes surpassing three phases: adopting the law of motion, adopting the geometrical parameters and drawing the profile of the cam.

When the follower is tangent to the cam's profile, (the case of flat face follower) the contour of the cam results as envelope of successive positions of the follower.

For the case of knife edge follower, when reducing the contact pressure from higher pair is aimed, at the end of the follower is mounted a roller, with the purpose to replace the sliding friction with rolling friction and thus, the profile of the cam will no longer be the theoretical one but an equidistant curve with respect to the theoretical contour; this curve is obtained as envelope of roller's positions when its centre moves alongside the theoretical profile.

One can affirm that regardless the constructive type of mechanism, the cam's profile is obtained subsequent to an enveloping process.

2. Undercutting Phenomenon. Theoretical considerations

The position of a plane mobile curve Γ depends on the α parameter and is defined by the equation:

$$f(x,y,\alpha)=0\,. \qquad (1)$$

The equation of the envelope is obtained by elimination of parameter between the equations of the system, [5]:

$$\begin{cases} f(x,y,\alpha)=0 \\ \dfrac{\partial f(x,y,\alpha)}{\partial\alpha}=0 \end{cases} \qquad (2)$$

Often, there are cases, when the operation is not possible and instead, the solutions of system (2) are expressed under the form:

$$\begin{cases} x=x(\alpha) \\ y=y(\alpha) \end{cases} \qquad (3)$$