

CAD - CAM PROGRAMS APPLIED TO THE CYCLOID PROFILE WHEELS PROCESSING

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Abstract: The classic manufacturing process of the cycloid profile involves important technological problems. Therefore, in this paper we propose a computational method of manufacturing and control process of the cycloid satellite gears, based on the theoretical 3D Model (obtained in CAD program) using compatibles CAD-CAM programs. The same computational method can be used in generating, manufacturing and control process of other complex profiles assuring the precision of the real profile related to the theoretical 3D model.

Key words: *generation, analyzing, simulation, manufacturing, control.*

1. INTRODUCTION

Numerous experiments point out that a major influence in the vibroacoustic performances of the cycloid gear reducer has the precision of the cycloid profile of the satellite gear. Therefore, to obtain the complex form of the cycloid profile we propose to use a CAD – CAM processing method in the generating – analyzing – simulation – manufacturing -control process of the cycloid profile wheels.

The computational method starts with 2D profile curve generation, 3D model generation and ends with the satellite gear final control.

Also, the 3D Model of the cycloid wheels obtained in the design process is used in Finite Elements Analysis (FEA) to determine the optimal dimensions of the satellite gear's geometrical parameters observing the stress and the deformations while it is being loaded.

In the very complex situation of the satellite gear gearing with some of the sun gear's roller teeth simultaneously with some of the homocinetic coupling's thumb, the simulation of the gearing, using the 3D Models of the gear reducer parts, provides the visualisation of the

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gearing's type.

The 3D Model of the cycloid wheels is also used in precise manufacturing and final control process based on the capabilities of the *Coordinate centre 3D* machine and the *Coordimeter 3D* measurement machine new generation.

2. THE PROCESSING STAGES

We present the six stages of the proposed computational method consist in design, analyze, manufacturing and control process of the cycloid profile wheels. It is pointed out also the utilitarian programs used and the necessary machines and soft machines used in manufacturing and control of a complex cycloid profile wheels. The same CAD- CAM processing method can be used to other wheels' profile, in scientific analyses, in didactical presentation, in current manufacturing process. Using the facilities of the parametrical drawing, we obtain increasing efficiency of the design process, increasing profile's precision and decreasing manufacturing time.

Table 1. CAD – CAM processing of the cycloid wheels

	I. Generation of the cycloid wheel's profile	 - using Auto Lisp program ruled in AutoCAD utilitarian program, <i>lsp file</i>
	II. Generation of the cycloid wheel's 3D Model	 - using AutoCAD to draw the 2D geometrical form, <i>.dwg file</i> , (<i>drawing file</i>) - using AutoCAD to generate the 3D Model, <i>dwg file</i> ;
	III. FEA of the cycloid 3D Model wheel	 - using AutoCAD Mechanical Desktop, <i>dwg file</i> ; In this program we transform <i>dwg file</i> in <i>.iges file</i> , (<i>Initial Graphics Exchange file</i>) - using Ansys <i>.iges file</i> ,
	IV. Simulation of the gearing	 - using 3D Max program, <i>.max file</i> , <i>AVI file</i> .
	V. Milling the cycloid profile of the wheel	 Coordinate center , ex: Bridgeport, VMC 600 Vertical Machine - machine soft to read the 3D Model <i>.iges file</i> - machine soft to transform the captured dates in machine language;
	VI. Control process of the cycloid profile wheel	 Coordimeter 3D ex: ME 3007 Metrologic Group - machine soft to read the 3D Model <i>.iges file</i> - machine soft to processes the impute dates captured by tactile part of machine

The cycloid profile of the satellite wheels of the cycloid gears has a complex form obtained through the generation of the equidistant curve to an epi-cycloid curve. The theoretical studies and the practical experiences give as the necessary modification applied to the bottom and to the peak of the teeth to obtain important improvement of

processed results for a used cycloid wheel, obtained in the classic manufacturing process.

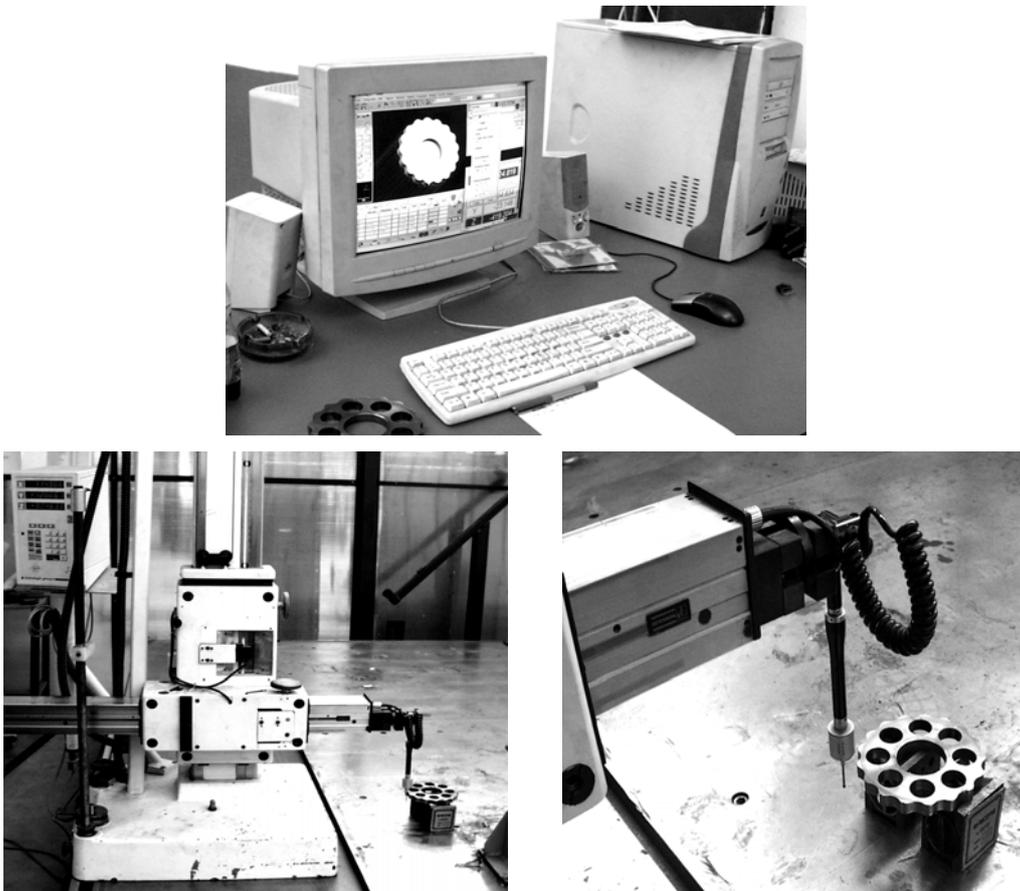


Fig. 3. Coordimeter 3D machine used to measure the parameters of the cycloid profile wheel.

Using the 3D Models of the gear reducer parts, we realize the simulation of the gearing in 3D Max utilitarian program who provides the visualisation of the gearing's types in the very complex situation of the satellite gear gearing with some of the sun gear's roller teeth simultaneously with some of the homocinetic coupling's thumb.

3. CONCLUSION

The behavior of the cycloid gear reducer is influenced by the constructive parameters of the cycloid satellite wheel [2]. Also, major influences have the technological parameters: *the shape errors of the wells' tooth* and *the roughness of the active cycloid profile*. The classic manufacturing process of the cycloid profile involves important technological problems.

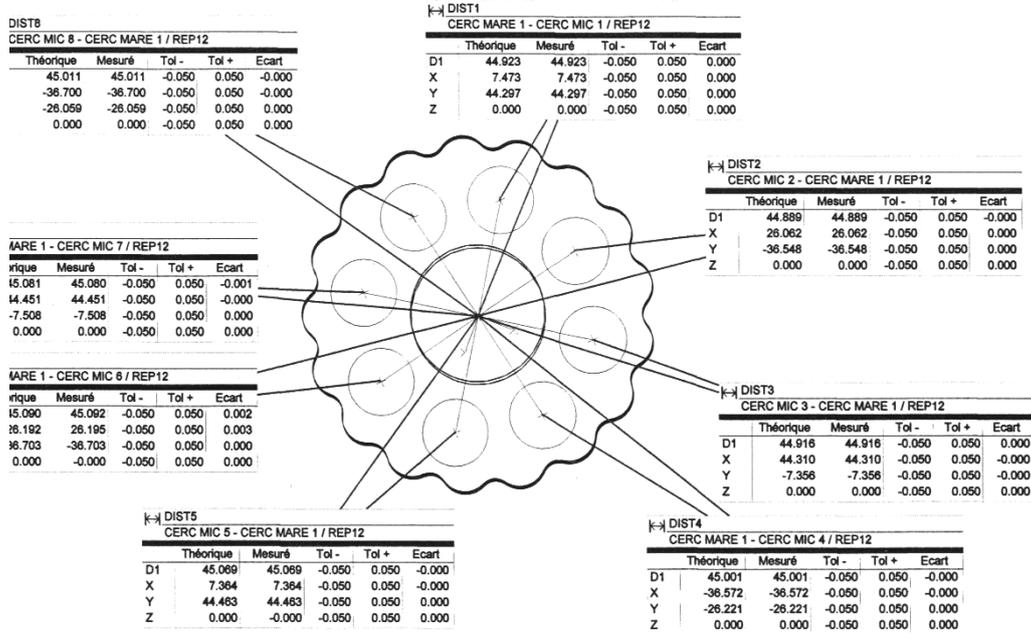


Fig. 4. The wheel holes centers circle's eccentricity.

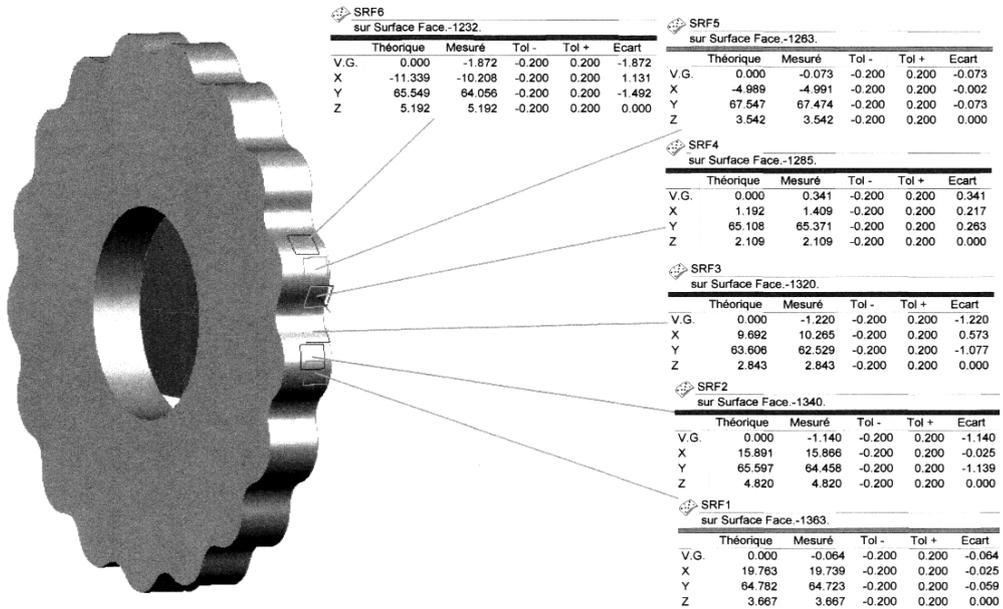


Fig. 5. The radial errors of the real cycloid profile.

Using the capabilities and the facilities of the new generation of CAD utilitarian programs and CAM process we assure the quality of the complex satellite gear.

The same computational method of manufacturing and control process can be used in generating and control process of other complex profile assuring the precision of the real profile related to the theoretical 3D model.

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