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The Union of Scientists – Ruse (US – Ruse) organizes publishing of scientific and popular informative literature, and since 1998 – the "Proceedings of the Union of Scientists- Ruse".

SERIES 5

"MATHEMATICS, INFORMATICS AND PHYSICS"

VOLUME 7

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AN APPROACH OF VISUALIZATION OF BELT PULLEY CALCULATION RESULTS

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Abstract: *Visualization of the results of belt pulley calculation using AutoCAD is presented in the paper. Calculations are made with an original software system. The results are visualized in AutoCAD, using possibilities of the VBA.*

Keywords: *visualization, tooth-belt calculation, VBA in AutoCAD.*

INTRODUCTION

Nowadays, for transmission of the motion in the industry, like electronics, electrical supplement, car industry etc., mostly are used belt pulleys.

The design of the most productivity tools for cutting belt pulley – worm hobs, practically is not given in the specific literature. One of the base moments, connected with the profiling of the cut tooth profile in normal section is control of the worm hob profile for working of another pulley with the same profile. There is no such control, described in the specialized literature [1, 2, 3, 4]. That's why is supposed that it is a "know-how" of the institutes, dealing with those tools.

Usage of the different software products and systems allows solving complicated mathematical formulas to search optimal parameters for the tools profile, in order to guarantee obtaining of the right pulleys profile.

CALCULATION OF BELT PULLEY

An author's software system for calculation of the worm hob tool, needed for cutting belt pulleys is designed [5]. The results of system's work are shown on fig. 1.

A module for visualization of the results in which the parameters variation through the calculation are shown, is also constructed [6]. Those results are not illustrative enough for the users. That's why was given a task for realization of a module for visualization of the results in a mode, which have to be clear and available for the user. The goal was to use one of the familiar CAD systems.

We choose AutoCAD as one of the familiar and most frequently used CAD system for design and graphic processing of the parts in the manufacturing.

PROGRAMMING IN AUTOCAD

AutoCAD gives the possibility to use come integrated programming languages like AutoLisp and Visual Basic for Applications (VBA). Both give good possibilities for drawing and graphic components realization.

Microsoft VBA is object oriented programming environment, projected for creation of user applications. VBA works in the AutoCAD environment, suggesting easy and accessible programming environment. There are some priorities, using VBA for AutoCAD, which were important for choosing VBA:

- easy for use and application.
- works in AutoCAD environment, so the execution of the program will be very quick and easy.
- the projects could be independent, or connected with definite drawing files. That allows more flexibility and effectiveness.

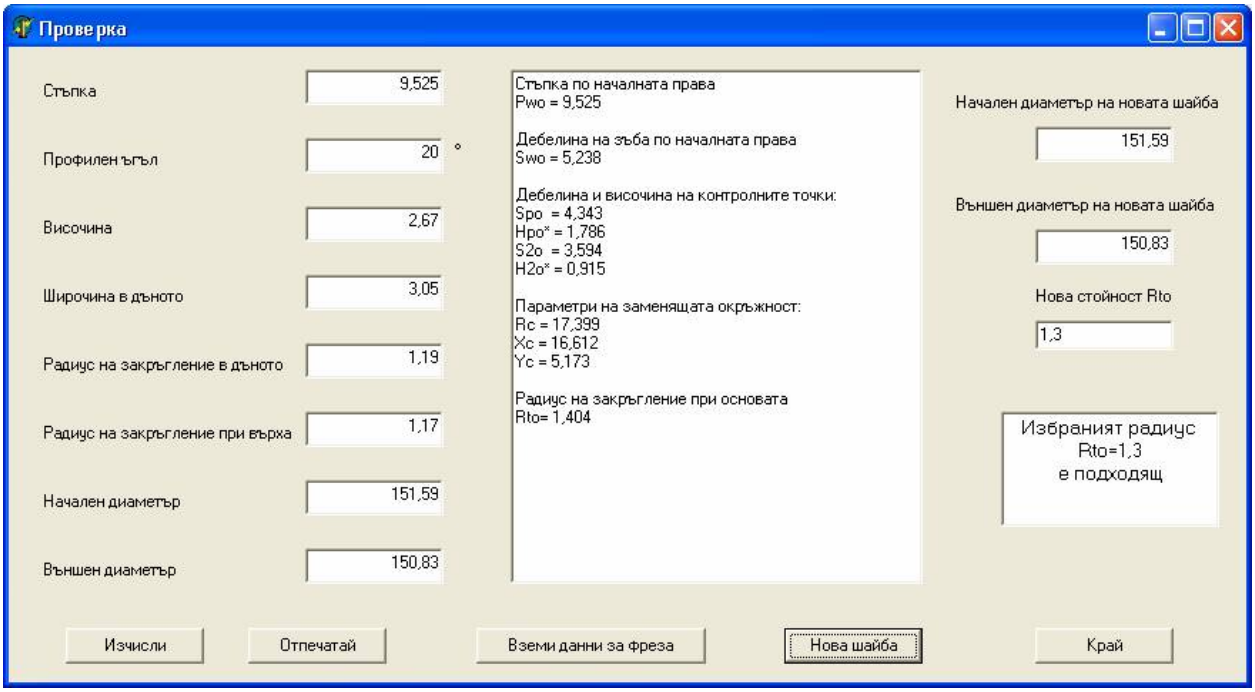

fig. 1 System's window with the calculated tooth-belt results

VBA completely supports the AutoCAD's object model and the ActiveX technology using at the same time the scheme for working with objects, methods, characteristics and events of Basic, which are much more transparent and user-friendly than those in other programming languages.

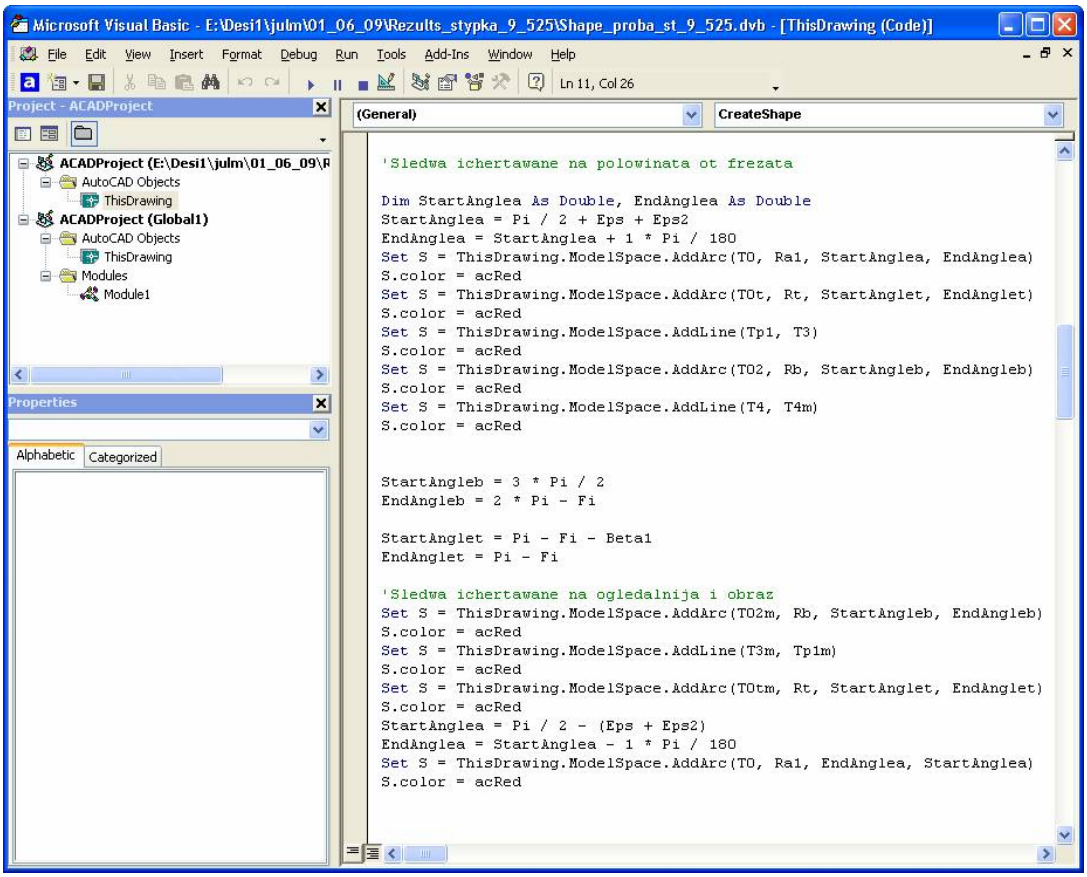

fig.2 Part of the VBA program for visualization of the results

A connection between the two systems (author's system "Check-Up" and VBA in AutoCAD) was created, using external data file. The results of calculation of the worm hob for manufacturing of a belt pulley, which are necessary for visualization of the results, are written in the external data file

VISUALIZATION OF THE RESULTS

When starting AutoCAD, a macro-program written in VBA is run. Part of the program is given in fig. 2. The execution of the program leads to drawing of the tooth gap profile of the belt pulley (marked with 1 on fig. 3). Along with that, an outline of the worm hob, used for cutting the belt pulley is also drawn (marked with 2 on fig. 3).

The outline, received of the worm hob is rotated consecutively in the two directions (positive and negative) of an angle, given in advance, in order to control if the proper (right) profile will be got or will be got an overlap in one of the directions.

The received final result, shown on fig. 3, illustrate that the worm hob, calculated for given belt pulley data is correctly calculated. The same could be used for cutting belt pulleys with given measurements.

The visualization allows additional preliminary control of the software system's results and that assure quality of the designed tool. It will also show the correctness of system's work once more, before application of its results.

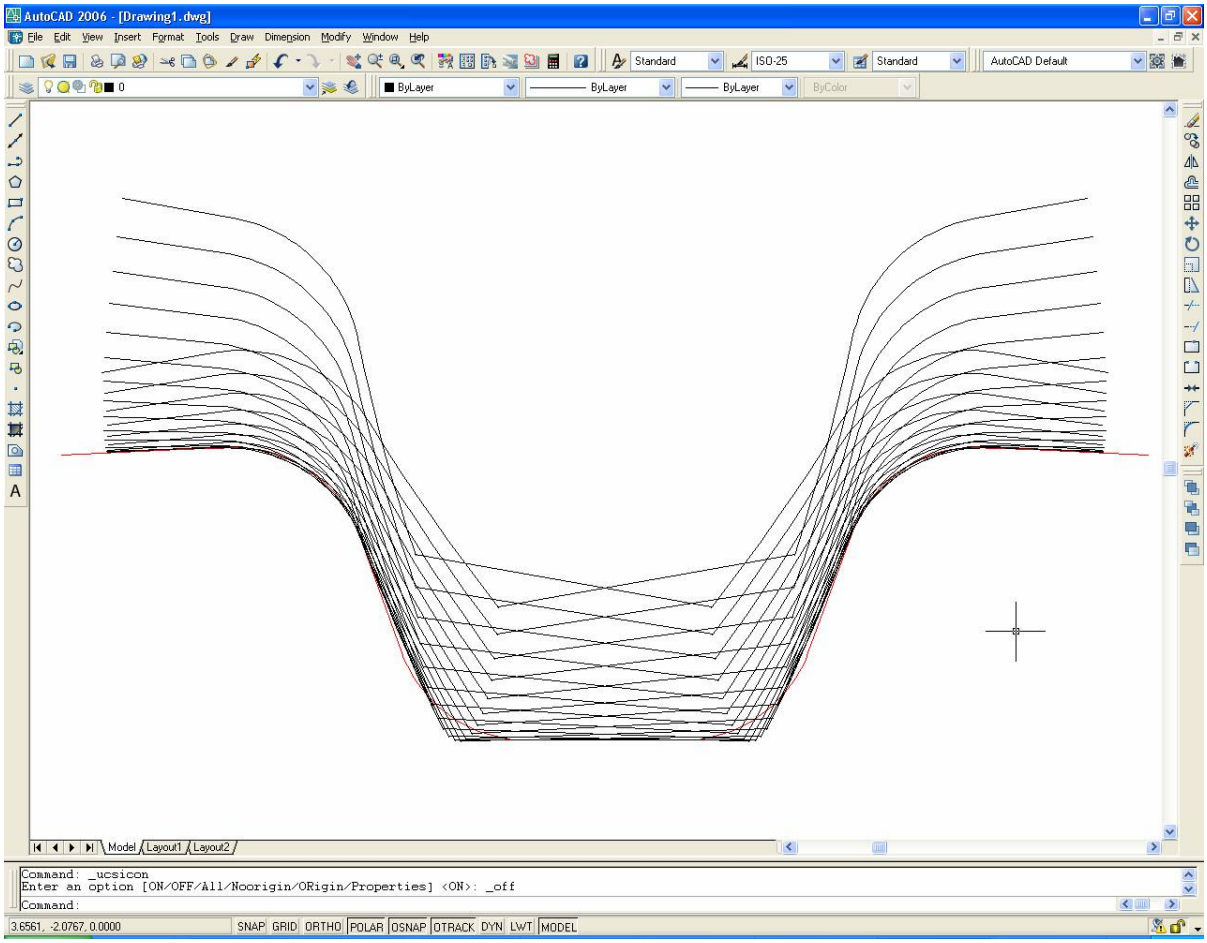

fig.3 The results of the VBA program in AutoCAD

If the results, received from the system's work are not good enough, it should be run again. There are some possibilities of changing needed parameters to receive new optimal results for calculated worm hob tool.

CONCLUSION

As the result, the authors software system for calculation of belt pulley can be used together with the visualization possibilities of one of the most often used CAD system – AutoCAD. It is important, while this is very useful for the constructers and designers of the machine elements.

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ПОДХОД ЗА ВИЗУАЛИЗИРАНЕ НА РЕЗУЛТАТИ ОТ ИЗЧИСЛЯВАНЕ НА ЗЪБНО-РЕМЪЧНИ ШАЙБИ

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Резюме: *В доклада е представен метод за визуализиране на резултатите от изчисляване на зъбно-ремъчни шайби с използването на AutoCAD. Изчисляването е направено с оригинална авторска софтуерна система. Резултатите са визуализирани в среда AutoCAD, използвайки възможностите на VBA.*

Ключови думи: *визуализиране, изчисляване на зъбно-ремъчни шайби, VBA в AutoCAD.*

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