FUNCTIONAL MODEL AIDED DESIGN TURBOCHARGER VANES

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***Summary.* The proposed functional model of computer-aided design of the turbocharger vanes, which is the basis for modeling software blade profiles based on adaptive discrete interpolation method.**

***Keywords:* adaptive method, discrete interpolation software, Delphi.**

Formulation of the problem. Energy transformation in compressors of gas turbine engines related to air flow, which limited working surfaces of the blades and the surfaces that form the meridional flow profile of the compressor. However, despite significant progress in improving methods of geometric modeling, processing and certain operations compressor blades manufacturing technology, it remains a range of issues related to ensuring accuracy, eliminating manual labor and increase the level of automation.

Scientists, researchers and manufacturers a number of countries have reached significant success in the development of powerful blade axial compressors mainly type. They developed and worked fairly reliable methods of geometric modeling aerodynamic contours and surfaces flow and working parts of the guide blade sets of data compressors. However, the question of drawing software to implement these schemes with specific software tools with numerical control (CNC).

Analysis of recent research. In this direction V.Vereschaha [1,2] proposed two schemes (multiplicative, additive) calculation of condensation and received results in the simultaneous formation of discrete graphics and neostsylyuyuchyh. These schemes guarantee the absence of oscillations and offer the designer maximum opportunity in correcting and finding the optimal solution. However, these schemes are applicable only for the KDP and unambiguous have large errors, the relevant provisions close to vertical. Therefore, further studies [3] have been aimed at developing local thickening adaptive scheme that takes into account the above shortcomings developed schemes. The main feature of the scheme is that the condensation process is carried out in one direction (from a smaller to a larger angle) as condensation point should be located at the link below the lowest point of intersection of this tangent line communication (fig. 1). Otherwise may cause oscillations.

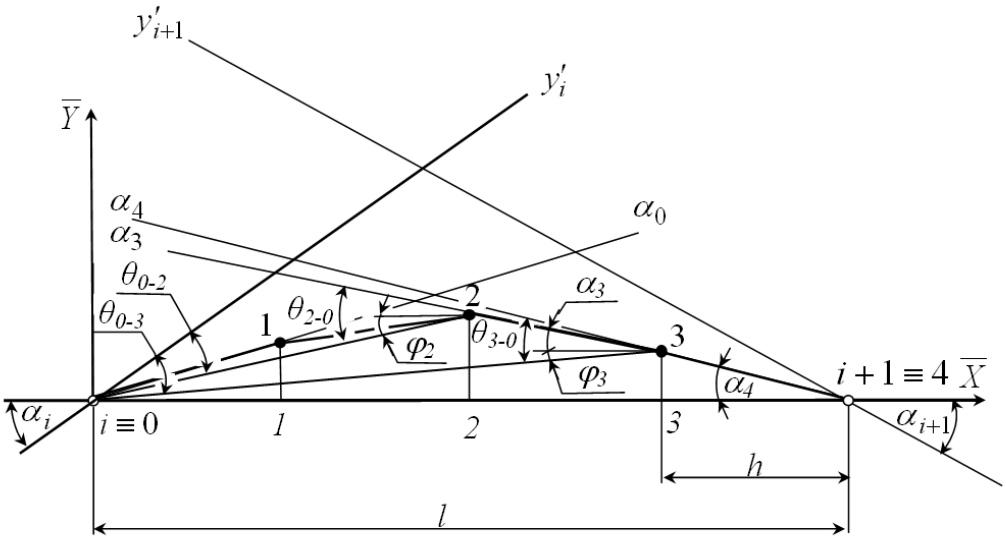

Fig.1. Adaptive scheme local thickening.

Adaptive scheme was the basis for calculation of the proposed functional circuit module.

The wording of Article purposes. The aim is to develop a functional circuit automated design of compressor blades.

Main part. The paper presents a functional diagram turbocharger blades aided design (Fig. 2). Functional diagram includes modules:

- points Profiles module of the blade sections (adaptive algorithm based on discrete interpolation method [3]);
- module forming surface of the blades;
- module test details on the aerodynamic characteristics;
- module development control programs for machining parts on CNC machines..

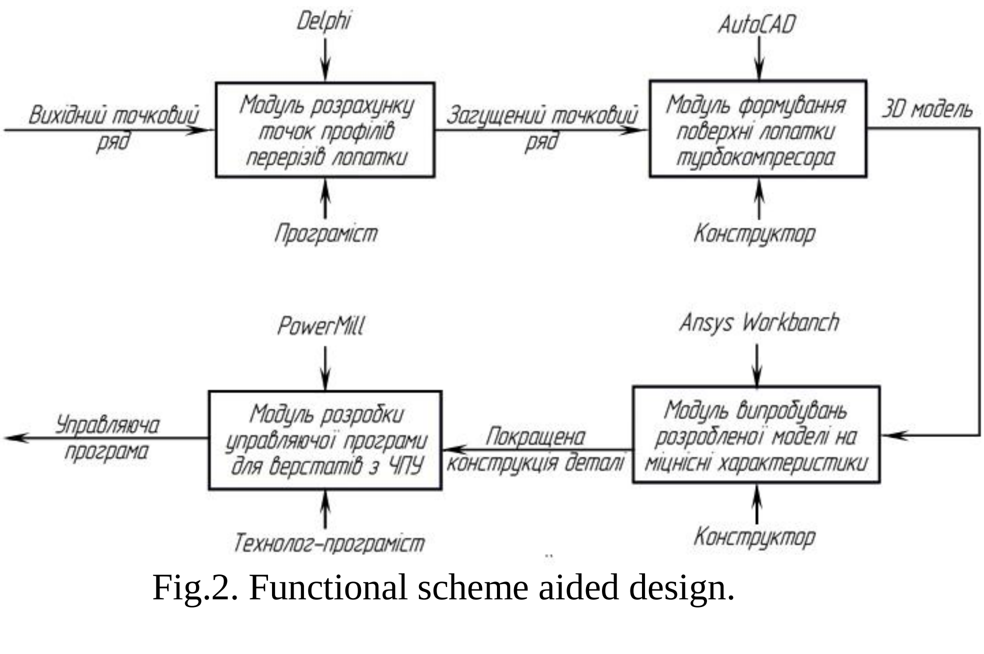

Fig.2. Functional scheme aided design.

The basis of the functional circuit is designed software high-level language programming Delphi, which allows:

- receive discrete point range that forms the blade profile devices compressors;
- export the results in AutoCAD .dxf format to further create 3D-models of blades on the basis of the software modules in flat sections;
- import of software module previously received discrete point numbers to view it or make changes.

Interface software (Figure 3) includes:

1 - graphical box that displays the starting points and thickened;

2 - scale for zooming graphical field;

3 - a table showing the coordinates of the points of reference points and thickened;

4 - buttons for adding, editing and deleting points;

5 - button for clearing the graphic field;

6 - button to import and export points in format .dxf;

7 - button for finding intermediate points (thickening);

8 - the status bar showing the coordinates of the cursor on the graphic field.

Description of the program:

1. The user enters the weekend coordinates by clicking "Добавить" and enter values in field 3 (Fig. 3) or by pressing the left mouse button at the right place on the graphic field.
2. After entering the coordinates of pressed button "Очистить."
3. To save the results in a file format used .dxf button "Экспортировать."
4. Use the "Импортировать" can still view the results and make changes.

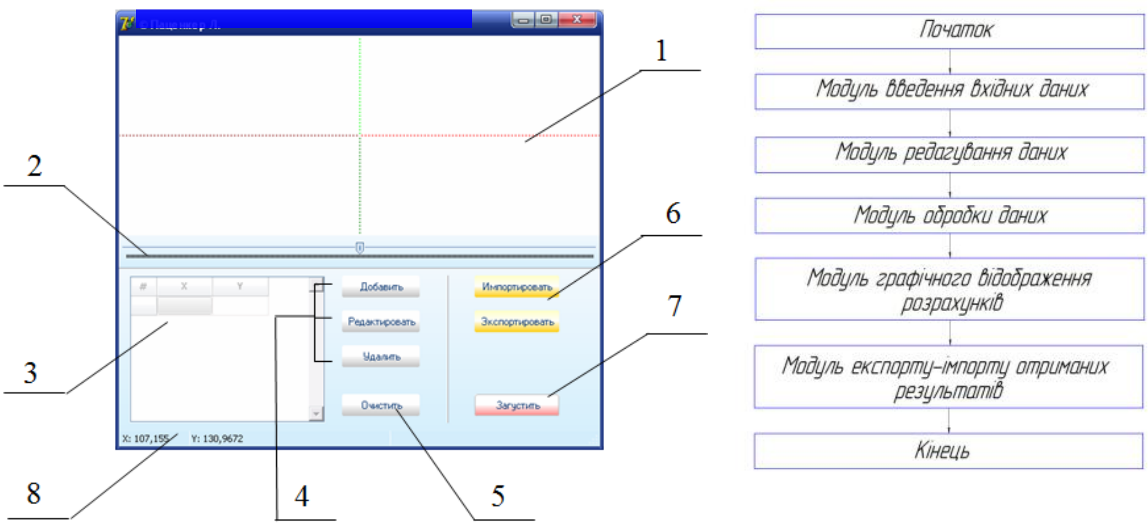

Fig 3. The interface module program and location.

The result created software module is shown in Figure 4. After a 3D model of compressor blades (Fig. 5) it is necessary to test parts on the aerodynamic characteristics (such as a software module COSMOS FloWorks) and draw the appropriate conclusions about the nature of flow blades, etc.

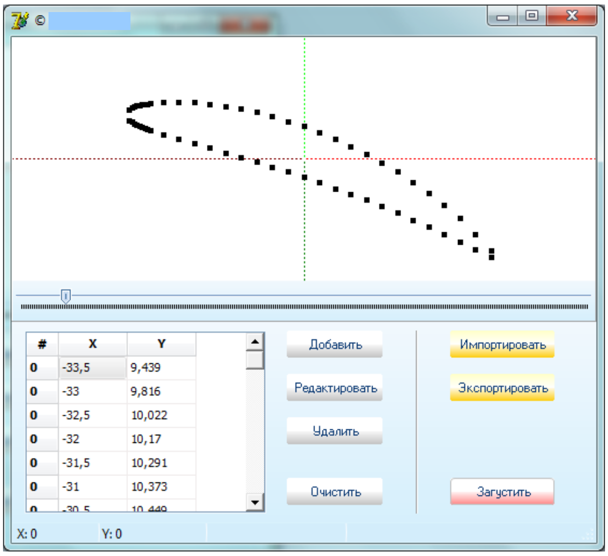

Fig. 4. The result of the module.

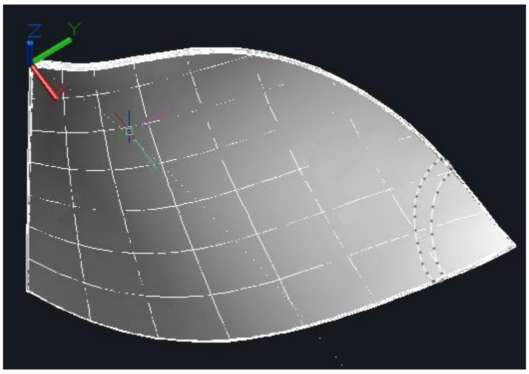

Figure 5. Formation of the 3D model compressor blades.

Further work is aimed at developing technical documentation for the creation and development of model blade control programs based on the established process.

Conclusions: We proposed functional diagram aided design apparatus compressor blade, which is the basis for software programming language Delphi to simulate blades of profiles based on discrete adaptive interpolation method.

Literature

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