Automated Technologies Production of Preform

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Automated radial braiding machine RP64-1-130 with a split housing

- Contour weaving with high-strength and high-modulus threads.
- Contour weaving in two and three axial (with skeletal reinforcement) schemes.
- Contour weaving products with a straight and curved axis.
- Contour weaving products with a closed axis.
- Applying a coating layer with a continuous surface hiding.
- Applying the sheath layer to larger diameters with the formation of a mesh structure.
- Independent movement of the supports in the transverse direction and joint in the axial direction.

Modernization
RP64-1-130
increased the number of controlled coordinates

- The support has a vertical rotation and a rotation of the mandrel.
- 5 program controlled coordinates.

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Equipment RP64-1-130 manipulator with CNC KUKA KR-61

- 6 controlled coordinates.
- 60 kg loading capacity.

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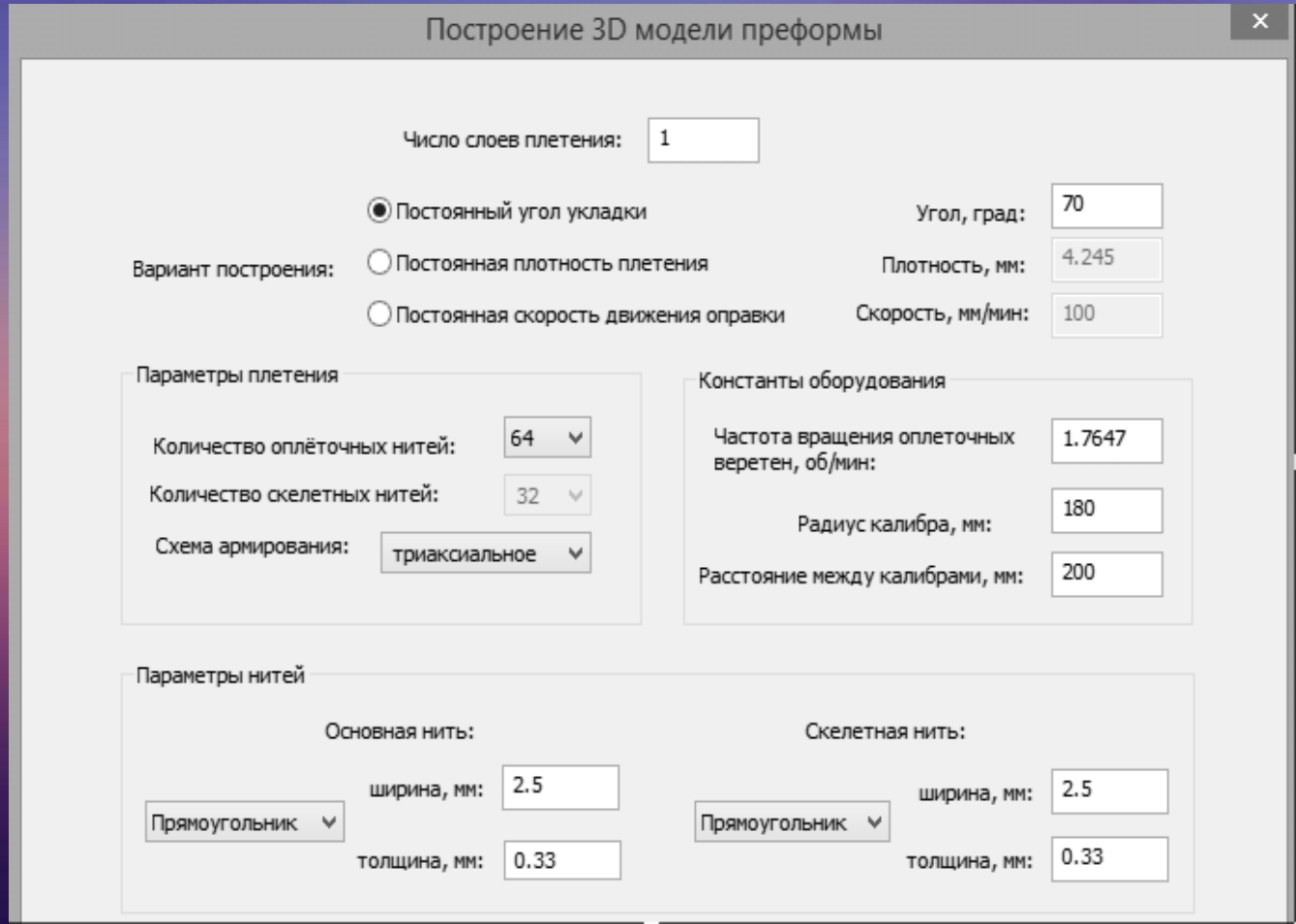
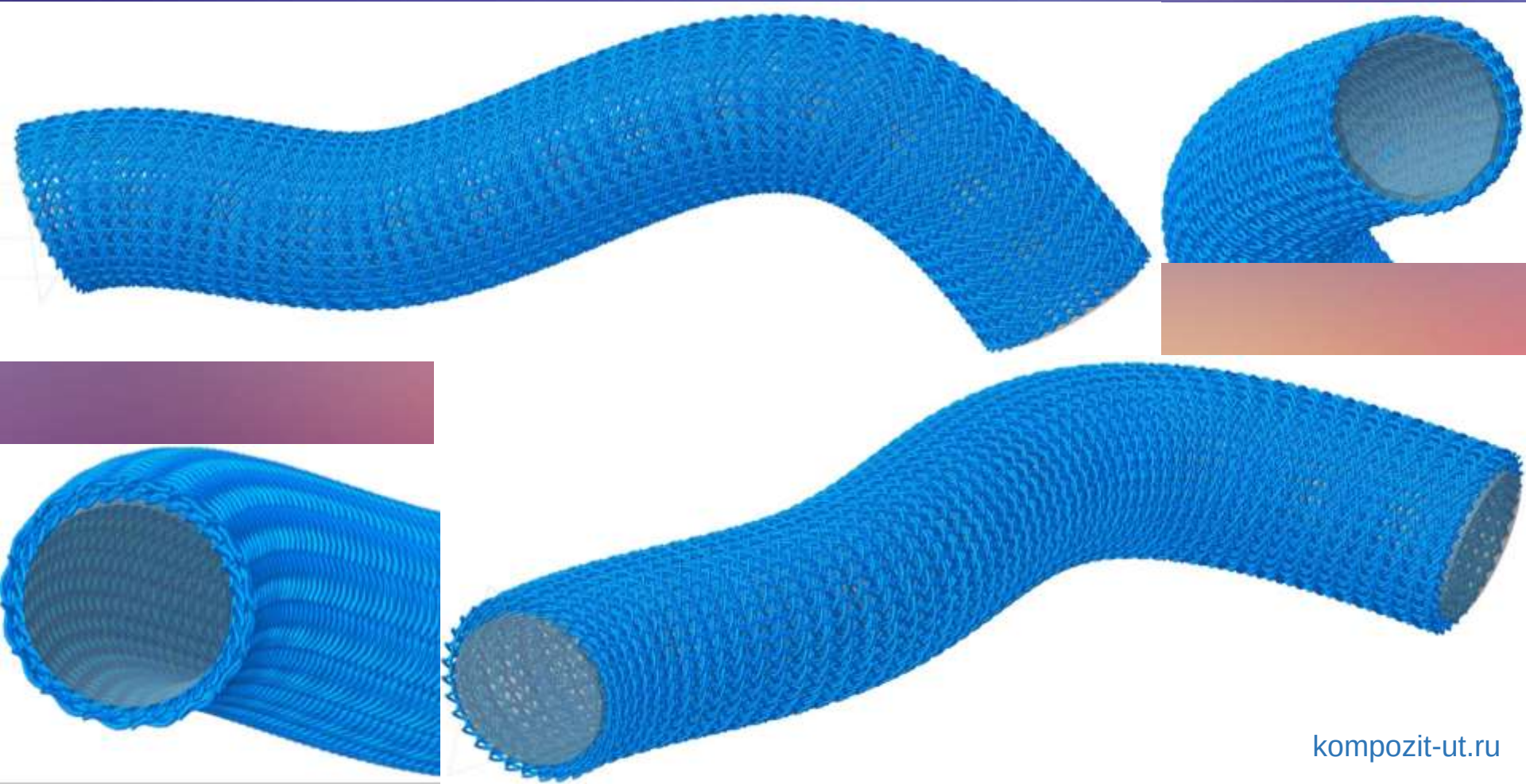
Developed software for modeling and control of radial weaving

Interface programs in Russian



An example of modeling woven layers of triax reinforcement



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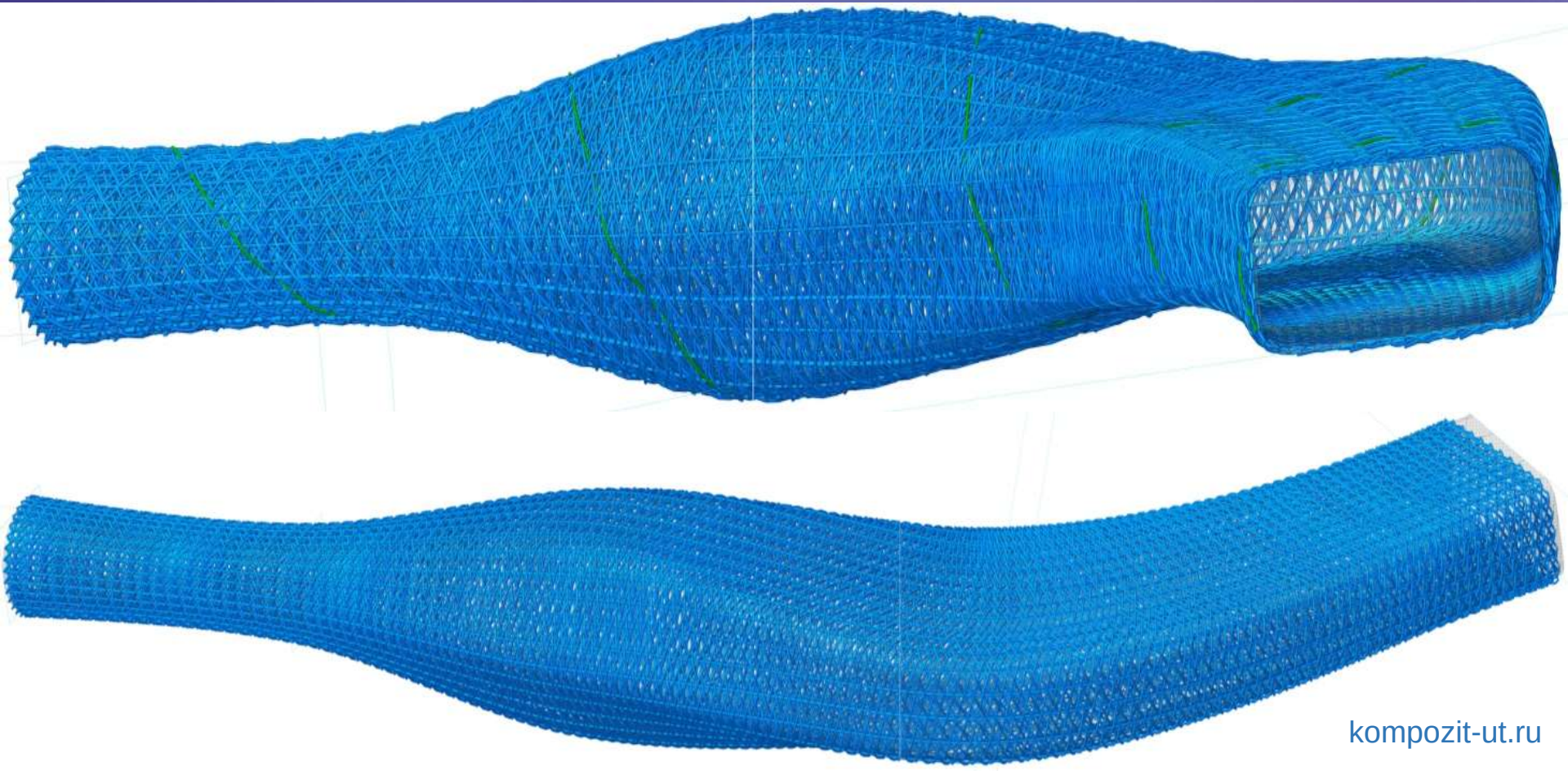
An example of modeling a woven layer on a complex preform



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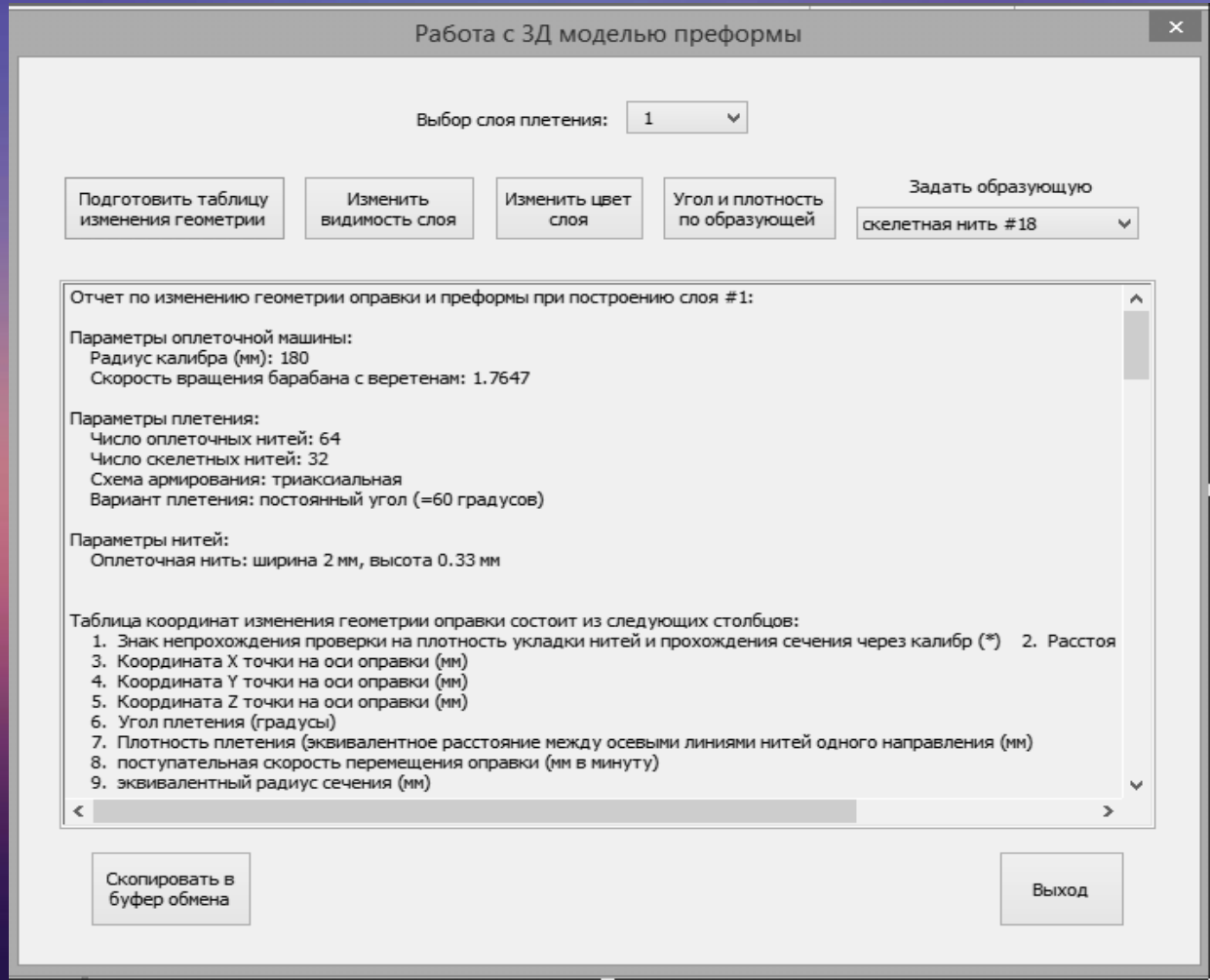
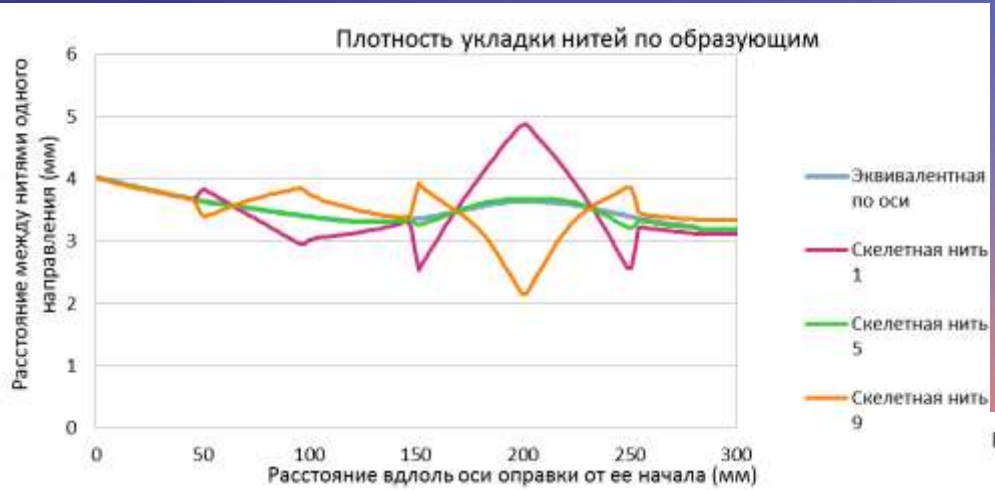
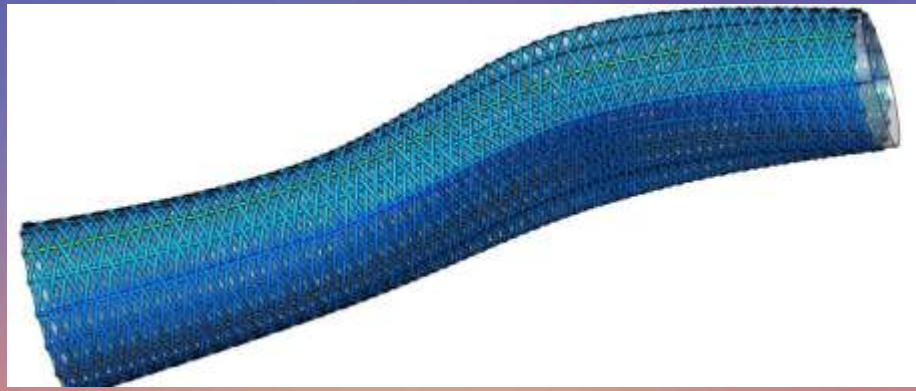
Preform Construction Results Dialog Box

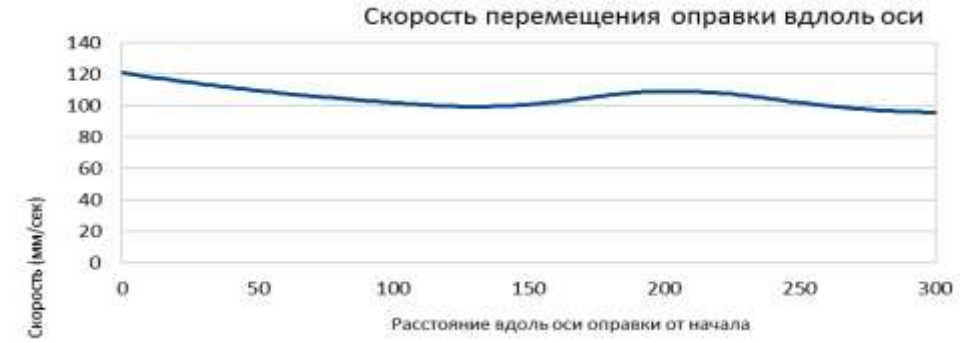
Displays
- Equipment parameters.
- Weaving parameters.
- Thread options.
- Information for programming braiding equipment.
- Parameters of the resulting preform on the selected axes.

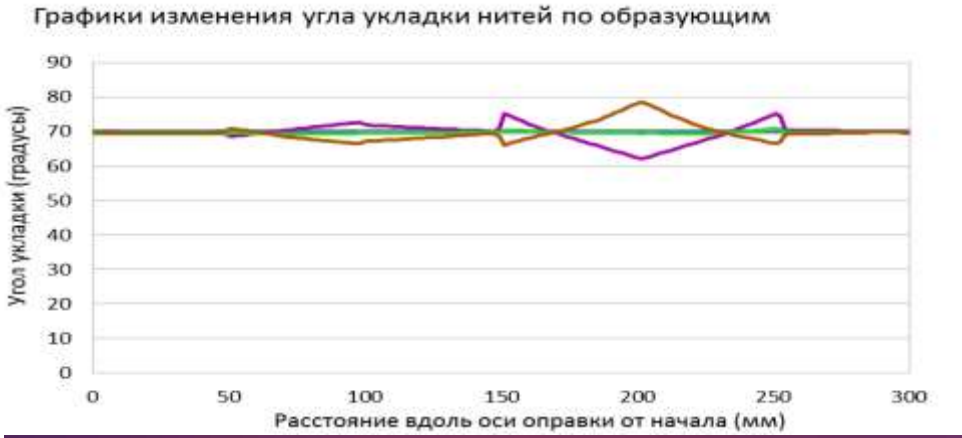


Graphs of parameters of the woven layer along the selected skeletal threads









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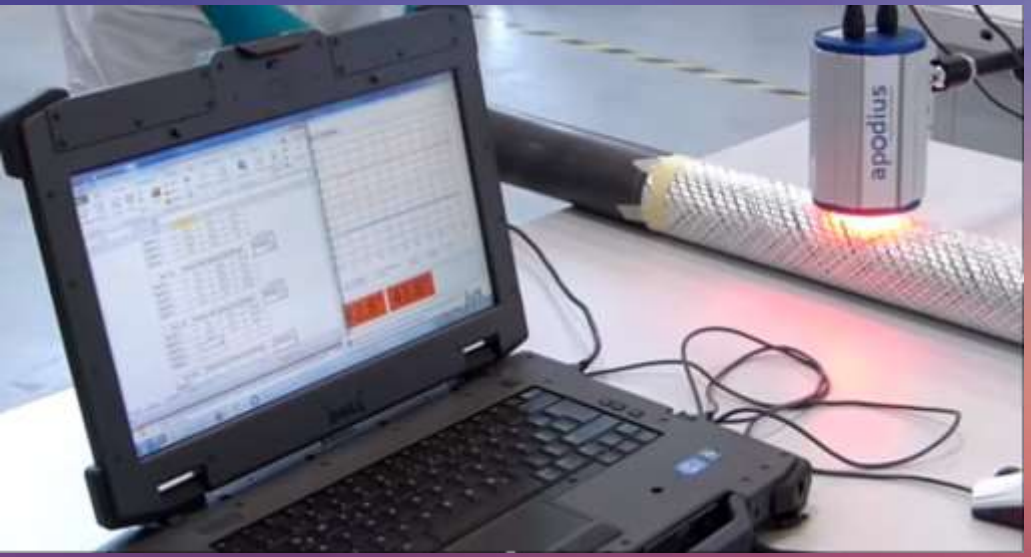
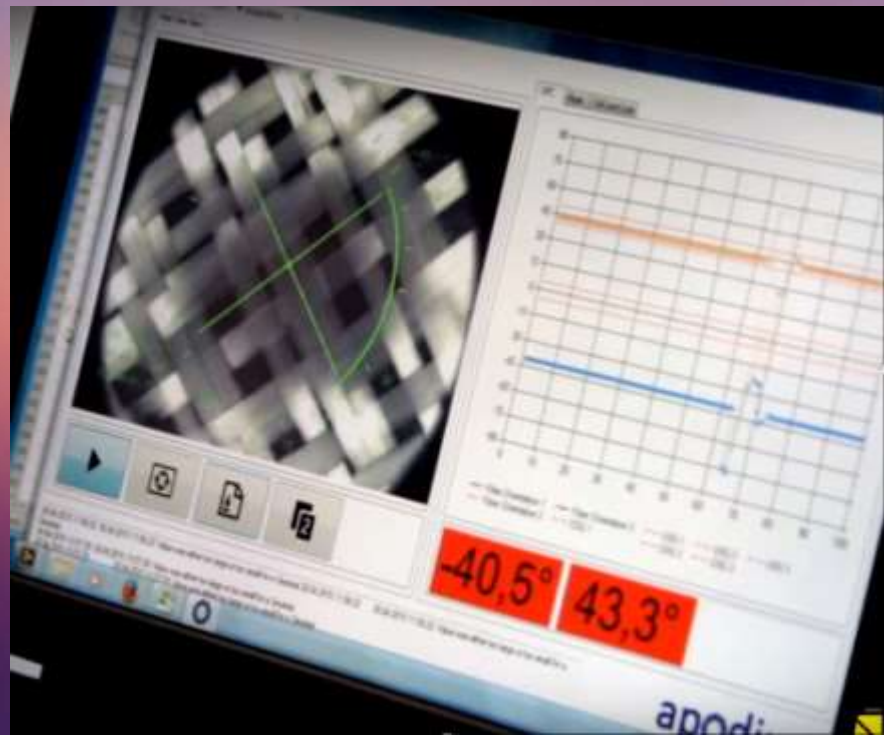
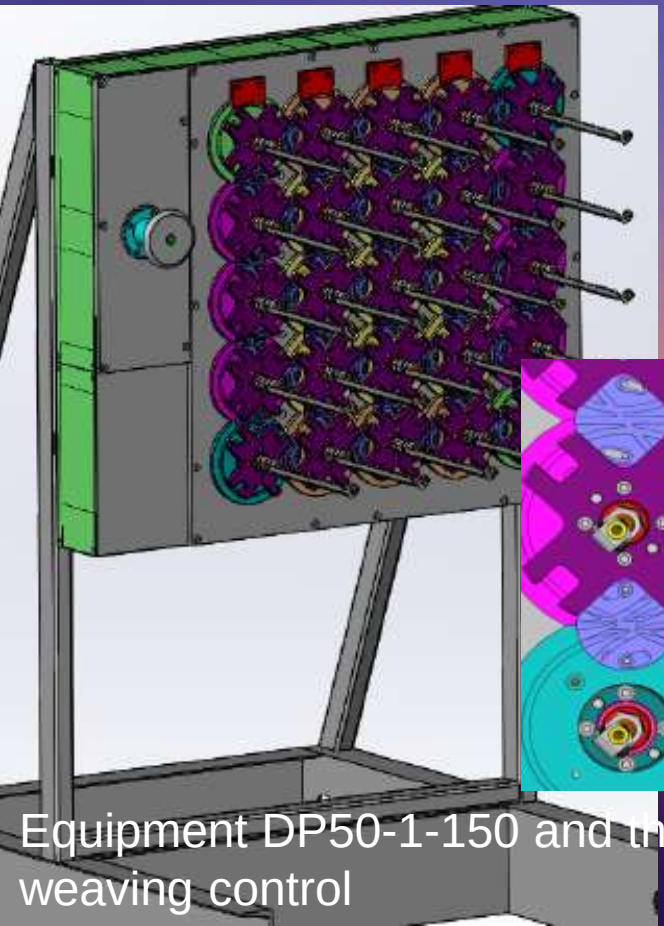
Work is underway to develop an automated optical quality control system for manufacturing preforms — machine vision



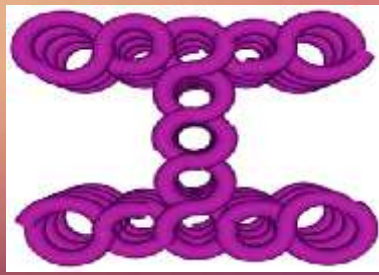


Automated technology of diagonal weaving of preforms



Equipment DP50-1-150 and the principle of weaving control

Trajectories of motion and examples of the resulting preforms



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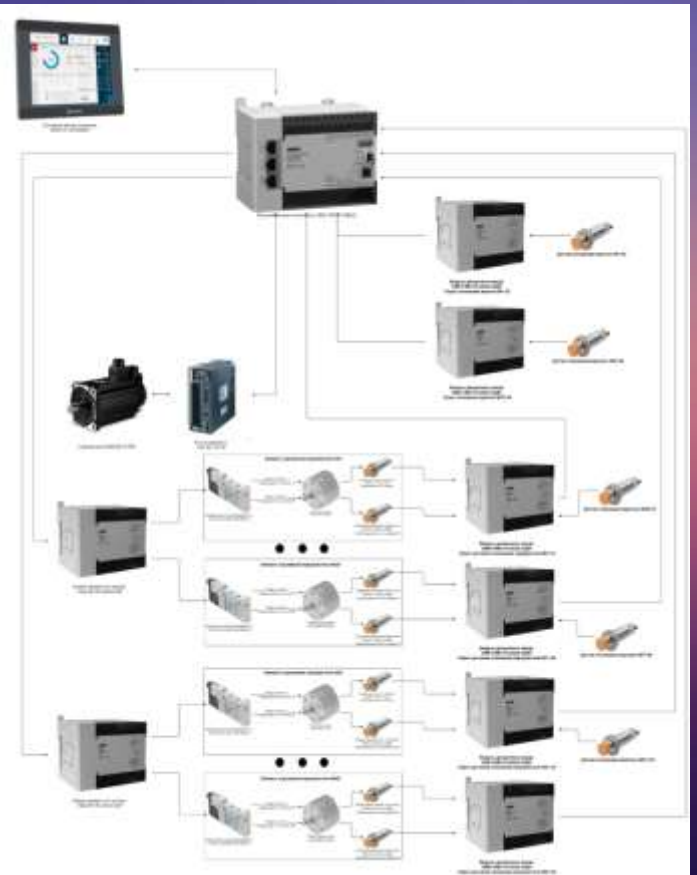
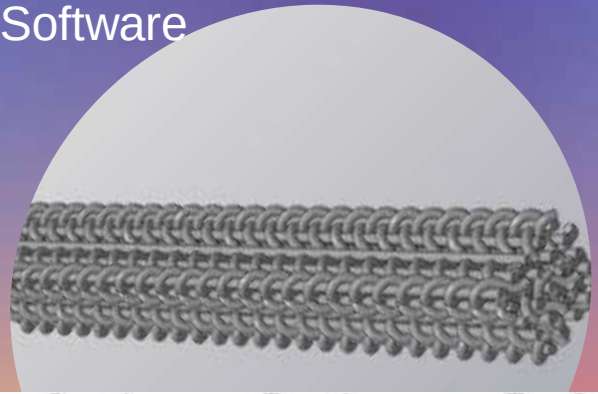
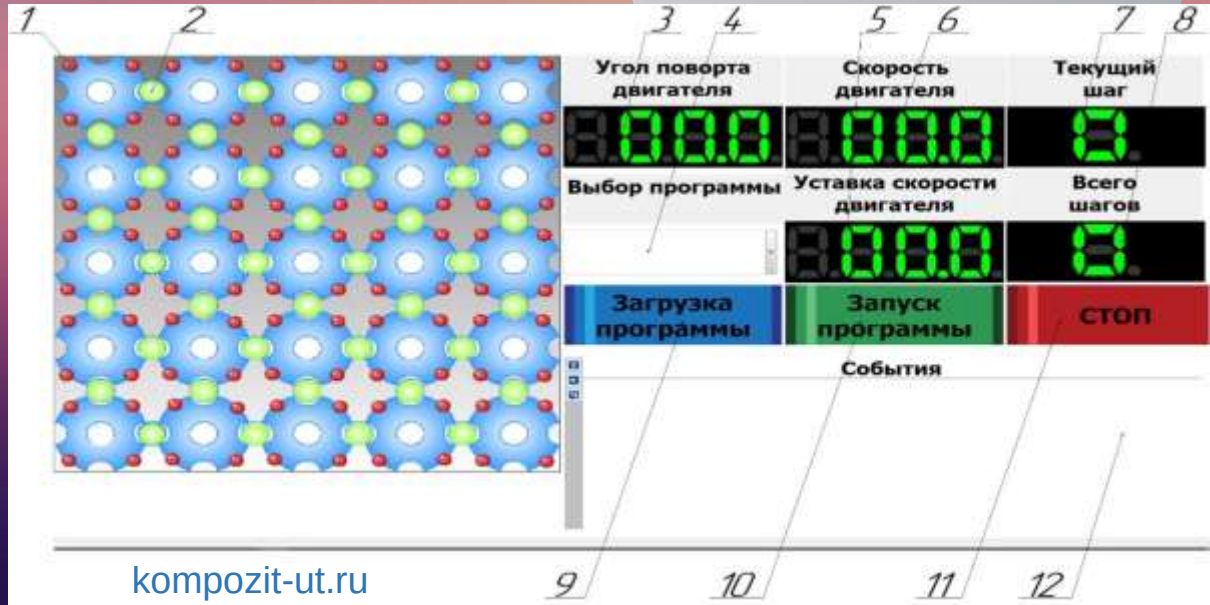
Control system DP50-1-150



Diagonal Weaving Software

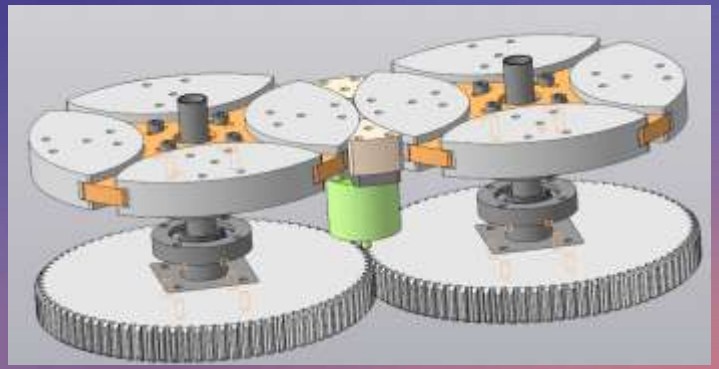


Management program DP50-1-150



Automated technology of rotary weaving preforms

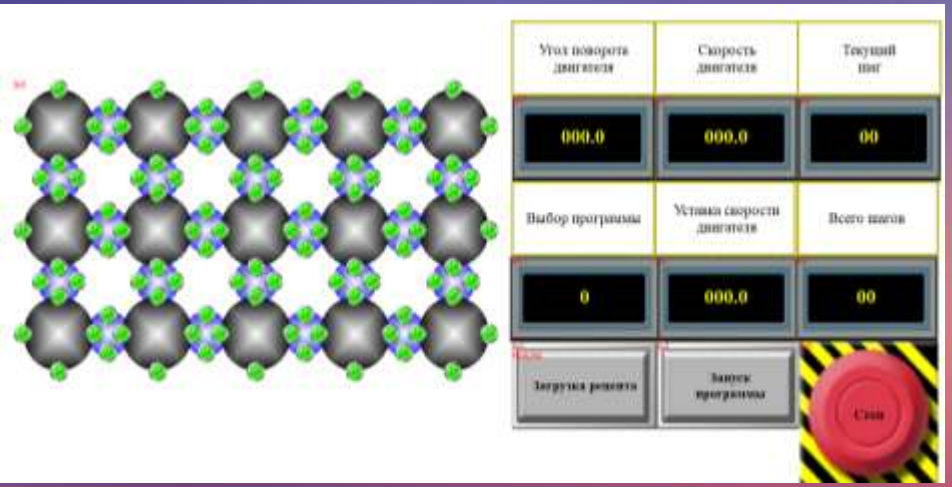
Element rotary installation



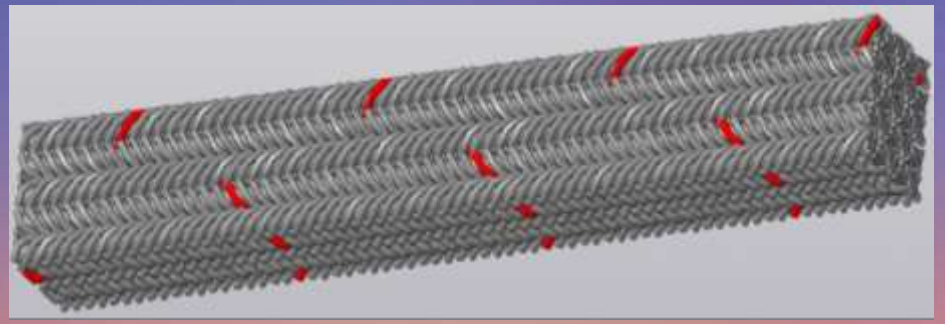
The system for setting the rotation and control of the spindle position

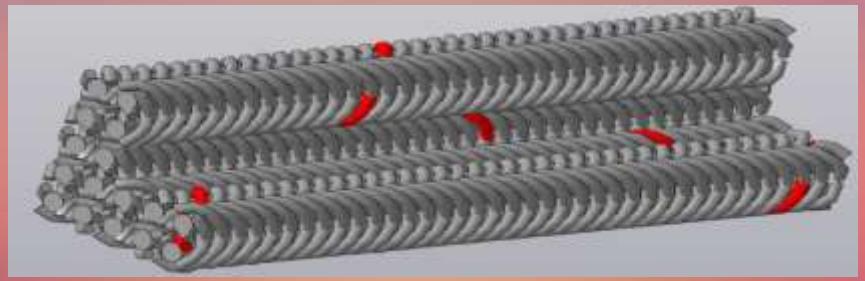
Practicing the principles of movement and control

Control system rotary installation



Braided patterns

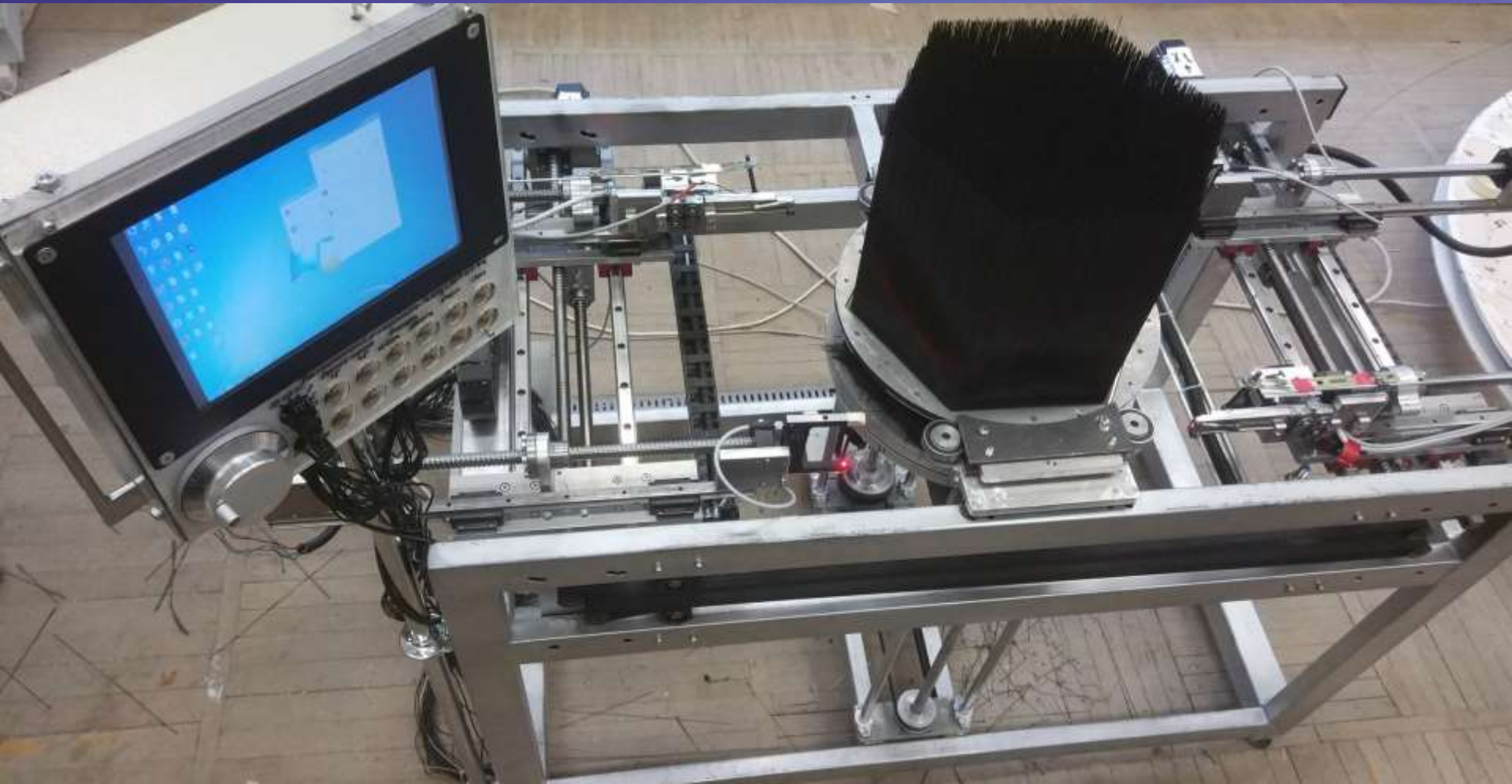




Advantages of rotary weaving

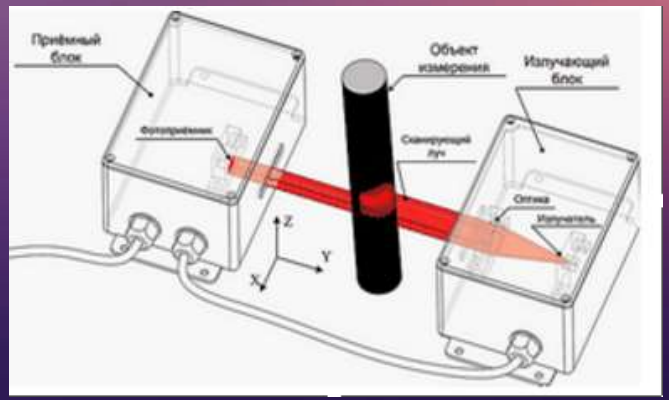
- Increase in productivity by 5 and more times in comparison with diagonal weaving;
- No spindle impact;
- Possibilities of changing the shape of the preform cross section that are not limited by collisions of spindles.

Automated installation of reinforcement preforms



Settings for the assembly of reinforcing preforms

- Implemented reinforcement structures - 3D and 4D-L.
- Preform form - cylinder, cone, solid or with a hole.
- The diameter of the rod used - less than 1 mm.
- The number of independently controlled coordinates – 8.
- Increased productivity compared to manual assembly - more than 2 times.
- Rod diameter control using an Lsten optical contactless micrometer, relative error limit - 1 micron.
- Automatic documentation of the assembly process.



Installation software

- Pictorial mimics of snap-in management in preform assembly mode and debugging on the touchscreen monitor

Areas of cooperation

- Development of technology for manufacturing preforms for carbon-carbon and carbon-ceramic products according to customer requirements.
- Joint research of manufacturing technologies for preforms and products based on them.
- Development of equipment and software manufacturing preforms.
- Joint research on modeling preforms and their manufacturing process.
- Modeling the properties of products based on woven preforms.
- Joint research on the development of new preform manufacturing technologies.

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Thanks for attention!

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