DESIGN ENGINEERING

Development of especially difficult, complex and medium complexity products and designs, meeting or exceeding customer requirements and expectations in terms of quality, namely:

- Development of a set of design engineering documentation (KKD) on standard items, products and structures using design automation tools.
- Development of a set of design engineering documentation on typified products and structures using computer-aided design tools.
- Development of conceptual designs (EP) on the non-standard and non-typified products.
- Development of technical proposals (TP) and technical design assignments (TZ) for non-standard and non- typified products and structures using computer-aided design tools.
- Planning, practical implementation, processing and making analysis of the measurements to do with environment for designing of products and structures.
- Release of measurements designs and guidelines for assessing the environment for designing of products and structures
- Development of detailed designs for non-standard and non-typified products and structures.
- Carrying out technical calculations: strength, kinematic and aerodynamic analysis of products and structures being designed
- Preparation of operating instructions to the structures, explanatory notes thereto, certificates (including patent and licensing ones).
- Improvement, updating and unification of products and their components being engineered, and development of the enterprise standards.
- Development, preparation and submission of reports, memos and reports on all matters related to designing.
- Search and making proposals on introduction of new materials and procedures.

STRENGTH CALCULATIONS

Static structural strength calculations occupy a special place in construction and engineering as part of designing, as while doing so necessity arises to estimate the stress condition of individual elements (parts) of the product or structure as a whole.

- As the necessity arises in the designing process to deal with assessing the stress condition of individual elements (parts) of the product or the structure as a whole. Typically, while checking calculations for mechanical strength someone is interested in:
- - Distributing stress components in terms of structural elements. Based on these data, we can draw conclusions about the most vulnerable areas of the structure and we can update the product at the design phase in order to achieve equal strength;
- - The maximum values of the stresses components inherent in material. In accordance with various strength theories to deal with relation of maximum calculated values to the maximum allowed voltage for a given material, we can draw conclusions about the reliability of the structure in terms of its strength (non-destructive ability) under the action of loads applied to the system.
- Sample strength calculations using modern systems of finite element analysis are given below:

- **Aerodynamic calculations**
- are feasible using both well-known software systems (FlowWorks, ANSYS, etc.), and using AACB system (own development), which is designed for aerodynamic analysis of space bodies system to be made with compressible fluid.
- AACB system implements a panel method based on source-drains and vortex frames. Three types of flow are implemented for 3D flotation: stationary non-circulatory flow; stationary circulatory flow and non-stationary circulatory flow with vortex shedding.
- Creating a panel pattern grid is possible in any finite element pre-processor (including CDFEM).
- The following are examples of the results of the aerodynamic analysis of buildings and airplanes:

Kinematic calculations

Designing and making analysis of planar and spatial mechanisms of any complexity (articulation linkage and robots-manipulators) for each production area (starting from fine mechanics and up to furniture production).

If we consider the analysis of opportunities in terms of the classical theory of machines and mechanisms, which states that whatever the mechanism - is an arbitrary set of so-called Assurov groups, we can say that the mechanisms collected from any articulation linkage Assurov groups are subjected to analysis. On the other hand, the mechanism - is an arbitrary set of closed and open kinematic chains and any type of kinematic chains, and combinations thereof are subjected to analysis.

According to the classification used in the theory of machines and mechanisms, articulation linkage is - a mechanism with the lower kinematic pairs. In this case, it is possible to simulate not only lower ones, but virtually all higher kinematic pairs.

The following is a list of kinematic joints that are available for simulation:

- Rectilinear kinematic pair;
- Rotational kinematic pair;
- Cylindrical kinematic pair;
- Spherical kinematic pair with a link pin (Hooke joint);
- Spherical kinematic pair;
- Planar kinematic pair;
- Gear kinematic pair;
- Chain reduction gear;
- Belt gearing;
- Worm linkage;
- Wedge coupling;
- Cable coupling;
- Screw kinematic pair;
- Cleat joint (tooth gear - toothed bar).

Three-dimensional modeling and assemblability testing of construction and engineering projects of any complexity (collision sites detection; visual observation of the virtual product assembly process).

Models of building structures:

Models of mechanical-engineering structures:

3D Printing

Aspects of end-to-end 3D designing to engineering analysis:

- Creating prototype real models aimed at monitoring multi-element assembly of complex spatial structures;
- Creating real capable models and the analysis of the models performance in relation to the complex spatial mechanisms;
- Ways of time and costs reduction in determining the ergonomics of products through the use of real models;
- The numerical and visual estimation of the behavior of products when exposed to different loads with reference to the structures critical sites on the models;
- Simulation of oversized and non-standard elements allocation in confined spaces;
- Single and small batch manufacture of products using 3D printers;
- Production of molds for plastic and fusible materials using high accuracy 3D printers.
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Application range:

- **Architecture**
- **Foundry engineering**
- **Simulation**
- **Product design**
- **Medical science**
- **Games and Entertainment**
- **Instrument making**
- **GIS**