

NEW CAE TECHNOLOGIES CADFLO ON EXAMPLES OF NUCLEAR ENERGY PROBLEMS

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CADFlo is a Russian multifunctional and multidisciplinary calculation CAE software for the analysis of fluid dynamics, heat transfer, stress, optics and electromagnetism. CADFlo is deeply and seamlessly integrated into Russian CAD systems T-FLEX CAD and KOMPAS-3D, as well as into popular other CAD systems such as SolidWorks, CATIA V5, Creo, Siemens NX and Solid Edge.

A distinctive feature of CADFlo is the ability to obtain highly accurate results much faster and with less labor costs compared to existing foreign analogues. The main time savings when using CADFlo occurs at the stage of preparing the geometry of the design model for calculation. Unlike other CAE solutions, in CADFlo, in addition to classic CAE technologies, original methods are implemented that allow you to get an accurate result without having to comply with classic requirements for the computational grid. For example, an accurate solution in CADFlo can be obtained without resolving the boundary layer with a computational grid by layer height. This is possible due to the presence of a unique integral boundary layer model in CADFlo, which allows one to obtain integral layer characteristics, such as friction stress and heat flux on the wall, without resorting to classical approaches that are demanding on geometry and grid leading to long and laborious solution. The report will examine the basic principles of this CADFlo technology, as well as special analytical and empirical models that work in conjunction with numerical methods, which allows for an even further reduction in the time required to solve a complex industrial problem without loss of accuracy.

As an example of CADFlo's operation, solutions to problems in nuclear power engineering will be presented: calculation of the WWER-1000 reactor, assessment of the coolant condition in a sealed penetration, and others.

Table 1
Comparison of accuracy and time of problem solving in CADFlo and its foreign analogue

Performance and accuracy parameter	CADFlo	Foreign product
Time to prepare geometry, hours	16	30
Time to set up the task, hours	0.1	1
Time to create grid, hours	1	40
Time to solve, hours	30	30
Postprocessor, hours	1	1
Total time to get the answer, hours	48	101
Difference with experiment for mass flow rate, %	0.13	0.13
Difference with experiment for pressure, %	3.3	3.1
