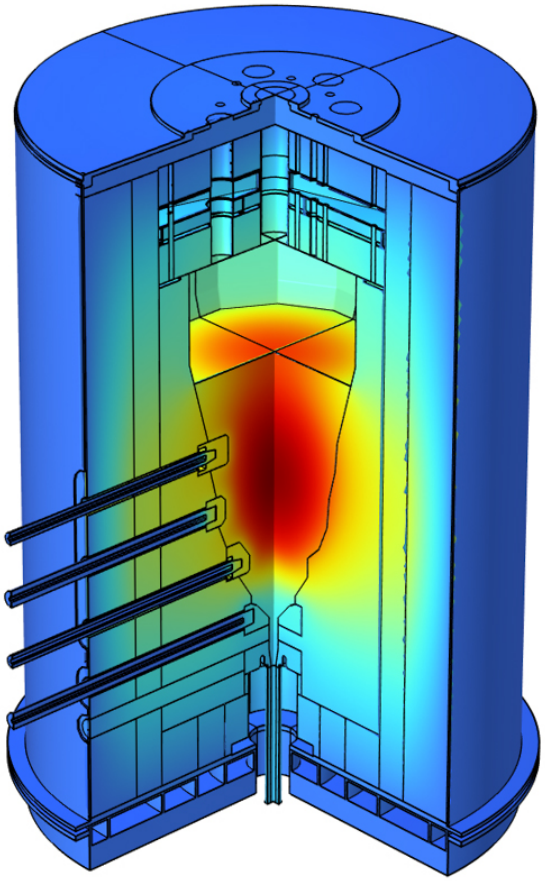
SPbPU has created a "Digital vitrification furnace" for the safe disposal of nuclear waste

Researchers from the Advanced Engineering School «Digital Engineering» of Peter the Great St. Petersburg Polytechnic University presented a digital model of a vitrification furnace for highly radioactive waste. The digital model will allow engineers to plan production cycles of sophisticated nuclear waste disposal equipment faster, more efficiently and more safely.



Vitrification technology is the world standard for the disposal of liquid radioactive waste. Sintering in a special furnace at temperatures above 1000 degrees turns waste into a hard glass-like substance. This approach solves two key tasks: firstly, it reduces the initial volume of hazardous materials by removing the liquid component, and secondly, it encloses them in a chemically stable and durable form, ideal for safe storage over a long period of time. This is the most effective and safest method available.

Engineers from the Institute of SPbPU have developed a digital model of a glass-melting furnace. It allows engineers to «look inside» a working installation and conduct hundreds of digital tests, which opens a new era in the design of critical nuclear industry facilities.

The model shows how the glass mass moves, how the temperature changes in different zones, and how the equipment reacts to regime changes. This is especially important to ensure the efficient operation of such complex equipment as a glazing furnace. The digital model takes into account the influence of complex physical processes, including heat transfer, hydrodynamics, electrodynamics, etc. The simultaneous consideration of many input parameters and their interaction allows us to conduct the most complex studies to optimize the glazing process ‘digitally’, which is cheaper and safer than field tests, said a leading engineer at the cross-industry Technology Department of the Engineering Center (CompMechLab®) the author of SPbPU is Dmitry Evstratov.

A limited number of countries have the technology to vitrify highly radioactive waste, but a digital model of the unique equipment was created for the first time in the world.

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