# CFD SIMULATION METHOD FOR ASSESSMENT OF THE EFFECT OF LARGE-SCALE ACCIDENTS ON HYDROGEN PRODUCTION FACILITIES

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Hydrogen is actively studied as an alternative energy source to reduce a carbon emission. Hydrogen-air mixtures are explosive in wide range of concentrations [1]. Hence, loss of containment may lead to accidents with severe consequences for environment, facility and personnel. Investigation of physical processes and their assessment are necessary to prevent possible accident on the hydrogen production facilities.

One of the investigation approach is a numerical simulation, involving engineer-grade and CFD-grade models. An advantage of engineer-grade models is low computational complexity that allows to conduct major number of simulations. At the same time, these models, typically, don't consider relief, obstacles and environmental conditions, while all of these factors could be considered in CFD simulation.

Current work presents a simulation method for safety assessment of severe accident on an arbitrary hydrogen production and storage facility. This method involves simulation with two separate CFD-software: OpenFOAM[2] is used to simulate the initial mixing process for combustible gas and air and its propagation, while KEDR [3] is used to simulate combustion and detonation of this mixture. In addition, the assessment of pressure loads was conducted with ГОСТ [4] engineer-grade model. This assessment gave probability of occurrence of personnel injury and facility damage.

Figure 1 shows comparison of simulation result of engineer-grade model and developed CFD-grade method. Damage zone acquired with CFD method is larger due to occurrence of obstacles along the way of detonation propagation.

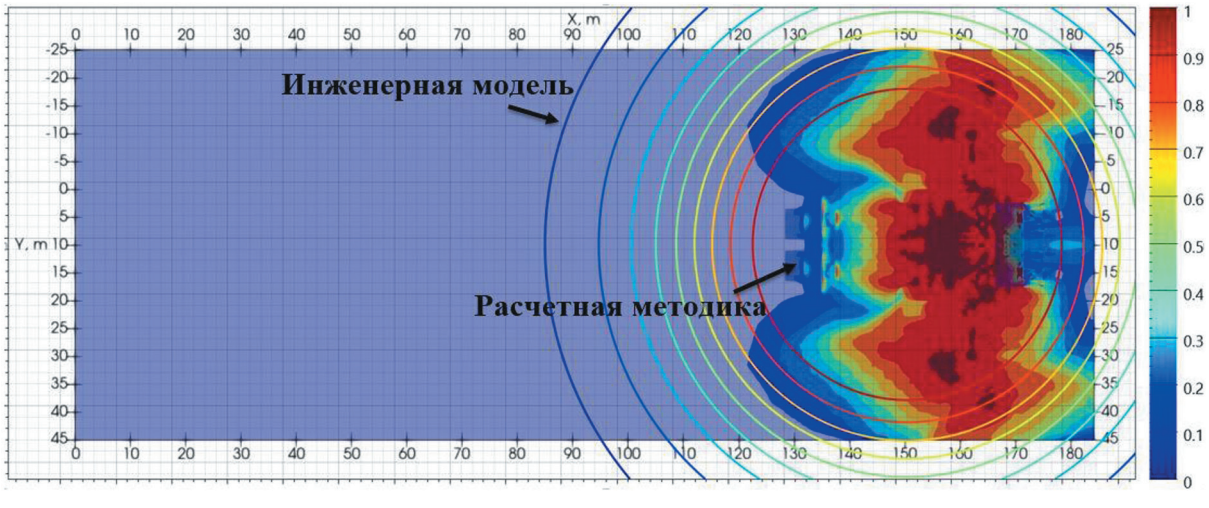


Fig. 1. Probability field for tympanic membrane rupture, assessed both with engineer-grade model [4], and with CFD-grade simulation

## References

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