

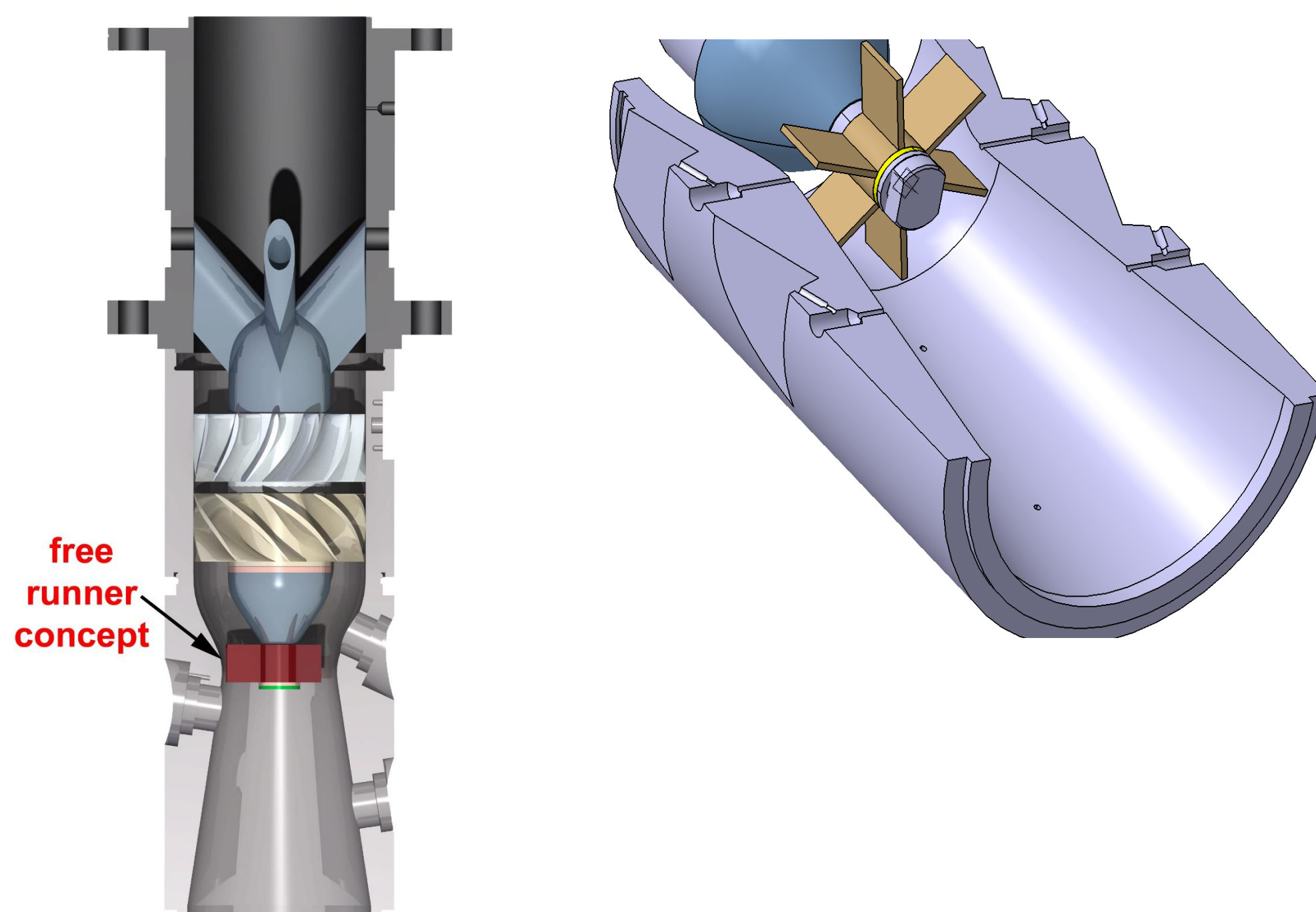
EQUIPMENT FOR REDUCING OF HYDRAULIC INSTABILITIES GENERATED BY THE SWIRLING FLOW FROM THE CONICAL DIFFUSER OF HYDRAULIC TURBINES.

Patent: a 2022 00182 / Research project: TE 179/2020: Free Runner for Swirling Flow Control at the Outlet of Hydraulic Turbines, PN-III-P1-1.1-TE-2019-1594

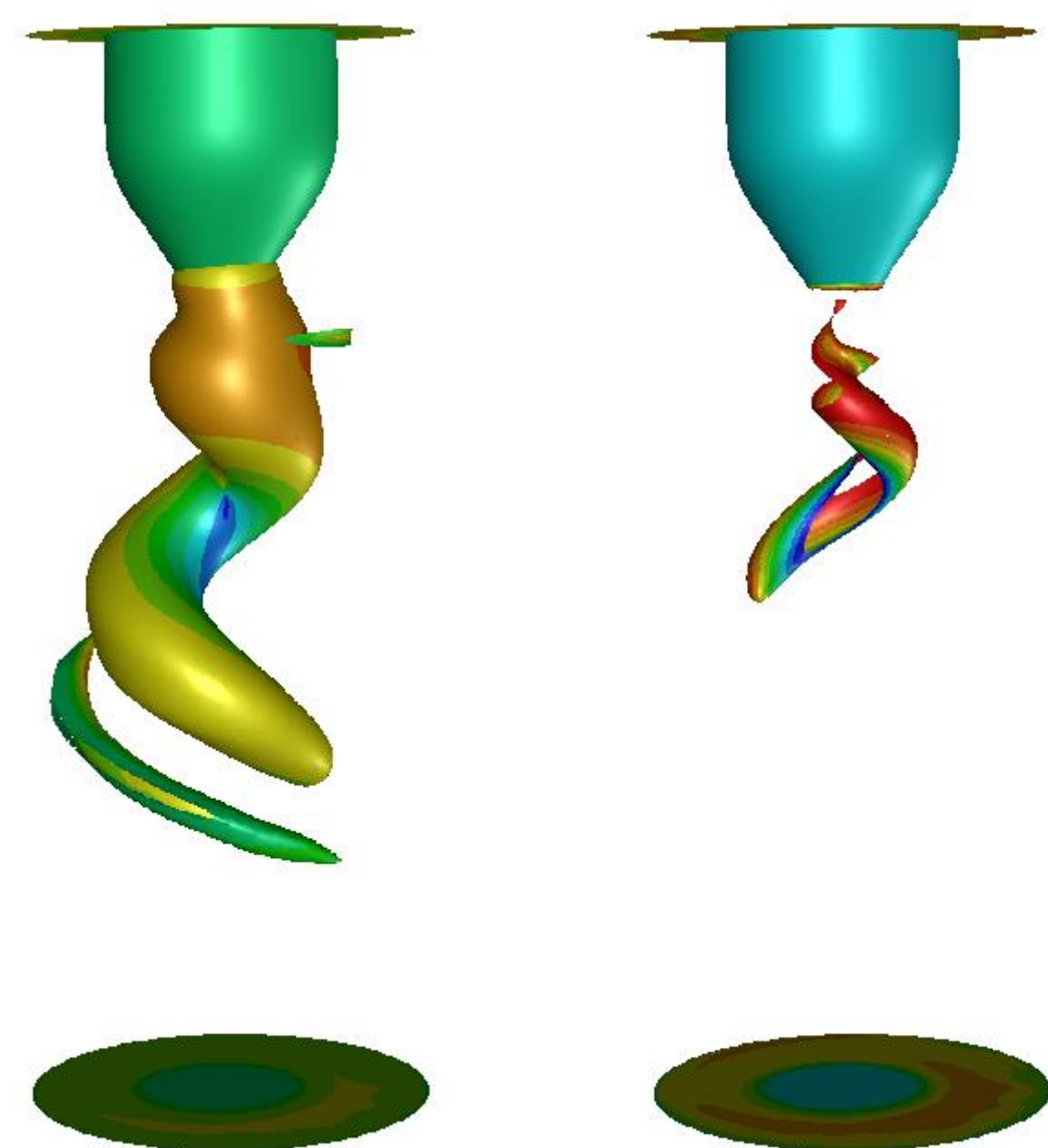
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The invention refers to a new equipment for eliminating/reducing the pressure fluctuations associated with the vortex rope, which appear at partial discharge in the conical diffuser of hydraulic turbines, especially those with fixed blades (ex: Francis turbines). The new equipment can be applied both in new hydropower plant constructions and in the case of existing ones. The main element of the invention is the so-called free runner, which connected to a shaft passing through the turbine rotor, eliminates the rope vortex and the pressure fluctuations associated with it, which are very harmful to the hydraulic turbines. The major advantages of the invention are: simple construction and implementation as well as low maintenance costs. Furthermore, it does not produce any other negative effects on the flow in the conical diffuser or on the turbine.

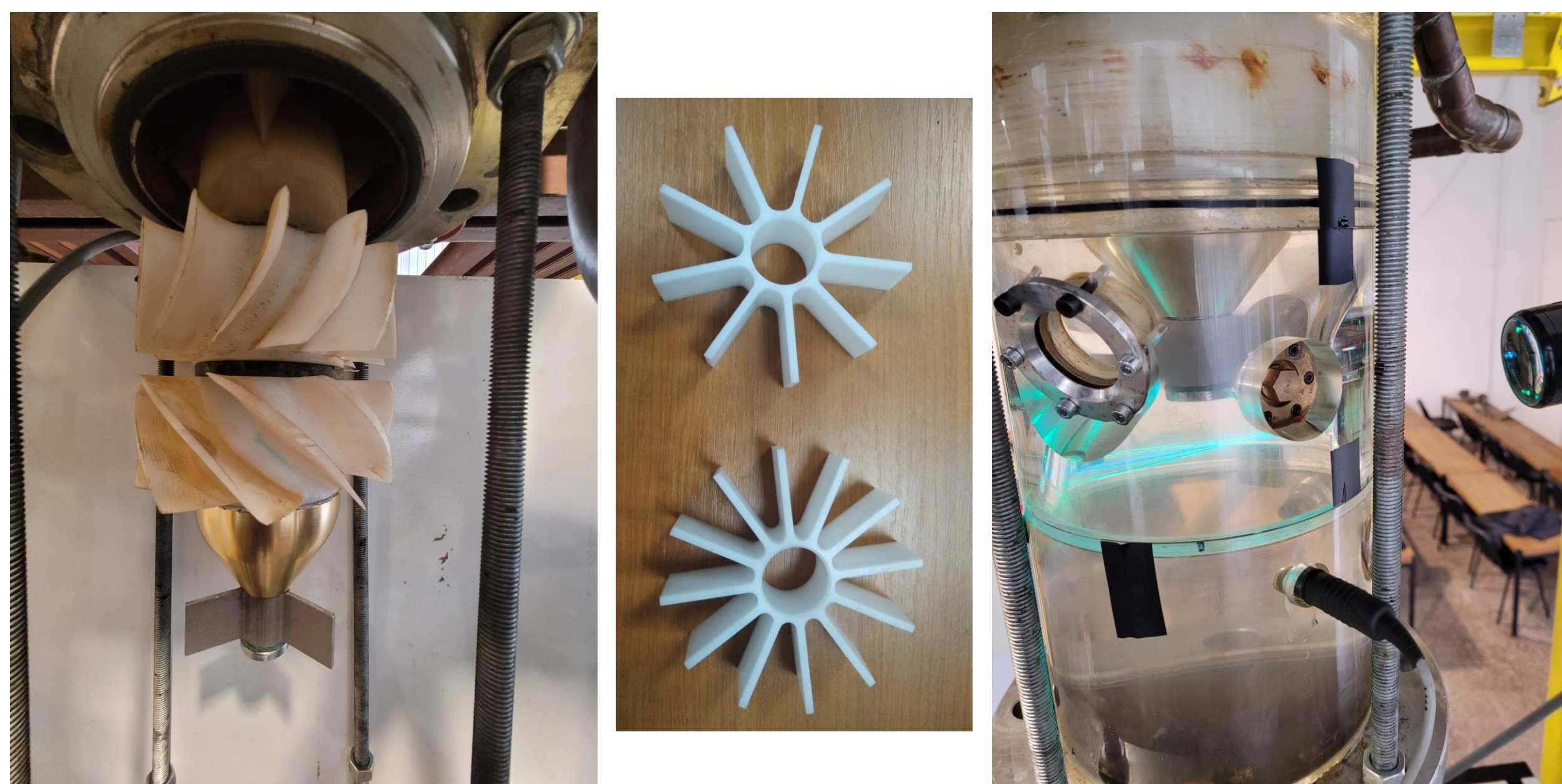
Results: Analysis Using Numerical Simulations



Flow in the conical diffuser of hydraulic turbines without and with the free runner concept



Results: Experimental Laboratory Analysis



Fast Fourier analysis of unsteady pressure at the wall of the conical diffuser without and with the free runner concept

