Laboratory of Hydrodynamics and Cavitation

Principal goals and activities

- Experimental research of cavitation in flowing liquid.
- Research of cavitation bubbles.
- Research of cavitation in hydraulic dampers and biomedical applications.
- Assessment of water quality in difficult locations.
- 2D visualisation in interior and exterior hydrodynamics.
- High precision local measurement of surface height and frequency of oscillation.
- Measurement of parameters in water pumps and valves.

Specific instruments and outcomes

- Ultrasonic generator of cavitation – study of resistance of materials to cavitation.
- Acoustic bubble spectrum analyzer – a unique instrument for assessment of water quality in inaccessible locations (e.g. water systems of nuclear power plants) that uses the relationship between quantity of bubbles in volume of liquid and the properties of that liquid.
- Hydrodynamic pool – for 2D visualisation in interior and exterior hydrodynamics.
- Sensor of water surface height and frequency of oscillation – spot measurement.
- Hydrodynamic track for measurement of parameters in water pumps and valves.

General focus of laboratory

The cavitation laboratory engages in research in behaviour of individual cavitation bubbles as well as in research of resistance of various material types to cavitation. Research of cavitation erosion uses an ultrasonic generator that accelerates reality tests of resistance to cavitation conducted at the cavitation tunnel. Cavitation damage first leads to strengthening of the surface; wear by cavitation follows in the onset.

Cavitation is a physics phenomenon that is related to the inception, cessation and activities of macroscopic cavities in a liquid; those cavities are referred to as cavitation bubbles or voids. Cavitation is known especially for the damage it causes in turbines, pumps and other hydrodynamic machines. The collapse of cavitation bubbles leads to high pressure and temperature, which may generate plasma. Hydrodynamics laboratory conducts experiments which render 2D flow of water visible. The principle of hydrodynamic analogy between the flow of a thin layer of water and 2D flow of gas may be used to simulate flow of compressible and incompressible liquids. The experiment apparatus is an analogue system – a unique modelling table of proprietary design and manufacturing. There are several visualisation methods; the most widely used one is the deposition of dust particles on the surface of dyed water. Apart from flow visualisation, high precision local measurement of surface height and frequency of oscillation may be taken.