DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Bubbly flow can be found in various industries like: metallurgy, chemical, food or pharmaceutical etc. This phenomenon is a basis for many processes such as: fermentation, aeration, homogenization etc. Understanding the physics of the phenomenon of gas bubble flow in a liquid in a more precise manner is necessary to control the mentioned above processes and in particular their optimization. That is why the construction of an accurate gas bubble flow model is the topic of many scientific works as well as an element desired by the industry. In numerous international literature there are many works dealing with the topic of analysis of gas bubble movement, yet there is still no unambiguous comprehensive study of three-dimensional trajectories of gas bubble motion (successively departing oneself) moving in a column. In order to understand the phenomena occurring during lift of a gas bubble column immersed in a liquid and the interaction between bubbles as well as the effect of fluid movement on surrounding gas bubbles and vice-versa an algorithm will be created that allows for the reconstruction of gas bubble trajectory (center of mass). The method of three-dimensional reconstruction of motion of gas bubble trajectories which will be used in the project consists of tracking single gas bubbles with help of a high-speed camera ipso facto the digital reproductions of bubble paths and the analysis for the presence of characteristic or anomalous behaviors for this type of process. The aim of the project is to create a mathematical model based on the analyze of dynamics and trajectories of gas bubbles moving in liquid ipso facto the phenomena taking place in the process and in particular the attempt to diagnose the occurrence of chaos. Furthermore, designation of dimensionless quantities used in fluid mechanics (Reynolds number, Bond number, Weber number) will allow to draw comprehensive conclusions, and will enrich the existing mathematical models of the studied process. The results obtained in the project based on, inter alia, multifractal analysis will not only allow for much more accurate and reliable generalized criterion relations to describe the phenomenon of two-phase flow but will also provide the possibility of a wider application of non-invasive methods of measuring chaos for other complex cases in research and technology. Moreover, the subject of the undertaken project is related to the topic of the projects manager dissertation work. Due to the fact that the Faculty of Mechanics of the Bialystok University of Technology is equipped with high-end research apparatus (camera for fast photography Phantom v1610, data acquisition system, pressure reducing valves Metal Work Regtronic, air pump etc.), and has extensive research background and technical experience in two-phase flow measurements and analysis of this type of system, will significantly improve the implementation of the project’s tasks.