ANALYTICAL STUDY OF LIQUID DEGASSING IN CAVITATION FLOWS.

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Cavitation is a phenomenon of cavities formation in liquid as a result of pressure drop. It plays an important role in a wide range of applications. Cavitation is known to be one of the key problems of design of pumps, hydraulic turbines, etc. One more important problem accompanying cavitation is liquid degassing due to diffusion of the dissolved gas into the cavities.

Cavitation degassing (deaeration, in the case of air) is an efficient method of removing dissolved gasses and/or entrained gas bubbles from a variety of liquids, including water, oils, biological liquids, emulsions and many more. Unlike conventional vacuum degassing, which is a batch approach, cavitation degassing can be carried out in a continuous-flow mode.

According to the available data, long-standing water contains gaseous bubbles with average radii of $10^{-7} \div 10^{-3}$ cm with concentration of $10^{6} \div 10^{7}$ cm^{-3}. Free carbon dioxide (CO_2 molecules) is found to exist in water as part of micro - nanobubbles, i.e. in the form of gas medium. In equilibrium conditions, gas content in the bubbles is ten times higher than the amount of that dissolved gas.

The report presents the results of analytical studies on the choice and validation of rational geometry of venturi and optimum operation parameters of liquid degassing as applied to the solution of specific technological problems.

A system is described for rapidly removing dissolved gasses or volatile contaminants from a liquid, which is forced at a sufficient pressure and velocity through a venturi, designed and operated in a fashion to produce vapor- gas micro-bubbles. The venturi comprises an entrance integrated with a middle throat and diffuser end section, such that the bubbles form and grow in the throat and diffuser section. The outlet of the venturi is connected through a short pipe with a vacuum tank, in which a constant pressure is maintained close to the saturated vapor pressure of the processed liquid at a given temperature.

Due to the coalescence of rapidly growing cavitation bubbles, phase inversion occurs - the gas-liquid medium of bubble structure passes into liquid-gas mixture of droplet structure.

Mathematical models of the degassing in cavitating flows are not yet developed and presented in the literature quite insufficiently. Therefore, development of a reliable model for simultaneous cavitation and liquid degassing is an important fundamental and applied task.

The proposed method of degassing and deactivating a liquid as a result of its cavitation treatment in the venturi can be used in various industries in solving specific technological problems.