Application of hydrodynamic cavitation in brewing

Štěrba, Jiří
2023

Application of hydrodynamic cavitation in brewing

Student: Ing. Jiří Štěrba
Supervisor: prof. Ing. Tomáš Brányik, Ph.D.
Supervising Expert: Ing. Miroslav Punčochář, DSc.

The positive role of hydrodynamic cavitation (HC) has been an object of study of the last two decades. HC phenomena involves the generation, growth, coalescence and subsequent implosive collapse of bubbles or cavities, occurring within a few microseconds and releasing large magnitudes of local pressure and temperature. Due to its very high oxidative capability in combination with mechanical shockwaves, HC processes can disrupt biological cells, destroy microorganisms, neutralize toxic chemicals or change molecule structures.

The aim of this work is to apply these advantages in the brewery industry. In the field of beer brewing, we would like to investigate several phenomenona, such as the isomerization of bitter hop acids, the reduction of gluten concentration or the cell-walls breakdown.

The first step of our work was the construction of the experimental setup formed by a special jet and pump control. A Venturi jet system with a special inclined tube was chosen as the HC technique due to energy savings and robust design. The process of cavitation was examined in more details. Hence, the Venturi tube was installed in a pilot scale brewery system.

Several experiments have been performed to confirm the positive effect of hydrodynamic cavitation on the isomerization of the hop bitter substances, and the influence in gluten removal due to the cavitation. Furthermore, several parts of the experimental brewery were improved. The regulation of individual parameters affecting the performance of HC was achieved due to equipment improvements.

Hydrodynamic cavitation is a very interesting phenomenon, which can see applications not only in the process of beer brewing, but also in the entire food industry. It is important to investigate this phenomenon, to find its mechanism and extend its applications.