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Modelling Heat Transfer Characteristics in the Pasteurization Process of Medium Long Necked Bottled Beers

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Abstract : Pasteurization is one of the most important steps in the preservation of beer products, which improves its shelf life by inactivating almost all the spoilage organisms present in it. However, there is no gain saying the fact that it is always difficult to determine the slowest heating zone, the temperature profile and pasteurization units inside bottled beer during pasteurization, hence there had been significant experimental and ANSYS fluent approaches on the problem. This work now developed Computational fluid dynamics model using COMSOL Multiphysics. The model was simulated to determine the slowest heating zone, temperature profile and pasteurization units inside the bottled beer during the pasteurization process. The results of the simulation were compared with the existing data in the literature. The results showed that, the location and size of the slowest heating zone is dependent on the time-temperature combination of each zone. The results also showed that the temperature profile of the bottled beer was found to be affected by the natural convection resulting from variation in density during pasteurization process and that the pasteurization unit increases with time subject to the temperature reached by the beer. Although the results of this work agreed with literatures in the aspects of slowest heating zone and temperature profiles, the results of pasteurization unit however did not agree. It was suspected that this must have been greatly affected by the bottle geometry, specific heat capacity and density of the beer in question. The work concludes that for effective pasteurization to be achieved, there is a need to optimize the spray water temperature and the time spent by the bottled product in each of the pasteurization zones.

Keywords : modeling, heat transfer, temperature profile, pasteurization process, bottled beer
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