Abstract

Mathematical modeling is usually applied in design and optimization of food processing systems. That the food products have no certain geometrically defined shape might result in certain difficulties on mathematical modeling. By defining the geometrical shapes as they are, that would be possible to get more accurate and precise results from a simulation. By using 3 dimensional scanners, geometrical modeling of a simulation study would be much easier and more realistic, and this is expected to be a control tool for process deviations through the quick simulations. Therefore, the objectives of this study were to obtain the digital images of the food products of no certain geometrical shape using a 3 dimensional scanner, to use these images in a food process simulation study and to define the advantages and benefits of the applied methodology.

Based on this concept, the following studies were carried out:

- 3D digital images of pears and strawberries (no defined geometrical shaped food products) were obtained using the NextEngine 3D scanner.
- The 3D surface images were imported to computational fluid dynamics (CFD) software Ansys after converting them into volumes in SolidWorks, and a cooling process was simulated using the experimentally obtained initial and boundary conditions.

This project demonstrated the significance of 3D image application with CFD analysis for an improved process modeling and analysis. The results of this project are expected to be used as an initial point for different projects that might concentrate on industrially energy saving and for manufacturing of high quality food products in the future process lines.

Target group

Food technologists/scientists/engineerings working/studying in food processing area.

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Ferruh Erdogdu received his Ph.D. in 2000 at the University of Florida. After his postdoctoral work at the University of California, Davis, in 2001, he joined the faculty of Food Engineering at the University of Mersin where he has been teaching courses on topics in food engineering. He is the author or coauthor of more than 35 research papers, 12 book chapters and 60 presentations. He is the co-author of the book “Virtual Experiments in Food Processing” and the editor of “Optimization in Food Engineering”. He has been serving in the editorial board of the Journal of Food Engineering and Journal of Food Process Engineering. His current research interests include mathematical modeling and optimization of heat, mass and momentum transfer operations in food processing."