Pornpen Nualnuk 2011: Simulation Spray Drying of Milk Powder using Computational Fluid Dynamics. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Thongchai Srinophakun, Ph.D. 89 pages.

The drying of skim milk in a spray dryer was simulated using computational fluid dynamics (CFD) method. The theoretical model of the process was based on two-phase Eulerian-Lagrangian approach for gas and droplet in the spray drying process The objective of the current study was to simulate air flow, temperature profile, and residence time distibution for skim milk powder in spray dryer. In addition, the stickiness of skim milk powder was also investigated. The spray drying model was divided into five major parts. The first part was the model to validate with the experiment data of Kieveit (1997) for the accuracy of the model. The second part was the model to predict the air flow pattern. The third part was the model to predict the particle residence time distribution. The forth part was the model to predict the occurrence of stickiness in the spray drying. The last part was created in spray drying process. Good agreement was obtained with the published experiment data where the CFD simulation correctly predicted a fast downward central flowing core and slow recirculation zones near the wall. The increment of the mean droplet size caused a decrease in the particle residence time distribution because of the results from gravity force. The increment of the mean droplet size caused an increase in the stickiness rate. The spray model simulation can be used the predict to particle motion inside spray chamber and also to explain the stickiness in skim milk powder during spray drying process.

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