Thesis Title	The Development of Mathematical Model of Drying Process Using Rotary Drum Dryer
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Candidate	Mr Chairath Tangdaungdee
Supervisors	Assoc.Prof.Dr. Sakarindr Bhumiratana
	Mrs Montira Nopharatana
	Miss Marudee Phongpipatpong
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Department	Food Engineering
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Abstract

Because there has been very few studies on the theory of rotary drum dryer and most of the mathematical models obtained can only be applied with very limited success, the objective of this research is to study the phenomena of heat and mass transfer in the food film on the rotary drum dryer, the effects of including important parameters controlling drying process with the hope of applying the result as a general procedure at the industrial scale.

From the experiment, it was found that the temperature of the food film approached equilibrium state rapidly. At the temperature below the boiling point, the pressure within the food film was only slightly different from that of the ambient. In such a case, mass transfer mainly occured under the driving force of the moisture gradients, therefore the equation followed Fick's second law. In the study, two models were set up, the first included the

surface mass transfer resistance. Whereas in the second model, the surface mass transfer resistance was disregarded.

The study on drying curve showed that both models correlated very well with the experimental data. The fitness depended largely on the ability to estimate the effective diffusion coefficient. The results indicated that internal resistance was the controlling factor. Further calculation showed this to be the case for Biot number upto 6.

From the heat balance over the control volume in radial direction, a mathematical model for surface temperature was developed. From the experiments, it was found that the difference between calculated data and experimental data was less than 10 percents. Further analysis showed that 81 percents of supplied heat was used for evaporation, 18 percents of heat was lost through heat convection and about 1 percent was lost through radiation.

Keywords : Drying/ Rotary Drum Dryer/ Mathematical Model/ Scale-up/ Mass transfer/ Heat transfer.