

C
660.2
THA

PERFORMANCE OF TRAY AND FLUIDISED BED DRYERS
WITH REFERENCE TO DESICCATED COCONUT MANUFACTURE

The thesis submitted for the
Master of Philosophy in Engineering

by

THAMBIPILLAI THANGAVEL

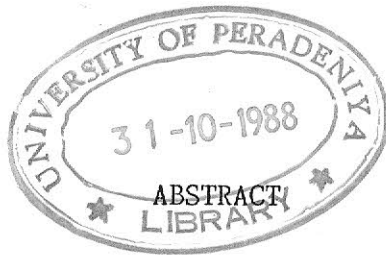
April 1987

University of Peradeniya

Sri Lanka

413029

PERMANENT REFERENCE
FOR USE IN THE
LIBRARY ONLY



Desiccated coconut is manufactured by drying shredded coconut with the aim of removing moisture in order to improve storage life and reduce bulk weight in transport. The drying operations used for this purpose can be either batch or continuous type. Drying equipments which are widely used in industry and in particular in desiccated coconut industry are described in chapter 1.

Compartment tray dryers, known as desiccators and semi automatic compartment dryers are used in Sri Lanka for manufacture of desiccated coconut. Theoretical studies of drying characteristics of materials to be dried and performance of tray dryers are outlined in Chapter 2.

Fluidised bed dryers are not widely used for the manufacture of desiccated coconut. Fluidised bed drying is generally accepted to be an efficient method of drying in other fields. An analysis of flow, heat transfer, mass transfer, mixing and bubble formation in fluidised bed dryer is given in chapter 3. The behaviour of gas fluidised systems are also discussed. A survey of fundamental studies carried out on bubble formation and particle mixing in fluidised beds are presented in section 3.5. The properties of fluidised beds could be made use of in drying desiccated coconut.

The drying characteristics of desiccated coconut in packed and fluidised beds are presented in chapter 4. A mathematical model is developed for the drying rates of packed beds of shredded coconut under vacuum condition. The governing relations for the vapour flow at different moisture contents of packed beds through such beds are developed. Experimental flow characteristics of shredded coconut were compared with theoretical relations for packed beds. Pilot tests were conducted in fluidised beds of column diameters 4 cm, 6.5 cm and 9 cm respectively. It was seen that for the above fluidised beds desiccated coconut cannot be fluidised above a moisture content of 0.55 dry basis and below a moisture content of 0.2 dry basis.

A thermodynamic and cost analysis of the drying and manufacturing system of desiccated coconut studied is presented in chapter 5. It is observed that nearly 700 percent of heat that is generated in the furnace is lost through the exhaust fan and chimney. A modified system is proposed to overcome this problem. A computer model is developed to analyse the performance of the system. It is shown that 50 percent of heat can be saved by introducing drying air and exhaust gas recirculation compared the present system of desiccated coconut manufacture.