

Design of indirect heating copra dryer

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SUMMARY : Coconut plantation is abundant in konkan region of Maharashtra (India). Small landholders can improve their income through value added activities in downstream processing of coconut. One such activity would be to dry copra for preservation and subsequent oil extraction. Copra drying in konkan region is practiced largely through sun drying and chula drying. In both these drying methods, copra quality deteriorates significantly due to either open fire smoke, dust and mould growth in sun drying. There is need to have a natural convection indirect heating small mechanical copra dryer suited to the requirements of konkan farmers. This paper present design features of a natural convection indirect heating batch type small mechanical copra dryer. The dryer was fabricated from the materials such as M. S. sheet, M. S. angle, G. I. sheet, aluminum pipe, glass wool and asbestos rope etc. Components of dryer were drying chamber housing with two trays inside, heating chamber, burning cum heat exchanging unit i.e. furnace and chimney. The total area required for housing the dryer is 0.81 m². The capacity of the dryer is 50 kg coconuts per batch (to hold coconut halves 50 per cent (w.b.) moisture content) The cost of the dryer was worked out to be Rs.10,000/-. This is suitable dryer for drying of coconuts in rainy season.

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The world production of coconut is about 55 million tons. In India, coconut is cultivated in about 19, 10,000 ha mainly in southern states of Kerala, Karnataka, Tamilnadu, Andhra Pradesh and Maharashtra (Thampan 1998). Maharashtra occupied eleventh place in area and seventh place in coconut production. The total area under coconut cultivation in the Konkan region is about 16789 ha with production of 244.4 million nuts (Indian coconut journal, 2003). In the year 2006-07 India is highest coconut producing country in the world, it is about 15840 million nut annually (Anonymous, 2008).

Dried copra is one of the major agricultural exports of konkan region practiced largely through sun drying and chula drying. The sun drying requires the drying cycle for a batch of copra is of 5 to 7 days, depending on the availability of the sun. As the drying cycle is long, this causes problem of dirt and dust accommodation on the surface of copra which deteriorate quality of copra. The

konkan region of Maharashtra has more than 100 rainy days of the year and receives average rainfall 3000-4000mm (40-140mm/hr). Sun drying is impossible during rainy season. In Chula drying, as direct contact of smoke copra quality gets deteriorates.

To get the mould free copra during rainy season natural convection indirect heating small mechanical batch type copra dryer was demanded for konkan region of Maharashtra. By keeping all these points in view, natural convection indirect heating small mechanical batch type copra dryer was design at Agricultural Process Engineering Department of Dr. Balasaheb Sawant Konkan Krishi Vidypeeth Dapoli, Ratnagiri (M.S.).

EXPERIMENTAL METHODS

A dryer working on indirect heating natural convection principle. The dryer was designed in following components:

- Drying chamber
- Heating chamber
- Furnace
- Chimney

The various dryer parameters like size of drying chamber, heating chamber furnace, air flow rate, fuel requirement and height of chimney etc. were worked out based on psychrometric and heat transfer principles. The

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