Abstracts of Ph.D. Thesis

Development and Performance Evaluation of Continuous Khoa Making Machine

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A continuous khoa making machine working on the principle of scraped surface heat exchanger (SSHE) was developed for the manufacture of khoa.The machine consists of three SSHE, Teflon coated spring loaded scraper assembles, drive for scraper assembles and milk supply arrangement. The performance of the khoa making machine was evaluated under different operating conditions. The present work covers evaluation of heat transfer behaviour, determination of heat transfer co-efficients, energy analysis, development of co-relationship between heat transfer and various operating parameters like scraper speed, steam pressure, milk flow rate etc. The product prepared under different operating conditions was also evaluated for its sensory chemical and rheological attributes. The output of the machine was 11.1 kg khoa/h with 13.73% TS milk which increased to 25.1 kg/h and 38.2 kg/h when vaccum concentrated milk of 23.77% TS and 35.08% TS were used for khoa making respectively.

A mathematical model to establish functional relationship among different operating parameters, linear regression equation between TS and U-values steam side film co-efficients using Nusselt theory were obtained for the khoa making process. The model based on dimensional analysis has indicated linear co-relation between operating factor and heat transfer factor. The specific steam consumption (Kg steam/kg water of evaporation) of the khoa making machine ranged from 1.446 to 1.618 and heat utilization was 81.60%. The convection and radiation losses were also determined.

The quality of khoa prepared in the machine was acceptable and suitable for the manufacture of different khoa based sweets. The shelf life of khoa was 3 days at room temperature (28-32ºC) and 20-22 days at refrigerated temperature (8-9C). The acidity, FFA and peroxide value of control and experimental khoa did not give significant variation during storage of khoa at room temperature and under refrigerated conditions. The cost of khoa worked out was Rs. 57.19 per kg which consists of 88.19% milk cost and 11.81% manufacturing cost.

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