

## **F2106. DEVELOPMENT OF A FLAT-PLATE SOLAR MILK PASTEURISER FOR ARID PASTORAL AREAS OF KENYA**

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### **Abstract**

Milk marketing is an important income earning opportunity for people in arid pastoral areas of Kenya. To minimise losses along the milk chain, traders boil milk using scanty wood fuel which negatively affects the environment. The abundant solar radiation in these areas could be explored for its suitability for milk processing. Therefore, a solar milk pasteuriser consisting of flat-plate water heating collector and a 1.5 mm thick stainless steel cylindrical milk vat was designed and tested in an arid pastoral area of Kenya. The milk vat had a capacity of 80 litres and a 50 mm wide hot water jacket insulated with 38 mm thick fibreglass. Hot water produced by the collector was used for pasteurising milk. Parameters measured included the maximum achievable water temperature, maximum amount of milk to be pasteurised, temperature of milk, temperature of hot water, total bacterial count and coliform in the pasteurised milk, solar radiation, ambient temperature and wind speed. Maximum milk temperature inversely varied with the amount of milk, reaching 81.4°C with 20 litres and 41.7°C with 70 litres. The optimum quantity of milk that could be pasteurised by this device was 40 litres, heated to 69.7°C in an average of 1.3±0.1 hours, at an average insolation and ambient temperature of 22.5±0.9 MJ.m<sup>-2</sup>.day<sup>-1</sup> and 29.8±0.1°C, respectively. The average temperature difference between hot water and milk being pasteurised was 8.1±0.6°C. Total bacterial counts in pasteurised milk were less than 10 cfu.ml<sup>-1</sup> while coliform counts were negative. The system had a payback period of 4.3 years. This low-cost solar milk pasteuriser is appropriate for arid pastoral areas without grid electricity, where milk marketing is an important income source, and where most of the milk is boiled using firewood.

**Key words:** Flat-plate solar milk pasteuriser, design, performance