

Sparkle ID

SP21C002875

Project Title

Nano-Fluid Based Portable Pail For Cooling Milk From Milking Point

Category

Energy Storage Technologies

Sub Category

Novel, Low Cost, Earth Abundant Electrode Materials for battery

Abstract

Milk chilling immediately after production is crucial for better quality and shelf-life of milk and milk products, since it is ideal substrate for bacterial growth and physico-chemical deterioration at a temperature ranges between it drawing temperature (37 °C) to 10 °C. The existing milk chilling methods (like bulk coolers) remains uneconomical and non-realistic for chilling milk from the farmer's door step, since milk production, procurement, collection, transportation and distribution are majorly contributed (70-80 % of total coverage) by small to marginal dairy farmers (producing 0.5-10 litres, scattered in villages). In India, tropical to subtropical climate is dominated, milk spoils rapidly. Therefore, a portable type nano-fluid based milking pail (resembles traditional pails) of enhanced thermal energy storage capabilities being developed to be used for chilling milk along with milking as well as during transit from farmer's doorsteps to the dairy plants.

Problem Statement

Feasible Milk Chilling Solution from farmer's doorstep (for small to marginal milk producers is not available to preserve quality and safety of raw milk. This hampers quality of raw milk and products derived out of it, thereby revenue from dairying. Therefore, a handy milking pail storing thermal chilled energy for chilling milk at production point till collection centre/processing plant is being proposed.

Solution

A portable pail integrated with nano-fluid based phase change materials for thermal energy storage, coupled with a de-attachable matching capacity refrigeration cum charger unit to facilitate chilling just after milking and during transit to a temperature below the critical temperature of milk spoilage.

Innovation

Existing milk chilling systems, particularly popular Bulk Milk Chillers are meant for a minimum collection of 500 liters, which takes at least 5-6 hours (sufficient to deteriorate milk quality) in existing scene of milk production and procurement in a developing nation like India. Our invention may be a game changer by facilitating a milk chiller in the shape of a portable ordinary milking pails. Rapid platform test plus temperature based quality grading (for pricing) of raw milk received at dairy plant can be enabled and will ensure higher income of farmers for quality milk; lower market milk wastage, higher shelf-life of milk-products, more exports of dairy products, less recalls from market (benefiting milk companies), and thereby influence the adaptability of the developed solution.

Technical Description

A propose pails having integrated nanofluid enhanced food grade, non-corrosive, PCM (phase transition temperature -5 to 8 deg C and working temperature 0 to 60 deg C), embedded into the jacketed walls of the stainless steel container. The nanofluid of enhanced thermal conductivity were developed and used for faster energy storage (less charging time) and rapid milk cooling. The unit is coupled with a detachable type matching capacity refrigeration cum charging unit to pre-charge the milking pails at farm/household/community premises whenever power supply is available. The cooling can be achieved by directly milking a dairy animal into the charged pail. The cooling of milk along with milking continues even during milk transportation till milk collection centre/processing plant. The pail extends handy touch to the innovation which makes it portable and farmer's friendly.

Keywords

dairy farmers, milk, quality and safety, nanofluid, energy storage

Patent Status

Patent Filed: yes

Patent Application Number: 202011033807

Patent Status: Complete Specification