Field testing of an innovative solar powered milk cooling solution for the higher efficiency of the dairy subsector in Tunisia

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University of Hohenheim, Institute of Agriculture Engineering, Tropical and Subtropical Group

Prof. Dr. Joachim Müller (joachim.mueller@uni-hohenheim.de, +49 711 459-22490)
Victor Torres Toledo (victor.torrestoledo@uni-hohenheim.de, +49 711 459-22840, Skype: vttoledo)

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Note: *This document aims to serve as internal documentation for all project partners. It shows the progress and results related to technical issues of the solar milk cooling system and its common implementation in Sidi Bouzid. For any suggestion or question, please don´t hesitate to contact us.*

1. Preparation of the materials

The 20 isolated milk cans are almost ready. At the moment, all cans are isolated and we are working on the handles and final polish. By the last week of January they will be cleaned and disinfected by the dairy plant of the university and delivered to Phaesun for packaging before shipping.



The control panels are being mounted and tested in the climate chamber for at least 48h at real conditions. Every control panel has a data logging unit with a SD-Card for research proposes. All cables are pre-connected in order to simplify the installation on the farms in Sidi Bouzid.



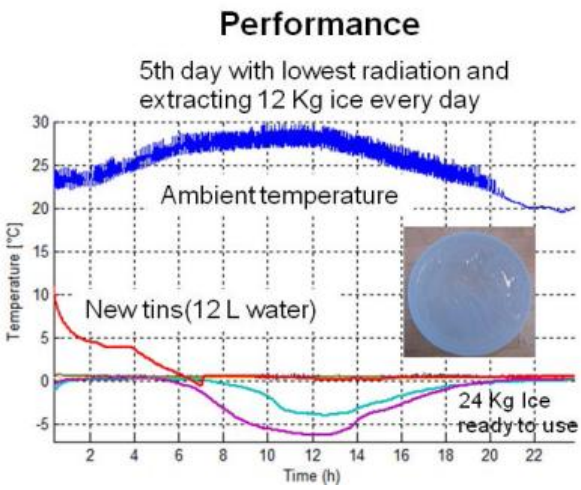
The installation is made by connecting the control panel to the PV modules, freezer and batteries which are directly placed on the bottom of the control panel.

2. Delivery to Sidi Bouzid (Tunisia)

All control panels and milk cans will be delivered to Phaesun by the end of January to be packed together with all solar components and freezers. The shipment to Sidi Bouzid will then take place as soon as possible. We will kindly inform about the delivery-state by the beginning of February.

3. Performance testing of the whole system under laboratory conditions:

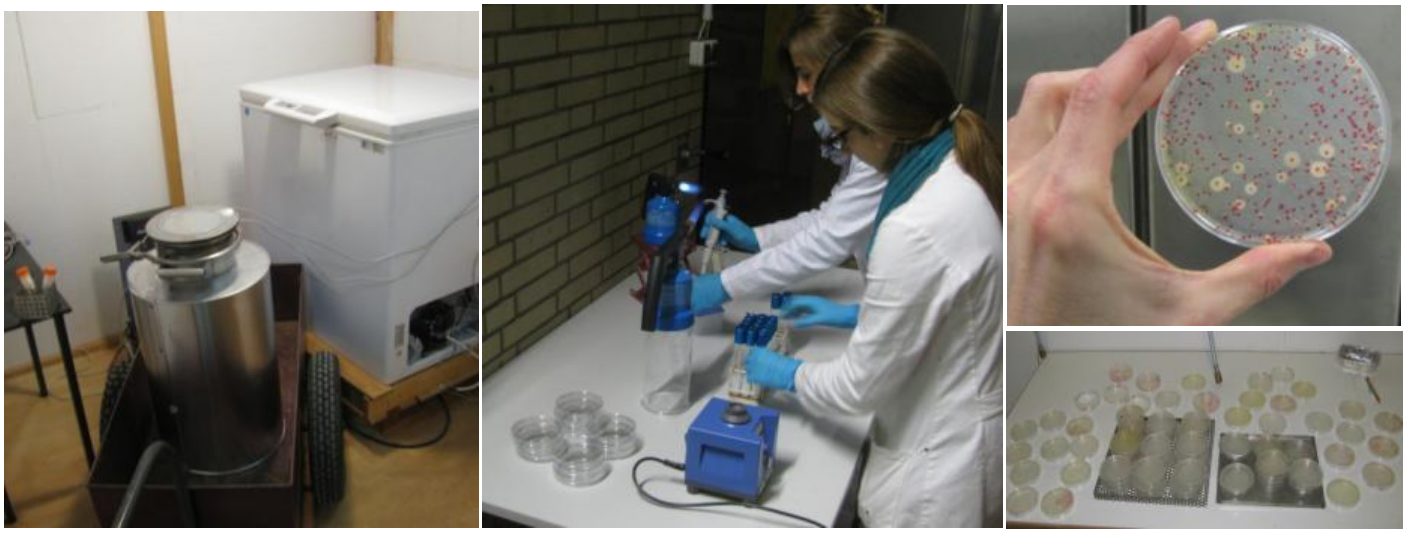
In the mean time, one milk cooling system has being operating under simulated farm conditions (climate chamber) in order to measure the performance of the system under different weather conditions of Sidi Bouzid (Extremely hot weather and/or low solar radiation)



The results showed a lowest autonomy of the system of 3 days by extracting 12Kg ice per day under hottest weather conditions and no solar radiation at all. In the case of repeated hot days with typical low solar radiation, the system delivered 12 Kg ice for at least 7 days. Since the freezer is able to store 50 Kg Ice and maintain it even with lowest solar radiation, a continuous access to frozen ice-tins is highly probable for every day of the year.

4. Milk Quality assessment

A second milk quality assessment has been carried out by milking directly in the isolated milk-can. As in the last measurement, a standard method with ager plates was used for bacteria counting of samples at ambient temperature, cooling in the isolated milk-can and instant cooling. The isolated milk can was placed in the climate chamber simulating a hot summer day and evening milking.



The experiments were started 20 minutes after milking. 30 Liter milk were introduced in the isolated-milk-can together with 6kg Ice. Additionally, a sample was left at ambient temperature and another was cooled instantly to 4°C. After 4 Hours, the samples were analyzed. The results showed that the milk in the isolated-milk-can had 95% quality compared to the milk that was cooled to 4°C.

After this 4 hours, additional 4kg ice were introduced into the milk-can in order to simulate the storage of the milk for the whole night. After a total of 12 hours after milking, the milk inside the can was analyzed together with the milk stored at 4°C and the one at ambient temperature. The quality of the milk in the milk can was around 70% as good as the one that was cooled at 4°C. This results confirmed, at laboratory conditions, the availability of the isolated-milk-can to store milk during transport(4 h after milking) and during night if necessary (12 h after milking by adding additional 4kg ice)

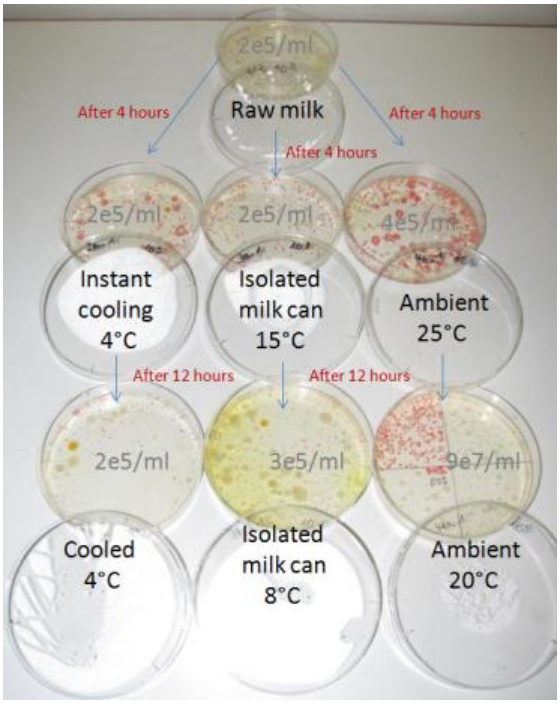


Fig. 1 Visual results of bacteria/ml (complete results will follow)

5. Further steps:

	January 16	February 16	March 16	April-May 16
Finalizing materials				
Pre-instalation and packaging				
Training of Tunisian system expert				
Transport to Sidi Bouzid				
Installation				
Start of on-field testing				
Workshop in Sidi Bozid				

Contact persons at the Institute of Agriculture Engineering**:**

Ms. Alice-Jaqueline Hack	Milk quality assessments, Laboratory Staff	a.hack@uni-hohenheim.de
Ms. Ute Waldeck	Milk quality assessments, Laboratory Staff	uwaldeck@uni-hohenheim.de
Mr. Winfried Okraffka	Control units production, Technical staff of the electronic department	winfried.okraffka@uni-hohenheim.de
Mr. Uwe Mauch	Milk cans production, Technical staff of the mechanical workshop	u-mauch@uni-hohenheim.de
Ms. Farah Mrabet	Msc. Student, Traductions to French and Arabic, of milk cans, milk quality assesments.	farah_mrabet@hotmail.com
Mr. Dino Tomazic	Msc. Student, production of milk cans and cabling of control units	dino.tomazic@gmail.com
Mr. Alexander Bosch	Msc. Student, production of milk cans	alexanderbosch4@gmail.com
Mr. Philip Täschner	Bsc. Student, testing of the final system under real conditions	philip.taeschner@t-online.de