

Research title

Daily and seasonal trends analysis of electricity use on conventional and automatic milking dairy farms

Analisi delle tendenze dei consumi giornalieri e stagionali di energia elettrica in stalle da latte con impianti di mungitura convenzionali e robotizzati

Tutor

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State of the art and aims of the project

The end of the European Union (EU) milk quota system allows EU dairy farmers to increase milk production for the first time over 30 years. Additional milk production may result in a milk price reduction for EU farms and increased milk price volatility. These predictions lead to focus on the production cost control both using new technologies to reduce labour demands, and limiting electricity costs through the adoption of energy efficient and renewable technologies.

The milk cooling is the largest consumer of electricity in a dairy farm (37-43 % of the total energy consumption in the milking parlour), followed by water heating (27-31 %) for milking machine washing and vacuum pumps (15-19 %), while other utilities (milk pumps, air compressors, ...) make up the balance. On the other hand, the largest energy-demanding processes associated with milk harvesting in automatic milking systems (AMS) are heating water, compressing air, and cooling milk.

The primary objective of the project is to establish the daily and seasonal trends of electricity consumption on conventional and automatic milking dairy farms over long period, before and after the adoption of energy efficient technologies.

A secondary objective is to implement a system of milk energy certification, according to daily and seasonal trends of electricity consumption previously calculated, to document the electricity use per kilogram of milk sold from the farm, providing the consumer with an unbiased index to evaluate the environmental sustainability of the milking process of a certain dairy farm.

Recent publications of the tutor in the field

1. Tangorra F.M., Calcante A. 2018. Energy consumption and technical-economic analysis of an automatic feeding system for dairy farms: Results from a field test. *Journal of Agricultural Engineering*, 49, 4, 228-232
2. Tangorra F.M., Costa A., Nava S., Beretta E., Lazzari M. 2017. Operating cost of milking in automatic and conventional milking systems. In: *Biosystems Engineering addressing the human challenges of the 21st century* - ISBN: 9788866290209
3. Calcante A., Tangorra F.M., Oberti R. 2016. Analysis of electric energy consumption of automatic milking systems in different configurations and operative conditions. *Journal of Dairy Science*, 99, 4043-4047,
4. Caria M., Tangorra F.M., Leonardi S., Bronzo V., Murgia L., Pazzona A. 2014. Evaluation of the performance of the first automatic milking system for buffaloes. *Journal of Dairy Science*, 97(3), 1491-1498
5. Leonardi S., Marchesi G., Tangorra F.M., Lazzari M. 2013. Use of a proactive herd management system in a dairy farm of Northern Italy: technical and economic results. *Journal of Agricultural Engineering*, 44 (s2), 208-210.