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Comparison of milk analysis performance between NIR laboratory analyser and miniaturised NIR MeMS sensors

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The capacity of milk production of dairy farms is not only dependent on farm animal counts, but is also affected by the ability of single milking cows to convert the energy uptake into milk secretion. The ability of a farmer to predict the effect of farm animal diet to the milking capacity requires information on the animal behaviour as well as on the near instant feedback of the milk composition in regards to the fed diet. The conventional method for information on milk composition at farms is sending samples to central laboratories for comprehensive analysis. However, many farms would consider alternative on-site analysis if cost-effective and reliable options would be available. In this study, we have evaluated the ability of affordable Micro Electro Mechanical System (MEMS) based NIR sensors on the analysis of milk ingredients such as fat and protein. These NIR MEMS sensors use Fabry-Perot Interferometers for wavelength scanning, which enables compact sensor packaging and fast signal collection. The spectral information content of milk was recorded using automated sampling device with integrated four NIR MEMS sensors. The results were compared from three different wavelength areas 1.1 - 1.4 μm , 1.7 - 2.0 μm and 2.2 - 2.5 μm in transmission and one wavelength area 1.7 - 2.0 μm in reflection method. The achieved MEMS NIR results were compared to the golden standard NIR spectrometer (Si-PDA) results.

Keywords: MEMS, NIR, milk analysis, fat, protein