A PAT approach for common wheat with IIoT NIR devices

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In the contest of Industry 4.0, the milling industry envisions solutions where sensors interconnect devices, machines and processes. Thus, the work presents an integrated solution for process monitoring and control based on the real-time data collection by MicroNIR sensors – installed directly from the manufacturing process - and Chemometrics.

Common wheat (*Triticum aestivum* L.) milling was monitored from October 2018 to August 2019 in two strategic points of the milling plant, i.e. at wheat cleaning (with the probe placed on a drop pipe before the wetting phase) and at flour blending phase, on the homogenization conveyor. The NIR spectra (951 – 1608 nm), after first derivative transformation, were combined with the results obtained by chemical composition analyses and Farinograph®, Alveograph® and Extensograph® indexes to develop PLS regression models for eighteen parameters.

The model performance was tested directly on the milling plant by an external dataset obtaining, for most of the parameters, RPRED higher than 0.80 and Root Mean Squares Errors in Prediction lower than two-folds the value of reference method errors. The proposed work succeeded in the implementation of a PAT approach with IIoT NIR devices for the prediction of relevant grain and flour characteristics of Common wheat at industrial level.

**Keywords:** Common wheat; Industry 4.0; NIR; PAT; PLS.

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