Abstract

Migrating instrument platforms from near infrared monochromator to diode array – an evaluation of ProFoss systems for on-line analysis of sugarcane

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Introduction

This presentation will report on the performance of the ProFoss diode array instrument for online analysis of sugarcane at the Mulgrave Central Mill, Queensland, Australia. Online analysis of sugarcane using monochromator near-infrared (NIR) instrumentation has been practiced for 12 years in the Australian sugar industry; however, the potential use of diode array instrumentation such as the ProFoss for this purpose will provide many significant advantages. In order to take maximum advantage of existing spectral databases and calibrations, it is a requirement that calibrations can be transformed from the existing Direct Light 5000 (DL5000) instrument without significant loss of analytical performance.

Materials and Methods

Commercial sugarcane consignments were scanned online using a DL5000 scanning monochromator and a ProFoss window reflection diode array instrument. Both instruments were mounted in the feed chute for the Number 1 mill but on opposite sides of the chute. Samples were identified electronically using the existing cane tracking system employed at the sugar mill and all laboratory analyses used the official methods described in the Laboratory Manual for Australian Sugar Mills.

Results and Discussion

Trial work was conducted using both NIR units mounted in the same process line. Calibration transfer to the diode array unit from the scanning monochromator unit was demonstrated though the comparison of predicted results from both units as well as independent validations against cane payment laboratory results. Cane constituents evaluated included Ash % cane, Brix in Juice, Pol in Juice, Brix in Cane, Pol in Cane, Commercial Cane Sugar (CCS), Fibre % cane and Dry Matter % Cane. Diode array calibration equations were developed from trimmed (1100-1648 nm) DL5000 spectra and, when applied to the ProFoss spectra, showed acceptable standard errors of prediction (SEP) and coefficients of determination (R^2). The validation statistics did show relatively large initial bias adjustments were required and that some skew was present but both of these effects were removed by the addition of a representative number (~8%) of spectra from the diode array instrument to the calibration set.

Conclusion

The successful transfer of calibrations from the DL5000 platform demonstrates that the ProFoss is a viable replacement for the older DL5000 units and that historical spectral data generated by the DL5000 units can be easily amalgamated with future data generated using the ProFoss.

Reference paper as:
S. Staunton, D. Donald, S. Aeberhard and K. Nedenskov Jensen (2012)Migrating instrument platforms from near infrared monochromator to diode array - an evaluation of ProFoss systems for on-line analysis of sugarcane (abstract), in: Proceedings of the 15th International Conference on Near Infrared Spectroscopy, Edited by M. Manley,C.M. McGoverin, D.B. Thomas and G. Downey, Cape Town, South Africa, p. 336.