



## How it all began

Phil Williams 

philwilliams@pdkgrain.com

R&D Director PDK Projects, Nanaimo B.C., Canada

This talk addresses the decade of the 1970s, when the NIRS technique was uprooted from pure science, and put to work in the demanding world of industry. This decade also heralded the appearance of the computerized NIR spectrometer, which has subsequently spawned thousands of scientific papers.

Toward the end of the 1960s the Canadian Wheat Board decided to offer Canadian Hard Red Spring wheat on the basis of guaranteed protein content, to commence with the 1971-1972 North American crop year. All of the wheat was tested by the Canadian Grain Commission Grain Research Laboratory (GRL) Kjeldahl laboratory, and I was appointed as the Chemist-in-charge of Protein-testing. During 1970-71 a feasibility study took place at 2 terminal elevators in Thunder Bay, to which 2000 cars were assigned. The study showed that the country sampling system was probably imperfect, so the need arose for testing each car on the arrival of trains at the terminal elevators, where the sampling was automated. The Kjeldahl test takes about 2 hours. It took about 4 minutes to unload each car, so testing by Kjeldahl was impossible.

Then we heard of a miracle instrument that would do a protein test in 10 seconds, with accuracy of 0.1%. The Neotec Grain Quality Analyzer (GQA) used three tilting filters, and was calibrated using multiple linear regression. During its evaluation in February, 1972, we found that it was sensitive to temperature, among other things. In May, 1973 Neotec loaned us 3 GQAs to start work at the terminal elevators in Thunder Bay. This let us determine the performance of the instruments in the hands of grain inspectors, with no laboratory experience.

Later that year Neotec invited my director and me to discuss design of an instrument that could test for protein content at the rate of 10 samples per minute. I pointed out that if they could invert the system, so that the sample was scanned from below we could design a tray with 10 cells, that would enable us to fill the tray and clean it ready for scanning in that time. So the ADA (automated digital analyzer) was created. It was the first NIR instrument that let the operator optimize the wavelength range. It

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could carry out 2500 tests in 7.5 hours, subsequently worked for 18 years, and performed 11 million tests.

During the 1970 decade Neotec was joined in the NIRS market place first by DICKEY-john, then by Technicon Industrial Systems, and LT Industries. The Saskatchewan Wheat Pool and Cargill were among the first commercial companies to acquire the new technique. In 1975 Dr. John Shenk introduced the field of NIRS forage analysis, and, with Woody Barton, and his USDA colleagues at Athens, Georgia developed the first NIRS instrument network. The year 1978 heralded the appearance of the first computerized spectrometer, the Neotec Model 6350, soon joined by the Technicon 500.

So in the 1970-1980 decade the NIRS industry was born.

Then in 1984 Harald Martens introduced PLS regression, which revolutionized calibration.