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Service and Support for Near-infrared Spectroscopy Applications: Ingredients and DDGS in the Ethanol Industry

- Advice on instrument purchase
- Advice and assistance in establishing an operation, including calibration, reference analysis, and logistics
- Troubleshooting an existing operation
- Training in practical NIRS theory and operation for users

What is Near-infrared Spectroscopy (NIRS)?

NIRS is a technology that uses the property of organic materials to absorb near-infrared light. This enables analysis for composition and functional properties. Near-infrared light is light with wavelengths of 700 to 2500 nm, next to and longer than visible light. Specific features of the absorption of the near-infrared light by the organic materials are used in the calibration process. Calibration involves developing a mathematical model between the spectral features of a set of samples and chemical or other conventional analytical data (reference data) on the same samples. Once NIR instruments are calibrated, they accurately predict the quantities of up to 30 constituents or functional properties of new samples simultaneously in seconds. Little or no sample preparation is required. Occasional conventional reference analyses are required for QA/QC in a routine NIRS operation. Analysis by NIRS is rapid, cost-effective, non-destructive, and environmentally-safe. It is analysis where it is required, when it is required, and in real-time.

How can NIRS benefit the ethanol industry?

The use of NIRS can afford direct economic benefit by providing accurate information on the composition and overall quality of incoming feedstocks to assist in maximizing ethanol production. NIRS can also enable batch-by-batch analysis of the co-product, dried distillers grains and solubles (DDGS), facilitate meeting specific requirements of customers, obtaining a premium for the product, and reducing wastage.

NIRS is used world-wide for the analysis of moisture/dry matter content, crude protein, fat and fibre in grains, feeds, and other commodities. Provided that accurate reference data are available, NIRS can predict total digestible nutrients (TDN), digestible energy (DE), metabolizable energy (ME), net energy of lactation (NEL), net energy of maintenance (NEM) or net energy of gain (NEG). Calcium and phosphorus can also be estimated.

PDK Projects, Inc.

PDK Projects, Inc. is a Canadian company with unique professional experience and credentials to support the application of near-infrared spectroscopy in agriculture and the environment. The company was incorporated in Manitoba in 1997 and registered in British Columbia in 1999.

NIRS experts, Dr. Phil Williams (analytical grain chemist) and Dr. Diane Malley (aquatic scientist), bring more than 50 years of combined experience in NIRS.

Dr. Phil Williams

- 37-year career as Head, Analytical Methods Development and Services, Grain Research Laboratory, Canadian Grain Commission, Winnipeg, Canada
- purchased the second commercial NIRS instrument ever manufactured in 1972 and worked with the then nascent industry to assist the engineers to increase reliability for grain analysis
- established NIRS as the primary method of analysis of protein throughout Canada's export wheat terminals in 1975-76
- over decades has worked with a wide range of applications of NIRS in plants, elevators, and other industrial settings, including distilleries and feed mills.
- technical missions and consulting on grain quality and/or NIRS in over 40 countries
- recipient of 7 international awards for excellence in NIRS application and grain chemistry, including the Karl H. Norris Award in 2006 and the Applied Research Award of the AACC in 2007 (first recipient).
- co-author of two editions of reference book used world-wide, Near-infrared Technology in the Agricultural and Food Industries
- developed a two-day course for NIRS users including 140-page manual; delivered in 7 countries.

Dr. Diane Malley

- 21-year career as Research Scientist and Section Manager with Department of Fisheries and Oceans, Winnipeg, Canada
- 16 years experience with innovative applications of NIRS for environmental monitoring and aquatic ecosystem protection with emphasis on field-portable instruments
- pioneered application of NIRS to hog manure nutrients and metals
- inventor on patent for NIRS flow-through cell for liquids and slurries

What can PDK Projects, Inc. do for you?

The choice of a NIR instrument to purchase can be daunting. There is a wide selection of instruments on the market varying in price, wavelength range, resolution, sample presentation, operating and calibration software, and ease of networking. PDK has wide experience with the industry, has worked with 20 instrument companies, and can advise on the one or a small number of instruments that can do the job. Perhaps your operation already has an instrument that has been delivered, set up to operate, and tested to be in perfect operating order. We play the important roles of:

- assisting in the development of reliable calibrations and on-going monitoring of the performance of calibrations, including instructing on the statistics to use in documenting calibration performance
- advising on reference testing methods and monitoring their performance
- instructing staff on instrument operation, including sample presentation, quality assurance/quality control (QA/QC), monitoring instrument accuracy and stability, and updating calibrations
- troubleshooting suboptimal performance of an operation.

Is NIRS being used in the ethanol industry?

The application of NIRS in the ethanol industry is blossoming even as the industry itself is expanding rapidly. The use of NIRS is a natural extension of its widespread contribution in brewing, distilling, wine-making, feed, and other industries. Several NIRS instrument companies focus on serving the biofuel market. The technology is employed now in ethanol plants for the monitoring of incoming ingredients and/or the co-product, DDGS. Researchers in universities and industry are expanding the applications, such as for the analysis of amino acid composition in DDGS. Near-infrared spectroscopy for analysis of DDGS is a focus of graduate programs in some Agricultural and Biological Engineering Departments in U.S. universities.

Using environmentally-safe NIRS for the analysis of ingredients and DDGS in the production of ethanol is consistent with the green goals of this industry.

For More Information

- Call toll-free at 1-866-808-6735
- Visit www.pdkprojects.com and use the contact form
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