Technical Note

Robust Near-Infrared (NIR) solutions for the Petrochemical Industry from NIRSystems

NIRSystems has provided fast, precise, and accurate Near-Infrared (NIR) spectroscopy analyzers to a number of industries since the late 1970’s. NIR spectroscopy has many advantages over other methods of analysis, including speed (seconds), is non-destructive, requires no chemicals or solvents, and is capable of performing analysis on a number of components simultaneously.

NIRSystems has successfully implemented NIR for petrochemical analysis in the laboratory, as well as directly into processes in refineries. NIR was first used in the analysis of Research Octane Number (RON) in gasoline in the late 1980’s. The main use of the analysis was for octane blending, and helped minimize the “octane giveaway” by controlling this process in real time on-line. In addition, other parameters such as Aromatics, Olefins, Oxygenates, and Reid Vapour Pressure (RVP) are simultaneously measured. Samples are scanned as-is, either in laboratory instruments (in cuvettes or disposable vials) or in process streams (using fiber optic probes).

Diesel blending can similarly be monitored by NIR. Typical NIR analyses for diesel are Density, Viscosity, D50%, D90%, D95%, and other important parameters like Pour Point, Cloud Point, and Cold Filter Plugging Point. These NIR analyses can be performed with the same NIR that does the gasoline analyses – the instrumentation and sample presentation for diesel and gasoline are identical. There is no need for a separate instrument for gasoline and diesel.

While these analyses of gasoline and diesel were originally performed in refinery labs or on-line, later use of NIR for these materials was for Regulatory Fuel Screening to ensure compliance with local country standards. In this case the NIR analyzer is located in a small truck or van and powered by battery using an inverter. The vehicle moves to different service stations where sample analyses for several components are done on the spot for both gasoline and diesel. For example, gasoline is analysed for RON, Total Aromatics, and Olefins, while diesel is analysed for Density, Viscosity, Cetane (or Cetane Index), and Distillation Points using the same NIR instrument. Some countries are also measuring the amounts of ethanol in gasoline, and biodiesel in diesel as well. This type of fuel screening allows regulatory agencies to obtain instantaneous results, rather than sending samples for routine laboratory analysis (eg knock engine for RON), which is both time consuming and costly.

NIR analyzers are also used in a number of other parts of the petrochemical refinery. NIR has been used successfully to monitor the input and output streams of Crude Oil Distillation units, Naphtha Crackers, Reformers, and other downstream processes such as para-xylene. NIR analyzers have also been used to measure low levels of conjugated diolefins (measured as Maleic Anhydride Value, or MAV) in Hydrotreated Fluid Catalytic Cracking Gasolines. NIR provides information in real time that is then used to control these processes. One process NIR analyzer can be multiplexed to provide analyses from a number of different process streams. NIR has advantages over all other methods of analysis, in that it is very fast, accurate, and reproducible, and is ideal for process control as well as for fuel screening purposes. NIR does not require any solvents or reagents for the analysis, and it is non-destructive. NIR analyzers provide multi-component analysis, and do not require highly trained experts to do the NIR analysis. The analyzers can be interfaced directly to a process line for process monitoring and control.
XDS Rapid Liquid Analyzer

The XDS Rapid Liquid Analyzer is designed to provide rapid quantitative and qualitative results for quality control and assurance. With the Rapid Liquid Analyzer, virtually any liquid or suspension can be analyzed in the laboratory or at-line. Samples are effortlessly analyzed in quartz cuvettes or disposable vials for trouble-free clean up. A temperature-controlled sample chamber provides the stable sample environment essential for precise measurements.

- XDS NIR technology ensures ease-of-use and seamless method transferability
- No sample preparation, no reagents, no waste
- Network-ready analyzer for centralized database management
- Hot-swappable modules - change modules in minutes with no compromise in performance

XDS Process Analytics

Process Analytics Analyzers are used throughout the process stream to ensure optimum performance for widely varying samples. Our analyzers allow for cost-effective analysis of sample types ranging from clear liquids to suspensions and solids. Configure the analyzer with a reflectance probe, an immersion probe or a transmission probe pair for an optimized interface to your particular sample type.

- Real-time analysis and data availability in seconds
- Microbundle fiber optic interface optimized for process streams
- One sample channel or multiplexing of up to either four or nine channels
- NEMA 4X/IP65 rated, ATEX approved
- Optional upgrade to hazardous area classification (Class 1, Division 1; Class 1, Division 2; etc.)