



LT Industries'
Quantum 2000
Near Infrared (NIR)
Technology

1. LT Industries' NIR Technology

1.1. System Configuration

The components of a NIR Process Analyzer system are:

- I. **Near Infrared Spectrometer Module:** This module includes the NIR Process Analyzer, as well as the computer, and all of the spectrometer operations for spectral data acquisition, control, diagnostics and fault isolation.
- II. **Sample Conditioning Systems:** This is a self-contained module that is based on an Absolute Reference Cell and is responsible for sample capture, temperature control, filtering and water removal. The control of the Absolute Reference Cells is pneumatic and automatically directed by the Analyzer's Controller.
- III. **Analyzer System Control Computer:** This module is the analyzer system supervisory computer. It handles all of the system operations ranging from spectral processing to communications with plant computer systems. System performance is continuously monitored and fault isolation and notification carried out. Full states, data and operations logging are continuously available. The computer console is the principal means of maintenance and diagnostic operations.
- IV. **Calibration Development Support Services:** Calibration, that is the development of the chemometrics estimators for the analyses provided, involves analyses of analytical data from process samples. Expert application support from LT involved in this phase, based on LT's extensive field experience.
- V. **Modbus Interface:** A software communication interface between the NIR analyzer and the Distributed Control System via an RS-232/RS-422 signal using the Modbus protocol. The customer is responsible to configure the Distributed Control System to read-in the appropriate Modbus values. Honeywell TDC3000, Foxboro I/A and other DCS are fully supported.
- VI. **Fiber Optics:** The on-line analyzer requires fiber optic cables to connect the probe to the spectrometer. These cables are fiber

"bundles" rather than single fibers because bundles offer better reliability and provide more energy than single fibers. Fiber optics allow safe remote measurement and combined with the optical multiplexer it is a key advantage for multi-point analysis.

- VII. **Optical Multiplexer:** 20 Channel optical multiplexer, including a reference channel.

These elements are complete except for local site preparation, local installation expenses and non-NIR sampling and sample analysis costs, which are typically responsibility of the customer. Manpower for training and support are estimated based on the scope of the project.

2. LT Industries' Technological Advantages

The Quantum 2000 NIR Process Analyser employs a rapid scanning and high resolution grating to provide the necessary wavelength dispersion of the infrared light.

1. The spectrometer design employs fiber optics to couple the sample to the spectrometer. This design separates the hydrocarbon-containing cell from all electrical components and provides an intrinsically safe design. It also permits an inherently modular design that permits the replacement of entire modules in the event of failure, non-routine service or future expansion of system capabilities.
2. An Indium-Gallium-Arsenide semi-conductor detector will be used. This allows the spectrometer to be operated in a spectral region that optimizes the sensitivity of the measurements. This also allows the use of sample size characteristics that reduce or eliminate the need for maintenance intensive filter sampling.
3. Low Maintenance: The Analyzer System spectrometer has exceptional up-time in excess of 99.6% annualized, including preventive maintenance. This being due to its ruggedness, simple design and few moving parts.
4. Internal optical referencing and dark referencing are performed in the hardware and firmware of the spectrometer. This enhances the long-term reliability of the system by enabling self-compensation for many of the key variables in the measurement. Internal quality control tests will identify any possible component degradation before failure of the analyzer.

5. The spectrometer will be packaged in a temperature stabilized, purged NEMA 4X enclosure. Under normal operation the package will not have to be opened.

LT's 20 channel optical multiplexer provides measuring of up to 19 channels. One channel is used for internal analyzer reference.

LT's complete software suite consists of Spectrametrix, LightCal, Trans , AutoDiscrim, as well as Windows-based Grams/32, PLSPlus, and Modbus packages. All software is fully integrated and provides full customization flexibility.