# SpectrOn™ Refinery Process Monitor

Guided Wave's **SpectrOn™ Refinery Process Monitor** is an integrated system for on-line measurement of hydrocarbon properties. Based on multiplexed near-infrared process spectroscopy (NIR), a fully configured **SpectrOn** measures multiple parameters on multiple process streams, thus potentially replacing dozens of analyzers. Whether the objective is process unit control or product quality control improvements, **SpectrOn** provides rapid, multi-parameter values to meet many diverse applications commonly found in refinery operations.

With over 130 systems sold to refineries worldwide, **SpectrOn™** offers a proven technology platform with a demonstrated low cost-of-ownership … an important basis for technical leadership. A typical **SpectrOn** system includes four hardware components: a high-precision process spectrometer, one or more optical probes, fiber optic cables, and a control system that features Guided Wave's unique, process-ready **SpectrOn** Software. Furthermore, **SpectrOn** system components interconnect in a flexible manner providing simplified system designs and expandability. Along with state-of-the-art hardware and software, Guided Wave also offers optional sampling systems, library calibration models, expert chemometric support, commissioning, training, and extended service contracts for system and model maintenance.

Block Diagram of Typical SpectrOn System
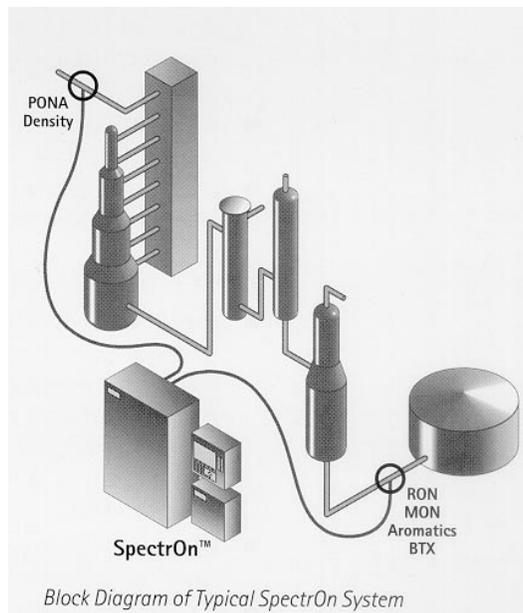
Applications

Guided Wave routinely supplies **SpectrOn** systems for the following applications:

- **Gasoline Blending (feed and product streams)**
  - RON, MON, (R+M)/2
  - RVP
  - % Benzene
  - % Aromatics
  - Distillation: D10, D50, D90; E70, E100, E180
  - % Total Oxygenates or MTBE
  - % Olefins
  - Density
- **Catalytic Reforming**
  - RON
  - % Aromatics
  - Feed analysis: paraffin, olefin, aromatic
- **Diesel Blending**
  - Cetane Number / Index
  - Flash Point
  - Cloud Point
  - Density
  - Distillation: D10, D50, D90
  - Cold Filter Plug Point (CFPP)
  - Bio Fuels

Chemical Information in Real-Time

SpectrOn™ provides chemical information on your streams when you need it, *now*. NIR spectroscopic analyzers are not only fast but can measure multiple properties of a single stream, thus replacing several analyzers. Guided Wave's multiplexed process analyzer can also measure up to 12 streams, thus reducing cost per measurement point. **Payback is rapid** resulting from *tighter control, less give-away, less off-spec product, fewer re-blends, and higher throughputs*.

412 Process Analyzer

At **SpectrOn's** heart is Guided Wave's **412 Process Analyzer**. This is a field-proven spectrophotometer with unique state-of-the-art capabilities: dual beam optics for long term drift free operation, integrated high efficiency multiplexer with no moving optical components, unsurpassed signal-to-noise ratio, and a modular design for easy maintenance. Guided Wave's fiber, probes, and software complete the system. **Everything is designed to work together reliably.**

How SpectrOn Works

The **412 Process Analyzer** transmits near-infrared radiation through fiber optic cables to a optical measurement device - probe or flow cell. The resulting NIR spectrum of the process stream contains chemical information that is related to the composition and properties of the sample. From spectra of previously collected test samples, a statistical model of the process stream is built, then used to predict the value of the current sample. Thus one spectral measurement yields multiple property values when multiple calibration models are employed. Stream properties are measured continuously, providing *real-time process data*. Process NIR is fast, only seconds as opposed to minutes or hours for other techniques. After installing a **SpectrOn** system, you will know *exactly* how your process is proceeding, *all the time*.

For many refinery applications, insertion probes may be mounted directly into the process pipe. Thus, costly sampling systems can be eliminated in many instances, *greatly lowering* typical analyzer maintenance demands. Diesel blend monitoring will most often require a sample conditioning system (SCS), mainly to remove free water. Guided Wave offers a variety of sample systems having very flexible designs to meet the requirements in the refinery. Each includes a high efficiency Guided Wave optical flow cell. Though more costly than insertion probes, the SCS provides the assurance that each diesel measurement is meaningful.
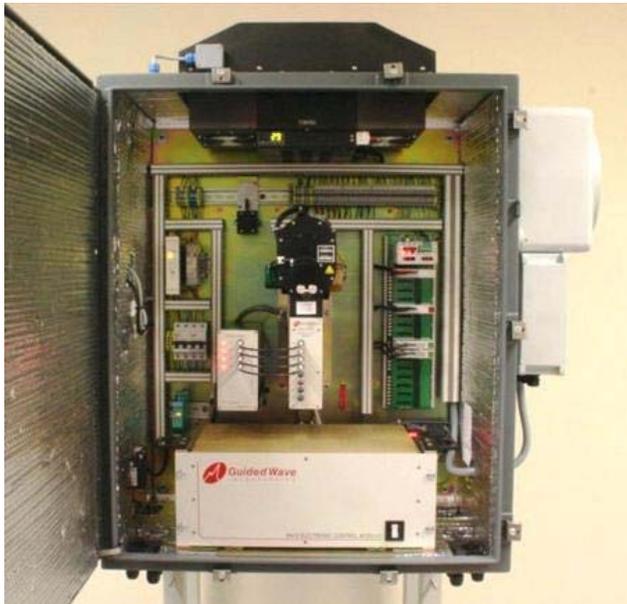
Specifications

SpectrOn™ Refinery Process Monitor is an integrated system composed of commercially proven Guided Wave hardware, software, and services. Contact Guided Wave for information on specific parameters and applications.

Analyzer

- **Guided Wave's 412 Process Analyzer**, a multi-channel, dual-beam process spectrophotometer, is the heart of the analyzer system.
  - Spectral range: 800 – 1700 nm
  - 3, 6, 9, or 12 channels
  - Photometric Noise: ≤ 45 µAU (single scan)
  - Baseline Stability: ≤ 0.001 AU/24 hr
  - Wavelength Accuracy: ± 0.20 nm
  - Wavelength Stability: ± 0.02 nm/24 hr
- Enclosures:
  - General Purpose NEMA 4 (IP66)
  - Z-purge, Class I Div 2 Groups C&D
  - ATEX , Zone 1 certificate.
- Modular design
- Built-in solid-state climate control
- Built-in DIN rails for accessories
- RS232, RS422, or fiber optic communications

Operator Interface (Computer)

SpectrOn operates on a standard desktop personal computer running Windows XP, NT or 2K. Computers can be supplied with the system in desktop, 19" rack mount, or NEMA 4 configuration.

Software

Three Windows-based software packages are used with **SpectrOn**. **SpectrOn Software** is the operational system for routine operations. It permits networking for remote access without interrupting the continuous operations of the analyzer. The other two packages are used for model development and model maintenance.

- **SpectrOn™ Software**, Windows based display and system control software
  - Real-time data displays
  - Links to Distributed Control System
  - Maintenance functions
  - Remote access via **SpectrOn Client**
  - Built in validation routines
- **Model Studio**, data preparation software for developing models
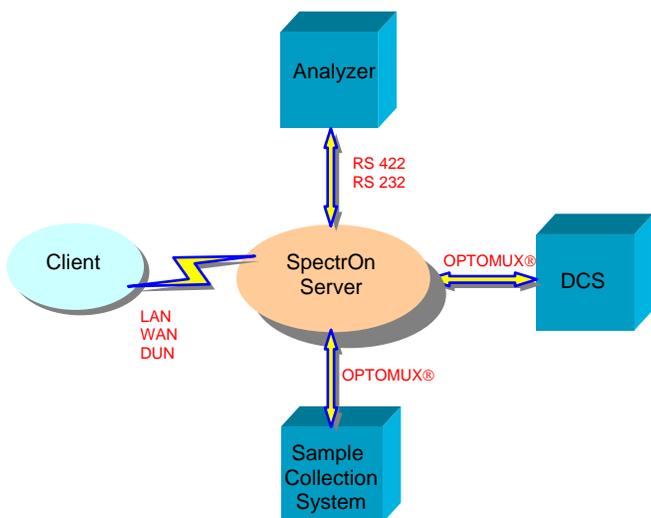- **Camo** *Unscrambler*™, PLS and PCR chemometric modeling software

I/O Interface

- All standard MODBUS™ communications are supported
- Discrete and analog I/O (OPTOMUX™) supported with modules mounted on DIN rails inside the analyzer enclosure

Library Models

Guided Wave can supply **Library Models** for several key refinery streams and properties. These models are built from data collected from several refineries processing and blending gasoline and diesel fuels. They may not provide accurate predictions of your fuels due to differences in crude sources, processing steps, blending targets, and laboratory procedures. However, they can serve as a rapid means to achieve repeatable short-term trend data of your stream, while more accurate models are developed using samples and results from your process and laboratory.
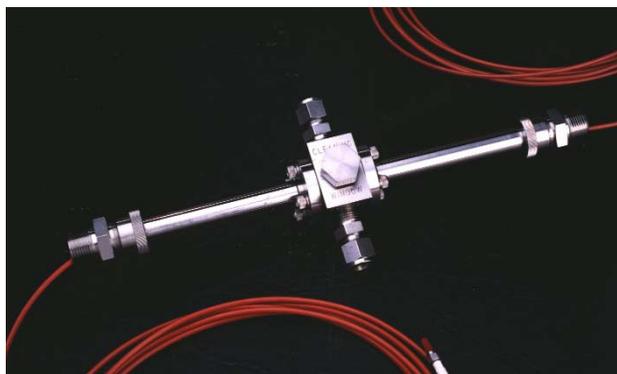
Process Interface

The *process interface* is the assembly that serves as the final interface between the analyzer, fiber optic cables and each process stream. For most applications, the process interface is an optical probe installed directly in the process stream.

- **SST Probe** for in-situ monitoring

- **Multi-Purpose Flow Cell** for bypass loops

- **Optional Accessories:**
  - SST Extractor™ mechanism
  - Sample tap valve and switch for synchronizing sample collection and spectral measurement
  - High Safety Flow Cell With Monitor Port
- **ROSA** (Remote Optical Sensing Assembly) for a bypass line with automated sample capture that occurs simultaneously with spectral analysis
- **SCS** (Sample Conditioning System) for a bypass line that allows pre-conditioning of the sample stream including temperature control and water removal
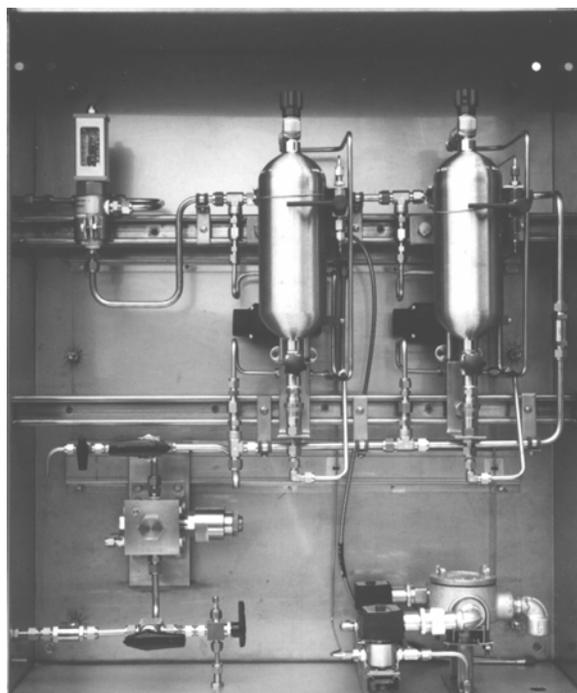
Safety

Remote, fiber optic based analysis offers a safety advantage: **SpectrOn's** spectrometer and operator interface can be located up to 200 meters away from the process, in a non-hazardous equipment room or other general purpose area.

Services

A wide variety of services are available. These include:

- Kick-off meeting to make sure the installation goes smoothly
- Installation and startup services including on-site training in system operation
- System maintenance training
- Chemometric model building training
- Custom model development – models developed from the customer's samples by GW's experts in model building
- Library models available for many parameters – basic models built from years worth of data and experience for rapid initial startup of an analyzer
- Contract model support – GW's experts can maintain the models to achieve optimum performance
- Contract service (hardware) support – GW's service engineers monitor the system remotely and report regularly on the system's health
- On-demand services – When service is needed, we are a phone call away

Stability Monitoring System

SpectrOn includes Guided Wave's Stability Monitoring System (SMS). SMS dedicates one channel of the spectrometer to measure an internally mounted multi-waveform filter. Tracking the spectrum of this filter allows one to monitor the quality of the analyzer performance on a continuous basis. Parameters such as wavelength accuracy, photometric noise, lamp output, etc. can be tracked and charted. Any anomalies in these results are then used to predict or troubleshoot instrument problems. This information also has value for a validation program, certifying the results of the analyzer.

For More Information

For more information on **SpectrOn** or any other Guided Wave product, please visit our web site at: http://www.guided-wave.com or send us an email at: gwinfo@guided-wave.com

Gasoline Spectra
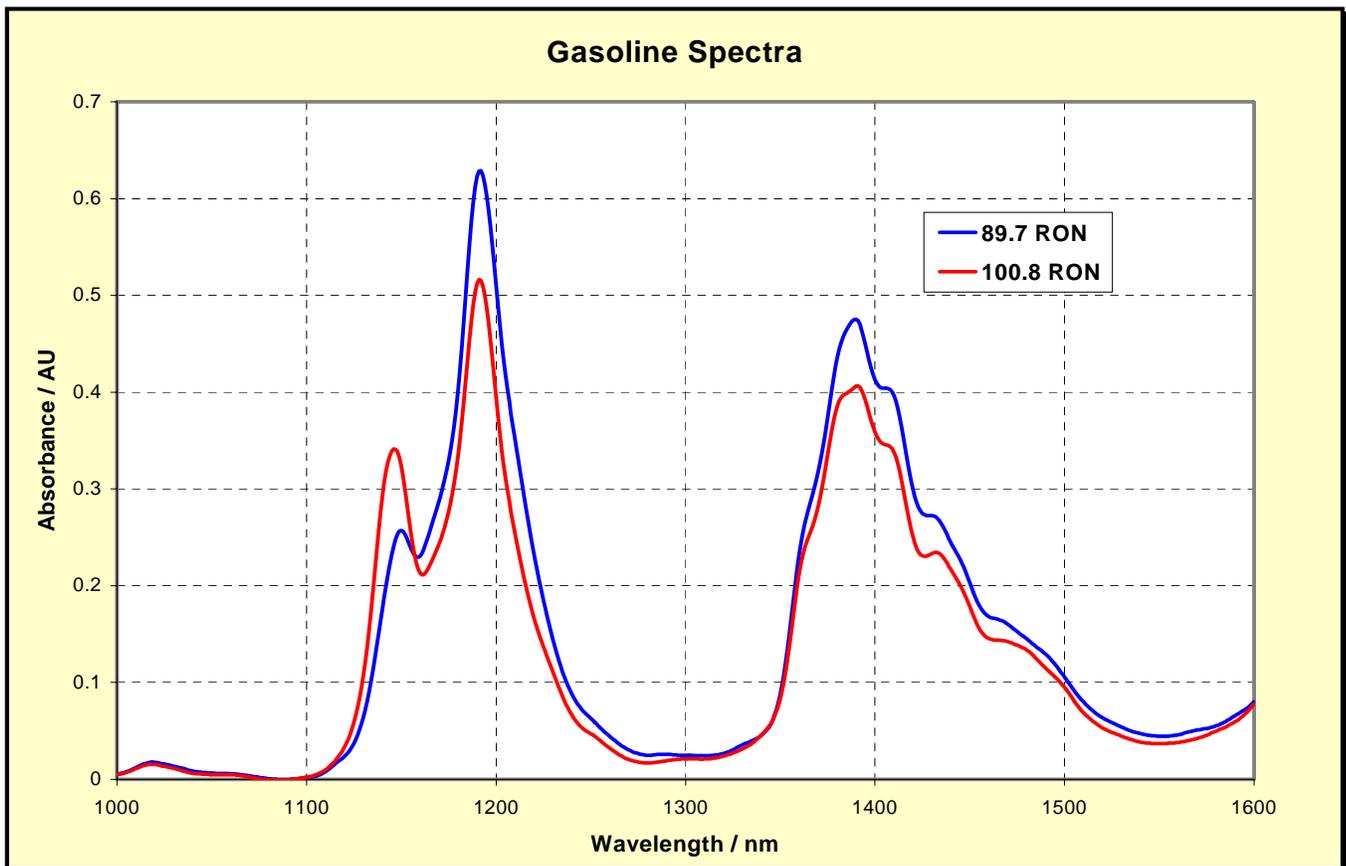
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