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CASE STUDY

RAPID RESPONDER: Hanby Kits Provide Real-Time Analysis in the Field

By: John D. Hanby, President and CEO, Hanby Environmental

Hanby Chemical Reaction Spectroscopy had its beginning with the observation in 1986 that a simple "spot" test method for aromatic compounds produced a strong color in the catalyst used in the reaction. The first application of the discovery was the development of a portable test kit that utilized a simple version of the method to perform environmental field test measurements of aromatics (Benzene, Toluene, etc.) and substances such as crude oils, fuels, solvents, etc. that contain these aromatic compounds. Two kits were designed for soil and water use. In March of 1989, both kits were used extensively during response efforts following the Exxon Valdez incident in Alaska. They were also widely employed in the large effort to discover and remediate the effects of the many leaking underground storage tanks that began in the 1970s.

Four fundamental actions necessary for effective response to accidental releases of harmful chemicals to the environment are analogous to typical responses to medical emergencies: 1. Stop the leak (stop the bleeding); 2. Assess the cause and overall extent of the container damage (what and where are the wounds); 3. Clean up the major sites of contamination (determine the major life-threatening trauma); and 4. Start initial clean up and remediation efforts (begin emergency and recuperative treatment).

Over 80 publications by the U.S. EPA since 1990 have noted the utility of Hanby Field Test Kits in rapid responses to environmental emergencies. One of the first, published by the Underground Storage Tank Division in September 1990, is entitled, "Field Methods: Dependable Data When You Need It." The report emphasized the accuracy, rapidity, and ease of use of the soil and water kits in the detection, removal, and cleanup of the thousands of leaking fuel tanks all over the United States. Of particular economy was the assistance to logistics planning for this massive effort.

In the winter of 1988 and the spring of 1989, two major environmental incidents occurred for which the Hanby kits performed these necessary rapid assessment duties. The first occurred at the Ashland oil storage tank facility. Approximately one million gallons of #2 fuel oil spilled over the protective burm surrounding one of the tanks and entered the Monongahela/Ohio river system. John Hanby was contacted to bring his kits to accompany a team comprising members of the EPA, the Ohio River Authority, and the West Virginia Wildlife Agency, which was pushing a barge load of sampling and analytical equipment up the Ohio River to determine the advance of the oil into the waterway. Only one other water analytical device had been provided on the equipment barge: a fluorescence spectrometer. When a generator failed on the tug/barge system, the Hanby water kits were the only available modality for the immediate analysis of the dozens of surface and water column samples that were being collected.

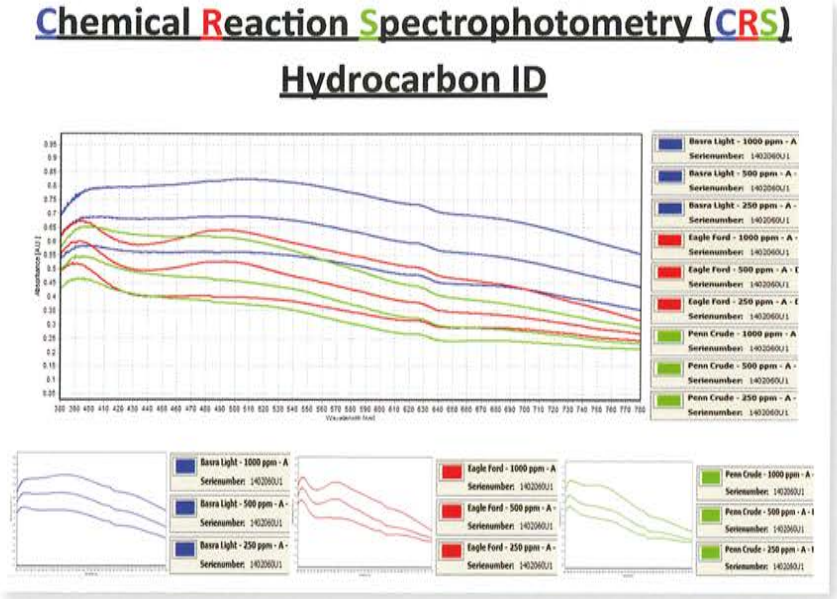
The second incident was the massive spill in Alaska caused by the rupture of tanks on the Exxon Valdez when the vessel grounded on Bligh Reef in Prince William Sound. One of the more immediate concerns was the pending release of millions of salmon from the hatcheries that were located around the Sound. When he met with Dennis Kelso, the Environmental

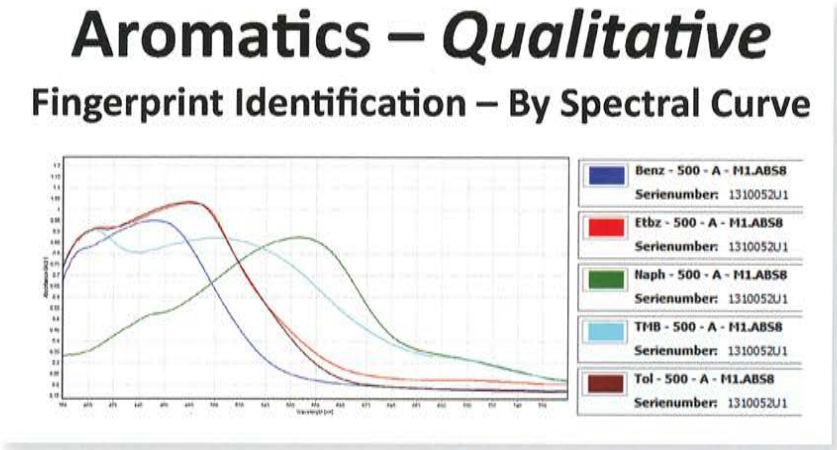
Commissioner for Alaska, it was quickly decided to fly Hanby to three of the major hatcheries so that the release of the 2-in. hatchlings could be coordinated with relatively low levels of the oil at the release points. Water test kits were demonstrated to hatchery personnel and left at each of the facilities for the appropriate timing of the releases, which was indicated by tidal, current, wind, and other conditions in the Sound. It should be noted that subsequent harvests of these matured salmon set records and far exceeded the expected catch.

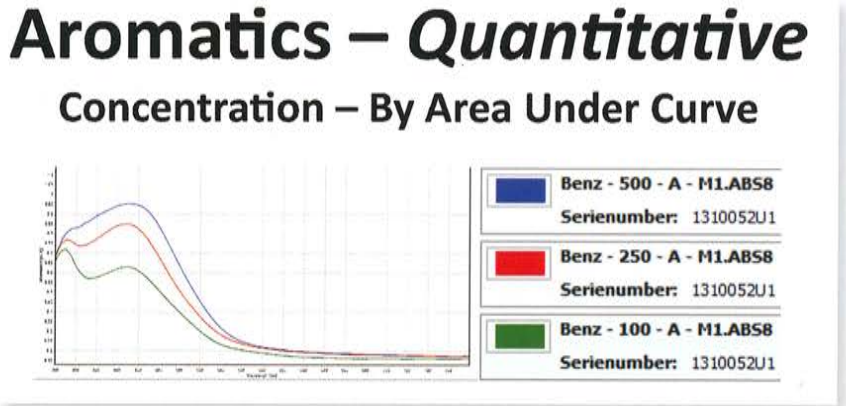
The obvious spectrometric potential of the method had been briefly examined in 1987 using a large bench instrument. The scans taken of a series of compounds and fuels revealed that broadband spectra of these substances generated "fingerprint" signatures from the ultraviolet through the visible portion. Also, precise quantitative information was available.

Recently, Hanby has developed a portable device that utilizes a spectrophotometer to read the sample and provides spectral fingerprint identification (qualitative); the concentration level is determined by an area under the curve calculation (quantitative). These are depicted in the charts shown. This will be a paradigm shift for the way analysis is done for both the environmental and oil & gas industries, putting a laboratory in the field that has real-time analysis, providing the most accurate results possible.

These environmental uses of this new chemical reaction method continue and are soon to be augmented by the spectrometric device that the company has been developing for the past several years. The qualitative and quantitative precision available with this new technology, Chemical Reaction Spectrophotometry (CRS), is currently being closely evaluated by the petroleum industry for its potential for providing immediate data in exploration and production (E&P) to aid in more efficient, economical, and safe drilling. Also, in the past few weeks, much interest has been shown in this new technology by the Department of Oncology at a well-known cancer hospital in its development of molecular spectroscopic methods for cancer detection. For more inforation visit www.hanbyenvironmental.com.







Hanby Environmental

"For Accurate Field Analysis."

Hanby Field Test Kits are:
A uniquely designed "mobile lab" that test for TPH in water & soil by using a precise scientific method to produce colors to identify contaminants, both qualitatively and quantitatively. Hanby test kits are designed to save time and money by significantly reducing the dependence on off-site lab analysis.

Uses for kits:
The kits can be used for many various applications, for instance in phase 2 site assessments, to monitor the operating conditions of a remediation system, or to confirm that contaminated soils and/or groundwater has been or needs to be removed. And to monitor locations to ensure continued compliance within approved guidelines.

Who uses the kits:
Environmental contractors and consultants, HazMat teams, remediation specialists, and even oil exploration geologists have been utilizing Hanby products at spill sites, underground storage tanks, pipeline leaks, remediation sites and Superfund sites.

Advantages of our kit:
- Speed (takes 5-10 min for a result)
- Portability (lightweight & rugged case can travel in back of truck & not be damaged)
- Easy to use (color is developed in response to the presence of a contaminant and the resulting color is matched to a color chart supplied in the kit)
- Low cost per sample (15 tests in one kit & 15 tests per refill order)
- Wide Range (test for a broad range of petroleum related chemicals)
- Accurate Results (results are scaled down in PPM – Parts per million)

Petroleum Detection Specifications
The Hanby test kits provide analytical results for petroleum fuels and constituents, such as gasoline, diesel fuel, jet fuel, crude oil, motor oil, BTEX, and PAHs, as well as PCBs in soil and water samples.

Hanby Test Kits have been serving as dependable field analytical tools since 1987 to provide rapid, accurate data. They have been published by the EPA since 1990.

SAVE TIME & MONEY!

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Hanby Environmental

The Utilization of Strong Chemical Reactions to Enhance the Spectral Signature of Petroleum Substances Chemical Reaction Spectrophotometry

By: John D. Hanby

A new method for the spectral analysis of petroleum compounds in the environment is described that utilizes a combination of chemical (bond) energy and UV/vis light energy.

The correspondence of chemical bond energy levels (10^4-10^5 Cal/mol) with UV/visible frequencies (10^{14}-10^{15} cps) results in a robust spectral resonance that provides a new spectrophotometric technique for the qualitative and quantitative analysis of complex organic substances such as crude oils. Particularly strong spectral signals in the UV/vis region are produced by certain chemical reactions. This strong spectral energy is related to the electronic population inversion achieved in the course of these exothermic chemical reactions, which is in line with the definition of a chemical laser as "*a laser operating on a population inversion produced—directly or indirectly—in the course of an exothermic chemical reaction.*" [1]

The discovery of the analytical capability of this technique was made by the author shortly after he left a 10-year position as Environmental Health Lab Supervisor at NASA, JSC, Houston in 1985. One of the methods for the analysis of Space Shuttle drinking water was the visual determination of the disinfectant used, bromine, utilizing Nessler tubes. The significance of this new technique lies in the enhancement of the signal-to-noise ratio (SNR) resulting from the strong spectral signals achieved by specific chemical substances, particularly aromatics, that are present (3% to 30%) in crude oils and readily undergo the FC reactions. This is analogous to having relatively few "marker compounds" present in a complex substance that provide definitive identification of the substance. Crude oil, petroleum, is the most complex organic substance on the planet. This is understandable given that it is derived from the biota that have accumulated on the earth for about 100 million years and, through sedimentation and geological processes, has "cooked" at high temperature and pressure through this time. Accordingly, the precise, definitive analysis of the hundreds of components in petroleum, or "TPH," is the most daunting task facing environmental chemists. Hanby patented a field test kit for water and soil samples that utilized the discovery in 1991.

Spectrometry is based on the fact that certain electronic configurations in molecules undergo harmonic resonances with specific frequencies in the electromagnetic spectrum. These frequencies range from extremely powerful energies such as X-rays to relatively low-energy frequencies such as microwave and infrared (heat). Ultraviolet and visible (UV/vis) frequencies have precisely the frequencies that resonate with the electronic structures of molecules. This spectral resonance is captured by the field device, called "Hydrocarbon ID," and compared with a spectral library stored in the computer of the device. These bonds are composed of electron pairs that strongly resonate with UV/vis spectral energy especially when the newly formed products, called chromophores, are still in close contact (adsorbed) with the catalyst. The first publication concerning this new utilization of the relationship between spectral energy and chemical energy was first described by Hanby in the proceedings of an environmental conference held in Newport Beach, California in 1990.

[1] Gross, R.W. 1976. *Handbook of Chemical Lasers*. New York. John Wiley and Sons..

Fingerprinting Crude Oil!

The five things you NEED to know!

*Where the Productive Zones Are
*The Composition of the Fluid
*The Oil/Water Ratio
*Increase/Decrease of Fluid Production
*Confluent Contribution from another Formation

Hanby PetroAnalysis

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***HANBY'S Chemical Reaction Spectrophotometry HYDROCARBON ID**

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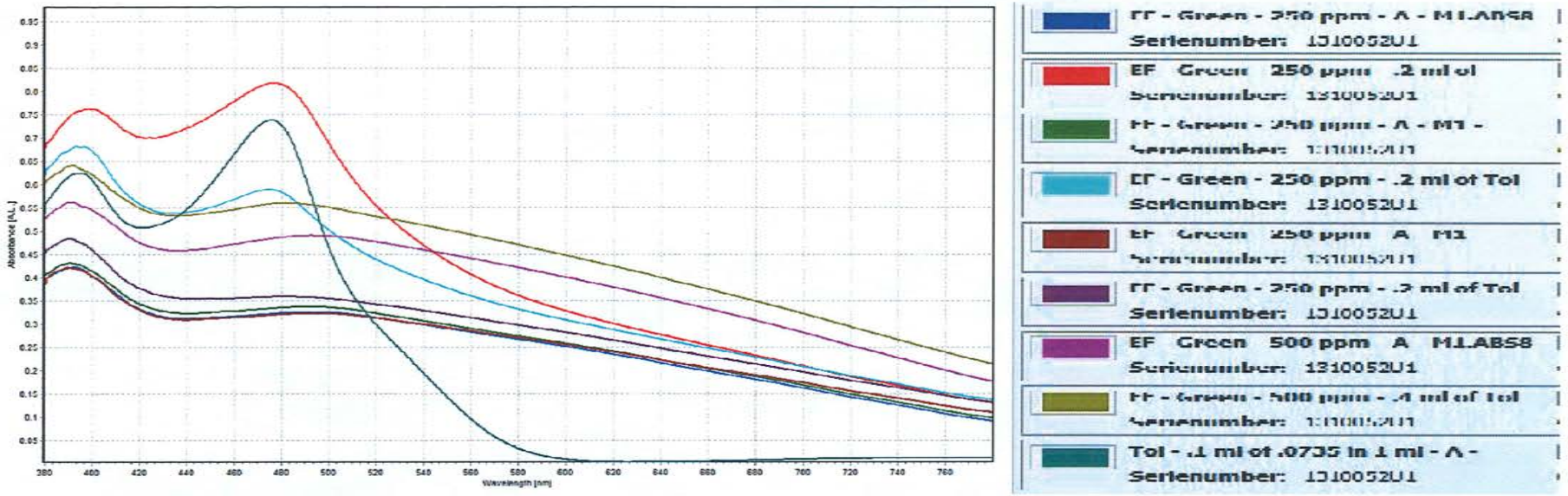
Hanby PetroAnalysis



Identification of Spectrograms according to Amount (mg) of Analyte

These are spectrograms taken, using the Hanby CRS method, of two analytes (Eagle Ford Oil and Toluene). The legend on the right side indicates the substances and spectrogram (from top to bottom, 1-9). The number of the spectrogram (1-9) is referenced at 500 nm (top to bottom) in Table 1. Table 2 indicates amounts of substances used in the preparation for the CRS procedure.

Table 1

Spectrogram Number	Spectrogram Color	Analytes
2	Red	EF & Tol
8	Camo Green	EF
4	Cyan Green	EF & Tol
7	Magenta	EF & Tol
9	Medium Green	Tol
6	Purple	EF & Tol

Table 2 (mg of Analyte)

Eagle Ford	Toluene
0.25	0.147
0.5	0.010
0.25	0.05
0.50	0
0	0.0735
0.25	0.005

Note: Spectrograms 1, 3, & 5 are repeats of samples of 0.25 mg of Eagle Ford oil with no added Toluene

PATENT PENDING

Evaluations of Field

The Hanby Test Kits and the visual methods of analysis are currently recognized by the U.S. EPA as a reliable field screening method for TPH in environmental matrices (EPA 1993)

The visual method of analysis, although subjective, was found to be reliable for identification of TPH contamination and for estimating concentration within an order of magnitude of the expected or certified value. (US Army Corps of Engineers 2000)

The Hanby Test Kit achieves selection limits of 1.0 mg/kg for soil and .10 mg/L for water. The typical range of the test is 1.0 to 1,000 mg/kg for soil and .10 to20 mg/L for water. - clu-in.org

"The development of a field method for the analysis of organic contaminants at sub-part-per-million levels in water has proved to be a valuable tool in the establishment and the sampling of the groundwater monitoring wells." (Hydrocarbon Contaminated Soils & Goundwater, Vol 1, Pub.1991)

TECHNICAL PUBLICATIONS & CITATIONS

Books:

1. Hydrocarbon Contaminated Soils and Groundwater, Chap. 9, "A New Method for the Detection and Measurement of Aromatic Compounds in Water", Lewis Publ., 1991.

2. Chemistry for the Protection of the Environment 1, Chap.13, "A New Method for the Detection and Measurement of Aromatic Compounds in Water", Plenum, 1991.

3. Chemistry for the Protection of the Environment 2, Chap. 43, "Use of a Portable, Fiber-Optics, CCD Spectrophotometer to Measure Friedel-Crafts Products in the Detection of Crude Oil, Fuel, and Solvent Contamination of Soil.", Plenum, 1996.

4. Monitoring and Remediation Technologies for Solid Wastes, Chap. 5.3, "Innovative, Field-Portable, Optical Fiber-Based Spectrophotometer for Detection and Monitoring Aromatics and Alkyl Halides", Plenum (in publ.)

5. Current Protocols in Field Analytical Chemistry, Chap.1, Volatile Organic Compounds, Unit 1J Reagent Chemistry, "The Hanby Method for Aromatic compounds", John Wiley, 97, 98, 99.

U. S. EPA Publications:

1. Field Measurements: Dependable Data When You Need It, EPA/530/UST-90-003, Sept. 1990.
2. Subsurface Characterization and Monitoring Techniques, EPA/625/R-93/003, May, 1993.
3. HNU-Hanby Environmental Test Kit, EPA/540/R-95/515, August, 1995
4. Superfund Innovative Technology Evaluation Program (SITE) Technology Profile, 9th ed. EPA/540/R-97/502, "Characterization and Monitoring Program", Hanby Environmental Laboratory Procedures, Inc. (Test Kits for Organic Contaminants in Soil and Water), pp.392-3, Dec., 1996.
5. Expedited Site Assessment Tools for Underground Storage Tank Sites, EPA 510-B-97-001, Chap.VI, "Field Analytical Methods for Petroleum Hydrocarbons; Colorimetric (Hanby) Test Kits, pps.VI 13-17, March, 1997.

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Hanby Environmental

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SOIL AND WATER

On-site Results in Minutes!

Hanby Environmental

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A uniquely designed "mobile lab" that test for TPH in water & soil by using a precise scientific method to produce colors to identify contaminants, both qualitatively and quantitatively. Hanby test kits are designed to save time and money by significantly reducing the dependence on off-site lab analysis.

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Who uses the kits:

Environmental contractors and consultants, HazMat teams, remediation specialists, and even oil exploration geologists have been utilizing Hanby products at spill sites, underground storage tanks, pipeline leaks, remediation sites and Superfund sites.

"The immediacy of analysis is key."
- John Hanby, Inventor

www.HanbyEnvironmental.com

WATER TEST KIT

Hanby Field Test Kits

Hanby Water Test Kits have been serving as dependable field analytical tools since 1987 to provide rapid, accurate data for fresh water and marine petroleum contamination. They have been published since 1990 by the U.S. EPA as a "Dependable data method" and have been evaluated and approved for field use by the EPA and State Agencies.

Hanby Field Kits have been utilized at the worlds most major oil spills, such as the Exxon Valdez, the Ashland oil tank spill, the Mega Borg, the Prestige and many others to provide sensitive precision data for clean up and remediation efforts.

Hanby Field Kits play a key role in monitoring the restoration of water and wetlands and in the determination of oil content in production water in offshore and onshore oil rigs.

SAVE TIME & MONEY

"Don't wait, add this wonderful cost effective tool to your business!"

Advantages of our kit:

Speed
(takes 5-10 min for a result)

Portability
(lightweight & rugged case can travel in back of truck & not be damaged)

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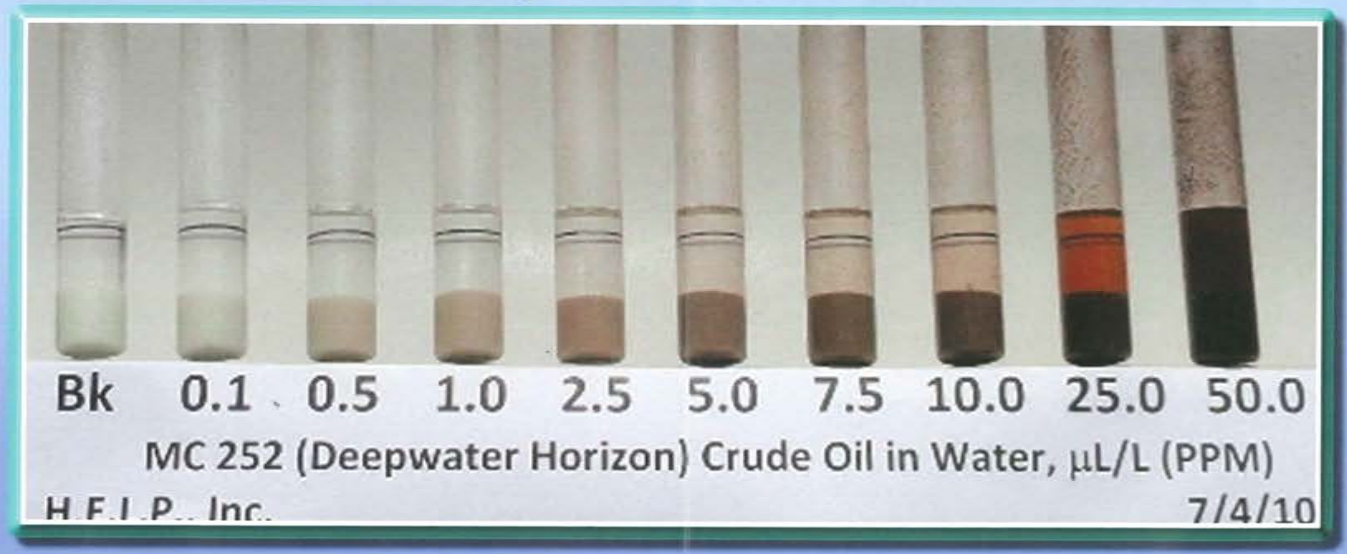
"Field Kits challenge fixed Labs in enviromental testing."
- R & D



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Lab Industry News

An independent publication not affiliated with any other organization

Distek sensIR 3200 "Bathless" Disintegration Instrument

Distek advances disintegration testing with the sensIR 3200. The sensIR 3200 uses the latest in bathless heating to offer a disintegrator without the mess and drawbacks associated with conventional water bath-based instruments. By eliminating the water bath and utilizing a semi-circular design, Distek's sensIR 3200 offers two, four or six disintegration test stations in the smallest footprint of any comparably equipped model.

The advanced features of the sensIR 3200 provide superior performance and functionality. With rapid media warm-up,

continued on page 12

LightGuideOptics, USA Makes Pittcon Debut

Mick Speciale was appointed C.O.O. of newly created LightGuideOptics, USA in January 2009. Previously he was the Medical Market Manager for OFS Specialty Photonics Division, a subsidiary of Furukawa Electric since 1995. He holds a B.S. in management with a concentration in marketing from San Jose State University.

Q: Please start by telling us a bit about the company, a brief history of LightGuideOptics, USA and an overview of your business today.

LightGuideOptics USA, LLC a member of LightGuideOptics Germany GmbH

A: LightGuideOptics, USA is a privately-held

continued on page 18

B&W Tek: The Leader in Mobile Molecular Spectroscopy Solutions

Dr. Jack Zhou is the COO and a board member of B&W TEK, Inc. He is a world renowned expert in miniature optical spectrometers, Raman, NIR and LIBS instrumentation.

Q: What is new and exciting at B&W Tek?

A: We will be introducing two new products at the show, the i-Raman Pro portable Raman spectrometer and our mobile LIBS solution. The i-Raman Pro is an advanced version of our

continued on page 27

Glass Expansion: World Leader in the Design of ICP-OES & ICP-MS Sample Introduction Systems

Article Courtesy of Glass Expansion

Glass Expansion has been manufacturing sample introduction components for ICP-OES and ICP-MS instruments since the early 1980s. Today we support instruments from 16 manufacturers, providing sample introduction systems for more than 50 different ICP-OES and ICP-MS models.

Many major ICP-OES and

continued on page 23

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The correspondence of chemical

continued on page 25

Daylight Solutions Launches Cancer Research Program with Spero Infrared Microscope

Daylight Solutions, Inc., a leading manufacturer of molecular detection and imaging systems in the mid to long wave infrared, has recently launched a research program with multiple institutes around the world to explore specific changes in tissue biochemistry associated with cancer. The program will include the delivery of four Spero infrared microscopes and will leverage the high-resolution chemical imaging capabilities of the instrument to accelerate the users'

continued on page 18

ABB Wins $35M Order to Strengthen Power Grid and Boost Wind Energy in Belgium

State-of-the-art gas-insulated switchgear and shunt reactors to support integration of wind power and strengthen grid reliability

ZURICH — ABB, the leading power and automation technology group, won an order worth around $35 million from Belgian electricity transmission system operator Elia for gas-insulated switchgear (GIS) and shunt reactors, helping stabilize and expand the country's power grid to accommodate more wind energy.

ABB's gas-insulated switchgear will help control,

continued on page 27

Advantage Business Media Announces STEM Awards Program to Challenge and Inspire Promising Future Engineers

Advantage Business Media Launches Young Mind Awards

ROCKAWAY, N.J. — Advantage Business Media announced the kick-off the Young Mind Awards, a program celebrating design engineering and research and development excellence among middle school, high school and undergraduate students.

The Young Mind Awards will recognize outstanding achievements and efforts of students who design and build a project in one of five innovation categories: electronic,

continued on page 27

Airgas to Build New Liquid Hydrogen Plant in Calvert City, Kentucky

RADNOR, Pa. — Airgas, Inc. (NYSE: ARG), one of the nation's leading suppliers of industrial, medical and specialty gases, and related products, announced plans to build a liquid hydrogen plant in Calvert City, Kentucky. The new facility is targeted to be on-stream in the summer of 2016 with the capacity to produce 10 tons per day of liquid hydrogen for use in a wide range of customer applications, including electrical power generation; the production of metals, glass, chemicals and food products; and emerging applications for hydrogen-powered fuel cells.

continued on page 23

HANBY

(continued from page 1)

bond energy levels (104-105 Cal/mol) with UV/visible frequencies (1014-1015 cps) results in a robust spectral resonance that provides a new spectrophotometric technique for the qualitative and quantitative analysis of complex organic substances such as crude oils. Particularly strong spectral signals in the UV/vis region are produced by certain chemical reactions.

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For more information, stop by Booth #430.

[1] *Gross, R.W. 1976. Handbook of Chemical Lasers. New York. John Wiley and Sons.*

BIOTOOLS

(continued from page 15)

excipients; and the ability to follow protein interactions as well as formulation studies (batch-to-batch; biosimilars vs. innovator; liquid vs solid).

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Smaller than a portable sewing machine, the new mobile design has enabled shorter, more efficient light paths and significant drops in laser power that are gentler on the sample. The integrated PZT stage dramatically increases scanning speed while the multiple sample modalities (microscope slide, vial, cuvette, syringe) make for unlimited sample handling. When used with SERS substrates or capillaries, the increased sensitivity enables ready detection of bacteria, body fluids, or metabolites in μl or ppm quantities.

Especially designed for ease-of use, they will find happy homes in industry and pharma, academe and forensics, museums, doctor's offices and infusion clinics, and food and water safety testing.

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BioTools also offers a wide range of unique spectroscopic accessories as well as full analytical Lab Services for structural characterization of chiral and biological molecules.

Visit us at Pittcon, in Booth #1247 and online at www.Btools.com

GAS PURITY LEVELS

(continued from page 6)

designed for safety and convenience. Acceptable materials of construction include brass, copper, Teflon, Tefzel and Viton. Packed valves such as needle valves and ball valves are often used for flow shut-off. Equipment manufactured to this level should not be used with high purity or ultra-high purity gases.

The second level, called high-purity, requires a higher level of protection against contamination. Applications include laser resonator gases or chromatography where capillary columns are used and system integrity is important. Materials of construction may be similar to general purpose applications except flow shut-off valves are diaphragm packless to prevent diffusion of contaminants into the gas stream. In addition, regulators will often be manufactured from brass or stainless steel barstock to reduce internal volume and improve surface finish.

The third level is referred to as ultra-high purity. This category requires the highest level of purity for components in a gas delivery system. Trace measurement in gas chromatography is an example of an ultra-high purity application. Wetted materials for gas equipment at this level must be selected to minimize trace components adsorption. These materials include 316 Stainless Steel, Teflon, Tefzel and Viton. All tubing should be 316SS cleaned and passivated. Flow shut-off valves must be diaphragm packless.

Learn more at Harris Products Group's Booth #3800.

GEAI

(continued from page 12)

sample streams with one instrument,

- Intuitive operation—user-configurable alarms and outputs, as well as a color touch-screen display,
- Easy maintenance and low cost-of-ownership.

In addition to this unique set of Analyzer features, GEAI provides aftermarket support. GE Certified Plus services and consumables offer users a start-to-finish and beyond solution for optimal operation over the life of the Analyzer. Advanced education and training found on the website includes, Benefits and Methodology for Process Water Facilities using Total Organic Carbon (TOC) Analysis. In this learning module are specific applications and case studies for using TOC analyzers within water systems across various industries. One highlight is the TOC technology comparison with location-specific monitoring recommendations.

To learn more about the Sievers InnovOx TOC Analyzer, view the presentation or schedule a demo of this robust, low-maintenance instrument, visit them in Pittcon Booth #1623, or on the web at www.geinstruments.com/InnovOx or call GEAI at 303-444-2009.

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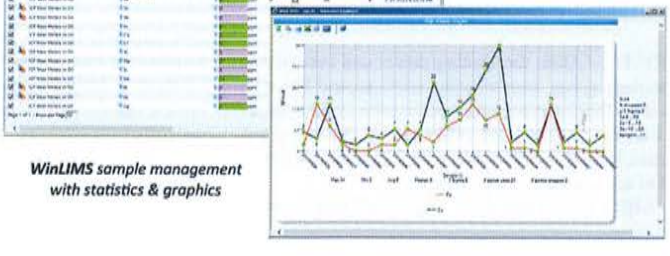
After implementation QSI's superior support and remote consultation services guarantee that you'll have instant access to our staff whenever you need us.



WinLIMS sample management with statistics & graphics

Eppendorf's New Mastercycler Nexus X2 Provides a Multi-Block Solution for Simultaneous PCR Runs

Eppendorf has launched the latest offering in its range of molecular biology instruments. The new Mastercycler nexus X2 is ideal for researchers looking to carry out two PCR reactions simultaneously, without any compromise on the number of samples. The instrument comprises of two asymmetric blocks, consisting of 64 and 32 wells, which can be programmed and run completely independently, enabling two separate PCR protocols to be run in parallel.

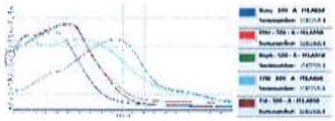
With reduced noise emission (< 40 dB), low power consumption and a small, well-designed footprint, the Mastercycler nexus X2 is perfectly suited for use in busy academic laboratories, or any institution with multiple users. In comparison to other dual block cyclers, the Mastercycler nexus X2 provides an elegant solution for users wishing to run procedures using a large number of samples, without taking up a large amount of bench space.

As the latest addition to the popular Mastercycler range, the Mastercycler nexus X2 continues Eppendorf's legacy of exceptional design and ease of use combined with efficiency and accuracy.

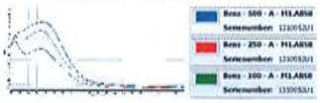
Hanby Chemical Reaction Spectroscopy

Hanby Chemical Reaction Spectroscopy had its beginning with the observation in 1986 that a simple "spot" test method for aromatic compounds produced a strong color in the catalyst used in the reaction. The first application of the discovery was the development of a portable test kit that utilized a simple version of the method to perform environmental field test measurements of aromatics (Benzene, Toluene, etc.) and substances such as crude oils, fuels, solvents, etc., which contain these aromatic compounds. Two kits were developed designed for soil and water use. In March of 1989 both kits were used extensively in the Exxon Valdez incident in Alaska. They were also widely employed in the large effort to discover and remediate the effects of the many leaking underground storage tanks begun in the '70s.

Aromatics – Qualitative Fingerprint Identification – By Spectral Curve



Aromatics – Quantitative Concentration – By Area Under Curve



The obvious spectrometric potential of the method had been briefly examined in 1987 using a large bench instrument. The scans taken of a series of compounds and fuels revealed that broadband spectra of these substances generated "fingerprint" signatures from the ultraviolet through the visible portion. Also, precise quantitative information was available.

Recently, they developed a portable device that utilizes a spectrophotometer to read the sample which provides spectral fingerprint identification (qualitative) and the concentration

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Gas Mass Flow Control in Bio Technology

Article Courtesy of Vogtlin

Vogtlin is a global designer and manufacturer of precision gas flow instrumentation based in Switzerland. Since 1986, we have been providing high-quality products and solutions for measuring and control tasks to companies around the world. Our thermal mass flow meters (MFM) and mass flow controllers (MFC) are offered with digital and analog output and IP67 (NEMA 6)/EX protection to serve a wide range of gas flow measurement applications, including: analytical, laboratory, pharmaceutical, scientific research, biotech/life science, and many other industrial applications.

Due to our experience we realize that most bio reactors are used for very critical and delicate processes where mass flow controllers need to be reliable, repeatable and flexible. It does not matter if you use perfusion, sparging, or immersed silicone tubing for your oxygenation, the amount of dissolved oxygen needs to be carefully controlled to get a perfect and repeatable pH balance. The quantities of your fermentation gasses (i.e.CO and H2) strongly influence your mass transfer coefficient, and there is no better way to precisely control your gas flows than with thermal mass flow controllers from Vogtlin. These instruments guarantee flexibility due to:

- Turndown of over 100:1 (application dependent)
- Up to 10 different programmed gasses in every flow meter
- Strong valve that can handle a wide range of inlet and outlet pressures

Especially the large turndown helps to cover huge gas mix ranges with less mass

flow controllers and it simplifies systems and reduces costs.

Most likely you already have a Vogtlin mass flow controller in your bio reactor, since Vogtlin is the preferred supplier of most large reactor system manufacturers. Most modern systems replaced the traditional VA (Rota) meters with MFCs. We would be very happy to demonstrate that you get a better process with mass flow controllers than with the traditional variable area meters. Beside the better control, you now have the ability to automate the process and record the gas flow electronically for future reference.

We have simple stand-alone solutions for bench-top systems or IP67 (NEMA6) and EX certified units that can be installed in a lab where regular wash-downs with high pressure waterjet cleaners are required.

Control can be done in many different ways; we offer complete gas mixing systems and stand-alone units that communicate with Modbus, Profibus and analog signals. Other options include VB, C++, Labview or ready-to-use data collection programs for instance. Units are available from the smallest SCCM flow range up to 450 SLPM. For system manufacturers, Vogtlin develops and manufactures complete OEM solutions.

Contact one of our local experts today and learn how Vogtlin can help you get the best flow solution!

For more information, stop by Booth #4525.

BIOS SYSTEM

(continued from page 1)

temperature fluctuations throughout a sample's lifetime in the system while ensuring integrity in a consistent -80 C environment.

"The expanded system allows us to manage more samples for research projects, which were previously stored in manual freezers and were not retrievable without affecting the remaining samples," said Niko Sahlberg, head engineer at the NIPH's Department of Biobank. "Maintaining the integrity of samples throughout the temporary unloading and reloading process has always been a risk. When we extended the BiOS system, the temperature in the existing chests with the previously stored samples was constantly monitored and did not show any significant changes."

"The BiOS system is helping the NIPH to actively share biological samples with global research partners, and the automated storage method provides confidence in sample integrity," said Dr. Martin Frey, director industrial solutions, Hamilton Bonaduz AG. "This installation and extension marks an important milestone and underlines the significant growth in biobanking requirements to properly store and manage a growing amount of sensitive samples."

The BiOS system is being used to store and manage more than three million biological samples collected in the Norwegian Mother and Child Cohort Study which were previously stored in manually operated chest freezers.

HANBY

(continued from page 6)

level is determined by an area under the curve calculation (quantitative). These are depicted in the charts below. This will be a paradigm shift for the way analysis is done in both the Environmental and Oil & Gas Industries, putting a lab in the field that has real time analysis, providing the most accurate results possible.

For more information, stop by Booth #430.

LIGHTGUIDEOPTICS, USA

(continued from page 8)

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(continued from page 12)

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2. THE COMPOSITION OF THE FLUID?
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5. INCREASE/DECREASE OF FLUID PRODUCTION?

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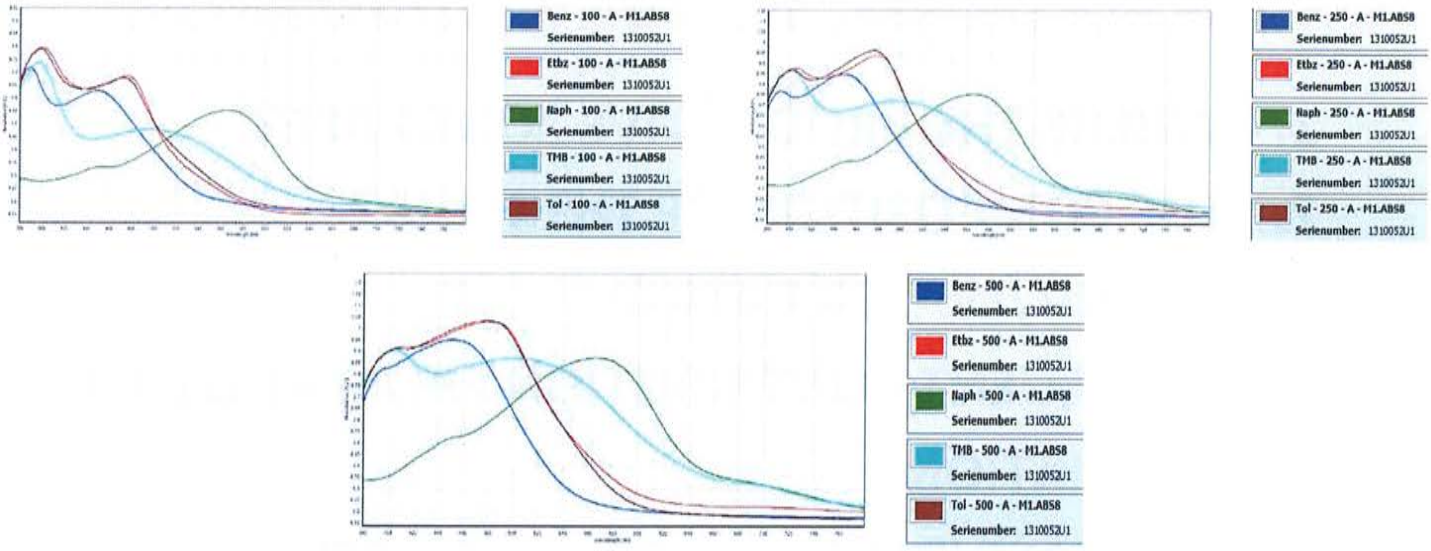
***HANBY Chemical Reaction Spectrophotometry**

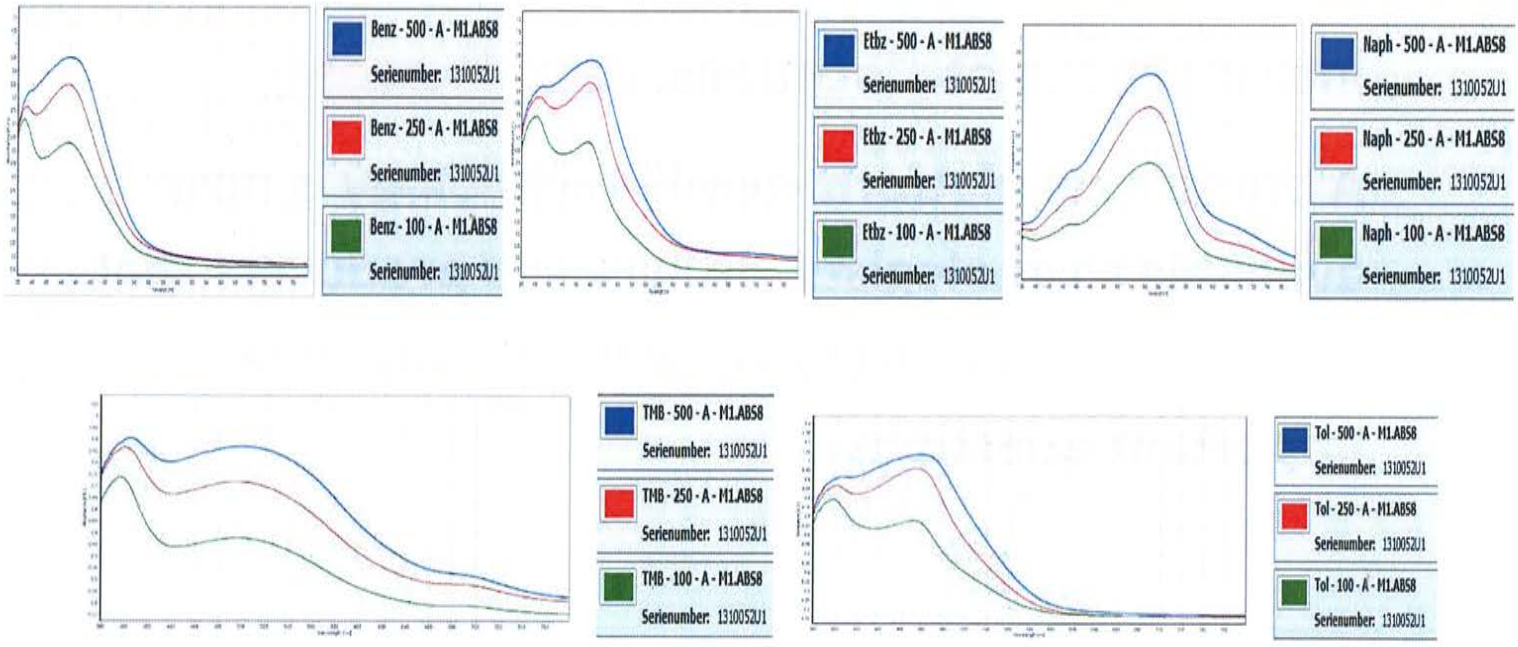
Aromatics – *Qualitative*

Fingerprint Identification – By Spectral Curve



Aromatics – *Quantitative*

Concentration – By Area Under Curve



Hanby PetroAnalysis
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Patent Pending - PCT/US2013/022263

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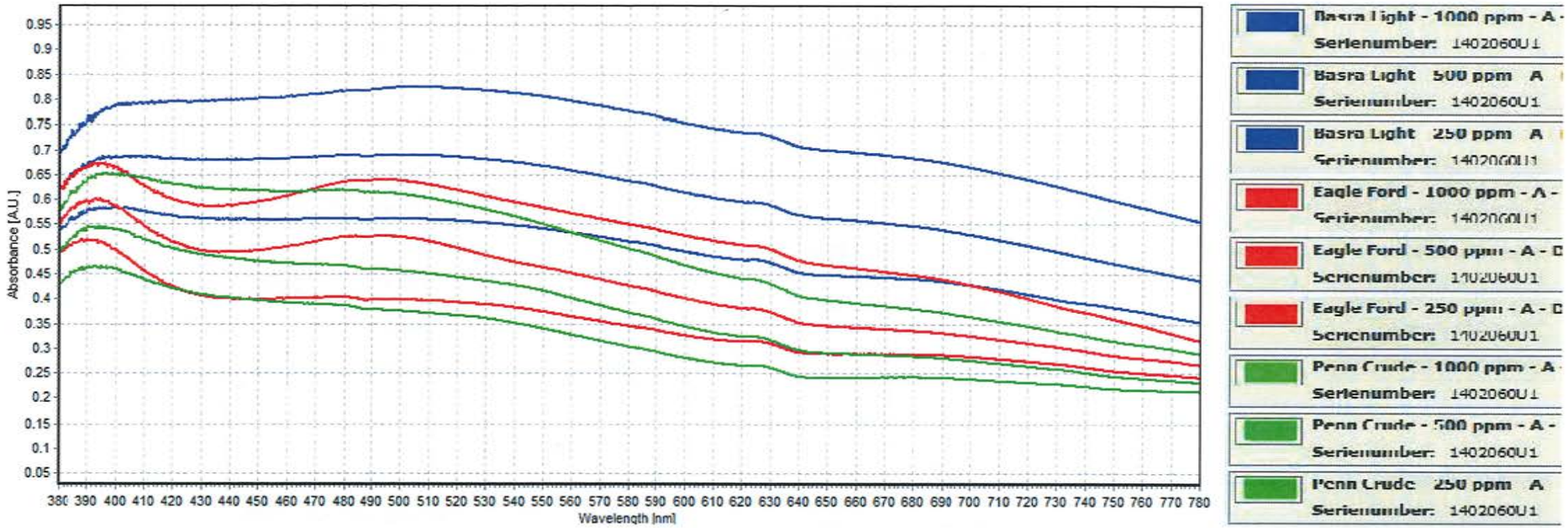
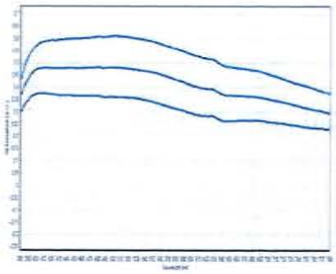
Chemical Reaction Spectrophotometry (CRS) Hydrocarbon ID

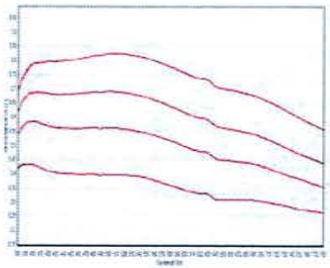


These nine spectrograms (*"band"* spectra) were acquired using Hanby Chemical Reaction Spectrophotometry (CRS) on 5/2/14. They represent three different crude oils, Basra light, Eagle Ford Shale and Pennsylvania Crude. Dilutions were prepared of each at 1000, 500, and 250 mgs/L (PPM). These dilutions are typical of oil/water concentrations seen in producing wells. Note the difference in curve shape between the **Basra Light** (B), **Eagle Ford Shale** (R) and the **Pennsylvania Crude** (G). These differences in shape correspond to the chemical differences in the crude oils which have been amplified by performing chemical reactions on the oils and then scanning the resulting reaction products (**chromophores**) from 380 nm through 780 nm (UV/vis) portion of the spectrum. The integrated area under each curve gives a precise quantitative value for the concentration of each oil.

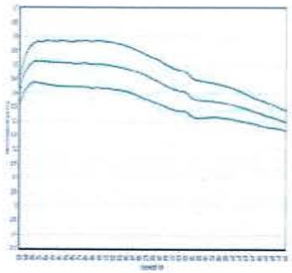
The identification (qualitative analysis) and concentration (quantitative analysis) of geological formation fluids is critically important to efficient, economical and environmentally optimal production of petroleum. From prospect assessment, through E&P and product distribution the ability to precisely *"fingerprint"* crude oils and obtain precise reservoir quantity information will aid every phase of these operations. The Hanby PetroAnalysis **CRS** technology has been developed and configured for adaptability as a reservoir evaluation (wireline) device and as a logging-while-drilling device. This UV/vis band spectral technology represents a paradigm shift in downhole information technology.



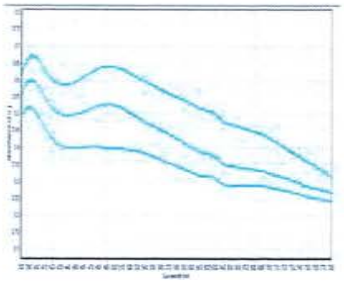
Arab Lt - 1086 ppm -
Serienumber: 1402C
Arab Lt - 543 ppm -
Serienumber: 1402C
Arab Lt - 100 ppm -
Serienumber: 1402C



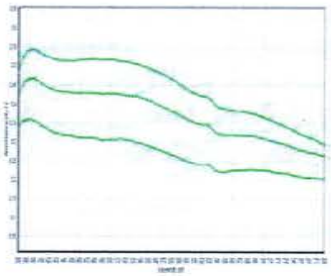
Basra Light - 1000 ppm -
Serienumber: 1402060U1
Basra Light - 500 ppm - A
Serienumber: 1402060U1
Basra Light - 250 ppm - A
Serienumber: 1402060U1
Basra Light - 100 ppm - A
Serienumber: 1402060U1



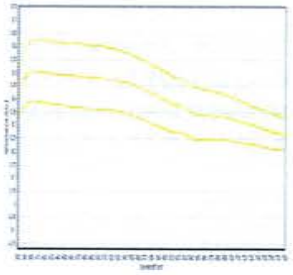
Bryan Mound - 963 ppm -
Serienumber: 1402060U1
Bryan Mound - 481 ppm -
Serienumber: 1402060U1
Bryan Mound - 193 ppm -
Serienumber: 1402060U1



Eagle Ford - 1000 ppm - A
Serienumber: 1402060U1
Eagle Ford - 500 ppm - A -
Serienumber: 1402060U1
Eagle Ford - 250 ppm - A -
Serienumber: 1402060U1



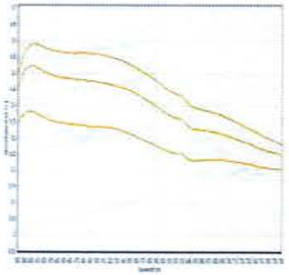
GOM - 1151 ppm - A
Serienumber: 1402C
GOM - 576 ppm - A -
Serienumber: 1402C
GOM - 230 ppm - A -
Serienumber: 1402C



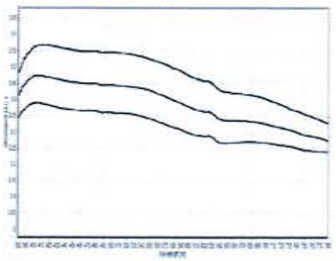
Louisiana - 764 ppm - A -
Serienumber: 1402060U1
Louisiana - 382 ppm - A -
Serienumber: 1402060U1
Louisiana - 152 ppm - A -
Serienumber: 1402060U1

ORI - 500 ppm - A -
Serienumber: 1402
ORI - 250 ppm - A -
Serienumber: 1402
ORI - 100 ppm - A -
Serienumber: 1402

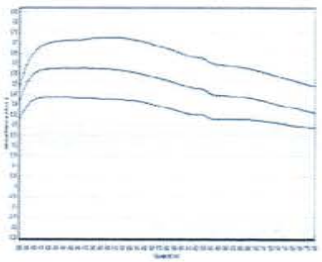
Penn Crude - 1000 ppm - A
Serienumber: 1402060U1
Penn Crude - 500 ppm - A -
Serienumber: 1402060U1
Penn Crude - 250 ppm - A -
Serienumber: 1402060U1
Penn Crude - 100 ppm - A -
Serienumber: 1402060U1



Quoa Iboe - 732 ppm - A -
Serienumber: 1402060U1
Quoa Iboe - 336 ppm - A -
Serienumber: 1402060U1
Quoa Iboe - 146 ppm - A -
Serienumber: 1402060U1



Sch - 873 ppm - A - D1 - 200
Serienumber: 1402060_1
Sch - 436 ppm - A - D1 - 200
Serienumber: 1402060_1
Sch - 175 ppm - A - D1 - 200
Serienumber: 1402060_1



Venezula - 727 ppm - A -
Serienumber: 1402060U1
Venezula - 364 ppm - A -
Serienumber: 1402060U1
Venezula - 145 ppm - A -
Serienumber: 1402060U1

Hanby PetroAnalysis

PATENT PENDING