



# Analysis Division Program Guide

## 10 — 13 September 2001

George R. Brown Convention Center  
Houston, Texas

ISA'2001 is coming to Houston and to make your planning for the event that much easier, this insert includes all the abstracts and schedule for the week as it stands at the time this newsletter goes to press.

It is advisable however to check the final program at the event or on the web at [www.toobigtomiss.com](http://www.toobigtomiss.com).

Monday			
	10:15 — 11:45	13:00 — 14:30	14:45 — 16:15
<b>Paper 1</b>	D.A. Smith, Containment and Transfer...	F&P: Charles L. Kenyon, Automated Aerosol Bacteria ...	
<b>Paper 2</b>	John G. Groetsch, Using Refractive Index...		
<b>Paper 3</b>	PMCD: Marc Buttman, Suspended Solids Measurement...		
<b>Posters</b>	Todd Hockenmeyer, Fully Automated Non-glass pH...		
<b>Tutorial</b>		NeSSI — Overview and Status	
<b>Panel</b>		ETCON: Advanced Optical Systems	NeSSI
<b>Emerging Technology</b>	Robert L. Ruedisueli, Corrosion Sensors ...		Dr. Wen-Bib Yan, A Fast, Innovative Infrared ... Hank Javan, Characterization of Solar Blind ... Uli Grenewald, Modulated Thermal Conductivity...

### Advances in Analytical Measurements

Developer - Dale Merriman

Advancements in Process Analytical Measurements will be discussed, including low level NO<sub>x</sub> measurements for CEMS applications, transfer of low level sulfur Compounds to Process

GC's, and the use of refractometers to improve refinery operations through the implementation of a digital refractometers.

### The Containment and Transfer of Low-Level Trace Sulfur Gases for Gas Chromatography

The analysis of reduced sulfur containing compounds such as H<sub>2</sub>S and methyl mercaptan has become more important because of odor complaints and new regulations for gasoline and diesel. Analysis of reduced sulfurs in the low

ISA—The Instrumentation, Systems, and Automation Society



part-per billion (ppb) range remains problematic. Because sulfur compounds can react with stainless steel surfaces, surface treatments must be used to create a barrier protecting the sulfur compounds from reacting with any stainless steel transfer or storage equipment

### Using Refractive Index Analyzers to Improve Refinery Operations

The refractive index principle has been used to measure a liquid concentration for over 100 years. The introduction of CCD-scanner technology combined with advanced imaging techniques has created true digital process refractometers. Digital refractometers have eliminated the problems created by prior instrumentation based on analog technology. Due to the true digital measuring principle, the calibration will not change with time. The measurement is not influenced by air bubbles, suspended particles, or fluid color. This in-line measurement device has been successfully used in refineries processes such as sulfuric acid alkylation amine gas treaters, crude oil API, and catalytic hydrotreaters. The ability to make this measurement has eliminated sampling, improved product consistency, reduced product waste and has helped to optimize the process

### Suspended Solids Measurement as Reliable Process Control Parameter

The detection and measurement of suspended solids is a desirable control input for a variety of industrial processes. Typical applications are found in purity control of incoming water or reagents, batch control for example during crystallization or polymerization, control of cleaning cycles for vessels or pipes, filter

control to initiate back wash cycles or to detect break through and sedimentation or oil/water separation in the waste water treatment area. Optical sensors that utilize backscatter or absorption by the suspended matter have been proven to be reliable. However specific requirements have to be fulfilled by the sensor to withstand the harsh industrial environment. High pressure and high temperature installation can be overcome with remote fiber optic corrections. Accessibility to the sensor can be enabled with retractable holders; coating end soiling of the optics should be compensated through multi beam technology to avoid moving parts like wipers. A design of a suspended solids sensor should also allow for an installation in hazardous areas.

### Fully Automated Non-Glass pH Electrodes for Critical Applications

For safety reasons, standard glass pH electrodes are not allowed in the main product stream at critical pH measuring points. In the food, beverage, dairy, home care, and cosmetics industries. In rare glass breakage instances, a large amount of end product is contaminated - regardless of the sophisticated glass breakage alarms built into state of the art pH analyzers. Existing alternative pH electrode designs often fail in real applications. Those failures result from cross sensitivities and erosion of the sensitive area during hot caustic cleaning cycles or highly abrasive product phases. By combining non-glass pH electrodes based on ISFET technology with an automatic retractable holder, users can take accurate measurements during the product phase. In addition the probe can be retracted during the harsh and aggressive cleaning cycle. During retraction the sensor can be cleaned and calibrated. A timer-based controller performs the successive steps that can be synchronized with the process through an external computers system. The electrode holder and integrated pH electrode must fulfill industry standards such as 3-A and EHEDG for clean-ability and sterilizing purposes. With this innovative pH measuring system, process control can be per-

formed with a higher accuracy and improved reliability. Cost savings are achieved in both production and maintenance.

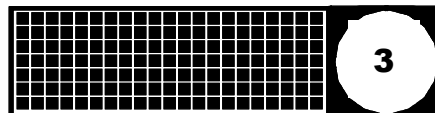
### Corrosion Sensors for Navy Ships & Marine Corps Vehicles

Future Navy ships and Marine Corps vehicles must meet the triple challenge of reduced total ownership costs, reduced manning levels, and increased availability and reliability; overtime "corrosion" is a more persistent threat than potential enemy weapons; in a reduced manning situation. Sensors will have to replace human presence; equipment for warships must be both sensitive and robust enough for the mission environment this may be especially challenging for sensors designed to monitor the operational readiness of ship or vehicle. This paper will point out some specific areas for monitoring and approaches under investigation.

### Automated Aerosol Bacteria Detection / Monitoring

My Development relates to the automation of cumbersome & non-practical labor intensive procedures. High volume air sampling, monitoring & detection of aerosol bacteria presence in aseptic environments in Hospitals, Pharmaceuticals Mfg, & Food Processing. The System consists of an instrument/housing and a 24 hour disposable cartridge. The instrument - size of a bread box - contains air flow channels, incubation oven (37C) and powered gear train to hold and operate the culture media tape cartridge - size of a brick. The sterile disposable culture media tape cartridge contains a nominal 2" wide non-woven polyester substrate coated on both sides with activated culture media - a 24 hour supply. Particle collection by impaction. The cartridge contains both supply & take-up reels and an interleaved separating strip to prevent cross contamination. Time markings can be printed on the tape to indicate the time of an event. Sterile environments have a high value & a corresponding high cost "Sterile" is a relative term, unfortunately, and today's

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mutant pathogens defeat our abused antibiotics. Hospital acquired or nosocomial, infections are rampant and generally a well kept secret. Not monitoring sensitive environments equates to "killing the messenger". Product contamination & recall in Pharmaceutical Mfg, and Food Processing are other very sensitive areas. Practical & continuous monitoring of aseptic environments is a practical addition to the arsenal of hard pressed Contamination & Infections Control Methodologies.

### The New Sampling /Sensor Initiative (NeSSI) — Overview and Status

The Center for Process Analytical Chemistry (CPAC) initiated NeSSI in May 2000 in an effort to facilitate the state-of-the-art evaluation of the next generation modular sampling system designs based on the SEMI surface mount standard manifold. By design, this effort is intended to compliment the ISA SP76 activities to adapt the SEMI interface standard for the chemicals/petrochemicals Industry. The tutorial will provide a short overview and summary of the NeSSI efforts to date. However the focus of the tutorial will be to provide feedback on prototype NeSSI implementations/evaluations and a progress report on the team efforts regarding power, heating, and sensor connectivity including wireless considerations. The tutorial will precede the panel discussion on Sampling Systems and SP76 Standards and as such should provide ample food-for-thought for this follow-up.

### Advanced Optical Systems: Part 2

Real-time nondestructive, in-line measurements of material properties are needed for process control in metallurgical manufacturing. With the incorporation of newly developed X-ray optics, X-ray diffraction (XRD) can be used to identify structural phases, determine grain size and measure stress and texture of materials in-line. XRD is widely used in laboratories to determine these material properties, but current XRD techniques cannot be used for in-line

monitoring as they require sophisticated sample preparation, weigh hundreds of pounds, require water cooling and consume several kilowatts of power. The newly developed system provides real-time material characterization capability, is portable (weighs less than 50 pounds) and uses about 100 Watts of power. The subject technology uses Capillary x-ray optics to collect X-rays over a large solid angle from a low-power x-ray source form an intense parallel beam. The parallel beam geometry eliminates the problem of sample misalignment and provides significantly higher signal intensity than current Bragg-Brentano XRD Systems. The system will be first applied to monitor zeta-phase growth in galvanized sheet steel.

### Pushing the Envelope in Analyzer Sampling Technology

Recent developments in modular sample components, power distribution, and wireless technologies have caused a revolution in Analyzer sample system design. What were once a few whispers have become a strong wave of interest in making change in sample system design. Recent efforts at ISA, the Center for Process Analytical Chemistry, and in the semiconductor industry have pushed forward new ideas in how sample system components are constructed, how power is brought to devices that require it, and how to get signals back to the analytical system owner. The goal is to make these systems easier to support, smart, and lower operating cost. This panel will explore these developments and describe the progress to date Panelist: Rick Junge -Chevron Products Company, Gary Frank- Kinetics Fluid Systems, Peter van Vuuren - ExxonMobil Chemical Company, and John Dooley - Go



### A Fast Innovative Infrared Analyzer for Monitoring Ultra-Trace Moisture In Semi-conductor Gases

The dramatic scaling down of the silicon chip to 0.13 micron brings new challenge to semiconductor IC manufacturers. As feature size continues to shrink, the need grows for processing materials of higher quality and purity. Evidence of direct correlation between gas purity and process defects has been documented in fields such as silicon epitaxy, oxidation and annealing treatments, and film deposition. This has driven equipment suppliers to develop new analytical detection systems for monitoring ultra-trace gas impurities in bulk and specialty gases for the semiconductor fab. One such device is an innovative infrared analyzer, which provides 500 PPT detection sensitivity for moisture. Moisture is a major contaminant in the semiconductor fab gas system. The analyzer uses a small, inexpensive diode laser that can operate in various parts of the infrared spectrum. The principle of operation is Cavity Ring-down Spectroscopy (CRDS), which was jointly developed by Tiger Optics, LLC and Princeton University. Data from gas suppliers will be presented and discussed on fast, trace gas impurity detection of trace moisture in both inert and corrosive gases used for semiconductor manufacturing.

### Characterization of Solar Blind Compound Semiconductor Devices

In this article we will examine an important newly NASA developed compound semiconductor UV detector, Al-GaN whose optical property falls way under the UV region, thus this device a solar blind detector. The performance of this device will be investigated, its band gap energy will be evaluated and the result will be compared with the experimental data. Finally suggestion will be made on how to design a ternary compound for a specific application.

### Modulated Thermal Conductivity: A New Applied Principal in Gas Analysis

We would like to present an invention in the field of the identification of complex process gases with a new Ther-

mal-Conductivity Principle. This sensor is based on a new Temperature-Modulation Technology coupled with a Fourier Transform Analysis. Since this new sensor technology is well suited for the identification of Hydrogen in complex gas mixtures we expect a big interest in the Hydrogen Energy Generation and Distribution as well as in the Fuel Cell Industry.

#### A High SNR FT-NIR spectrometer for Process Monitoring

We developed a FT-NIR spectrometer with high signal-to-noise ratio (80dB at  $5,700\text{cm}^{-1}$ , 0 abs, frequency intervals of  $2\text{cm}^{-1}$ , a Hamming apodization, and an observation time of 1 second). To apply this spectrometer with high SNR to harsh or on-line measurement on the site of process automation, we achieved high vibration resistance and high temperature stability with new unique scanning actuator. Its structure is composed of parallel sheet springs doubled up, and a voice-coil-motor drives it to make the velocity of a reflector con-

stant with servomechanism. As a result, we can make it compact, and realize the scanning distance for resolution of  $2\text{cm}^{-1}$  with high stiffness. In addition, this actuator has no frictional wear, so it has a long life and high reliability. We assumed operating conditions for industrial process measurement, and confirmed to keep the SNR under the following conditions; sinusoidal vibrations of 1.5 mm peak-to-peak (<9Hz) and of  $2\text{m/s}^2$  (9Hz to 150Hz), and ambient temperatures from -10 to 50 degree-Centigrade.

Tuesday			
	10:15 — 11:45	13:00 — 14:30	14:45 — 16:15
<b>Paper 1</b>	M.C. Coudace, Analysis of Diesel Fuel Properties...	M. Fraser, Advanced Applications for Gas Quality...	S. Leslie, Online Monitoring of Acetic Acid Concentration...
<b>Paper 2</b>	P.V. Gutierrez, Controlling Ethylene Oxide Production...	U. Gokeler, Application Benefits of a Versatile Compact...	A.J. Eilert, Acousto-Optic Tunable Near-Infrared...
<b>Paper 3</b>	P. Trayno, Developments in Process Mass Spectroscopy...	F. Mueller, Single Analyzer Module Process Gas Chromatograph	T.M. Cardis, Sour Gas Feed Analyzer in Sulfur...
<b>Paper 4</b>			B. Belair, Rapid Gas Analysis with a New, High Speed...
<b>Posters</b>	Todd Hockenmeyer, Fully Automated Non-glass pH...		
<b>Emerging Technology</b>		E. Johnson, Simple Infrared Gas and Chemical Sensors	C.L. Kenyon, Bacteria Detection
<b>IMEKO</b>	S. Smith, Complex Biological Degradability Test... L. Van Bieson, Functional Relationships between...		

#### Online Mass, Mid IR, and NIR Spectroscopy

Developer -James Tatera

Successful process control and environmental applications of On-Line Mass, Mid IR, and NIR spectroscopy technologies will be presented. Reliability and recent technical advancements of process instruments implementing those analytical techniques will also be reviewed.

#### Analysis of Diesel Properties by Mid- and Near-IR

Important chemical and physical property analyses required by the US EPA for diesel fuel regulations are addressed

by a two-year, co-development project between Shell's Thornton Research Laboratories, BP Oil, Ethyl Corporation, and PetroSpec. To produce a tool for worldwide diesel quality monitoring, these companies approached cetane number determinations through the detailed analysis of mid and near infrared spectra, using Petrospec's rugged, industry tested, and temperature controlled instrument platform. Using a calibration set of diesel fuels rated a minimum of three times for cetane number in engines around the world, the team created a robust analytical tool that brings the laboratory into the field. Refiners can monitor blending opera-

tions and measure final specifications more efficiently. Marketers and distribution groups gain a cost-effective quality control tool for monitoring diesel fuels as they move through the distribution system. Such a benefit virtually eliminates the sale of non-branded product and practically halts potential of selling off-specification product. The talk will focus on the instrument's development, studying how diesel's chemical composition is directly determined by measuring the separate peaks absorbed by saturates, olefins, aromatics and cetane improver. The chemical

compositions are then related to the physical properties of cetane number, cetane index, and density.

#### Controlling Ethylene Oxide Production with Extrel Mass Spectrometry

In the process of Ethylene Oxide Production, Ethylene reacts with Oxygen in the presence of a Silver catalyst. Two reactions take place. The production of  $C_2H_4O$  (EO) occurs in reaction (R#1) and in a second reaction (R#2)  $CO_2$  and  $H_2O$  are produced. To favor reaction #1 and produce the major output of EO three major variables need to be controlled: the pressure in the reactor, the temperature as a function of the Selectivity, and the concentration of the Chlorides is a function also of the Selectivity. The EO producer needs a process analyzer that is stable, reliable, precise and with a large dynamic range. The stability, reliability and precision of a process Mass Spectrometer with real data will be explored, and the benefits of fast analysis time, on board calculations and indirect monitor of the life of the catalyst will be discussed.

#### Developments in Process Mass Spectrometry

On-line Process Mass Spectrometry (PMS) is a mature technology that has benefited from a range of increments improvements over recent years. The modern PMS is a flexible process analytical tool that can be adapted to a wide range of applications, operating environments and operator skill levels. The available options for achieving a well engineered and highly reliable analyzer installation will be discussed

#### Complex Biological Degradability Test of Pharmaceutical Waste

Wastewaters of the EGIS Pharmaceutical Factory, Inc. were analyzed for biological degradability by aerobic and anaerobic methods. Since the main objective of the experiments was to obtain information about the treatability of the wastes in a sewage treatment plant (STP), the experiments were car-

ried out with continuous instruments capable of modeling the operation of the biological stage of the STP. Three types of wastewaters: (1) the average and of (2) the veratric aldehyde and (3) cyanide content, were analyzed. Aerobic experiments were accomplished in a laboratory respirometer and in a short-time BOD-meter. For anaerobic tests, a digester was used. The experiments were performed in both batch and continuous circumstances. The averaged wastewater contained alcohols in high concentration and acetic acid, toluene, xylene and other benzene products, as well as chlorinated hydrocarbons, chlorobenzene, dichloroethane and benzene-chloride. The COD of the untreated waste was 4806 mg/l. Under conditions of continuous anaerobic respirometry, at a 24-hour retention time, the COD content of the averaged wastewater was 817 mg/l, i.e. the treatment efficiency was 83%. In the case of wastes containing veratric aldehyde and cyanide, the respirometric measurement, at a 48-hour retention time, resulted in 41 % and 33% decrease in COD, respectively. The anaerobic treatment of all the types of wastes yielded nearly same effluent quality as the aerobic one. It was determined that only 20 % of the total COD load of the factory originated from the wastes containing veratric aldehyde and cyanide, however these wastes represented 63 % of the non-degradable COD. Withdrawal of the wastes of high non-degradable COD content from the biological sewage treatment process of the factory was recommended as the most economical solution.

#### Functional relationships between Acoustic and Sedimentological Sediment Properties

Past works starting in the fifties have focused on both the fundamental and the empirical studies of sound propagation along porous media in general and sedimentary deposits in particular. The technique of remote sensing by means or acoustic measurements to indirectly observe the characteristics of porous, fluid saturated layers constitutes an

excellent option for the fast and non-destructive evaluation of these layers. Especially the marine sedimentary environments have been dedicated great concern to, not only for scientific reasons oriented towards a fundamental understanding of the Earth in general but also because of economical implications in a number of ways (fisheries mineral resources, navigational routes, harbor development ...) and because of the great importance of this environment for man's quality of life. The extensive bibliography published by E Hamilton covers mostly the empirical study of the topic, whereas the theoretical part was pioneered by M. Biot and followed by R. Stoll and several others. To the moment, nevertheless, a comprehensive coupling of theory and measurements is not well defined, particularly if the acoustic reflectometry is intended to identify the intrinsic properties and geotechnical characteristics of the uppermost non lithified sedimentary strata in the marine environment. The current study focuses on the validation of the theoretical grounds by means of measurements performed in-situ at sea and on experimental scale in the laboratory. To accomplish this, a careful integration of several parameters is necessary. Previous scientific studies show steadily that there exists a relationship between the reflected acoustic signals and several sediments' parameters as density, porosity, heterogeneity, discontinuities between the sedimentary layers, and others, so that the significance or the aim of this project is justified. These relationships are still not known or only partially solved due to the great complexity of the problem, and require an interdisciplinary investigation to be properly and systematically searched for. The sedimentologic contribution for this research consists of integrating into the acoustic identification model validation; The characteristics of the surfaces of discontinuity between sedimentary units; The nature and degree of the heterogeneity within the particular unit; The characteristics of the sediments belonging to the particular unit; The rheological and specifically relevant geotechnical

cal properties of the sediments. This integration permits one to establish a basic classification of these characteristics that is meaningful from an acoustical point of view and therefore that is acoustically recognizable. In accomplishing this, other criteria are to be considered, different from those that are classically used for sedimentological studies. Starting from the sediment-acoustic classification one can propose a first modeling process that can work on-line and can facilitate a continuous registration and mapping of the seabottom. It is therefore the aim, in this paper, to recover the physical sea bed parameters. This approach yields better results than the recently proposed heuristic classification methods, which are not based on theoretically or numerically validated models.

#### **Process Gas Chromatography — Applications and Technological Advancements.**

Developer - James Tatera

A new compact transmitter sized GC technology, parallel chromatography techniques and advancements in detector technologies will be presented and proposed as technologies to increase process GC responsiveness while decreasing the cost of ownership.

#### **Advanced Applications For Gas Quality Measurement Using an On-line Chromatograph**

This paper will discuss recent advancements in parallel chromatography that allow the use of basic Thermal Conductivity Detectors (TCD) in applications for additional gas quality analysis in the field or the lab. This increased GC capability and simplified detection method greatly reduces the total capital equipment cost and maintenance cost associated with gas quality analysis.

#### **Application Benefits of a Versatile Compact Process Gas Chromatograph**

Traditional On Line Process Gas Chromatographs are typically analyzing multiple components in several sample streams in a sequential or parallel manner utilizing more or less complex analytical solutions. Because their complexity and the required stability, several of these traditional analyzers are

typically mounted together in an analyzer shelters located close to the sampling points to be analyzed. However, by mounting analyzers very close to individual sampling points, sample transport time can be virtually eliminated; sample integrity ensured and update times for these specific points significantly reduced to the benefit of process control. Except in very selected cases, it is cost prohibitive to use traditional PGC's directly at specific sampling points due to their size, installation requirements and costs. A very compact On Line Process Gas Chromatograph that is almost the size of transmitter or actuator can be mounted directly at sampling points without the need of air conditioning. That analyzer needs significantly less utility gases and has a fraction of the costs of traditional gas chromatographs and consequently is most advantageous as long as it is designed for the process application requirements and process environment. There area variety of applications and sampling points that benefit from a compact Single Analyzer Module, such as remote sampling points on pipelines or within process plants, issues concerning sample integrity and update frequency or sampling points which have not been considered because unfavorable cost/benefit ratio considering installation costs. This paper outlines applications, installation possibilities and plant benefits by augmenting existing traditional chromatographs with dedicated cost effective Single Analyzer Modules to have more efficient process control, reduced analyzer cost of ownership without compromising on analyzer reliability, uptime and maintainability.

#### **Single Analyzer Module Process Gas Chromatograph**

Typical On Line Process Gas Chromatographs are versatile tools to analyze multi components in multiple streams automatic and unattended. Due to their complexity, performance requirements and maintenance, on line process analyzers are typically installed in controlled environments. Using analyzer shelters makes the installation

rather expensive especially on remote sampling point locations or when a single analyzer has to be accommodated. Attempts have been made in the past to reduce the size of the analyzers and package it so that no analyzer shelters are required. Most of the designs just miniaturize the mechanics and don't address the maintenance and service issues entirely, lack the requirements of the process environment or have the necessary versatility of the application required. An entirely new Single Analyzer Module Process Gas Chromatograph has been designed and tested. Based on silicon wafer technique and compact electronic modules, the Process Gas Chromatograph is about the size of a transmitter. Designed specifically for process requirements, it uses proven analytical techniques, such as capillary columns, valveless column switching and semi valveless injection techniques. Communication and observation is achieved by networking using high speed Ethernet links. The analyzer packaging permits the installation in a process environment without the need of an air conditioned shelter. By means of the analytical design and the hardware arrangements, not only the analyzer cost basis and cost of ownership could be addressed in a very favorable way, but the limited requirements of maintenance and the ease of exchangeability satisfies on line process needs. The presentation describes the concept and design of this new, compact Process Gas Chromatograph, outlines application versatility and addresses maintenance and service concerns.

#### **Joint A&T / I&S Awards Luncheon**

Wednesday September 12,  
2001

George R. Brown Convention  
Center

US\$27.00 / person

### Process Spectroscopy

Developer — Ken Konrad

Optical Spectroscopy can solve many plant measurement problems. These include the measurement of a sour gas feed stream to a Sulfur recovery Unit by a Multi-component process IR Analyzer and the application of an Acousto-Optic tunable Filter (AOTF) spectrometer to provide real time NIR analysis of process streams.

**Acousto-Optic Tunable Filter Near-infrared Spectroscopy for Real-time Process Monitoring In the Chemical, Petrochemical, and Polymer Industries**

**On-Line Monitoring of Acetic Acid Concentration In a Distillation Process using Near Infrared Acousto-Optic Tunable Filter Spectroscopy**

Near-infrared (NIR) spectroscopy is a useful analytical technique for on-line process monitoring applications. Because acousto-optic tunable filter (AOTF) technology offers the flexibility and durability high-speed no-moving-parts wavelength access, it is extremely well suited for process monitoring applications. The use of NIR ACTF spectroscopy for on-line process monitoring of acetic acid concentration in a distillation process has been investigated. A pilot plant distillation system producing three fractions of acetic acid was monitored using a commercial NIR AOTF spectrometer in conjunction with a fiber-optically coupled transmission mode flow cell. The system was setup to measure acetic acid concentration in the range 0 - 26% on a continuous distillation apparatus. The initial trial used a calibration derived with a lab version of the spectrometer using synthetic standards. As these were found to differ from the samples encountered when running on-line, an "on-line" calibration was generated. Accuracy of the analysis using the on-line generated calibration was found to be 0.3% in the range 0-22%. The performance of the distillation process could be successfully monitored and could potentially be controlled by the

system, with analytical results being used to improve the yield of high grade acetic acid through control of the heating of the distillation column.

Near-infrared (NIR) spectroscopy can be an important analytical tool for numerous process monitoring applications. Acousto-optic tunable filter (AOTF) spectroscopy offers several important advantages for the successful implementation of NIR. Principle among these is high-speed programmable wavelength switching capability (continuous or random access) which is accomplished with no-moving-parts. Most on-line NIR spectrometers require constant, precise motion of either gratings or mirrors, making them susceptible to misalignments or other mechanical malfunctions caused by vibration or wear. Solid-state ACTF technology provides continuous operation without such concerns and permits dual-beam (simultaneous sample and reference) measurements for improved analytical precision. In addition to using the most appropriate technology, the spectrometer must be suitable for repeatable and reliable presentation of the product. Fiber optics can be used to couple the AOTF spectrometer to the most appropriate sampling accessory, usually either an in-line probe or flow through cell (for products that require pre-conditioning). Considerations for design and use of a dual beam AOTF based spectrometer for process monitoring will be discussed and examples of applications in the chemical, petrochemical and polymer industries will be presented.

### Sour Gas Feed Analyzer in Sulfur Recovery Units

Sour gas feed streams contain hydrogen sulfide, ammonia and hydrocarbons. The sour gas feed stream is sent to an oxidation furnace of a Sulfur Recovery Unit where the hydrogen sulfide is converted to elemental sulfur and sulfur dioxide. The combustion air requirement changes as the hydrogen sulfide, ammonia and total hydrocarbon concentrations fluctuate. An on-line Infra-

red (IR) Photometer can be used to measure hydrogen sulfide, ammonia and total hydrocarbons in sour gas feed streams. The fast response time of the Photometer allows feed forward control or the airflow valve to the combustion furnace that provides the following benefits: 1. Maximize the sulfur recovery efficiency 2. Protection of catalysts 3. Ensure that environmental regulations are achieved

### Bacteria Detection

The detecting/monitoring system is centered around a long, flexible Petri Dish, a tape, wound in a sterile disposable cartridge in the manner of a video cassette. See Fig. 1. Bacteria collection is by implication on both the media tape surfaces. The media tape, or substrate, is an unwoven polyester, coated on both sides with an activated media of choice. An interleaving strip for separation of active surfaces and necessary air entrapment is incorporated. This non-woven polyester interleaving strip travels its own route from supply reel to take-up reel, separate from the media strip during inoculation from the divided air flows. The media cartridge has a 2" x 1" opening, centered on the top, allowing the divided air flow to impact on both sides of the media strip with equal force. Air flow channel access to the media strip surfaces is via the 2" x 1" top opening in one case and a cartridge side opening in the other. The cartridge will be no smaller than a brick. Strip travel is planned at 3" per hour. Time markings will be printed on the substrate to mark the time of an event measured from the start of the cartridge. See Fig. 2. The distance between the media strip and the air flow channels is critical. Too close and a "dead cone" is established, airflow is restricted, and particle velocity is high enough to allow some bacteria to escape. Too far away and impact will be outside the cartridge opening. The physical characteristics of the media will require adjusting to prevent surface drying during exposure and sufficient flexibility to permit winding as a tape. The biological characteristics of the media will not be effected. The instrument/housing exists only to hold and

operate the cartridge, direct the air flows and provide a 37 Deg C incubation oven for the inoculated media. Aseptic environments tend to have very sophisticated air handling systems. In it's simplest form the air flow thru the instrument results from mounting the instrument over the facility air handling/conditioning room exhaust vent which draws room air through the in-

strument and impinges it on the media strip Air flow/velocity can be modulated by an adjustable iris type orifice in the front of the instrument. A simple motor and gear train transports the strips from supply to take-up reels. The incubation oven will provide a head-start on the traditional 24 hour incubation before reading See Fig 3. Real time detection is not possible as some

colony growth is necessary for identification. The instrument needs no calibrations, etc., and is about the size of a window air conditioner. A fan can be incorporated to induce air flow through the instrument but the sampling technique suffers from stratification.

### Wednesday

	10:15 — 11:45	13:00 — 14:30	14:45 — 16:15
<b>Posters</b>	R. Morgan, Online Photometric Measurement of Fuel Properties		
<b>Emerging Technology</b>		F. Behroozi, Non contact Measurement of Viscosity E. Pfannenstiel, The Continued Evolution of Process pH...	

#### On-line Photometric Measurement of Fuel Properties

Process photometric methods have been developed for simultaneous on-line measurement of ASTM and Saybolt color equivalents, red dye in dyed diesel or as an impurity in aviation turbine fuel (equivalent to ASTM D 625S), and haze (equivalent to ASTM D 4176) using a single fiber optic probe. Multiple linear regression calibrations for the ASTM and Saybolt colors were developed using calibration standards specified in the ASTM D 6045 Tristimulus Color Method. These same standards were spiked with Solvent Red 26 to generate an MLR calibration equivalent to D 6258. Thus, calibrations for the determination of ASTM and Saybolt colors in the presence of Red Dye were also created. A proprietary approach was used to generate a calibration for the measurement of haze equivalent to ASTM D 4176. Examples of this technology's application in the pipeline industry will be shown. Dedicated analyzers that can be used for ASTM or Saybolt color plus haze will also be described.

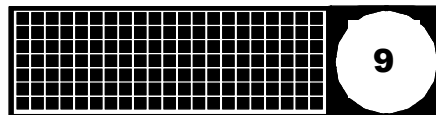
#### The Continued Evolution of Process pH Measurement

The measurement of pH is a key parameter in many chemical-manufacturing processes. Initially measurements were performed by collecting grab samples and measuring the pH with laboratory instruments. The desire to gather representative, real-time information necessitated the development of in-line, process pH measuring systems. Initial process pH sensors were often large, cumbersome and expensive. Often laboratory technology was integrated into the process environment. Unfortunately many times this did not account for the rigors of the process environment. The evolution of pH sensor technology has enabled tremendous changes to occur in the performance and price of today's sensors. Attendees at this presentation will hear about the latest advancements in Sensor technology, construction, and performance and how this directly relates to improved confidence and reliability in the process measurement.

#### Noncontact Measurement of Viscosity

The determination of viscosity from the damping of capillary waves is of great interest as it affords the possibility of measuring viscosity without contact with the fluid. We shall describe a non-contact method for precision measurement of the amplitude and wavelength of capillary waves on fluids. The technique utilizes a miniature laser interferometer to obtain the wave profile with a resolution of about ten nanometers. As a test case we use the system to obtain the dispersion and attenuation of capillary waves on water. Furthermore, the attenuation data is used to obtain the viscosity of water as a function of temperature.

Watch the Analysis Division Home Page at [www.isa.org/~analysis](http://www.isa.org/~analysis) for photos from the Spring Symposia and ISA'2001. Additional pictures will be printed in the next newsletter as well.



# Join Your Analysis Division Colleagues for Lunch during



Mark your calendar now and register for the Analysis Division luncheon during ISA 2001, Tuesday, 11 September, 11:30 a.m., at the George R. Brown Convention Center in Houston, room 311. It's an event you don't want to miss.

Bringing together Members and prospective Members, the luncheon gives you a unique opportunity to meet and mingle with Division Members and leaders. You'll learn more about the Analysis Division, how the Division fits into ISA, and the Division's current status. You'll also have a chance to congratulate Members who will receive awards during ISA 2001.

The luncheon will begin promptly at 11:30 a.m. with a box lunch followed by the business meeting and recognition, finishing by 1:00 p.m. Be sure to arrange your schedule to attend.

The price is US\$16.00 per person. Space is limited, so be sure to complete and return the reservation form below by 31 August 2001.

## Reservation for Analysis Division Luncheon / ISA 2001

Name: \_\_\_\_\_ ISA Member No.: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip code: \_\_\_\_\_

E-mail: \_\_\_\_\_

I wish to reserve \_\_\_ tickets at \$16 per ticket.

Payment Method: \_\_\_ Check enclosed \_\_\_ Credit Card

Credit Card No.: \_\_\_\_\_ Expiry date: \_\_\_\_\_

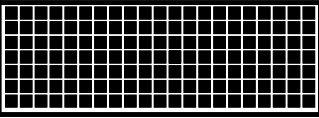
Signature: \_\_\_\_\_

**Mail to:** ISA – Customer Service, PO Box 12277, Research Triangle Park, NC 27709

**Or fax to:** ISA Customer Service, (919) 549-8288

**Or call:** (919) 549-8411 to register by phone.

If you have comments or questions, contact Kelly Bishop at ISA headquarters, (919) 990-9249, or kbishop@isa.org.



Monday			
	10:15 — 11:45	13:00 — 14:30	14:45 — 16:15
Paper 1			
Paper 2			
Paper 3			
Paper 4			
Tuesday — Analysis Division Luncheon @ 11:30			
Paper 1			
Paper 2			
Paper 3			
Paper 4			
Wednesday — A&T / I&S Luncheon			
Paper 1			
Paper 2			
Paper 3			
Paper 4			

Personal Planner of:

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Please return to:

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