Paper Number	Paper Abstract	Paper Title	Author
AD.09.01.01	In Situ Tunable Diode Lasers (TDLs) are ideal at measuring oxygen for Process Control and Safety applications in various industries. They offer extremely fast response to abrupt oxygen concentration changes and since they have no extractive type sample handling systems, can be used in dirty, highly corrosive samples with very low maintenance and subsequent high on stream time. One operational issue has been problematic; online calibration of the oxygen TDL. This paper explains the design and advantages of an internal reference cell which continually, on line, automatically calibrates a TDL measuring oxygen.	Stable, Long Term Calibration of an In Situ Tunable Diode Laser measuring oxygen with a 18 O2 Isotope Internal Reference Cell	Warren Dean
AD.09.01.02	Tunable diode laser (TDL) based gas analyzers continue their emergence as a new, main stream, on-line gas measurement technique for the petrochemical industry due to superior accuracy, sensitivity, repeatability, operational robustness, fast response and lower total cost of ownership, compared to incumbent analytical techniques. This paper presents ongoing improvements made in the trace gas analyzers developed for various petrochemical and energy applications such as measuring from ppb level to % level hydrogen sulfide in sour natural gas, process tail gas, hydroformer regeneration gas and coke gas streams, and measuring from ppb to % level hydrogen chloride measurements in hydroformer regeneration gas, butanes, vinyl chloride monomers and hydrogen recycle streams.	Tunable Diode Laser-Based Gas Analyzers for Hydrogen Sulfide and Hydrogen Chloride Detection in Hydrocarbon Background Streams	Xin Zhou
AD.09.01.03	Important features of gas analysers based on tuneable diode laser absorption spectroscopy (TDLAS) are the speed of response, non-contact in-situ measurement, high dynamic range, and zero cross interference from background gases. Historically most TDL analysers have employed the dual modulation technique for detection. In this paper a new detection concept based on direct absorption spectroscopy (DAS) and digital filtering is presented. The electronic design behind this concept is fully digital enabling response times of 100 ms or lower. Moreover, it is very compact and will fit into analysers with a footprint of less than 12 x 40 cm. These analysers can be designed intrinsically safe (EEx ia) for the measurement of Oxygen (and other gases) in hazardous areas.	Gas analysers based on Tuneable diode laser spectroscopy	Christian Heinlein
AD.09.02.01	The measurement of the concentration of oxygen is a critical factor in the control of many processes. The emergence of new techniques for oxygen measurement in-situ has extended the range of methods available to the user. However, to date there has been limited analysis of the actual errors present for both in situ and traditional extractive methods. This paper explores the major contributory errors present in both cases providing increased understanding of the capabilities of the available techniques to users interested in the selection of oxygen analysers.	A comparative analysis of the errors in the measurement of oxygen between in situ and extractive methods.	James Hobby and Mike Proctor.
AD.09.02.02	Coal is utilized as an energy source by two primary methods: burning in coal-fired electric generation plants and coal gasification the second method results in synthetic gas, known as syngas. Sulfur is the main pollutant-- it must be removed, whether the coal is burned or gasified. UV spectroscopy techniques are used in the measurements of sulfur based components in various critical monitoring sites. The analysis technology needs to be in sync with process developments in order to assure environmentally friendly and economically sound use of coal. In the following, the measurement principles, applications, and sampling systems for a variety of applications will be described.	PROCESS ANALYZER for clean coal applications	Andy Burgess and Yael Barshad

AD.09.02.03	The development of an online multi-component analyzer, incorporated with Two Stage Advanced Oxidation process, for the measurement of Total Nitrogen, Total Phosphorus and Total Organic Carbon, has highlighted the significance of complete oxidation, oxidation load and oxidation capacity. The identification of each element in an oxidation process has clarified the limitations associated with oxidation technologies. When the analysis of a target component in a liquid sample requires an oxidation process, not only the primary compounds, which contains the target component, but also any other secondary compounds present in the sample, will require oxidation. Even if the primary compounds are oxidized completely, any un-oxidized or partially oxidized secondary compounds may create interference and false signals on the measurement of the target component.	A Discussion on the Significance of Complete Oxidation of all Oxidisable Compounds present in a Liquid Sample, where a Target Component to be Analyzed requires Oxidation prior to Measurement.	Ali Demir / Martin Horan
AD.09.03.01	To reduce the negative environmental effects of acid rain, federal regulations require limits on the emission of SO_2 from combustion processes. In many plants, the choices for measuring and controlling SO_2 include the indirect method of measuring H_2S in the fuel gas used for furnaces and other process combustion units. The federal regulations specify a limit on the quantity of H_2S that is permitted in such fuel gases and one common method for measuring the H_2S concentration in fuel gas is with process chromatographs. But two markedly different chromatographic methods also exist which involve using thermal conductivity detection in one case and flame photometric detection in the other. This paper looks at the two techniques and provides comparisons of their relative advantages and disadvantages. Additionally, the potential of the two techniques for modification is considered in light of current discussions about possible further changes in the federal regulations	Topic for GC, will be applications measuring H2S in Fuel Gas by alternative techniques, pros and cons	Bob Farmer
AD.09.03.02	This presentation will discuss a micro gas chromatograph in an explosion proof box with the NeSSI™ sampling platform. The gas analyzer comprises of a credit-card sized cartridge providing the chemical analysis functionality: the detector, separation capability, sample loop, temperature programming and controls. The system can thus be serviced within minutes by exchanging the cartridge, unlike traditional process systems. Together with a docking station the system is world's first reconfigurable chemical analysis system compatible with the NeSSI sampling platform	First NeSSI™ III reconfigurable Gas Analyzer: C2V-200	Job Elders
AD.09.03.03	Even though the Dielectric Barrier Discharge (DBD) principle has been in use for over a hundred years for the production of Ozone, it offers several unique features that are highly advantageous for its use as a Gas Chromatographic (GC) detector. Using only inert gases for operation eliminates the concerns often associated with Flame Ionization Detectors. In addition, the fact that the detector does not burn the sample, eliminates the corrosive atmosphere often created by products resulting form this process and subsequent failure of the detector components. This paper discusses the merits of the DBD over more traditional detectors.	Applications of a Dielectric Barrier Discharge Ionization Detector in a Process Gas Chromatograph	Jerry Clemons
AD.09.04.01	Working your way through the maze of a modular sampling system can be challenging at best. The case is nowhere more pronounced than in liquid sampling applications. Unsubtle details, if overlooked, can alter the outcome drastically. Although modular design offers a great flexibility, attention must be paid to what goes into your system and how performance is affected. This paper takes a close computational and empirical look into the design parameters required when selecting your modular sampling system and makes recommendations on optimizing flow behavior through it.	The Devil is in the Details": Understanding the impact of your design selection on the flow behavior in a Modular Liquid Sampling System	Tanios Bougebrayel and Mike Cost

AD.09.04.02	Type 316 stainless steel is the most common material of choice for process analyzer sample handling systems. While 316 stainless is suitable for many applications, chloride laden sample streams present a challenge that usually leads system designers to alternate, and more costly, materials. The ASTM G48 Method-A Ferric Chloride test is a standard protocol designed to determine the relative pitting resistance of stainless steels and nickel base, chromium bearing alloys. This paper will discuss the test results of two different stainless steel surface treatment processes compared with untreated stainless steel, as well as the potential use of such treatments in sample handling systems to prolong duty cycle in chloride laden samples.	Comparison of the Chloride Pitting Corrosion Resistance of Surface treated Stainless Steel with Untreated Stainless Steel	Tim Volin
AD.09.04.03	Throughout the years there have been a variety of coatings and improved coatings recommended for process streams. This presentation will review test data to develop guidelines of coating compatibility. Sulfur, mercury, moisture and chloride containing streams will be investigated. Data will be applicable to equipment used in stack gas monitoring, compliance with Rule 1118 for flare gas emissions, mercury sampling, and general data for any components exposed to chloride containing streams.	Selection of surface coatings for process lines and equipment used in corrosive and reactive streams	Gary Barone
AD.09.05.01	X-ray Transmission (XRT) is an analytical technique used for the on-line measurement of between 0.05-5% sulfur by weight in hydrocarbons. Using a built in densitometer and temperature sensors, the technique compensates for variations in oil density and minimizes the effects due to changes in the C/H ratio of the oil. XRT is also a technique well suited for the high pressure flow conditions commonly used in pumping heavy hydrocarbon oils. This paper discusses the theory and use of XRT, including trend analysis and blending operations, and shows sulfur calibration results, precision and long-term stability with experimental data obtained using a commercially available on-line XRT analyzer.	Monitoring the Sulfur Content of Hydrocarbon Oils Using On-Line X-Ray Transmission Technology	Scott Fess
AD.09.05.02	FTIR spectroscopy is a mature analytical method for industrial level emission monitoring systems. Experience gained from 16 years of monitoring stack emissions will be presented as well as the operating principle and construction of the FTIR-based Continuous Emissions Monitoring System (FTIR - CEMS). FTIR -spectrometers designed for industrial environments normally provide measurements of up to 12 gases simultaneously. The FTIR analyzer with heated sample cell allows measurement of stack gas “as is”, avoiding distortion of the results for water-soluble compounds like HCL, HF and NH3. Measurements are reliable for low ppm levels in the presence of significant amounts of water vapor. Criteria such as availability, accuracy and calibration stability will be discussed. The design fulfills of the European regulation requirements for emission monitoring and meets US EPA methods.	Fourier transform infrared spectroscopy in continuous emission monitoring	Bruce Herman

AD.09.05.03	The proper operation of an industrial scrubber requires an accurate pH measurement in order to perform to specification. In-line pH electrodes are frequently the target of replacement due to improper readings and poor performance. Sensor installation, including orientation, depth, pipe velocity and other factors can significantly impact the accuracy of the reading, the life expectancy of the sensor and the maintenance requirements. This paper will explore optimization of these conditions giving the user a better understanding on how to improve scrubber performance. Sensor fouling or coating can be a concern, therefore automatic in-place cleaning will be discussed. The use of digital sensors can provide diagnostic feedback such as sensor wear, reference fouling and glass impedance to improve the accuracy and lifetime of the sensor. Data from both on-line and off-line pH and/or ORP analyzers will be reviewed along with the sample conditioning challenges encountered.	Using In-line ph Measurements for Improved Process Control of Scrubbers	John Groetsch
AD.09.06.01	For 2008-2011, the Process Analyzer Enterprise is expected to approach $28 Billion. Optical methods, particularly tunable diode laser based (TDL) instruments, are finding an expanding application scope. The telecommunications industry, with their huge development budgets, has underwritten significant optical technology advances that are ripe for industrial deployment. Traditional methods, such as trace moisture measurement by aluminum oxide capacitive sensing, are being upgraded to meet increasingly demanding standards. Solid-state, dedicated, microanalytical sensors are emerging that can be ganged on a NeSSI platform to provide a complete analytical system tailored to a particular application. Ultimately, the overhead burden and concomitant reliability problems accompanying the use of complex multicomponent analyzer systems may eventually disappear.	PROCESS ANALYZER MARKETPLACE – ABSTRACT	Steve Walton
AD.09.06.02	The petroleum refining and chemical manufacturing industries nationwide have a quantifiable need for Analyzer Technicians to monitor, maintain, repair, and install sampling and analysis equipment. To meet this challenge, Lee College and San Jacinto College have joined forces to create the Analyzer Technician Opportunities Project (ATOP) curriculum funded through an NSF grant. The first analyzer education program offered by a college in the United States, the ATOP program will engage students in the study of analytical instruments, emphasizing their use in safety, product analysis, product quality, and environmental monitoring and control. Hands-on analytical instrumentation applications in the curriculum will include gas chromatography, continuous emission monitoring, pH, conductivity, air and water quality, oxygen in gases, spectrophotometric technologies and sampling systems.	ATOP Grant Lee College & San Jacinto College	Marsha Tuha

AD.09.07.01	The accuracy of the on line analyzer is of the utmost importance to the companies that use these numbers in quality and volume calculations. An on line analyzer can only analyze a sample that is delivered to it by its sampling system. This paper will cover the important points of the typical sampling system. Regardless of how expensive an analyzer might be, or how qualified the operator, the accuracy of the result will be dependant on the sampling system.	Sample system selection and reliability	Tom Welker
AD.09.07.02	A new analyzer for the measurement of water vapor and carbon dioxide concentration was developed, based on Tunable Diode Laser Absorption Spectroscopy (TDLAS). 1854-nm and 2004-nm DFB laser diodes were used for measurements of moisture and carbon dioxide content in natural gas stream. An original feature of the instrument design is the use of an all-digital protocol for the modulation of the laser drive signal and the demodulation of the detector response, providing a simple means of varying the type of modulation protocol and all associated instrumental parameters. A limit of detection (LOD) of 5 ppmv and a range of 2500 ppmv were demonstrated under a variety of experimental conditions and background gases.	Process Gas Analyzer for the Measurement of Water and Carbon Dioxide Concentration	Airat Amerov, Sam Langridge, and Robert Fiore
AD.09.07.03	This presentation is intended to highlight the need for a fundamental change in the design and architecture of commercially available measurement systems. A quick overview of the current state of the art is used to identify the issues that directly impact implementation, maintenance, and overall cost of ownership. Supplier opportunities are identified as the incentive for a new approach. A design philosophy that expands the supplier's scope from a device centered approach to a whole system approach is presented.	The User's Input To Future Commercial Measurement System Design	Manual Alvarez
AD.09.08.01	Process mass spectrometers are recognized as valuable tools when speed and accuracy of gas composition analysis are important aspects of a process optimization scheme. The complexity of calibration can be problematic for some applications, however. This paper describes the use of advanced ion optical modelling tools as used in the design of a mass spectrometer that provides a high degree of calibration transferability. Problems of analyzer complexity (both real and perceived) are also addressed with a view to achieving a sub 3-hour annual maintenance procedure to maximize analyzer availability and minimize technical training requirements.	Process Mass Spectrometer Development Using Advanced Software Tools	Peter Traynor, Darren Groombridge
AD.09.08.02	Control of material color characteristics is a critical requirement for manufacturers of a wide array of consumer products such as counter tops, paints and cosmetics. The primary method of measurement is by colorimeter in the factory lab. It is now possible to take these measurements at the process line in real time through use of vision system technology which can be calibrated to yield the same RGB (or Lab, XYZ etc…) data as the colorimeter. This advancement in vision technology, along with the existing process readiness of vision equipment, enables the process engineer to improve quality and eliminate waste of time, material and energy resources.	ON LINE COLOR ANALYSIS WITH STANDARD VISION TECHNOLOGY	Thomas Canty and Paul O'Brien

AD.09.08.03	Petrochemical process industries have been pursuing techniques which provide accurate, reliable, fast and cost effective, online trace gas measurements for process control purposes. Tunable diode laser absorption spectroscopy (TDLAS) technology is being used advantageously in the measurement of trace gases since it offers significant advantages due to their high sensitivity, high spectral resolution, fast response time and operational robustness. This paper presents the latest progress in the development of advanced TDL trace gas sensors. Example measurements of ppb level NH_3 in Ethylene and ppm level CO_2 in very complex Synthol reactor tail gas are presented, demonstrating that TDL trace gas analyzers deliver improved sensitivity, accuracy, repeatability and dynamic range for on-line petrochemical applications.	Advanced NH_3 and CO_2 TDL Gas Analyzers for Petrochemical Process Control and Product Qualification	Sherry Liu
AD.09.09.01	Clean Fuels regulations have a substantial impact on a refiner's ability to maximize product draws. Many refiners are significantly undercutting these draws ensure minimum error in downstream product blends. On-line NMR based analytical and process control strategies enhance clean fuels production directly at the CDU. As ultra-low sulfur requirements force stringent constraints on hydtotreater feeds, NMR can maximize clean diesel recovery by enabling closer cut point control in the CDU mid-section thereby reducing dibenzyl thiophene breakthrough. Integrating proven NMR technology with a focused measurement and control strategy enables crude unit operations to cut "chemically" closer to the hydrotreater constraint limit.	Integrated Analysis And Control To Enhance Clean Fuels Production	Paul Giammatteo, Tal Cohen, and John Edwards
AD.09.09.02	BOD – Biological Oxygen Demand is key parameter to monitor Industrial Water Quality. Patented & versatile BOD- biosensor provides rapid & reproducible results in samples with varying bio-degradability. It senses BOD Load within 5-10 minutes. Bio-component provides pre-standardized microbial consortium. Immobilization leads to long shelf life, viability & stability. The patented cell beads capable of assimilating almost entire organic matter comprise of a formulated, synergistic, immobilized microbial consortium *which after interfacing with electronic device provides instant BOD estimates*. Upon validating results in Beverage & Dairy, similar efforts are continuing in Pulp & Paper, Petrochemicals etc, before completing process of Commercialization	BOD Analyzer: Focus on Reliable, Rapid Method of Measurement with Validation	Prakash Bapat.

AD.09.09.03	This work presents a new methodology for the fast implementation of industrial control and automation applications using structured cores compositions for the formulation of control algorithms and efficient systematic procedures for mapping these algorithms to multiple programmable logic controller (PLC) hardware platforms, through modular and functional programming techniques, and portable core generation efforts. Structured language is used as a tool language to identify in an integrated and coherent manner similarities and differences between traditional PLC hardware implementations, which usually result in time consuming and hardly portable applications between different hardware platforms. The new methodology presented in this work has been successfully tested for the generation of automation processing cores using PLC platforms and software development tools from different hardware manufactures, for the water filtration and waste water processing analysis.	Programming methods for a plc multiplatform implementation of water filtration and waste water processing applications	Alberto Quinchanegua
AD.09.10.01	In order to demonstrate compliance with EPA Emission Standards, production plants must§ interpret the standards, implement solutions, and then maintain measurement systems. This paper will provide an overview of environmental measurement objectives and experiences of selected existing regulations. Although required in a limited geographical area, some State regulations will be discussed as well, as they contain a number of analytical peculiarities, and which may impact other regions in the near future.	Environmental Regulations for the Petroleum and Petrochemical Industries	Jerry Combs
AD.09.10.02	Globally, safety standards play a key role in designing and executing gas and flame detection projects. How can we turn these standards, which might seem cumbersome at times, to our advantage from a safety and process efficiency standpoint? What benefits can we as safety engineers see for our companies? This paper will analyze standards from an end-user view, will consider standards' importance in flame and gas detection, and will assess the value of third-party certifications to those standards.	Improving safety by conforming to industry standards and obtaining certifications	Jerry Alley
AD.09.10.03	Combined oxygen and combustibles analyzers have been widely used to improve combustion efficiency and to reduce NOx emissions. The past few years have seen increasing numbers of applications where oxygen and combustibles analyzers have also been used to detect unsafe conditions in fired heaters, and they have proven themselves to be very reliable. However, the use of IEC 61508 and IEC 61511 in the process industries mean that process operators are using SIL certification as a tool to improve process safety. This has important implications for the design and operation of these analyzers	Oxygen and Combustibles Analyzers in Safety Instrumented Systems	Derek Stuart