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Providing Complete Solutions for Energy and Chemical Analysis

AGILENT HELPS SCIENTISTS DISCOVER, REFINE, AND DEVELOP USEFUL CHEMICALS AND FUELS

The world is in a race to develop alternative energy sources such as biofuels and to create better ways to harvest hard-to-get resources such as natural gas trapped in shale formations. With this race comes the necessity for advanced technologies for testing, analyzing, and producing these products—technologies designed to ensure they meet current safety, quality, and regulatory standards.

Agilent is a leading provider of testing and measurement systems that meet the diverse needs of the energy and chemical industries. All around the world, the company's technologies are used in testing consumer products, refining crude oil, and conducting research into alternative sources of energy.

Agilent's portfolio includes powerful gas and liquid chromatographs, spectroscopy systems, automated analysis solutions, and data management technologies. The company's solutions are distinguished by their ability to perform with exceptional speed, precision, and reliability.

Today, Agilent works with customers around the world to develop enhanced technologies and applications that will drive advances in the fields of energy and chemical research. Some of these important technologies and applications are featured below.

An ongoing collaboration between Agilent and the University of Houston's Department of Earth and Atmospheric Sciences is opening up exciting opportunities to transform energy production in the United States. Agilent is supplying the DEAS with a comprehensive suite of technologies that will aid in research into the geology and composition of crude oil. The company's instruments will be used to identify and measure constituents in geological specimens and to separate, identify, and measure the thousands of compounds found in crude oil samples. These tools will enable researchers to generate once-inaccessible data and provide new insights into the discovery and use of petroleum.

Exploration and Production of Petroleum

Consider a company drilling for oil. With the help of a high-end Agilent gas chromatography system, the company can determine what the biomarkers, or molecular fossils, in the oil have to say about its origins. That information, when combined with various kinds of geological data, can help the company estimate the size of the reserve.

Petroleum biomarkers are complex molecular fossils derived from once living organisms which provide unique clues to the identity of source rocks from which petroleum samples are derived. These biomarkers are often elusive and difficult to identify and measure, requiring traditionally lengthy and complex protocols.

Recently, using column back-flushing with one of Agilent's triple quadrupole GC/MS systems, collaborators from the United States and Brazil discovered that they could not only reduce run times to analyze petroleum biomarkers, they could also run at higher speeds/volumes than traditional characterization processes—all while maintaining the high levels of chromatographic sensitivity and resolution needed for petroleum fingerprinting.

Oil Refineries and Chemical Plants

Crude oil is a mixture of thousands of different compounds, and each reserve has a unique composition. The question oil companies ask, then, is this: How can we get the most valuable slate of products from this crude oil? Agilent's gas chromatographs provide answers. Oil companies can shoot a sample into the GC and look at the patterns that come out. From that, they get information about all the compounds that are present. They put that data into their refinery model, and it tells them the best mix of products they can get from that oil.

Gasoline, obviously, is one high-value product. Diesel is another. There are also lighter materials such as ethylene and propylene. Downstream, those are fed into polymer plants to make plastics for everything from milk jugs to children's toys. Each product, whatever it may be, has to meet certain specifications. Certain amounts of different components are allowed, and Agilent instruments are used to measure the amounts.

In a refinery or chemical plant, as the material is being processed, technicians take samples and send them to the lab for analysis. It's a continuous process, and the results have to go back to the operations unit quickly. That allows refineries to make adjustments to ensure their products are within specifications. This in-process testing is extremely important. If the process drifts out of specification, it can cost the company thousands of dollars per hour.

Natural Gas

The technology of hydraulic fracturing of shale formations to release trapped hydrocarbons has made vast global reserves of natural gas economically accessible for the first time. While the US is currently the major producer of natural gas using this technology, other regions are debating the exploitation of these vast reserves as the associated environmental problems are solved and a proper regulatory framework is developed for the industry. As more natural gas replaces coal and other heavy hydrocarbons, this clean burning fuel will play an increasingly important role in determining the future of both energy and climate policy for decades to come.

Prior to entering the commercial distribution network, natural gas must first be certified to meet purity and heat content standards. This testing is important for the gas producer to determine the fair market price for the product and for the consumer to ensure that the product safely delivers the agreed energy content at the contracted cost. Agilent natural gas analyzers deliver fast, reliably, precise measurements to meet these needs.

Biofuels Analysis

Sample preparation, a critical component to any chemical measurement and analysis process, can be extraordinarily complex and hazardous if conducted improperly. Agilent provides simple, yet highly advanced solutions to address complex, multistep tasks that once required laborious manual processes. Agilent sample-prep solutions are used to prepare biodiesel calibration standards and to perform sample preparation for several different types of biodiesel. Compared with traditional manual sample prep methods, this technology provides equal precision, uses fewer solvents and reagents, and eliminates the need for expensive glassware.

Predictive Maintenance Testing

Lubricants are essential for maintaining the operating integrity of machinery such as turbines, pumps, compressors, extruders, and so forth in refineries and chemical plants. Maintenance programs regularly test the condition of these fluids to ensure that their properties remain within the proper range to protect the machine from damage that might lead to a catastrophic failure that shuts down operations.

To keep that from happening, Agilent has developed a predictive maintenance program using Fourier transform infrared spectroscopy for on-the-spot analysis. Just place a drop of the oil in the sample cell and rotate the spectrometer head into place. The instrument then displays the condition of the antioxidants that protect the lubricating oil, the degree of oxidation in the oil, and the moisture content. Since results are available immediately, antioxidant levels can be restored or the lubricant changed during the inspection process, without waiting for lab results.

Transforming Power Generation

Electrical transformers are used to “transform” voltage from one level to another, usually from a higher voltage to a lower voltage. Because these transformers use oil as a coolant and insulator they are vulnerable to natural aging and the effects of oxidation, vaporization, oil breakdown, and other decomposition. They must be routinely monitored and carefully maintained. Agilent provides ready-to-use analyzers that enable fast, accurate analysis of transformer gas to prevent transformer failure.

To learn more, visit Agilent’s [Energy & Chemicals Solutions](#) website.