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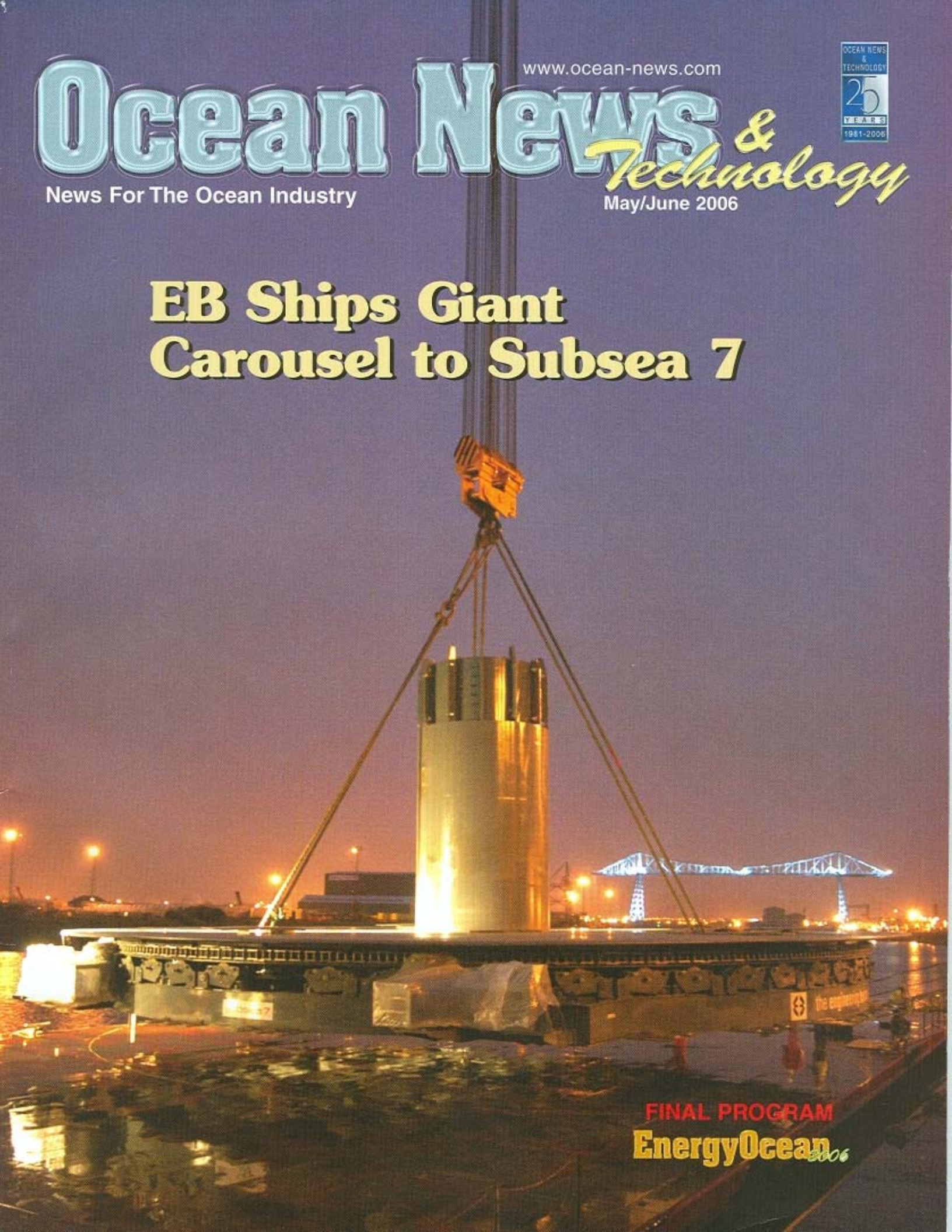

FINAL PROGRAM

EnergyOcean 2006

COMPANY SPOTLIGHT

SpectraSensors, Inc.

NASA-Based Technology Keeps Moisture Out of Gas Pipelines

Reliable NASA-based gas analyzer technology keeps producers aware of moisture content before entering El Paso Natural Gas Company pipeline, blocking formation of problematic carbolic acid and helping producers avoid expensive shut-ins.

The U.S. space program has produced an amazing number of advanced technologies, many of which are benefiting consumers, science and industry every day. Among those, NASA-sponsored research has developed sensors for environmental control that are now applicable to the natural gas industry. Tunable diode laser (TDL)-based technology developed by NASA's Jet Propulsion Laboratory (JPL) now promises highly accurate and dependable detection of contaminants – including moisture—in a natural gas analyzer that enables producers and pipeline operators to prevent "wet gas" from entering the pipeline system.

In the past, natural gas producers, processors, and distributors, have relied on direct-contact, surface-based electrochemical and crystal sensors for measurement of residual moisture or other contaminants in gas pipelines. However, that technologically old sensor technology has, at times, proven highly unreliable—producing false data that can result in unwarranted shut-ins or contaminated gas getting through pipelines.

"If we were to shut-in a producer due to a false moisture reading, millions of cubic feet of gas could be delayed and possibly incur unnecessary dehydration costs," said Melvin Yancey, a Field Measurement Technician at the El Paso Natural Gas Company's (EPNG) San Juan District in the Four Corners Area. "On the other hand, if the gas does not meet EPNG's criteria for quality, as required in our tariff, we would not take the gas and the gas may have to be vented."

To avoid those possibilities and meet quality standards of pipeline gas, EPNG has installed new TDL-based (also known as "laser-based") analyzers where each of its 16 major producers in the San Juan area joins the pipeline. Companies such as SpectraSensors, Inc manufacture TDL-type analyzers. The California-based company is one of the leading developers and producers of optical-based sensors. They manufacture "bread-box-size" sensors that provide non-contact measurement of moisture, carbon dioxide, and other corrosives and contaminants in natural gas pipelines.

Because pipeline operators time have multiple producers flowing large volumes through a common point, they must immediately and accurately know the "point of concern" where unacceptable impurities such as moisture are entering the system in order to notify or shut-

in only the input at fault. By providing real-time communications with producers who are unknowing shipping over-spec (wet) gas, pipeline operators can provide huge savings and keep the pipeline full. At the same time, with a SpectraSensors-type TDL analyzer installed, the pipeline operator can automatically shut-in individual producers with an over-spec gas problem. This allows the other producers to maintain their flow requirements and also improves system reliability over thousands of miles of pipelines. With those benefits in view, a single incident could easily pay for this advanced sensing technology.

This advanced analyzer technology also saves on pipeline maintenance costs. By blocking the formation of carbolic acid (from water combining with the CO present in natural gas), resulting corrosion and erosion of pipeline is prevented, thereby also saving substantially on associated maintenance expenditures.

The ever-increasing use of TDL analyzers by the natural gas industry has consistently shown that they are fast, highly accurate and much more flexible than their electrochemical predecessors. They are also proving to be cost effective as well. While initial purchase price is somewhat higher than surface-based sensors, even the most conservative evaluation of this advanced technology indicates that maintenance saving alone (e.g., calibration, replacement sensor heads, service labor), will also provide a return on investment in a relatively short period of time.

El Paso feels that pipeline operators and producers alike are in need of ongoing and accurate gas analysis. "If there were faulty or bad readings," said Yancey, "then the customer is going to dispute why I shut them in. Let's say a producer is piping 400 million cubic feet of gas. So, if I shut in that producer, the cost could be immense."

So that each producer can monitor El Paso's gas analyzer readings, they are capturing the electronic signal from El Paso's unit via a SCADA system and viewing the readings at the producer's control room.

Considering the downside risk from moisture in the gas, and that TDL analyzers are monitoring the quality of gas worth tens of millions of dollars per day within this area of EPNG's transmission alone, it is reasonable to conclude that this laser-based sensor system could pay for itself in a brief period of time.

For example, transmission pipeline operators have frequently relied on electrochemical sensors as gas analyzers to monitor moisture. These sensors incorporate a coated surface, and a higher electrical capacitance across the surface, indicating higher water content. However, these capacitance sensors are susceptible to contamination by glycols or amines in the gas, which can cause exaggerated readings or a failure to detect. An erroneously high reading could force the operator to temporarily shut down the pipeline, costing the company tens or hundreds of thousands of dollars. The gas producer may choose to over-process the gas to ensure that it is within the tariffs imposed by the pipeline operator. The TDL analyzer responds quickly and provides a reliable measurement that will not drift; it can be used in a closed loop to control the blending of dry and wet gas, allowing the producer of pipeline to optimized costs by staying just within the tariff.

The high spectral purity of the TDL enables the detection of specific gases – such as water, ammonia, and carbon dioxide. Measurement intervals are as frequent as every two seconds, giving far more timely responses than the several-minute (sometimes hours) readings of contaminant-vulnerable quartz crystal and electrochemical sensors. And those must be frequently cleaned and replaced.

Because a laser system never comes into contact with the contaminants present in natural gas—as do electrochemical and crystal gas sensors—the laser-based gas analyzer practically eliminates maintenance and operational costs. Studies have shown that the cost of operating and maintaining "conventional" electrochemical continues to escalate annually, including labor, recalibration, and rebuilding, back-up sensor heads as well as unnecessary gas dehydration and tariffs—all of which are obviated by the laser-based gas sensor. It is not unusual for electrochemical sensors to carry with them a cumulative annual expenses exceeding $50,000 per unit, most of which can be avoided through the use of a more dependable laser-based technology that provides more timely information and eliminates maintenance headaches.

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