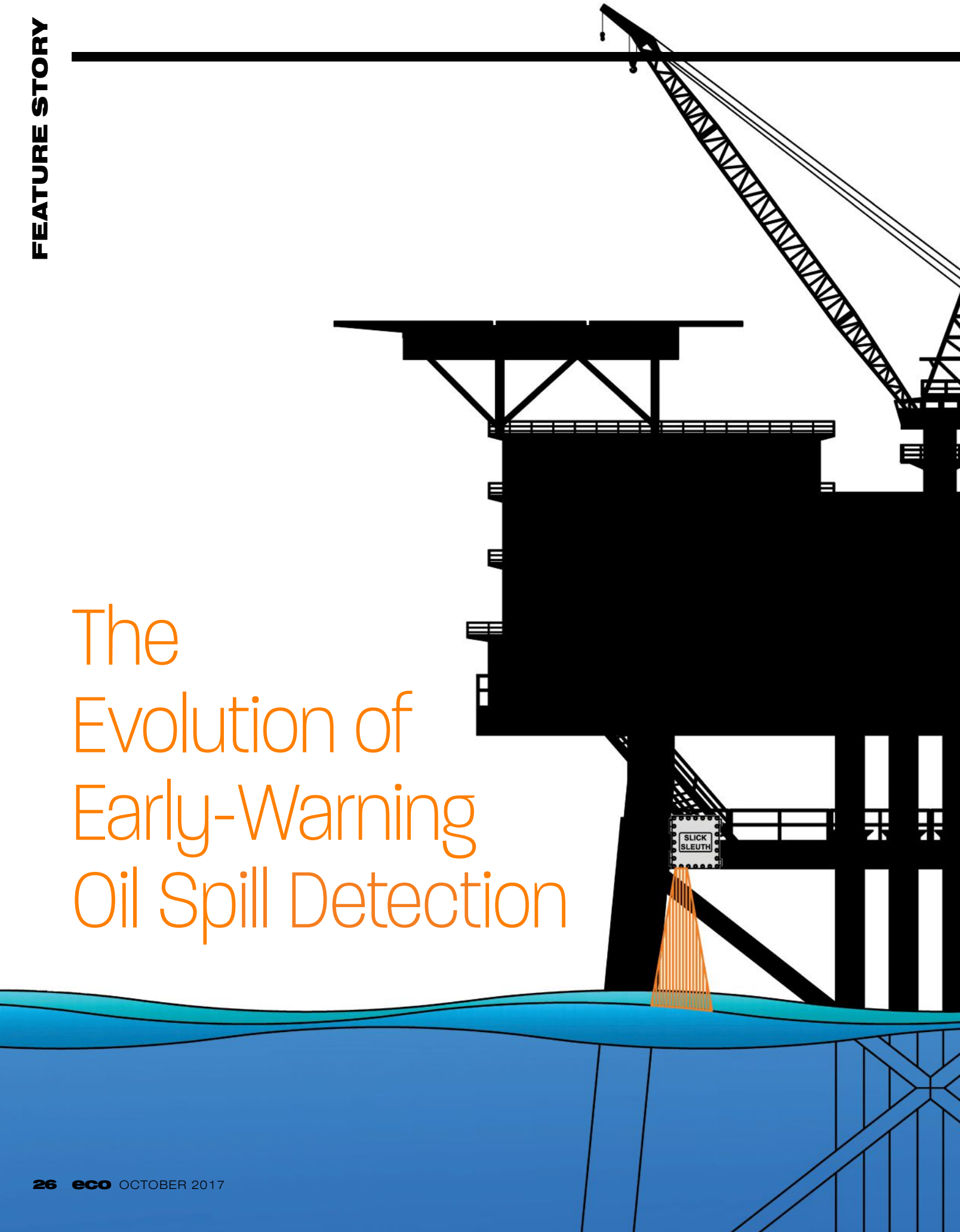
The Evolution of Early-Warning Oil Spill Detection



How Slick Sleuth Oil Spill Detectors Prevent Oil from Ever Reaching the Environment

By Chris Chase, Interocean Systems

Background

Oil spills from sinking tankers and rig failures make headline-grabbing news and are a source of nightmarish spill events. In fact, however, the majority of oil pollution released to the environment comes from shore-based sources (industrial activities and urban runoff) coupled with frequent smaller events occurring every day along our coastlines and offshore.

Twelve years ago, InterOcean developed an oil-on-water sensor system for an overseas customer interested in installing oil spill detectors on environmental monitoring buoys throughout their working port. The system worked—our "Slick Sleuth" product line was born, and off we went to other ports and harbors to promote use of this novel new system. Unfortunately, we met with limited success, as we discovered that while port operators liked the idea of early-warning spill detection, neither the existing regulations nor the cost-benefit arguments were sufficient to compel them to invest in systems of their own.

This may have been the end of the story had not a larger and more immediate market for early-warning spill detection presented itself. Unanticipated inquiries began flowing in from operators of refineries, power plants, steel mills, and other industrial entities concerned with preventing accidental releases of oil from their facilities. It quickly became evident that the spill detection technology we'd developed for use on monitoring buoys was (and is) a cost-effective tool for use at industrial facilities to prevent oil from ever reaching the environment.

By detecting and containing a spill that would otherwise have reached an inland or coastal waterway, a refinery (for example) avoids costs associated with cleanup, remediation, fines, unwanted public/regulatory attention, and tarnished corporate image. And the benefits extend well beyond cost-savings when a company presents a posture of environmental stewardship and adopts a culture of social responsibility.

Solution

Slick Sleuth oil spill detectors are an optical non-contact system that can be thought of "like a camera that sees oil, combined with a smoke alarm" that sends remote early-warning alerts whenever oil is detected. The patented sensor technology is based upon the principle of ultraviolet (UV) fluorometry, which enables highly sensitive micron-level sheen detection of a wide array of hydrocarbons/oils on water (and ground). The optical sensor and detector are housed in a ruggedized enclosure that can be mounted anywhere there is value in early-warning spill detection, so long as it has a clear optical path to the surface being monitored below and is within roughly 30 feet of the target.

The majority of sensors installed to date are used to monitor storm water and cooling water discharge in industrial sewers, sumps, separators, settling ponds, and outfalls. When an accidental discharge is detected, a real-time alert is sent to facility personnel, enabling early-warning response and, in many instances triggering automated containment by actuating a valve or controlling a pump. Early-warning detection equates to spill risk mitigation, and Slick Sleuth technology has evolved in recent years for use in a variety of applications that we had not anticipated at the outset, but provide value to the end users and benefit our communities and the environment.

Typical installation of oil spill monitor on an industrial sewer.

Refineries

Refineries tend to have many types of oil, many potential sources for leaks and spills, and many points where oil can potentially be discharged to the environment. Oil detectors are are now commonly installed on catchments, oily-water separators, drainages and outfalls to provide real-time monitoring, alerts, and even containment. A 'heat-mapping' approach can be used to assess where the highest-risks of spills occurring are, whereby sensors can be strategically placed, (1) at locations where spills have occurred previously; (2) in proximity to point sources, or automated containment points, near to sensitive areas that would be most heavily-impacted should a spill occur; (3) positioned at confluence points, where one sensor can in-effect cover a wider area; (4) as well as at facilities' fail safe points such as dischargs and outfall.

Floating-Roof Tanks

Many of the large oil/fuel tanks that we see as we drive by storage terminals have floating roofs, which rise and fall depending on the fluid level within the tank. When it rains, the storm water drains through a line that goes from the roof, through the tank, to a discharge valve exiting the tank at ground

Real-time spill monitoring on an offshore buoy.

level. This discharge valve is either left open all of the time or kept in a normally closed position and then must be manually opened when rainwater begins to accumulate on the roof. The risk in the "valve normally closed scenario" is that human intervention is required (to open tank roof valves while it is storming)—and if too much water accumulates, the roof can sink—a worst case scenario. In fact, a number of sunken roofs have been reported recently in the wake of Hurricane Harvey.

On the other hand, if the valve is normally left open, then any time a roof drain line or coupling begins to seep, or worse yet fails, the contents of the tank discharge through what is meant to be only a roof drain—also a very undesirable outcome. Slick Sleuth spill detection sensors are now being incorporated into a system called EnviroEye, a system that connects to floating-roof tank drain lines, monitors for oil, and if even the slightest amount of oil is present the system detects it, automatically shuts the drain valve, and alerts facility personnel. This new solution is being used to solve an age-old problem, which allows operators to leave floating-roof drain valves open all of the time, secure in the knowledge that their tank roofs will not fail and no accidental spills will occur.

Marine Terminals

The greatest risks for spills at marine terminals are associated with product transfer between ship and shore. Spill detectors are now being installed along fuel/oil loading piers, to provide 24/7 monitoring, for early-warning detection and alert in the event that an over-fill occurs, coupling fails, pipeline leaks, etc. This is especially valuable at night time when personnel cannot see if there is oil on the water, which is the most common way a spill is detected from a loading pier—in absence of a real-time spill monitoring system.

Tidal Wetlands

Oil production within the Bolsa Chica Wetlands in California abuts an exclusive coastal community, the Huntington Beach shoreline, and is a revered bird nesting sanctuary. Tidal gates are in place around the wetlands to contain a spill (should one ever occur), and each of the tidal gate locations is coupled with a Slick Sleuth oil spill detection sensor for early warning monitoring and control. While this spill detection system cannot prevent a spill from occurring, it is an example of using environmental technology as a proactive measure to help mitigate risk, protect against a spill going unnoticed for any period of time, and prevent an accidental release of oil from spreading beyond the immediate area of containment.

Moving Forward

Looking ahead, technology will continue to play a bigger in all facets of life, including the seemingly disparate fields of industrial automation and environmental monitoring. It is also a certainty that our reliance on oil as a primary energy source will continue for many years to come. As such, we anticipate that expanded use of autonomous real-time monitoring technologies will be deployed to protect against oil spills, both for existing applications such as those described above, as well as for farther-reaching applications.

For example, there has been huge public outcry against new pipelines planned for oil transport across the U.S. and Canada. These projects are likely to proceed; at the same time, the methods for monitoring pipelines for leaks and spills still leave much to be desired. There is a need for improved technology to monitor pipelines and minimize the risk of spills and leaks.

Likewise, oil drilling and production offshore will continue for the foreseeable future, yet there is currently little or no automated monitoring for spills on drill rigs or offshore production platforms. Interocean has developed a new system for this application and the first installation of "Rgi Guard" is planned for December 2017. This system will be used to monitor for oil on the sea surface under/around platforms, to alert personnel in real-time should an accidental release occur. We anticipate this system will provide value for all stakeholders and offer a win-win solution, particularly for regions such as the Gulf of Mexico. No doubt similar opportunities abound to adapt and develop environmental solutions for real-world applications, some of which have not yet even been envisioned.