Oil and gas drilling operations can be among the most hazardous on the planet. The shale plays of North America harbor an abundance of critical resources. Unfortunately, they also contain other substances like butane, propane, and hydrogen sulfide (H2S) that can leak during extraction or fracking processes and create explosive and hazardous environments. Monitoring and control systems, gas detectors and alarms, and advanced communications help keep these facilities safe, but only recently have advanced technology and automation come together to create a high-level solution that is taking life-safety to a new level and changing the playing field of oilfield automation.

Known as TekNet, this dynamic safety system technology provides life-safety gas detection that enables real-time decisions, and is the culmination of a cooperative strategic partnership among four firms. The brainchild of Crawford Technical Systems (CTS), a systems integrator that works with industrial manufacturers and shale gas exploration, the system uses Siemens Industry's TIA Portal programming software to integrate a variety of Siemens automation components. The system uses wireless gas detection equipment from RAE Systems, a provider of connected, intelligent detection systems, creating an enterprise-level SCADA system offering marketed and distributed by TekSolv, an East Coast safety consulting firm.
It was a development that happened almost by chance. Conversation among Siemens, Crawford Technical Systems, and TekSolv representatives at an oil industry show in the fall of 2012 turned to the problems of detecting hazardous gases – in particular H2S – in oil and gas drilling. "In the course of our discussions," explains Matthew Netsch, TekSolv’s director of sales and marketing, "we realized we could incorporate Siemens automation components [PLC’s, communications modems, and visualization systems, in particular] into a configuration that would make real-time data accessible to everyone and raise the level of safety for these often highly volatile operations."

**So just what is TekNet?**

In those brief moments, a solution was born. The end result was a process facility monitoring system that controls life safety systems (gas detection), process and production data, security systems, alarm management, and data logging. TekNet features unlimited process data connections; its open protocol connects to thousands of manufacturers. Its success turns on its use of Internet and smartphone capabilities to alert authorized personnel to impending hazards in real time through alarming, email, and text messaging.

Mr. Netsch calls it extraordinary safety system technology that saves time and money. Integral to the system is RAE Systems MeshGuard gas detection system. "We had used this equipment previously and were familiar with its communication capabilities," says Netsch. It features a Class 1, Division 1 sensor in a connected, intelligent wireless gas detection system designed to save lives, cut regulation compliance costs, and facilitate information processing by putting current information at the fingertips of safety personnel throughout the network. RAE systems were the first in the industry to develop wireless gas detection for safety applications with real-time monitoring capability. "For over 13 years our cutting edge technology has been able to protect lives in oil and gas industry in a variety of applications”, says Prabhu Soundararajan, Director of Applications / Solutions at RAE systems.

Imperative to the success of TekNet was the integration of automation products from Siemens Industry to control the operations and manage and distribute data. Key components include the Siemens S7-1200 product family operating on the TIA Portal software suite. As the largest manufacturer of industrial control automation, Siemens can provide and support existing and future applications regardless of location and project site.

"And, of course, we’re using TIA Portal, v. 12, to program everything," adds Jason Reed, CTS vice president. Chosen for its size, cost, reliability, and functionality, the powerful S7 1215 PLC offers a number of advantages, including its ability to be programmed with Siemens’ programming software. "TIA Portal ties everything together in one environment," notes Reed. "We can use the same software to configure the SCADA system that we use to program the PLC’s."

Reed admits to liking virtually everything about the TIA Portal, pointing to such features as reusability of code, which can reduce engineering time for a task by nearly a third. "All the built-in functions of S7-1200 PLC’s are in TIA Portal," he goes on, "as are all the communications and the Modbus network. It is all drag-and-drop. It allows you to build your own libraries. And, it is easier for our technicians in the field to use it because it is easy to learn. They can come up to speed faster. It is a unified automation platform that enables standardization of operations.”
**Seeking a new and improved solution**

In seeking a new and improved solution In short order, TekNet found acceptance in the drilling industry at Pason Systems USA, who quickly became one the of solution’s strongest proponents. A global provider of specialized data management systems for land-based and offshore rigs, Pason is a leader in the field with more than 2,000 drilling rigs operating worldwide. Its primary function is to install sensor suites and computer systems on rigs, monitor drilling activities, and aggregate data into computer terminals for distribution over the Internet throughout a location and throughout the world.

Joe Watson, Eastern regional manager at Pason elaborates; “Once we saw the TekNet system, we recognized the potential of tying it into to give our customers the ability to view and access their drilling data on all their workstations across all locations. And by integrating with TekNet, we also are achieving the high quality, reliable sensing we need. Any drilling location that could potentially encounter H2S must have good monitoring equipment. H2S is one of the most toxic substances known and a serious problem on drilling rigs. It is a naturally occurring byproduct of oil and gas creation underground,” says Watson, a geologist. “It always has the potential to be there to one degree or another. This advanced technology has enhanced early detection system capabilities for protecting workers in the field. It alarms in milliseconds at H2S levels as low as 10 ppm and gets the right people looking at the situation fast.”

TekNet is presently active at twenty-five Pason locations, with a dozen more in the works. “We don’t mandate its use,” says Watson, “but our customers have been asking for this type of technology and this solution is the one we are recommending. The equipment has been highly successful and I have every reason to believe installations will continue. TekNet features quick, simple, and easy installation and connection. The first system, which connects to a Modbus network, was installed in March 2013 and took about two days to become active,” recalls Watson. “But the additional ones took only about 15 minutes each. Once we knew how to do it, it was pretty much plug-and-play.

**Game-changing technology that saves lives**

The new system improves safety by gathering precise data in real time, giving all authorized personnel access to safety-critical data where once they had no access at all. Information is distributed over the Internet and, in a groundbreaking move, is also accessible through smart phone applications. Further, more data is permanently stored to make available historical trends and aid post-accident investigations. Alarms can be set to bundle our technology with automation solutions to protect lives in the drilling and fracking industry to secure our energy future,” said Prabhu Soundararajan, Director of Applications and Solutions at RAE Systems.

Matt Netsch calls TekNet “technology that is game changing for the oil and gas drilling industry. We can take our gas detection readings from the rigs and give it to safety personnel in the field as well as corporate-level management, showing them on their smart phones what is happening with gas detection in the field in real time,” he stresses, adding that by tapping into the capabilities of today’s popular smart phones, the system is able to increase the reliability of drill rig safety systems and reduce the number of incidents. He sees the use of smart phones to transmit data instantly as revolutionary.

“Providing such data lets educated decisions be made about current site conditions,” he continues, “alerting personnel to issues by email or messaging and rapidly dispatching professionals to investigate an alarm while triggering audible and visible alarms on site through local annunciation systems. Smart phones make information readily available to corporate safety and health managers, safety personnel, and even operations personnel. We believe we are leading the industry here as one of the first applications to pull real-time data to smart phones.”

Evaluating the success of TekNet at this point is admittedly difficult because there are no metrics against which to measure. Nothing like this system existed before. However, no incidents have occurred in areas in which the system has been installed, although an abundance of alarms have been recorded. “At first, I was surprised at the number of alarms,” admits CTS’ Len Crawford. “I thought the system was not working properly or that the alarms were mistakes. So many sensors were detecting high gas values. But we found these were not errors. Our system was working appropriately and these were simply real-world situations. The system was detecting circumstances that could lead to potential hazards more frequently than in the past – and keeping them from happening.”

Every player in this joint effort agrees this is a technology that will save lives. “People aren’t used to seeing this kind of system yet,” says Crawford. “It is a brand new product that offers real-time life safety and process automation for the oil field. However, the industry is continually coming up with new ways to integrate it into existing infrastructures.”

![RAE Systems MeshGuard Wireless Gas Detector](image)
TekNet is patent pending. For more information on TekNet and the products that are making this new technology possible, visit the websites of the companies who have contributed to its success: Crawford Technical Services (CTS), [www.crawford-tech.com]; Pason Systems [pasonusa.com]; RAE Systems Inc. [www.raesystems.com]; Siemens Industry, Inc. [usa.siemens.com/automation]; and TekSolv [teksolv.com].