



RFID Implementation in Oil & Gas Industry

Introduction

The oil industry has recently had their business processes re-analyzed with recent events and new regulations that have caused oil companies to rethink their supply chain, maintenance procedures, and asset management. The good news is that technology has evolved to help provide faster, safer, and more intelligent methods to keep employees safe, ensure maintenance and inspection processes are followed, and keep businesses running smoothly.

In this whitepaper we will consider three top areas where RFID technology is benefiting the oil and gas industry in performance: maintenance and inspection, asset tracking, and supply chain operations. The following whitepaper is collaboration from the top specialized providers of RFID technology for the petroleum industry to share the lessons learned about the use of RFID, and its potential to improve operations within the industry. Each case study will provide a model for technical considerations in RFID deployment and the benefits the technology can bring.

Oil & Gas RFID Solution Group

Supporting the successful adoption of RFID within industry will require the consolidated effort of industry professionals and end-users. Recently, a solution group within the space was formed to accelerate and execute these very activities. Named the "Oil & Gas RFID Solution Group", this group consists of Oil & Gas companies, technology service providers, and academic researchers from Texas A&M University and University of Houston. The group is working in collaboration with other standards bodies including EPC Global, as well as some end-users, to define industry wide road- maps for successful adoption of RFID Technology.

Currently, the OGR is identifying high-value opportunities for RFID and gathering use cases that demonstrate the technology's viability for applications such as construction management, drill string validation, hazardous material disposal, and product lifecycle management.

Standards

In order for the oil and gas industry to adopt RFID on a wide scale, industry standards must be established so that stakeholders can be confident that the technology is stable, reliable, and interoperable, and that it can successfully relay the data required by the industry.

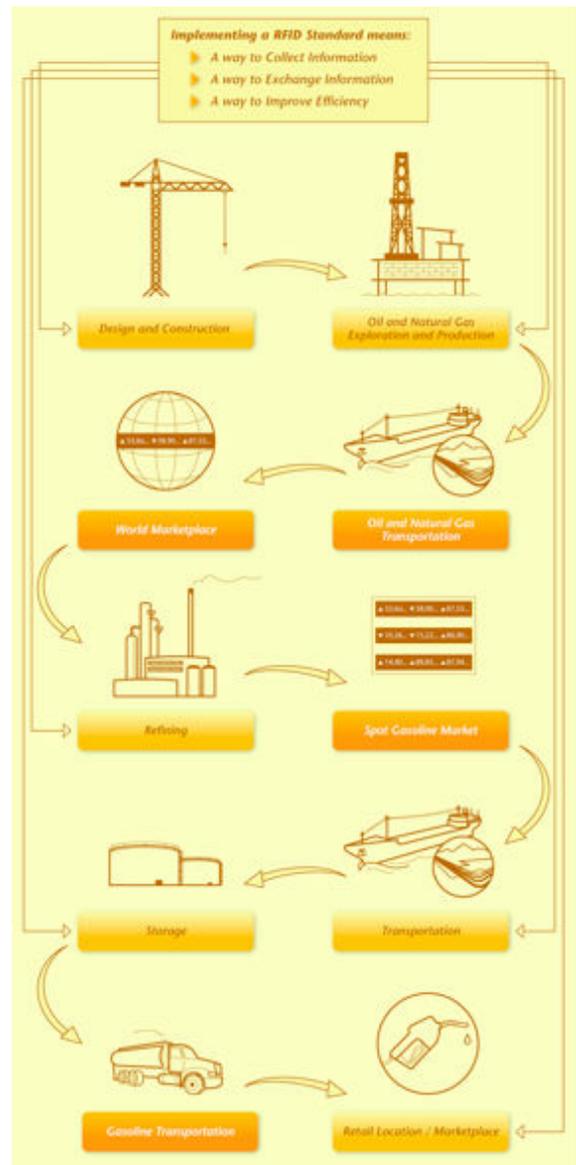


FIGURE 1: PROCESS MAP OF RFID DATA STANDARDS FROM SUPPLY TO THE PUMP

The Future: The Internet of Things

Although RFID is largely thought of as the next phase in automatic identification of goods and assets, the technology is increasingly recognized as a way to enable tagged assets to capture, analyze and communicate data across a network—creating an “Internet of Things” in which “smart” assets become an element of the information framework.

Maintenance and Inspection

The standard method for recording maintenance logs is to record information manually, leaving significant room for error. Recent mandates in several industries including: airlines, oil and gas, and power, demand traceability and accountability for PM. The expensive machinery and the cost of downtime in these industries provide a short return on investment through automating the maintenance and support infrastructure. In a typical RFID PM monitoring system, the asset's entire repair and maintenance history is recorded automatically to the RFID tag, which can be affixed on a repair tag, attached to the asset, or embedded within the product. An RFID

By integrating sensors, actuators and other technology with RFID, assets within the oil and gas industry could report on environmental conditions, equipment operation, safety data, regulatory compliance conditions and other information, in addition to location data. By extending the information network out to specific field assets, oil and gas companies could achieve a new level of visibility into remote operations that could both improve operational productivity, as well as safety.



FIGURE 2: XERAFY PICO-IN TAG EMBEDDED IN BOLT

reader can scan equipment when it comes in for service and when it leaves. Service providers can also record all relevant information, including service date and time, who performed the service, what happened, and when the equipment should be serviced again with handheld readers.

RFID For Asset Tracking

Asset tracking is a key application for RFID, particularly in remote oil field sites where it is critical to keep track of tools and equipment that can only be replaced at considerable expense. But location tracking is only one part of the equation. By linking a part or tool to data about how that equipment has been used, oil and gas companies can more easily retire assets that have reached the end of their service life—an important safety concern, since worn piping or tooling can create dangerous conditions in the field. This data can also help companies balance their asset inventory, shifting idle equipment to different job sites and reducing capital expenditures.

RFID For Supply Chain

Human error is inevitable, but when it comes to a crucial process as ensuring that customers receive their shipment on time, much less, the CORRECT shipment. Finding the right pipe in a field and ensuring product meets API specifications based on outer diameter, wall thickness, steel grade, weight / unit length, and type of coupling is a common scenario in the oil and gas industry, and errors could

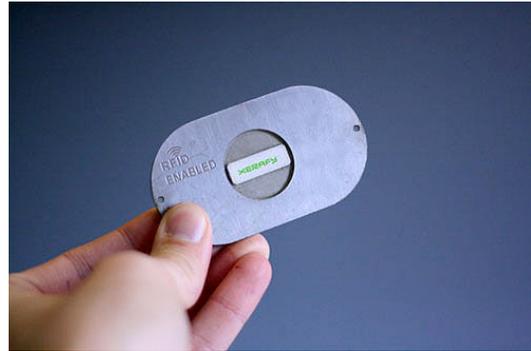


FIGURE 3: XERAFY MICRO-IN TAG EMBEDDED IN METAL PLATE

cost more than money. According to technology analyst firm VDC, the oil and gas industry spent approximately \$104 million in 2007 on RFID solutions to help refineries, rigs, manufacturers and distributors gain greater visibility into their valuable drilling equipment, while also helping to safeguard mission critical parts from tampering and counterfeiting as they travel from one destination to the next. Being able to RFID tag assets and determine their location and status in real time as they travel from manufacturing floors to on-site delivery is extremely important for oil and gas businesses.

Case Study: FMC Technologies PM and Maintenance

Hydraulic fracturing is a process in which high-pressure fluids are pumped through a network of oil field assets such as pipes, valves, swivels and other components that are attached to manifold trucks, in order to break apart oil and gas formations and stimulate production.

In order for FRAC operations to move quickly and efficiently, all components must be warranted that they are fit for use. That means pipe service life has to be certified before the job begins.

Previous methods of tracking a pipe's service history have been hampered by the harsh environment the pipes are used in, and the intensity of the FRAC process. Identification bands bearing etched part numbers were often difficult to read, which slowed down the process. Bar code labels would not stand up

to repeated use after being exposed to water and other chemicals, as well as the processes involved in pipe assembly and handling.

FMC Technologies, in conjunction with OGR has developed a tracking solution based on passive RFID tags to alleviate issues surrounding redundant inspections, job delays and cancellations. By utilizing rugged, RFID tags to serialize the pipes and record service information, FRAC operations can ensure the integrity of the inspection process while improving efficiency, and reducing risk and uncertainty.

Pipe use and history can be recorded and read in detail using fixed-position or hand-held readers. FMC estimates the potential savings of using RFID in this application at \$60 million annually industry-wide.



Case Study: XERAFY

Although RFID is relatively new to the oil and gas industry, XERAFY and its partners are collaborating to provide custom solutions for the oil industry with pipe tracking, quality control, and supply chain management. XERAFY has designed the Micro^X EPC Gen2 RFID tag to track large assets such as oil drill bits, pipe fitting, pumps and even platform supports for the oil and gas industry. The Xerafy Micro^X fits very well into the oil and gas equation with its long-range performance and ruggedized encapsulation to survive the abrasion, impact, salt spray, chemicals high temperatures and pressure common to the oil and gas environment.

The Micro^X tag is currently being piloted for asset



FIGURE 5: XERAFY MicroX TAG

tracking on oil equipment to ensure inventory management and quality control over order fulfillment to make sure the right equipment is installed properly. In addition, the XERAFY embedded Micro-iN RFID tag provides greater durability compared to a tag merely attached externally to an asset. A permanently mounted RFID tag is the most secure and effective means of real-time tracking.

The RFID data collection equipment automatically tracks and manages supplies as they move from onshore operations facilities, to port transfer



FIGURE 6: RFID TAG INSERTED ON LIFT HOOK BY XERAFY PARTNER, HOLLAND1916, TO HELP STOP BP OIL LEAK

facilities, to offshore oil and gas rigs, and back. Typical supplies including critical consumables and equipment such as risers, choke valves, wire rope, stud tensioners, slings, wellheads, in addition to various containment units used to store and deliver material to the oil platforms.

Once you have the tracking database that RFID enables, you can use the information you gather in new ways to provide the operators with information, reports, and preventative maintenance instructions.

Case Study: Petro Rabigh, Supply Chain

Rabigh Refining and Petroleum company is one of the world's largest export oriented refinery and petrochemical complexes, producing over 18.4 million tons/year of high value petroleum products and 2.4 million tons/year of petrochemical derivatives. The company built the largest and most advanced petrochemical facility utilizing RFID to fully automate the inventory management process.

Before implementing RFID, a thorough business process analysis was performed that showed the areas where they need to improve:

- Tracking polymer products from manufacturing to warehouse.
- Automating the tracking of pallets to reduce misships.
- Reducing the number of existing manual processes to reduce inherent errors.

Shipcom Wireless, a leading supplier of integrated supply chain execution solutions and software, worked to accomplish their objectives by integrating an RFID enabled inventory tracking system into the company's SAP backbone. The RFID-based Warehouse Management System (WMS) is powered by the Shipcom Wireless CATAMARAN® Platform, and fed RFID-captured data using Motorola RFID handheld and mobile products. The system uses the CATAMARAN server along with web services for seamless integration with various components of the warehouse automation system.

In total, the 56,000 square meter warehouse has 10 container shipping docks and 12 trucking shipping

docks. RFID tags are attached to product pallets and all material handling is confirmed with RFID readers. The handlers carry Motorola MC9090-G RFID handheld computers, 66 forklifts are mounted with Motorola RD5000 mobile readers, and trucks are equipped with Motorola VC5090 vehicle mounted computers.

The CATAMARAN Warehouse management system monitors both the in-bound and out-bound operations to make sure that the correct cargo is delivered to the appropriate container. The system is integrated with all major warehouse functions, including:

- **Receiving** – RFID tagged pallets are received and the warehouse management system assign a rack/floor location.
- **Storage** – The Motorola RD5000 RFID reader on the forklift scans the tagged bin location (floor location), verifying storage location is correct.
- **Picking** – Picking instructions, sent from the WMS to the Motorola VC5090 on the forklift, instruct forklift drivers to pick the correct items from the appropriate rack locations.

The automated inventory management system has delivered additional benefits beyond higher accuracy in reducing human errors. The benefits include increased productivity in employees by spending less time looking for missing product, streamlined operations by more efficient pack and pick, plus improved warehouse safety. In addition, the more efficient tracking provided an automated method for regulatory reporting thereby ensuring proper treatment of all assets and compliance against fines.

Getting Started

While the capability exists, change can take time. The first step for companies interested in exploring the potential of RFID is to join industry groups such as the Oil & Gas RFID Solutions Group to develop a better understanding of the capabilities. Typically, organizations setup an internal team of people across their organizations to evaluate the technologies, vendors, and best ways of implementation. Once a target need is established, it's important to test the technology in the real application environment to remove potential barriers to implementation. After a successful pilot, it's important to develop a tracking database or software platform that can be configured to utilize the information from the RFID equipment and integrate with existing systems, reports, and information processes. Finally, a necessary key to success is good training on the technology use and limitations for all employees involved.

RFID brings new levels of strategic and operational decision-making to oil and gas companies. No other data-capture technology can enable the sort of seamless, automated tracking in the way that RFID can. RFID adoption is gaining momentum, and large companies in the industry are already leveraging the technology. With the industry focused on improving safety and reducing the chance of catastrophes at remote work sites, there is even more impetus to deploy this type of real-time technology.

Conclusion

RFID technology can improve quality control, part utilization, supply chain efficiency, and security by providing real-time information on asset status, as well as historical information equipment utilization. This data not only helps companies respond to incidents, but also proactively reduce the risk of failures in the field. The Oil & Gas RFID Solution Group has been working with technology providers like XERAFY and Shipcom Wireless to develop customized solutions that meet the unique needs of the oil & gas industry through the development of new technology like the XERAFY Micro^X tag and supporting proof-of-concept implementations that demonstrate the value of RFID in these applications.

About XERAFY

XERAFY is committed to bringing our customers the world's smallest and most reliable passive UHF RFID-On-Metal (ROM) and iN metal tags that are qualified and tested to meet extreme conditions over the lifetime of the asset.

XERAFY's innovative technology offers the Industrial, Manufacturing, Defense, IT, and Supply Chain markets, an affordable, durable, high temperature smart tag that can be easily attached to or embedded to metal assets. XERAFY enables packaging solutions for automatic check-in / check-out tools, Work In Progress, IT auditing, product authentication and asset management with a competitive advantage in size, cost, design, quality, and performance of tags. XERAFY is headquartered in Hong Kong, and maintains sales & support offices in Dallas, Texas, Maryland and in Shanghai, China.

About Oil & Gas RFID Consortium Group

The Oil & Gas RFID Solution Group (OGR) is most recognized collaborative group of subject matter experts in this industry. The group is supported by the world's largest oil companies and serves as a cornerstone for technology and standards development around RFID within the oil and gas sector. With a combined 120 case studies worldwide, the group also has the largest industry database of technology application and return on investment metrics. This extensive influence and expertise affords the OGR with an unprecedented ability to build fundamental technology and business roadmap, for any oil and gas organization, that are the foundation for a successful step forward within RFID. Visit Oil & Gas RFID Solutions at rfid.tamu.edu

About Shipcom Wireless

Shipcom is a leading provider of integrated supply chain execution software solutions focused on the RFID and enterprise mobility markets. Its open standards platform, CATAMARAN, is a server-based solution that captures and transforms data from devices such as RFID readers and barcode scanners and integrates directly into SAP, Oracle and other legacy ERP systems.

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