



RFID Solutions in the Oil & Gas Industry



RFID provides the automated end-to-end visibility needed to streamline every day tracking of all materials, equipment and personnel in the oil and gas industries. From the offshore oil rig to the plant, RFID gives companies a tool to maximize uptime, respond faster to day-to-day business needs, restore production more rapidly in the event of an incident, and better protect employees.

Business challenge

In the trillion-dollar oil and gas industry, success hinges on timely and error-free delivery of product through a complex, high value supply chain. In this extraordinarily capital intensive business, a failure of even the shortest duration anywhere along the supply chain can instantly ripple into a multi-million dollar loss.

In this high-stakes environment, proper infrastructure maintenance as well as inventory and asset management are not just regulatory issues, they're mission critical for business health – and employee safety. Inspections, routine maintenance, and repairs must be performed on time on oil rigs, pipelines and downstream facilities to not only prevent the disastrous ramifications of a failure — but also to maximize the efficiency and lifespan of key infrastructure investments, where a single component failure can result in million dollar losses.

However, tracking assets, workers, asset maintenance histories and even the production and distribution of product are a challenge in far flung operations. The paper-based processes that are typically utilized are labor-intensive, costly, present significant opportunity for error and often result in the very slow movement of information to key decision makers. Lack of information visibility can threaten the health of the business, rapidly translating into inventory shortages that can result in unplanned downtime in the field, process inefficiencies that can result in reduced staff utilization and non-compliance with recordkeeping requirements that can translate into heavy fines or even the injury of employees.

While bar code technology has helped automate these processes in other industries, bar code labels present serious limitations in the oil and gas industry, where harsh operational and environmental conditions are the norm. And line of sight requirements force workers to manually scan each and every item — rendering item-level visibility of every asset, part, and tool impractical due to the time requirements and associated labor costs.

The benefits of RFID in oil and gas

By automating critical business processes, RFID delivers a wealth of benefits that help protect profitability — and customer satisfaction:

- Increased productivity
- Improved production uptime
- Improved equipment maintenance and infrastructure
- Increased asset utilization
- More efficient and cost-effective regulatory reporting
- Improved worker safety

The RFID solution

Where bar code data capture technology falls short in this industry, Radio Frequency Identification (RFID) succeeds. The next evolution in automated data capture technology, RFID's automated bulk data capture and non-line of sight technology makes cost-effective real-time visibility of assets, asset location, employees and more a reality – with very little human effort. Time spent filling out paperwork, performing computer data entry, or manually scanning labels on boxes and pallets is significantly reduced or eliminated. Accuracy is dramatically improved, as is the utilization of a highly trained workforce. Any time lag associated with a paper trail and manual data entry times are eliminated. And RFID's unique read-write capability streamlines recordkeeping and data collection — and provides access to the data recorded on the RFID tags at the point of business activity.

The chart below highlights the benefits of RFID for asset management in the Oil and Gas Industry Sector:

RFID in the oil and gas industry

With surging demands for oil in the global market, today's oil rigs might easily generate over a half million dollars in a single day. But this enormous revenue potential comes with a hefty price tag. Whether in operational or leasing costs, energy companies can spend hundreds of thousands of dollars per day to keep the oil pumping. Since a large number of barrels must be pumped daily to break even, any unplanned downtime can have grave consequences on the bottom line. Production losses caused by unplanned downtime are compounded by the high labor and operational costs incurred until the rig is back up and running.

To keep the oil flowing to meet customer demand in the global marketplace, rigs, pipelines and other equipment must run at peak efficiency. In this environment, inventory accuracy is particularly critical. Overnight courier services cannot easily reach offshore or remote rigs to replace a shortage of parts needed for an emergency repair. And today's crowded marketplace is creating further

The advantages of RFID over bar code technology

	Bar code/UPC labels	RFID EPC tags
Efficiency	Reads one tag at a time	Reads multiple tags simultaneously
	Line of sight required	No line of sight required
	Action required by scanner operator	Action not required by operator — but does accommodate on demand identification with a handheld RFID reader
Durability	Paper labels are easily damaged or obscured by oil and/or dirt	RFID tags can be matched to the application needs, providing the right level of durability for specific environments — from durable flexible labels for use in warehouses to hardened, encased RFID tags for field use
Data Capacity	Limited amount of data capacity	Significantly greater data capacity, enabling the capture and storage of more detailed and relevant information
Flexibility	Static information — write once to any given label	Dynamic information — ongoing read/write capability enables creation of a continual record
	Tags are not reusable	Tags are reusable
Security	Information usually printed right on the label along with the bar code (i.e. EPC code)	Information encoded in RFID chips
Uniqueness	Bar codes can only identify a class of goods	RFID tags and their associated serial identification number provide unique serialization

delays in obtaining replacement parts — there are more companies requesting parts, impacting the speed in which orders can be fulfilled. To minimize the detrimental impact of a parts shortage, energy companies often resort to keeping excess safety stock on hand — a costly strategy given the number and cost of these high valued parts.

From exploration and production to drilling and refining, RFID can help companies streamline business processes to better protect the health of the business by:

- Increasing employee efficiency
- Increasing the automation of product movement and supply
- Ensuring optimal use of all assets
- Reducing inventory carrying costs
- Protecting against unplanned downtime
- Ensuring cost-effective regulatory compliance
- Improving employee safety

Some of the key applications for RFID in the oil and gas industry include:

Pipeline inspection/maintenance

Today, monitoring pipelines is an expensive and time-intensive process that involves workers covering an area as great as 500 square miles by vehicle to physically inspect and repair pipelines as needed. With RFID, oil and gas companies can heavily automate and improve the quality of pipeline inspection and maintenance.

The many parts throughout a pipeline can be serialized with an RFID tag — including flanges, gaskets and bolts. Now, with a quick scan of the RFID tag via a handheld RFID reader, field operators can determine when the part was placed in use, any known defects, maintenance history, repair procedures, the date the part should be retired and more. The ability to couple rich data with every part provides maintenance staff with the granular visibility required to better monitor the pipeline. The incidence of leaks and failures that can occur when parts are incorrectly repaired or replaced is substantially reduced, helping prevent unplanned downtime, losses and environmental catastrophe.



Handheld mobile RFID readers, such as Motorola's MC9000-G RFID, enable instant processing of exceptions anywhere in your facility, from the loading dock to the warehouse aisles and even out in the yard.

Asset tracking

In the large and geographically dispersed environments of the oil and gas industry, asset tracking can be a highly labor-intensive and costly process. But the use of RFID can automate the tracking of everything from consumable supplies and safety equipment to trucks, cranes, tools, parts, and even drill bits — from the moment of arrival in your facility to end-of-life. Tracking begins at the receiving dock with mobile or handheld RFID readers, where assets are immediately identified, entered into your system and visible in your inventory.

Now, no matter what your workers need — from tools and parts to equipment and more — the exact location is never more than a few keystrokes away. A quick scan of an RFID tag provides valuable, verification that the right asset was selected. For example, workers can easily verify that the right pipe is used at the right time, preventing a potentially costly error.

Another advantage of RFID is the ability to write data to the tag. Unlike the static information contained on a bar code, data on an RFID tag is dynamic, enabling, for example, a complete usage history to be embedded in the RFID tag on every pipe. This ‘wear-and-tear’ history provides the data needed for better decision making. Drilling engineers have the information they need to better and more accurately project when to retire pipe, helping avoid the high cost of a pipe failure.

This real-time automated inventory visibility:

- Frees your high-dollar workforce to focus on more critical tasks, improving worker productivity and staff utilization
- Ensures the rapid location of safety equipment, tools and parts to ensure uptime and protect workers

- Enables cost-effective compliance with government regulations
- Improves tool utilization, reducing tool inventory and management costs
- Protects against loss or theft of assets
- Ensures proper tax treatment of assets, preventing financial penalties due to non-compliance

Equipment maintenance

The read-write capability of RFID technology enables automation of record keeping for asset maintenance. This, in turn, ensures the highly accurate and complete maintenance records required to best adhere to maintenance schedules and optimize an asset’s performance. As a technician completes service, critical maintenance data can be written to the asset tag — such as service date and time, technician, service performed and next inspection date. An asset’s complete history is always available to the technician with a quick read of the asset’s RFID tag. And in addition, the information is not only stored directly on the asset tag, but can also be sent automatically to the EAM system, ensuring the timely scheduling of future maintenance required to maximize equipment uptime.

Personnel Tracking/Safety

RFID-tagged identity badges and helmets can provide supervisors with the location information required to better protect workers in the hazardous environments of oil and gas facilities. Fixed RFID readers help ensure employee safety by automatically tracking the movements of your workers. As a result, in an emergency evacuation, you can verify that all employees have arrived in a safe muster point. In addition, if an employee remains in an area longer than expected an alarm can be automatically triggered and sent to your security/safety staff, enabling rapid identification and location of employees who may be injured or still in a hazardous area.



Motorola's RD5000 RFID mobile readers can be installed on forklifts and other material handling equipment as well as in challenging static locations to enable cost-effective real-time tracking of every asset.

The benefits of RFID in oil and gas

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By automating critical business processes, RFID delivers a wealth of benefits that help protect profitability — and customer satisfaction:

- **Increased productivity:** Employees spend less time tracking down missing equipment, improving staff utilization
- **Improved production uptime:** Faster response times to disasters, failures and outages minimizes downtime
- **Improved equipment maintenance and infrastructure:** Prompt inspections and more informed, on-the-spot repair decisions keeps production running at peak performance — for peak volumes.
- **Increased asset utilization:** Improvements in asset visibility and utilization reduce stocking inventory levels
- **More efficient and cost-effective regulatory reporting:** Ensures proper treatment of all assets and compliance with regulations to protect against fines
- **Improved worker safety:** The ability to quickly locate workers and instantly spot and respond to potential 'man down' situations helps better protect the safety and health of your workers



For more information about how RFID can help streamline your operations, please visit us on the Web at www.motorola.com/rfid or access our global contact directory at www.motorola.enterprisemobility/contactus

Case Study: Shipcom Wireless

RFID Logistics System for Oil Refinery and Petrochemical Enterprise



Motorola Products:

- 66 Forklift-mounted RD5000 mobile readers
- VC5090 Vehicle Mounted Computers
- MC9090-G RFID Handheld computers

SAP-Integrated WMS:

Shipcom Wireless CATAMARAN®

Plant Cost:

US \$10 B

Warehouse Capacity:

- 56,000 sq. meters
- Bin Capacity for 75,000 tons of polymer products
- Open Yard Capacity is 25,000 tons

Container Shipping Docks: 10

Trucking Shipping Docks: 12

In January 2008, a multinational petrochemical company launched the largest and most sophisticated integrated oil refinery and petrochemical production facility ever built at one time. The 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 has a long standing philosophy of integrating new technology to improve efficiency in its material movement and inventory processes, and looked to utilize the latest technology in this new facility. They saw an opportunity to invest in RFID to address several problems inherent to their core business, including a better method of tracking polymer products that are stored and shipped from the product warehouse. Automating the tracking of pallets to streamline operations was a major objective that would ultimately decrease the percentage of mis-ships, ensuring that the correct cargo is delivered to the appropriate containers, and ultimately reducing the number of errors that are representative of the existing manual processes.

A thorough business process analysis revealed that their objectives could be accomplished by integrating an RFID-enabled inventory tracking system into the company's SAP backbone. A leading provider of integrated supply chain execution solutions with significant expertise in deploying RFID was selected to implement the solution — Shipcom

Wireless. 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.

Today, a total of 66 forklift-mounted Motorola RD5000 mobile RFID readers are used in conjunction with Motorola MC9090-G RFID handheld readers to capture the pallet-stacked polymer product data, which is then delivered wirelessly to the Shipcom WMS. The WMS then sends the appropriate processing instructions to forklift drivers via Motorola VC5090 vehicle mount computers mounted on the forklifts.

The 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:

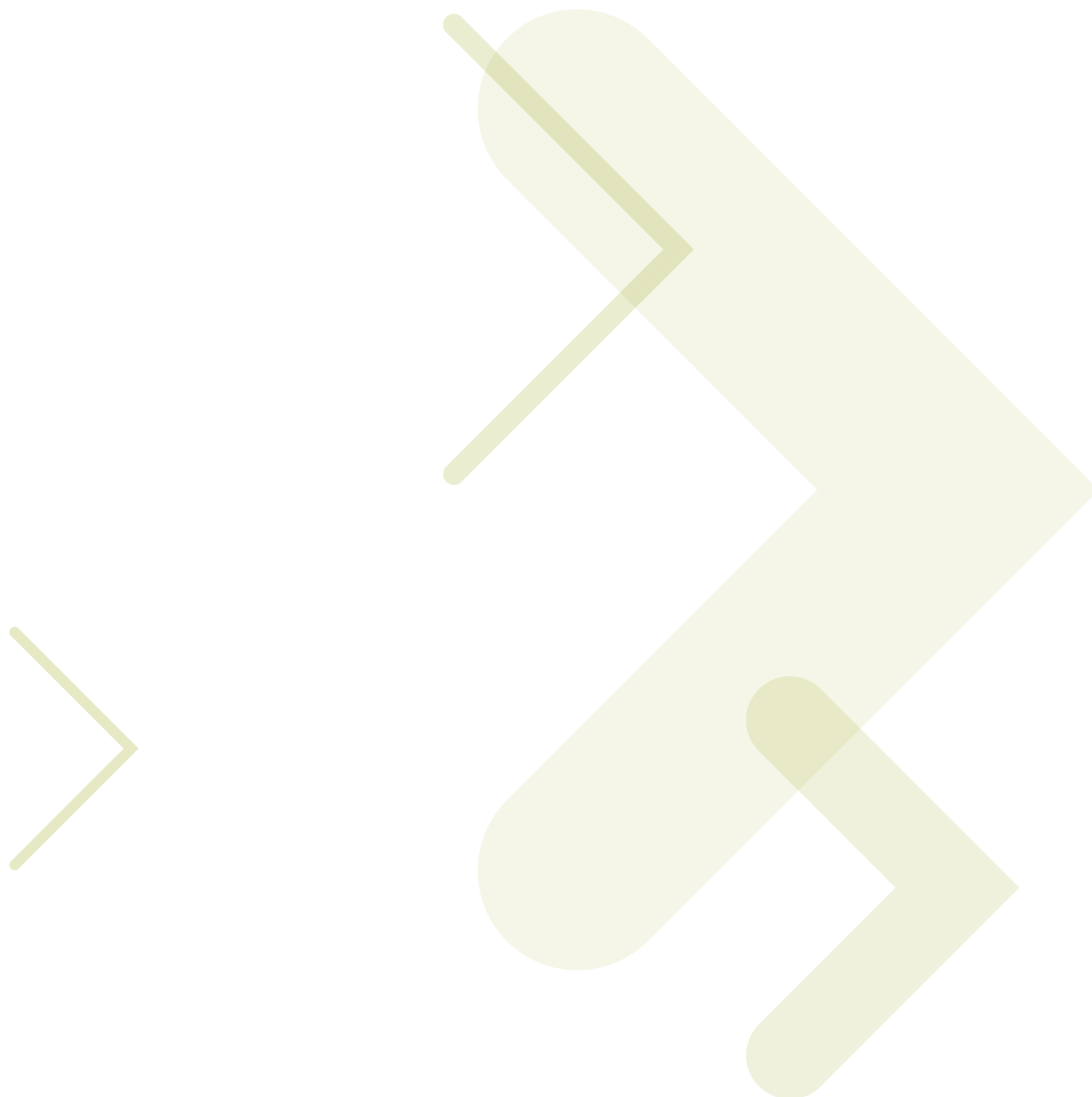
- **Receiving** – RFID tagged pallets are received and the tag associations are saved in the warehouse management system, which then assigns a rack/floor location.
- **Put Away** – The Motorola RD5000 RFID reader on the forklift scans the tagged bin location (floor location), verifying that the location is correct for the particular put away.
- **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 Motorola RD5000 RFID mobile readers installed on the forklifts enable forklift operators to locate the right rack, retrieve the right pallet and prepare the pallet for shipment.

The company has not only achieved its original goals of automating pallet tracking, but has also reaped benefits beyond its initial goals, including:

- **Data collection automation** – RFID readers at critical points within the product warehouse automatically read the pallet tags for accurate pallet tracking, and has resulted in reduced manpower, increased automation, reduced errors and more accurate reporting.
- **Streamlined operations** – The automation of pallet tracking helps to streamline operations with more efficient tracking of pallet movement and status, and optimized forklift task sequencing.
- **Accurate material picking** – Better identification of pallet contents allows for increased picking accuracy, resulting in decreased mis-shipments.

INDUSTRY BRIEF

RFID SOLUTIONS IN THE OIL & GAS INDUSTRY



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