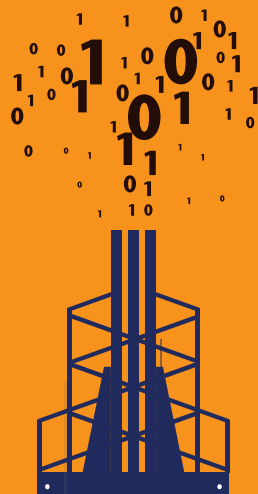


WHITEPAPER

Radio Frequency Identification: HYDRAULIC FRACTURING



OIL & GAS
RFID SOLUTION
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About Us

The Oil & Gas RFID Solution Group (OGR) brings together select industry subject matter experts, academic researchers and technology service providers to identify, define, develop, and deploy cutting edge solutions for Exploration, Production, Drilling, Refining, Petrochemical Processing and Field Product Manufacturing in the Oil, Gas, and Petrochemical markets. By educating and refining the customers understanding of what the technology can do for them, and developing systems with the help of a consolidated effort of industry professionals, the solutions group is creating scalable application systems and data standards, and helping to generate understanding and adoption of Radio Frequency Identification within the Industry.

Its members include BP, Dow Chemical, Exxonmobil, FMC Technologies, Weir SPM, and many other oil and gas industry leaders

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What is Hydraulic Fracturing? What is RFID?



Hydraulic Fracturing Job

Overview

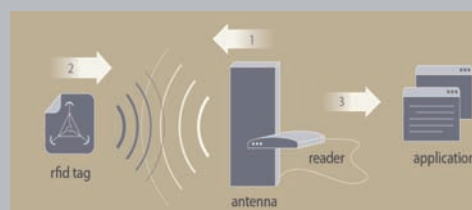
Hydraulic fracturing

A process that involves pumping very high pressure fluids through a network of oil field products such as pipe, valves, swivels, and other components that are interconnected and attached to manifold trucks with powerful pumps on one end and the well at the other. This fluid is pumped under high pressure to break apart the formation.

Radio Frequency Identification

A method of wireless identification that uses electronically programable microchips. The technology space can be separated into active tags, semi-passive tags, and passive tags. Where active tags have an internal battery source and continuously transpond, semi-passive tag have an internal battery source that supports the outgoing signal, but still require an external energy source to transmit, and passive tags that do not have a battery and require an external energy source to transpond/transmit.

The work in discussion uses passive UHF RFID technology that is inherently well-site safe in nature and meets all I-Safe or equivalent requirements for Class 1 Div 1 hazardous areas.



RFID Communication



Business Case

FMC has developed a comprehensive business case behind the technology and its use within the hydraulic fracturing industry. This includes estimates of \$60 million in savings per year industry-wide.

Adam Berg, Engineering Service Manager at FMC Technologies and his team, are focused on addressing specific pain points of the industry with RFID technology, which include redundant inspections, job delays due to out-of-compliant parts, and job cancellations.

RFID technology provides our customers with substantial improvements in their ability to address and improve some common industry pains around part inspections and identification. The ability of RFID to alleviate or eliminate these issues is key to our business case," says Berg.



RFID Tagged Part

What are the Challenges of Identification?



Sledgehammer Assembly

Challenges

It is not unusual for a FRAC operation to arrive at a remote site at 4am finish by noon and move to a second site to finish before late night. To achieve this level of efficiency several elements are critical.

Certified Parts

Among the most important aspects to achieve a high efficiency and safety all components (pipes and supplies) must be at the site with a warrantee that they are fit for use.

There is NO room to improvise in a FRAC operation without creating real risk. The tools of the trade must be "to spec" pipe service life must be certified before and job begins and the ability to monitor the use history of all components provides ability for true process optimization as well as safety.

Optical banding marginally useful

Tracking of pipes is a key aspect of supply management and banding has been one technique employed with limited success. Since FRAC applications include water discharge during operation as a matter of practice any banding using optical recording (person reading numbers of bar code scanner reading a bar code mark) is destined to have very limited practical use and could never be imagined as part of a semi-automated data collection solution.

An additional point is that handling, including pipe assembly, routinely damage or destroy the optical bands, A third point is that during repair many times these bands are removed in supply.



Vision

A leading player in the global energy market, BG Group is a dynamic growing business with operations in more than 25 countries over five continents.

Mr. Anwar Husen, Head of Production Technology for BG Group adds, "Among the most critical factors in achieving efficiency, safety and sustainability in operations is the integrity of the equipment that is exposed to high pressure and abrasive environment (i.e. pipes, valves, chocks etc). The integrity of the equipment must be trackable and auditable. This will drastically reduce the risk and uncertainty of the operations."



RFID Scanner Reading
"Frac-Tag"

Next-Generation RF Identification



Outdated Methodology of Serializing using etching

SOLUTION

RFID is able to outlast the pipe life

This provides an ideal opportunity to consider RFID (radio frequency identification) and a means for serializing the FRAC components as well provides a means for recording this data with semi-automated readers onsite under the worst of conditions.

Tags able to stand up to the rigors of FRAC procedure must have exceptional mechanical integrity. Pipe operations such as offshore where the tags are designed to last life of pipes on oil wells and in field applications where similar abuses exist use metal rings tags.

FRAC pipe however is moved, assembled, disassembled, maintenance and shipped with great frequency. Additionally FRAC pipes are exposed to mechanically corrosive mixes under extremely high pressure which causes shortened life. The ideal tags for this environment are rubber encapsulated cabled RFID tags.



Variation of RFID "Frac-Tag" on valve (left) and swivel (right)



Conclusion

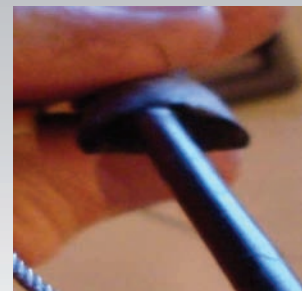
The Oil and Gas Group has evaluated large numbers of tag candidates for FRAC applications and has endorsed the TROI FRAC dome cable tag based on both direct field testing, client testing and certification (particularly EN 62262).

TROI is the only supplier to provide tags of this integrity. TROI is also the only supplier compliant with IP 69-K(1K10)

The definition for FRAC is clearly "time is of essence" for which the next level of progress is being realized.

For more information contact:
info@rfidsolutiongroup.com

The RFID "Frac-Tag"



SOLUTION

The cable recommended here is 5/16th stainless steel with synthetic outer shell onto which a metal mount rubber based tag is permanently molded.

IEC/EN 62262

These Cable Dome FRAC tags are Gen 2 UHF and exceed EN62262 testing. International test method EN62262 is a pendulum striking force which is designed to impact the object (tag in this example) with tremendous force. IP 69-K(1K10) which most tag suppliers only speak of IP 68 because they fail the next level where physical impact is required. As a simple example placing a series of tag onto the face of a 6 kilo sledge hammer and dropping two meter showed that the dome tags were able to sustain hundreds of drops while "rugged" tags broke or totally died in less than 5 drops.

Process Improvement

This is the opportunity for FRAC operations to enhance all process improvement objective. Pipe use and history can be recorded in detail. The key points of use can best be managed by a data base with the tag having a unique ID. An alternative is to add limited information directly to the tag for which options for up to 100 characters exists within the memory of the UHF tag. Semi-automated data collection is also now possible where the tag can be read remote by a hand held reader or even a fixed reader for true hands free operation. This last feature is ideal for the rework area where the parts are certified or recertified. These tags can be used in mud, water, dirt, oil environments with no difficulty. The tags can be painted to match the pipe colors and even sand blasted should repainting be required. Secondary marking such as bar code and human readable are equally