Quest Journals
Journal of Research in Humanities and Social Science
Volume 6 ~ Issue 8 (2018) pp.: 12-16
ISSN(Online) : 2321-9467
www.questjournals.org

Research Paper

RFID Technology In The Oil Industry "Feasibility Study"

Shougi Suliman Abosuliman
Department of Port and Maritime Transportation Faculty of Maritime Studies, King Abdulaziz University P.O. Box 80204, Jeddah, 21589 Saudi Arabia Email:
Corresponding Author: Shougi Suliman Abosuliman

ABSTRACT: *There is a growing case for automation in the oil drilling industry. Whilst new technology is the driver for oil production, the application of such technology was limited by the oil industry's environments: rigs located on land or at sea, in deserts and on continental shelfs. Robustness, reliability and over-engineered plant and equipment are necessary in these environments. The hardware and software elements of automation all too frequently are not cost-effective.*

Received 08 August, 2018; **A**ccepted 23 August, 2018 © The author(s) 2018. **P**ublished with open access at **www.questjournals.org**

I. INTRODUCTION

There is growing interest in radio frequency identification (RFID), especially in tracking items through the supply chain. This assessment is presented as a feasibility study so that Saudi Aramco's Drilling & Workover Operations (D&WO) can explore a wider use of RFID throughout the corporation. The application is in the tracking and usage of drill bits for remote wells.

RFID Technology

RFID technology enables and accelerates automatic identification and localisation of objects, utilising radio frequency technology to wirelessly transfer data about the object to a computer (Kator 2008).

The RFID systems consist of a tag (transponder), a reader and a host computer. The RFID tags have at least two components: an integrated circuit used for storing and processing information, and an antenna used for receiving and transmitting the signal. There are three types of RFID tags. First, active tags are powered by a battery and can transmit over long distances. Passive tags receive power from the RFID reader; however, their read range is limited. Finally, the semi-passive tags utilise a battery to enhance the read range.

When the RFID tag is energised by the reader, the data stored in the tag's memory is sent to the reader by radio. The reader then communicates the data to the host computer. The tags can be reprogrammed to enable change on the type of data stored on the tag (Kator 2008) Of the several advantages of RFID, the primary factors are:

- the RFID technology facilitates real-time, wireless data transfer between the tag and the reader. The elements do not have to be in direct line of sight to transfer the data, and the transfer is considerably faster than traditional tools such as bar codes
- the diversity of the RFID functions can offer, with data storage the primary purpose of the technology
- the technology is useful in harsh climates, with greater resistance to extreme temperatures, high pressures, dirty or wet environments.

The characteristics of the RFID system are the amount of data stored, the physical size of the tag, the range of detection, the ability of the system to communicate simultaneously with multiple tags and the speed of communication between the tag and the reader (Gupta 2005). Passive RFID tags cost less than $US1 each; however active RFID tags costs start at about $US5 and can reach $US100 each, depending on their functions (IDTechEx 2005).

Methodology of RFID

Due to RFID's relative stage of development, it is intended to embed passive RFID tags in drill bits in an area less prone to abrasion and damage and use the tags initially for location and supply chain administration. Later, if proven feasible, there are a range of in-well uses that are an interesting and valuable opportunity.

Drill bit RFID application

The oil and gas industry is experiencing volatile trading conditions and strong pressures to meet performance targets. Moreover, the sophisticated nature of the drilling operation requires planning, ordering, and delivering only high quality materials and equipment to avoid failure of components in the field. Whilst reusing drill bits to cut costs, adding to the failure rate, there are instances of errors in deliveries and misapplication of drill bit types, necessitating lengthy delays retrieving tools from deep wells and locating and redrilling with the correct bit. Thus using RFID tags could identify the bit and remove the element of human error from bit usage.

Saudi Aramco

Oil drilling is a difficult venture with high failure rates in extreme environments, long periods of intense work and short-term targets. Drilling companies require dependable supplies and good logistic support to fulfil their contractual obligations wherever they are drilling.

Saudi Aramco, the state-owned oil company of Saudi Arabia, is the world's largest oil corporation in terms of proven crude oil reserves and production. A primary element of Saudi Aramco is Drilling & Workover Organisation (D& WO) which administers all the parent company's drilling operations. D&WO has undergone major expansion in the last three years to drill new wells to increase the Saudi Aramco's production capacity from 9.4 million barrels per day to 12.5 million barrels per day by early 2010 (Schoen 2005).

Definition of project

The project is two-fold: first a supply chain application is required to purchase, supply, locate and distribute a multitude of different bit types; to track wear and to ensure adequate inspection and detection of possible catastrophic fault. However, as this technology matures and becomes more reliable, there are many other uses that can significantly improve future productivity. Thus a strong partner is required as a vendor, one who is knowledgeable in the oil industry and has a comprehensive approach to work over the years to integrate RFID technology, if proven feasible, throughout Saudi Aramco.

Business Case

Implementing an RFID technology for D&WO is a cost-based decision as much as a technology decision, and should be justified in terms of the economic value for the company. In this case, the RFID deployment can be assessed based on time (short-term or long-term) and also in terms of tangibility (direct or indirect). Other benefits that should also be factored in are quality assurance, competitive positioning and compliance to government regulations.

Cost elements in RFID deployment

RFID applications can be divided into three cost areas: hardware, software and services. The hardware costs are the RFID tags, readers, antennae, network equipment and host computers. Software costs include installation of software on computers, and other applications such as enterprise resource planning. Lastly the service costs would include the cost of installing, tuning and integrating various components, training and maintenance (Manish & Shahram 2005).

With oil drilling, there is an additional cost for robust RFID equipment that can survive harsh temperature conditions whilst drilling. A complementary cost advantage is the reduction of labour costs in the running and retrieving, and re-running of an incorrect drill bit incident which may take up to 16 hours in total.An RFID application facilitates handling, transport to the site, and prevents the incident occurring.RFID benefits are predicted to exceed the overall cost of the technology for this case.

Feasibility assessment

The feasibility assessment is includes some phases as encompassing technology, marketing and commercialization. Also, the assessment will carried out for the proposed technology to take an advantage of the current problem situation in the filed.

As was explained previously this innovation is considered as a product with high technology information. The study guide will help the study by using the template of the Customization in order to fit the proposed product to the selected template.

Technical feasibility
Technical description:

1.	Project initialisation
	Approval of the project and project meeting
	Team formation and work allocation
2.	Placement of order
	Computer equipment
	RFID Tags and Rig-hand
	Applications and software
3.	Network cabling
	Laying down the network cable
4.	In-house assessment of CATS software
	Configuring the CATS application according to requirements
	Case simulation
5.	Assembling and installing of terminal equipments
	Installing PCs
	Installing operating systems
	Installing software applications
6.	Installing the RFID readers
	Configuring RFID readers and Rig-hand
	Synchronising the application server with handheld devices
7.	Transfer existing data
8.	Training
	Training for the CATS Application
	Training for database management
	Training for Rig-hand
9.	Testing user competency
10.	Project completion

Technical Viability
The system can perform well in terms of technical viability, due to the variety of the methods and tools that will helps to operate the business to perform efficiently.

A- Market Feasibility:
1-Estimated Market Size:

A primary service section of Saudi Aramco is Drilling & Workover Organisation (D& WO), based in Dhahran, Saudi Arabia with several service offices in the country and the provider plans and executes all Saudi Aramco's onshore and offshore drilling operations within an area of some 780,000 km2. D&WO has undergone major expansion in the last three years to increase the number of new wells to increase the Saudi Aramco's production capacity from 9.4 million barrels per day to 12.5 million barrels per day by early 2010 (Schoen 2005). The organisation has increased its rig count, a platform used to drill the well, from 55 rigs in 2005 to 120 rigs in 2008. Furthermore, due to the lack of skilled field personnel, the organisation was forced to hire several less experienced drilling engineers and supervisors to meet demand in the field.

2-Market Structure/ Competition:

In general there are several different segments of customers. But, in this market customers can belong only to Saudi Aramco Company. Moreover, the competition is very limited in this case due to Saudi Government's regulations about drilling in oil industry, so the Aramco company doesn't have any real competitive issue locally.

3-Price:

The cost benefit of selecting and using the correct drill bit. The industry cost for drill bit misuse was estimated at about $US200m, and Chevron's Gulf of Mexico operations costed each incorrect drill bit incident at $US700,000 (Topcu 2003). RFID usage would reduce downtime and location costs and would significantly improve the productivity and reduce expenditure.

RFID benefits are predicted to exceed the overall cost of the technology for this case. A cost-benefit analysis is critical to the successful deployment of the RFID project and this solution will be viable for the long-term productivity of the enterprise.

B-Commercial feasibility:

1- Key success factors

Vendor

D&WO is expected to choose a full service provider due to the client's lack of expertise in RFID technology and the remoteness of the location. Good logistics and management is essential. In the full service approach, it is important that the best vendor is selected based on vendor comparison criteria.

Experienced and knowledgeable management are required in this instance, due to D&WO's current growth and inability to recruit sufficient expertise in RFID applications. The contractor's management must have a track record in Saudi Arabia and an appropriate profile of disciplines. Further, the contractor must communicate very well with the D&WO management team.

The contractor's reputation in the oil industry is crucial in determining its track record of quality work delivered on time and on budget. As vendors rarely engage in all activities in-house, it is essential to assess a vendor's partners and alliances; that they are well known and are willing to be referenced.

Addressing quality standards in this harsh climate is the key to a successful project. The vendor must have a proven record in International Standards Organisation (ISO) complianceto meet the ISO 18000-2:2004 standard.

Implementation

'Implementation of RFID must be done in a holistic manner if the efficiencies and controls the technology offers are to be truly realised' (Kleefeld 2005). After acceptance of the vendor by the stakeholders, the systematic implementation of this technology can be performed on the basis of a work breakdown structure which distributes the implementation process in different subsections and schedules dates for task and project completion within these subsections.

Training is a crucial step in implementing this technology; it is regarded as a change management process due to the IT, management and supply chain aspects, with the logistics of transport, storage and reuse of drill bits.

Challenges and risks

Challenges and risks for RFID deployment in D&WO are analysed as economic, technical and implementation. These factors need to be examined carefully to develop a successful migration strategy.

II. CONCLUSION

RFID is rapidly changing the way enterprises operate in today's competitive environment. This technology can reduce expenses, increase revenue and drive competitive advantage if implemented in the correct manner. For deployment of RFID, it is necessary to develop a business case including a cost benefit analysis to weigh its potential benefits to the organisation. Thus to gain maximum benefit from RFID technology, an organisation should prepare a strong future case for this emerging technology.

REFERENCES

[1]. Abosuliman, S.S. (2015). A System Dynamics & Emergency Logistics Model for Post disaster Relief Operations.A thesis submitted in fulfilment of the degree of Doctor of Philosophy. School of Aerospace, Mechanical and Manufacturing Engineering College of Science, Engineering and Health. RMIT UniversityMelbourne, Victoria. September 2014

[2]. Burnell, J 2008 (21 Jul) , Oil industry forms RFID group to aid adoption, RFID Update, Viewed on 10 September 2009 at <http://www.rfidupdate.com/articles/index.php?id=1641&from=rss>

[3]. Fischer, PA 2007, 'RFIDs for drilling & completion', World Oil Magazine, vol. 228, no. 7, Viewed on 10 September 2009 at http://www.worldoil.com/magazine/MAGAZINE_DETAIL.asp?ART_ID=3239&MONTH_YEAR=Jul-2007>

[4]. Gupta, V 2005, Blending oil with RFID, Wipro Technologies, Viewed on 12 September 2009 at < http://www.oilit.com/papers/wipro.pdf >

[5]. IDTechEx 2005 (12 Dec), *Active RFID- a profitable business*, Viewed on 12 September, 2009 at <http://www.idtechex.com/research/articles/active_rfid_a_profitable_business_00000396.asp>

[6]. Kator, C 2008 (2 Jan), RFID Basics, modern materials handling, Viewed on 12 September 2009 at < http://www.mmh.com/article/CA6528796.html>

[7]. Kleefeld, E 2005. 'RFID expert says piecemeal approach won't work'. WTN News. Viewed on 12 September 2009 at< http://wistechnology.com/articles/2122/>

[8]. Manish, B & Shahram, M 2005, RFID field guide: deploying radio frequency identification systems, Prentice Hall PTR, Upper Saddle River, NJ.
[9]. Myerson, J 2007, RFID in the supply chain – a guide to selection and implementation, Auerbach Publications, Boca Raton, FL.
[10]. Schoen, J W, 2005 (4 Aug), 'Can Saudi Arabia keep its oil promises?', Peak Oil News, viewed on 8 September 2008 at <http://peakoil.blogspot.com/2005/08/msnbc-can-saudi-arabia-keep-its-oil.html>
[11]. Swedberg, C, 2008 (23 May), 'Tough RFID tag strikes oil', RFID Journal, Viewed on 12 September 2009 at <http://www.rfidjournal.com/article/articleprint/4095/-1/1>

Shougi Suliman Abosuliman"RFID Technology In The Oil Industry "Feasibility Study"." (Quest Journals) Journal of Research in Humanities and Social Science 6.8 (2017): 12-16.