Active RFID Solutions Support Health and Safety Global Initiatives for the Mining Industry
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Background

In response to the increase in the number of accidents in the mining industry, many international legislative bodies have initiated more stringent laws to address health and safety issues. In June of 2006, US Congress sent the "Mine Improvement and New Emergency Response (MINER) Act" to the President of the United States. The MINER Act covers the following provisions:

- Mine operators install wireless two-way communication equipment for locating trapped miners by 2009.
- Mine operators equip each miner with an electronic tracking device by 2009.
- Mine Safety and Health Administration (MSHA) set minimum fines for some safety violations and raise the maximum for others. The maximum civil penalty for flagrant safety violations would rise from $60,000 to $220,000. It also imposes minimum fines of $2,000 for unwarrantable failure violations and $4,000 for unwarrantable orders.
- Mine operators must provide two-hour emergency supplies of air to each miner.

Abstract

The implementation of active RFID in the mining industry provides application solutions that support the required health and safety initiatives that are employed globally. The deployment of active RFID involves many divisions/departments within an organization. In many instances, the coherent flow of communications and data between the different divisions of an organization, in this case an ore mining facility, are complex in nature. To deploy and commission an active RFID solution involves intricate processes, workflows and strong relationships between the different divisions within an organization.

Wavetrend, in partnership with its solutions partners, provides a solution suite that can be seamlessly integrated into the mining sector. When integrating the Wavetrend solution into a mine's operational methodology and structure, advantageous effects in mining productivity and risk management are experienced. In addition to the mining section, the tunneling sector has successfully implemented active RFID for the location of workers on the construction site of the Gottherd Tunnel project in Switzerland in 2002 through 2005, and most recently in the Brisbane Tunnel project in Australia commenced in 2007.

This paper identifies and discusses the valuable solutions Wavetrend has developed, in the successful development and deployment of active RFID in the mining and tunneling sectors. The advantages of active RFID solutions over more conventional techniques will also be identified. The paper also discusses the challenges faced by the different parties involved.
The industry as we see it

Anyone that is familiar with the mining industry and its regulations willingly acknowledges that it is no trivial matter to specify, design and deploy a robust, reliable solution into a mission critical environment, where every problem seems similar, yet is actually very different and complex in nature.

The mining industry relies heavily on producing the maximum amount of ore in each working shift. It is therefore evident that the success of a particular mining facility is largely dependent on its productivity. As productivity increases, the potential risk and operational cost of the operation also increases. Based on our experiences, there are operational and risk factors that can be managed, and also minimized by adopting and deploying the Wavetrend mining solution.

Wavetrend, responsible for the design and manufacturing of innovative active RFID solutions, achieved a successful deployment stage by partnering with industry leaders in the mining industry. By entering into strategic joint ventures, Wavetrend has been able to rapidly deploy customized solutions that are seamlessly integrated throughout the mining operations and support the required health and safety mandates.

Examples of such strategic joint ventures are with companies such as NLT (Northern Light Technologies) in Australia and Canada, MinLog (Mining Logistics) in South Africa, and also the joint venture between CSI (Core System Integration) and Royal Access Control in South Africa. Accompanied by Wavetrend, these companies form formidable partnerships in the mining sector, for both the open and underground mining verticals.

The challenges that exist

Throughout an active RFID mining solution life cycle, there are constant and sometimes complex challenges that exist. As with all large active RFID deployment projects, some of the mission critical challenges could be technical, logistical and/or process related and should be dealt with seamlessly and effectively. Wavetrend with its strategic solutions partners has developed successful, proven, reliable processes and methodologies, to efficiently implement the right solution first time, whether it be a human, asset and/or vehicle tracking solution in the mining sector.

It is essential before system rollout that the companies agree on clear project specifications and deployment strategy. It is standard practice for Wavetrend to adopt a phased approach to project implementation, which tends to be the best method for deploying an active RFID mining solution. Firstly, an initial pilot phase is completed, followed by a proof of concept phase, which then leads to an enhancement of the proof of concept already deployed. The next logical step, and the final phase in the deployment cycle, is total system deployment. This system deployment methodology can easily be adopted in focused, problem solving applications.

The integration and deployment of active RFID solutions in the mining industry pose challenges to the mine’s day-to-day operations. The adoption of the technology throughout the mine is in some cases slow. The slow adoption of the technology is due to old rudimentary legacy systems that remain. The mining environment is one of the most hostile and risk-intensive working environments imaginable, so to convince mine authorities to convert operations and proven legacy processes to implement an active RFID solution is a even greater challenge. Wavetrend with its solutions partners is able to successfully approach, convince and work with the mining sector to embrace active RFID solutions purely on demonstrating the following factors:

- Ease of operation and integration of the system in existing legacy operational structures.
Benefit and increase of productivity, but not at the expense of risk.

Decreased risk throughout the mine.

Expedited communications/processes in the mining environment.

These are factors that enable the mining sector to embrace active RFID technology and solutions. Wavetrend and its solutions partners have successfully approached and negotiated the deployment of projects in the mining sector. By being able to locate and track assets successfully, more time can be allocated towards productive activities.

Technology we provide

Throughout the active RFID industry, Wavetrend is known as a leader in the development and deployment of value added active RFID products. The innovative Wavetrend RFID product range is comprised of two main product categories:

- Robust, low current consumption beacon type tag devices consisting of several form factors.
- An OEM robust receiver module capable of integration within any intrinsically safe certified platform.

Each of the Wavetrend tag and receiver devices used in the mining sector conforms to the intrinsically safe design and manufacturing specifications. Wavetrend and its manufacturer partners are subject to regular audits to ensure quality and certification compliance to the rules and regulations enforced by the intrinsically safe governing bodies.

Within the market sector, there are various solutions and technologies one can deploy in the mining sector. In order to quantify and establish which technology could be the ideal solution to implement, it is necessary to obtain answers to these questions:

- What is the unit cost per tag and receiver device?
- What is the operational frequency of the tags?
- What is the data structure of the protocol, and is it user configurable?
- What is the lifespan of each tag device?
- How easy is the deployment of product?
- How easy is it to maintain the system?
- Does the product vendor provide professional services as an added value?
- Is the product to be tagged metallic or non-metallic?

The Forward and Reverse tracking solution from Wavetrend and NLT (Northern Light Technologies) is providing the mining industry location information but also with a valuable, reliable communications link to the mining personnel, for both the open and underground mining verticals. The technology provided by Wavetrend and its solutions partner NLT is unique, for instance, in that the technology facilitates the relaying of data and communications messages from anywhere within the mine and to the command center in a matter of seconds as opposed to the older rudimentary legacy feeder systems. This enhancement in communications is revolutionary to the mining and tunneling industries.
An example of such a successful deployment of active RFID solutions is the Brisbane tunnel project located in Australia (Brisbane). Wavetrend and its solutions partner, NLT, have successfully deployed a solution to locate, track and communicate with assets throughout the construction site. Wavetrend’s active RFID solution for the mining industry is totally scalable and expandable.

Wavetrend’s active RFID solution for the mining and tunneling sectors is totally scalable and expandable. The solution is customized for the specific mining application and is offered at very competitive pricing, with more functionality than conventional legacy systems.

Solution to the challenge

Wavetrend has been working closely with market leaders in the mining and tunneling sectors, and this has enabled Wavetrend to supply a solution based on the specific needs of the sectors. The company and its strategic solutions partners are able to provide a customized application-specific solution using a standard product mix. The success of a solution is based on the deployment of product within a certain paradigm. The technology is then utilized to provide the location of an asset or in many cases the movement of personnel and assets. This results in increased productivity and better time and resource management.

Mining Personnel Tracking - NLT

As the mining industry expands, human and asset risk management has become more difficult and important to manage. It has become standard, even mandated practice for a mine to do absolutely everything in its power to eliminate accidents and risks, or to put extra precautionary life saving processes, procedures and technologies in place to be able to locate, communicate and rescue employees if something should go wrong. Tim Haight, the managing director of NLT noted that:

"being able to direct people is critical if there is a fire in an evacuation route. Or, if someone is hurt, you can send a first aid certificated rescue team and direct them to the injured person when time is of the essence."

Wavetrend and its strategic solutions partners are able to facilitate in the design, deployment and commission of technology solutions to provide a better, safer working environment within the mine. Wavetrend and its partners consider it their passion and vision to drive and initiate easy deployable solutions and tools to facilitate a more risk-free mining environment.

The Wavetrend-NLT solutions offer increased productivity, and the system also facilitates with the communications process in the mine. Tim Haight also noted that:

"by incorporating the Wavetrend product with our product line, it is clearly noticed that mine productivity goes up when you know where people and equipment are, because now you can get people reacting quickly to equipment breakdowns reducing downtime..."

Wavetrend differentiates its product range from those of the competition by supplying high-value intrinsically safe certified, innovative product to the mining sector in the form of solutions or technology building blocks that are easily and seamlessly deployable. Below is a feature set that is standard to the Wavetrend product range:

- All product destined to be deployed and used in the mining industry is certified to the intrinsically safe "Ex-a specification."

- Excess of three years lifespan on all standard tagging product.
Small and robust form factor for ease of deployment.

User configurable data section to ensure maximum solution efficiency.

User changeable features on each tag device, e.g. repetition rate and site code.

Considerable price advantages to that of competitors.

Anti-tamper functionality added as a standard feature.

A distinguishing strength of the Wavetrend product range is the large investment in an intellectual property protection scheme. The standard product range is protected by several patents, which have been successfully filed throughout various geographical regions. The customers of Wavetrend and its solution partners can be assured that their investment is protected against imitations and inferior product introductions.

Mining Health and Safety CSI & Royal Access

Another innovative solution provided by Wavetrend and its strategic solutions partners, CSI & Royal Access Control, is a solution that effectively and successfully manages intelligent assets in the mining industry. The joint venture between CSI and Royal Access Control has resulted in the development of an innovative system known as LAP (Loco Accident Prevention). LAP not only minimizes potential risk towards human life, but also increases asset management and shift productivity. Hannes Potgieter, Director of CSI noted that:

“a primary reason for the development and deployment of the LAP system is because of typical harsh environmental conditions that exists in all underground mines in South Africa… for instance, the system successfully facilitates accident prevention in scenarios where there is little or no visibility underground. Such a scenario where assets and people interact with little or no visibility becomes a potential high risk working environment…”

The LAP system is an innovative early warning system based on the Wavetrend product range. The early warning system consists of a control device with a Wavetrend active RFID receiver incorporated and retrofitted to the locomotive. Throughout the mining environment, assets and personnel are issued standard Wavetrend active RFID tag devices.

The early warning device then limits or controls the actions of the mining locomotive based on certain pre-programmed rule sets, for instance the speed of the locomotive could be reduced to a crawling speed when a deployed Wavetrend active RFID tag device is detected. The early warning system incorporates a data logging functionality that in case of an accident provides total visibility of the locomotive and conductor’s actions. Hannes Potgieter, Director of CSI noted that:

“Our greatest asset is our team of dedicated mining personnel. With increased mandates, it is our responsibility to protect our employees while maintaining productive and efficient mining operations. Down-time of mining equipment and missed production targets may result in an unanticipated negative impact on revenues and financial expectations for that particular shift.”

Wavetrend and its solutions partner CSI have experienced that, in many instances, the LAP system also increases the safety awareness and productivity of underground locomotive conductors. This contributes favorably towards overall mining safety and efficiency.
Another successful solution deployed by Wavetrend and its solutions partners CSI & Royal Access Control is an intelligent underground mining solution known as TCS (Traffic Control System). TCS dynamically controls the speed of the underground mining vehicle as it approaches either a bend, cross cut, tip or bypass. Total system control is enforced by being in control of the brake system of each vehicle. The system also dynamically controls underground traffic lights in order to successfully regulate the flow of traffic at either a bend, cross cut, tip or bypass.

This is vital to overall mine safety and productivity, and is rapidly becoming a requirement within the mines in South Africa. The enormous response from the mining industry is largely due to the positive impact the system has had on mine safety and productivity. This in turn has had a positive effect on revenue and targets for each shift.

The value of such a system is easily realized when considering the management advantages obtained when being able to dynamically retrieve data-sets obtained from each deployed system. For instance, mine management can easily establish locomotive conductor driving behavior by identifying problematic patterns and taking the correct steps in a pro-active manner. TCS provides mine management with the data sets in the form of time stamped logs, which reflect the location and behavioral data patterns of a particular locomotive for each shift.

The TCS system contributes successfully towards increased mine safety and productivity. The system is easily deployed and is totally scalable. The TCS system is again a testimony to the successful deployment of the Wavetrend product range in the mining environment.

The way forward

Wavetrend has become a recognized name within the mining and tunneling industries for providing practical, cost-effective and easily implemented solutions. The result is a safer, more efficient and productive mining environment that complies with industry mandates. There is thus a clear indication regarding the value added by systems, like the LAP and Forward and Reverse Tracking solutions, which are regarded as critical to the ongoing operational flow of a mining facility when deployed.

Wavetrend positioned itself within the mining market vertical as a leader in providing solutions accompanied by its solutions partners, whether the focus is on personnel identification and communications with NLT, or mining productivity and management with CSI & Royal Access Control.

The mining and tunneling sectors are very demanding markets with mission critical requirements. With Wavetrend’s multiple customers worldwide, it has the strongest, most diverse fit for custom solutions for these industries.

About Wavetrend

Operationally headquartered in the United Kingdom with regional offices in South Africa, Asia, and the United States, Wavetrend is a world leader in the deployment of active RFID and track-and-trace solutions. Wavetrend technology enables enhanced management of people, assets, and logistics for improved business performance while optimizing customer return on investment and payback time. Through both its direct Professional Service teams and its global network of accredited application and integration partners, Wavetrend delivers a wide selection of proven, superior-performing active RFID products and track-and-trace solutions to customers around the world and supports a variety of industries including transport, automotive, defense, healthcare, aviation, and construction.