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CASE STUDY

How One of the World's Largest Mines is Improving Safety and Productivity

TECHNOLOGY CHALLENGES IN UNDERGROUND MINING

Wide-spread & Dynamic Global Tracking Area

Blasting & Seismic Events

Poor Visibility

Poor Signal & Radio Interference

Harsh Working Conditions

Crowded Broadband Space

Limited Physical Space

When a person is within proximity to a vehicle or motorized equipment, their safety—or even their life—could be at risk. In the mining industry, vehicle-to-vehicle and vehicle-to-pedestrian interactions cause serious workplace incidents that account for a significant percentage of the total injuries and fatalities every year.

Reducing the risk of these incidents continues to be a top priority for mining companies, but there are many challenges to solving the problem. First, reliability and durability are important for any safety technology system, especially when operating in an extreme underground mining environment. Eliminating vehicle collisions means that the system needs to work 100% of the time, even if some nodes become damaged and during unexpected power outages (which are common underground). Additionally, there have been few system developments to date which enable better safety and measurable productivity improvements.

When the largest global mining company was searching for a solution to reduce safety incidents, improve efficiency, and increase productivity in their mines, they knew it would require cutting-edge location tracking technology and unprecedented visibility into their operations. They selected Redpoint Positioning's real-time location system to deliver real results in one of their largest operations.

SOLUTION

Recent advancements in Ultra-wideband (UWB) indoor Real-Time Location Systems (RTLS) offer a potential opportunity to reduce accidents, as they can respond faster than their human counterparts can react and are not susceptible to human error and fatigue.

How it Works

For indoor and industrial environments like mines, UWB outperforms many other positioning technologies, including GPS and WiFi. These other frequencies are easily blocked by walls and equipment or suffer reduced performance in challenging environments, while UWB does not.

UWB's high precision does require a more complex initial set-up compared to other location networks which can be a barrier for small-scale projects. But for an underground collision avoidance system, the advantages of an UWB RTLS network far outweigh the costs as UWB is the only frequency that retains its accuracy in the mine, and all installations in the mine are challenging and costly anyway.

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Why Redpoint

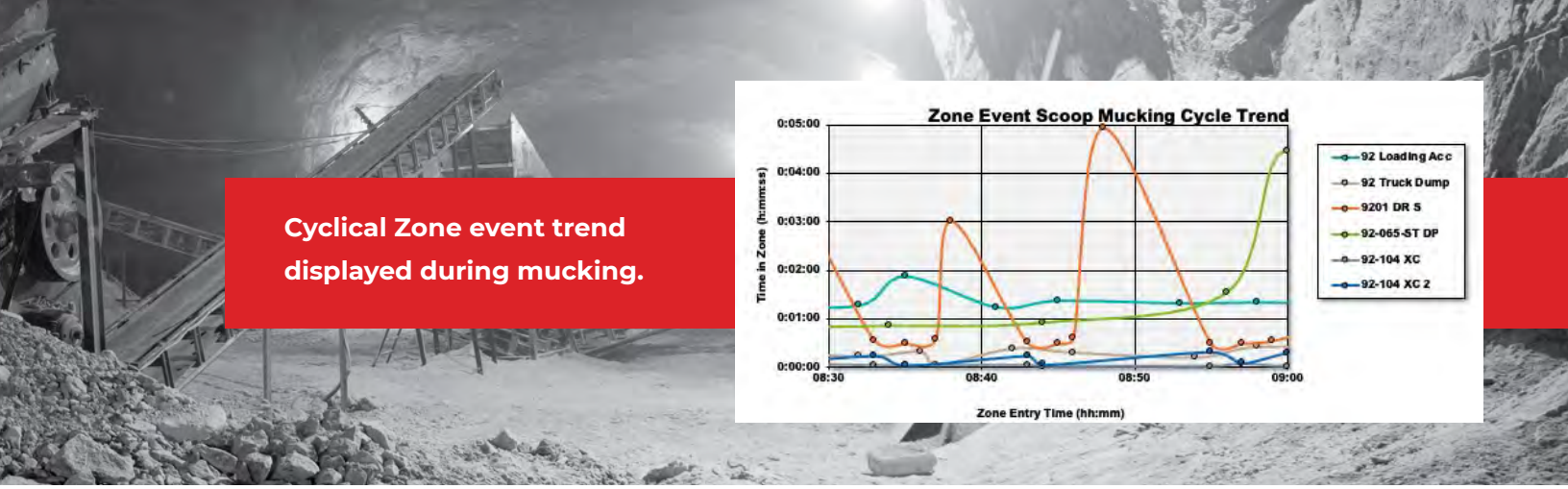
Redpoint Positioning's RTLS uses UWB and patented, cutting-edge technology to offer proximity detection and geofencing that holds up even in the most challenging mining conditions.

A unique feature of the Redpoint UWB RTLS is that the tags can calculate the linear distance to other tags based on a direct tag-to-tag Bluetooth connection called the Low Latency Link (LLL). A minimum LLL distance can then be applied to a 'broadcast' tag, which will then set off an alarm similar to a buffer zone when another active tag comes too close. The tags can broadcast, receive, and calculate the distance between themselves, even if there is no anchor nearby.

RESULTS

In January 2020, the company decided to evaluate Redpoint's RTLS in one of their largest mines as a potential underground proximity detection and collision avoidance system.

To test the system's ability to function in an underground mining environment, one of the active production levels in the mine was outfitted with a complete RTLS network and tags individually assigned to operators on the level. Overall, mucking data was collected sporadically throughout the mining of two production stopes.



Cyclical Zone event trend displayed during mucking.

The initial objectives of the pilot project were:

1. Prove that the system is capable of operating in an underground mining environment without significant reduction in tracking performance or excessive maintenance costs.
2. Trial Redpoint features and applications, especially geofencing.

Zone Activity

The Zone Activity Report data shown highlights the key trends that occur during a typical mucking shift. During the pilot program, the Redpoint system identified three main types of data anomalies that could have a huge business impact:

1. Double entry – When a tag enters a production zone and exits without completing the assumed zone task.

Double entries result in an overestimation of the total production values due to registering two zone events in a single cycle trip. The double entry also needs to occur within the draw point or loading access zone depending on which one is used to measure the total number of cycles. Fortunately, the majority of them are easily identified by the Redpoint system, enabling managers to consider improvements including zone placement, vehicle specifications, and more.

2. Vehicle idle outside of zone – Large spikes in both the gap time and the total time spent outside the zone indicate that the mucking cycle was interrupted for some unknown reason.

3. LHD idle inside of Zone – The time that a tag spends inside a zone is also automatically captured and recorded by the system. In theory, this time period should correlate with the mucking difficult of the stope, stope brow status, and operator skill.

Based on the dataset collected, it appeared that there were several instances of the scoop being idle inside the draw point zone for an extended period ***(see figure above)***.

By correcting this error, this mine could increase productivity significantly while improving personnel safety. That increased production grows exponentially if the system is expanded to other levels of the mine and other mines managed by the company.

CLICK HERE to learn more about how Redpoint is improving safety and productivity in mining environments.

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