



Amandelbult Scraper Winch Proximity Detection Development, Trial, and Lessons Learnt

MOSH Transport & Machinery Day of Learning

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No Classification



Background

Why was the SWPD developed?

- Scraper winch operations remain one of the highest-risk mining activities due to the potential interaction between personnel and rigging equipment.
- Historical incidents and recurring near misses showed that procedural and administrative controls alone were insufficient to adequately manage the risk.
- In 2019, the Amandelbult Engineering team initiated the Research & Development of the Scraper Winch Proximity Detection system (SWPD) to introduce an engineered safety control.
- As the project progressed, the scope expanded to address additional high-risk unwanted events identified through incident investigations.

Objectives

- Eliminate personnel exposure within the scraper path.
- Improve safety through engineered controls.
- Validate the system through structured underground trials.
- Develop a practical and standardised solution suitable for broader implementation.

Rev.3 System Demonstration



Integration between two existing, proven products, to create an exclusion zone along the length of the scraper path – providing for fail-to-safe operability of scraper winches.

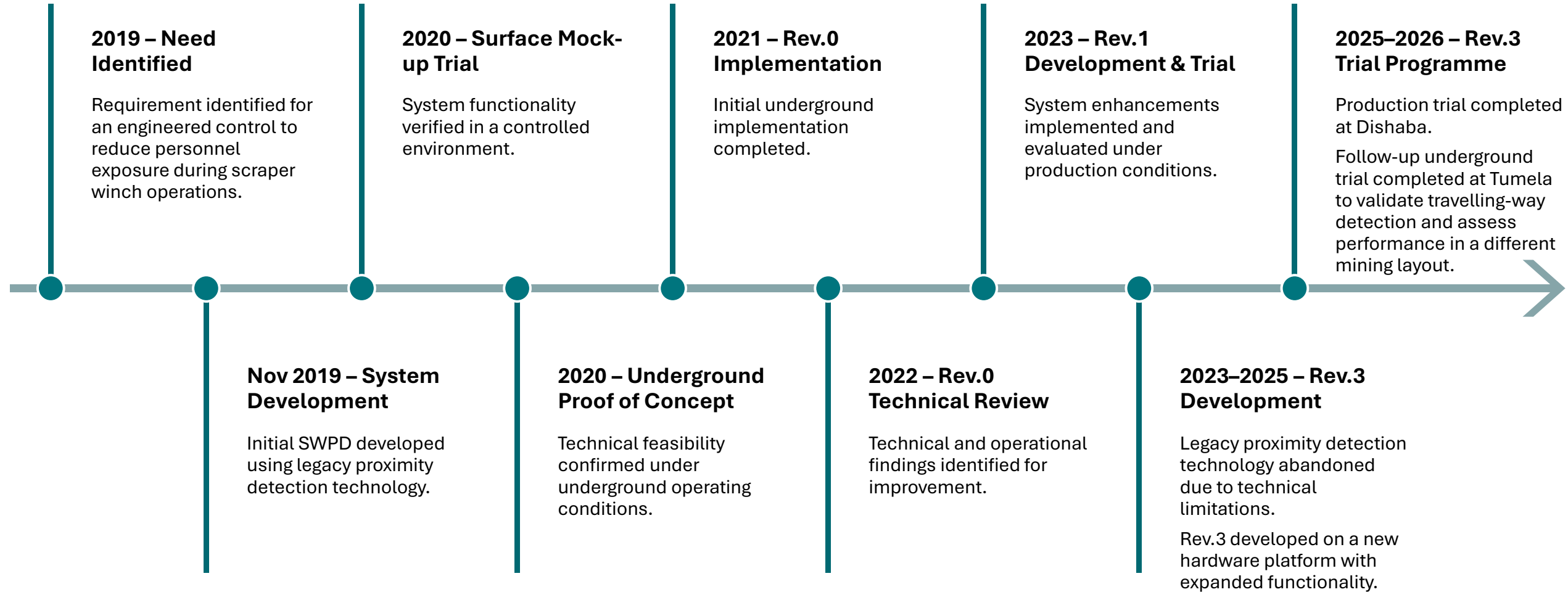


During the demonstration, observe how the system:

- Monitors the **defined** protection zone.
- Automatically trips the scraper winch when:
 - a person enters the scraper path;
 - a personnel tag indicates a potential fall or incapacitation near the scraper path; or
 - the operator leaves the operator station.
- Displays a live view of the installation and personnel movement.
- Enforces a pre-start inspection of the full scraper path.
- Records system events.
- Controls the restart sequence.



Development History



Development Findings

Development Phase	Key Findings	Design Improvements
Rev.0 Review	- Inconsistent personnel detection. - Installation and maintenance challenges identified.	- Detection logic refined. - Hardware configuration improved. - Installation requirements standardised.
Rev.1 Trial	- Additional operating scenarios identified (adjacent travelling ways, Centre Gully and ASG interactions, and system start-up/reset behaviour). - Existing hardware could not support additional functionality.	- System logic expanded to manage additional operating conditions. - Legacy proximity detection technology replaced with a new independent platform.
Rev.3 Development	Legacy hardware and software limitations removed through system redesign.	- New hardware platform. - Updated software architecture. - Improved system reliability.

Legacy SWPD

- Proximity Detection Only

Scraper Winch Proximity Device



Control Module Antenna

CONTINUOUS IMPROVEMENT

Scraper Winch Proximity Device



Control Module Antenna

Rev.3 SWPD

- Winch Runtime monitoring
- Integrated Pre-start Checklist
- Operator Vigilance interlocking
- Operator Key Control

Rev.3 Trial Programme & Results

	Dishaba Lower	Tumela Lower
Trial Purpose	Production trial	Production trial
Primary Focus	Reliability, stability and production readiness	Travelling-way detection and performance under a different mining layout
Key Results	• 720+ operating hours • 386 system interventions • 91.7% verified detections • No unsafe events	• Travelling-way detection confirmed • Stable system operation • Positive operational feedback
Outcome	Production readiness demonstrated	Production readiness demonstrated

Overall Outcome

- Reliable operation demonstrated under production conditions.
- Travelling-way detection successfully confirmed.
- Consistent system performance achieved across different underground environments.

Limitations

Technology Proven

The Rev.3 system has demonstrated that the technology is effective; however, broader implementation remains constrained by implementation requirements.

Long-term Objective

Implementation across both CG and ASG scraper winch installations remains the long-term objective.

Implementation Requirements

Each installation requires significant underground installation, commissioning and supporting infrastructure, resulting in a high implementation cost before it can be placed into service.

Specialised Technical Personnel

Installation, commissioning and maintenance require specialised labour to install, configure, commission and maintain the system.

Future Development

Alternative manufacturing options are being investigated to reduce installation and life-cycle costs.



Thank you

