MANDELA MINING PRECINCT
MINDS FOR MINES

Longevity of Current Mines (LoCM) Programme

Martin Pretorius

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Work Package Introduction

Programme Intent:

The Longevity of Current Mines intent is to develop a winch control system with proximity detection as a proof-of-concept prototype for industry uptake.

Aim	Deliverables	Status
The development of a winch operational control system guided by industry criteria and requirements, which enables the automatic shut-down when operator is not present or in an unsafe position, or where persons are to enter in near proximity of scraper pathway whilst the scraper is operational. *A further requirement is to introduce a remote functioning unit to enable scraper winch operation remotely.*	• *Establish industry criteria and requirements* • *OEM collaboration to develop prototype* • *Develop prototype to criteria and requirements* • *Performance test on surface new technological prototypes* • *Proof of concept result findings* • *Preparation for underground testing* • *Underground trial and testing with performance measure* • *Final findings report & Roll-out plan*	✓ ✓ ✓ ✓ ✓ x x x

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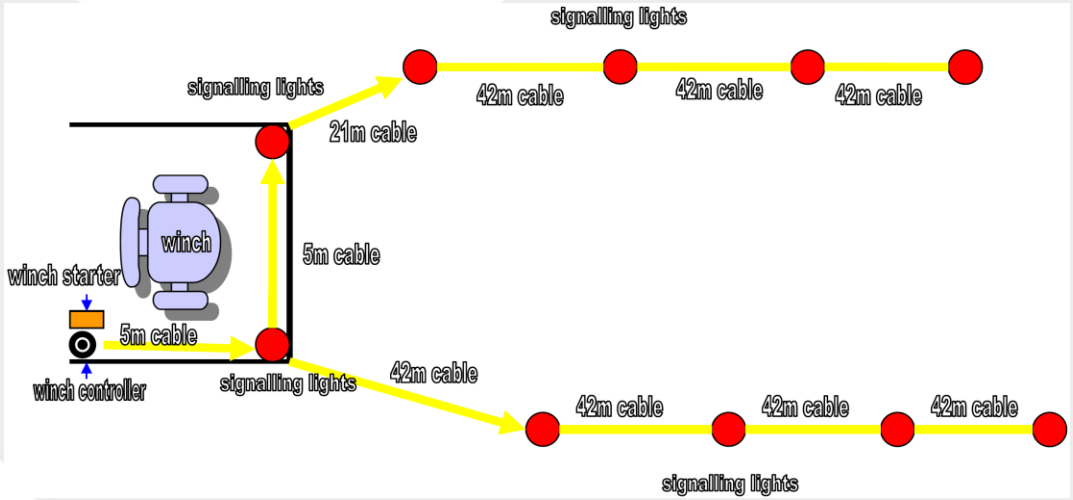
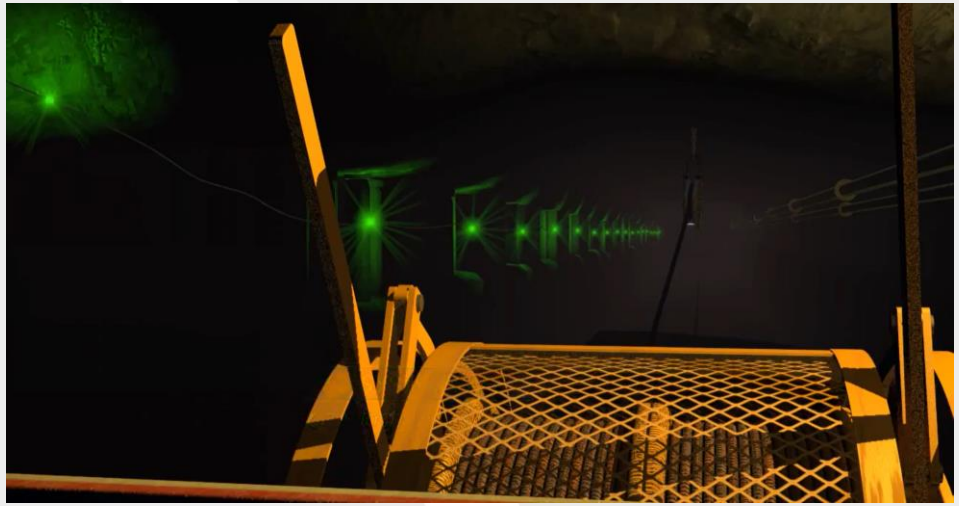
Existing scraper winch signaling systems

"Winch Signalling Devices"



- Pre-startup warning: 15-second safety start-up delay with audio warning and LED signalling lights changing from green to red
- LED signalling lights always ON to indicate the operation status
- Winch tripped by pulling the cable, the pull wire or shining a cap lamp for 5 seconds onto any of the lights

"Scraper Safe"



- Pre-startup warning: 30-second safety start-up delay with audio warning and LED signalling lights changing from green to red
- LED signalling lights always ON to indicate the operation status
- The system <u>does not</u> trip the winch

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Signalling Systems vs. Proximity Detection Systems

Features	Signaling systems	Proximity detection systems
Detection process	Assisted (e.g. cable pulling, light shining)	Automatic
Motor shut-down	Design dependent	Yes
Pre-startup warning	Yes	Design dependent
Continuous indication of the system status	Yes	Design dependent
Signal means	Visual, audio	Design dependent

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Prototype development

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In-house testing

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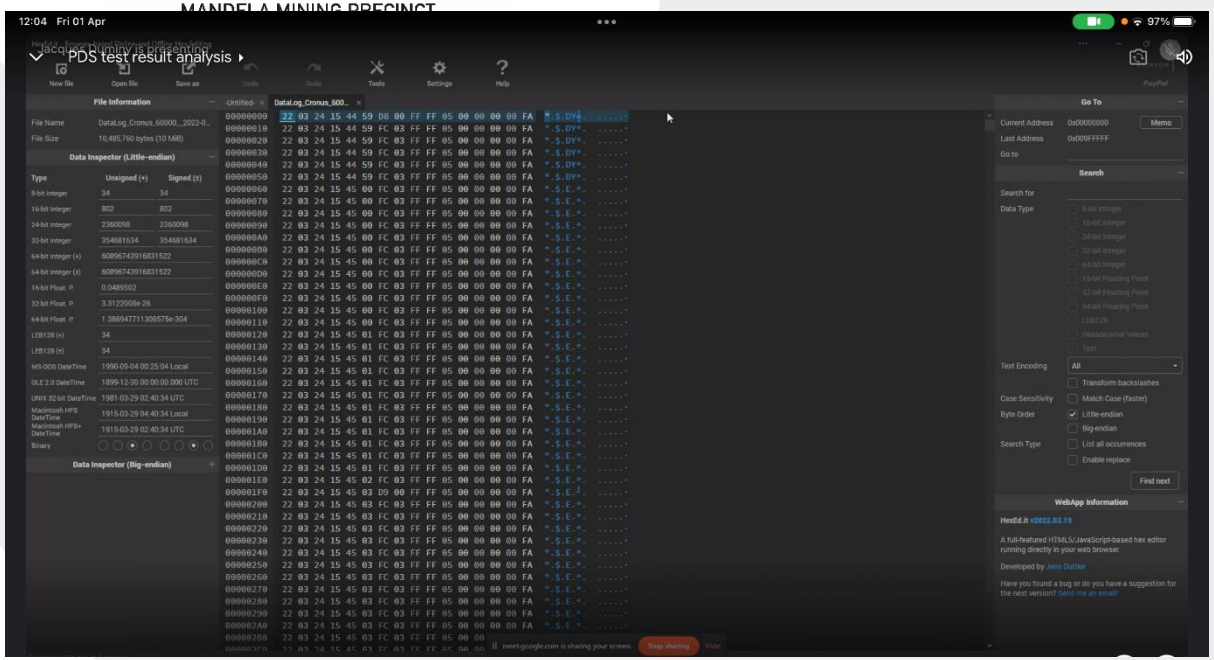
Onsite testing

Result analysis



Event ID	Event name	18 March 2022		22 March 2022	
		Recorded entries	Cap lamp ID missing	Recorded entries	Cap lamp ID missing
15	EV_PreUse_Bypass_Active	0	0	1	0
31	EV_InternalEstop_Pressed	1	N/A	10	N/A
32	EV_SignallingFaulty_Active	2	N/A	9	N/A
33	EV_WinchFaulty_Active	0	N/A	3	N/A
35	EV_PDS_Pedestrian_Detected	699	0	7	0
36	EV_PDS_Operator_Missing	23	23	5	**0**
37	EV_ExternalEstop_Pressed	0	N/A	5	N/A
38	EV_PDS_Excessive_Exclusion	734	0	0	0
39	EV_License_Missing	2	0	10	0
40	EV_License_Invalid	0	0	1	0
41	EV_License_Valid	1	1	3	**0**
42	EV_Vision_CAN_Failed	6	N/A	17	N/A
43	EV_Handheld_Missing	2	N/A	9	N/A
Total		**1470**		**80**	

Unix Timestamp	Event ID	Event Name	Instance ID	Set or Clear	Log Data	Log Data	Log Data	Log Data	Log Data	Log Data	Log Data	Log Data
2022-03-18 10:48	38	EV_PDS_Excessive_Exclusion	0	Set	0	0	0	0	0	0	0	0
2022-03-18 10:49	35	EV_PDS_Pedestrian_Detected	0	Set	107	114	65	35	0	0	0	0
2022-03-18 10:49	38	EV_PDS_Excessive_Exclusion	0	Clear	0	0	0	0	0	0	0	0
2022-03-18 10:49	35	EV_PDS_Pedestrian_Detected	3	Set	136	102	77	78	0	0	0	0
2022-03-18 10:49	35	EV_PDS_Pedestrian_Detected	3	Set	136	102	77	78	0	0	0	0
2022-03-18 10:49	38	EV_PDS_Excessive_Exclusion	0	Set	0	0	0	0	0	0	0	0
2022-03-18 10:49	35	EV_PDS_Pedestrian_Detected	3	Set	136	102	77	78	0	0	0	0

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Equipment Details & Demonstration

Flexible low-frequency magnetic field antenna

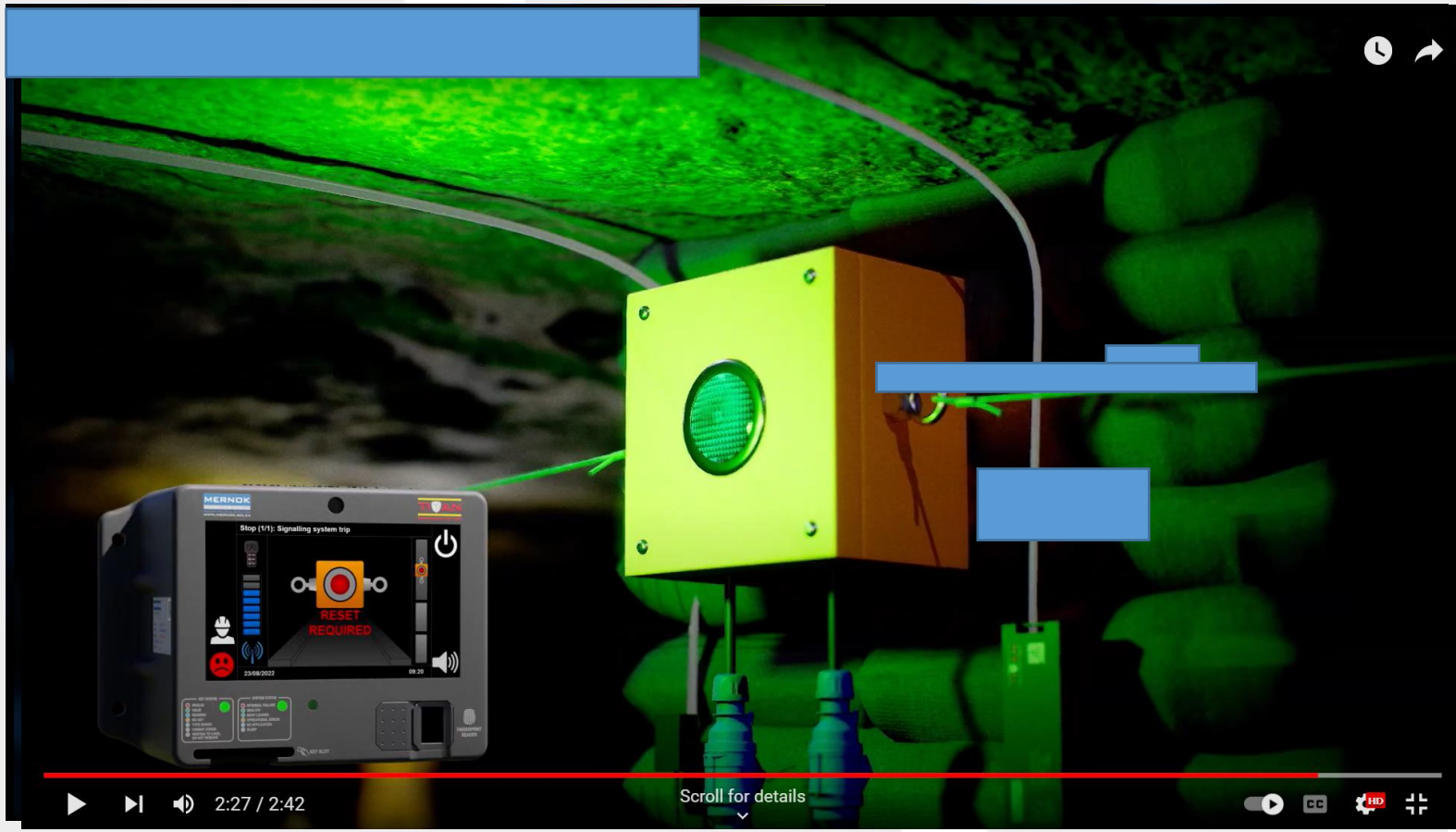
Dual-purpose proximity detection and signalling device

Commander Human Interface (HMI)

Field monitoring of winch operator presence

Multi-purpose handheld device

Full integration with the existing signalling devices



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Project Achievements

Remote Scraper Cleaning with proximity detection

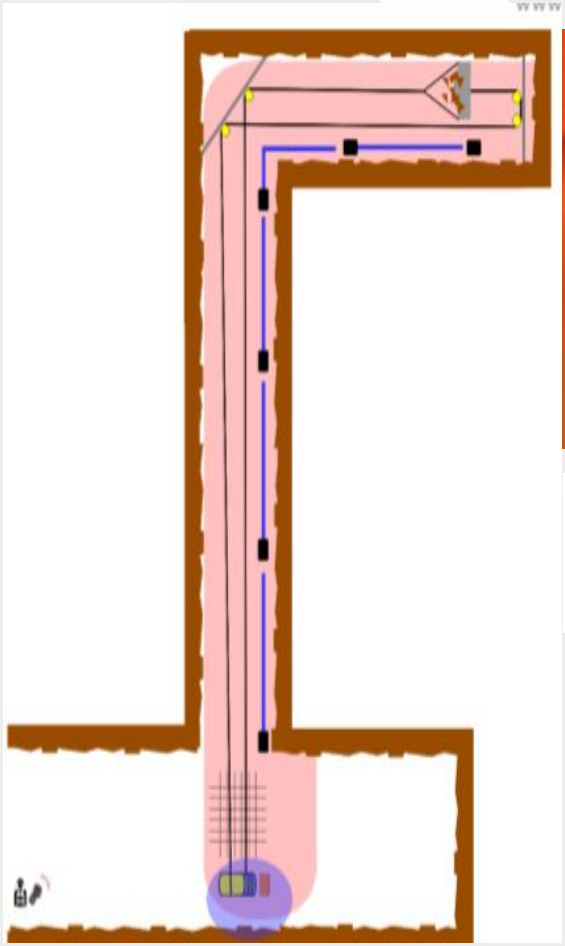
Two prototypes have been developed, [redacted], which the control unit is connected to the scraper winch, enabling emergency shut down when people are detected in close proximity of the winch or the scraper pathway. A fail-to-safe sensor system, transmitting along the scraper path.

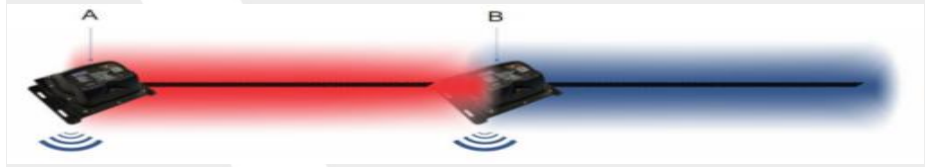
Value proposition for Industry are the following:

A safer scraper winch operation system, which only allows certified winch operators to operate the winch, but also switches off automatically when any person is in close proximity of the scraper or within the scraper pathway, detecting the cap lamps, and preventing injuries to persons. It further records all activities of these occurrences on a data log system, which can be linked to existing reporting systems.

Next steps for completion and implementation:

The completion of the remote functioning design, development and testing to follow. Underground testing of the system is planned by September 2022, following demonstrations.





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Questions

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