


Use Of Emerging Technologies In Quarries

Small Mines Roadshows 2023

February to March 2023





The Department of Regional New South Wales acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for Elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

What we will cover.

- Drone Technology
- Collision Avoidance Systems
- Hybrid Technology
- Hybrid technology case study
- Mobile phone technology

Disclaimer: The Resources Regulator does not endorse any products or services mentioned in this presentation

Drone Technology

The use of drones in mine and quarries.



Question

Does anybody here use drones on their site, either by using an external provider or conducted in house?

Can someone give me an example on how it has changed the way they do business or a certain activity.

Benefits of using a drone on site.

Capture data faster and more cost effectively

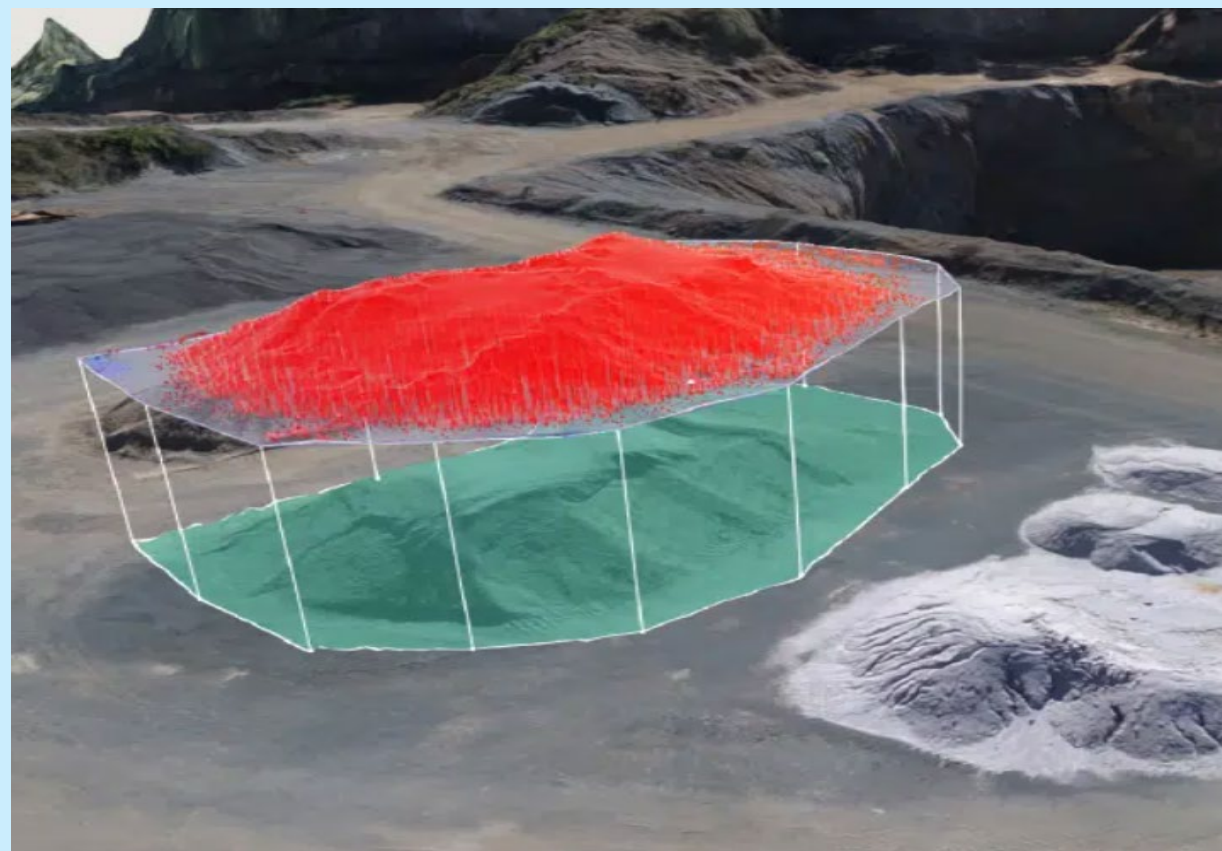
- Complete survey in hours not days.
- Cheaper surveys
- Generate 3D and 2D digital replicas of site with 24 hours.
- Measure pit angles and calculate stockpile volumes.



Benefits of using a drone on site.

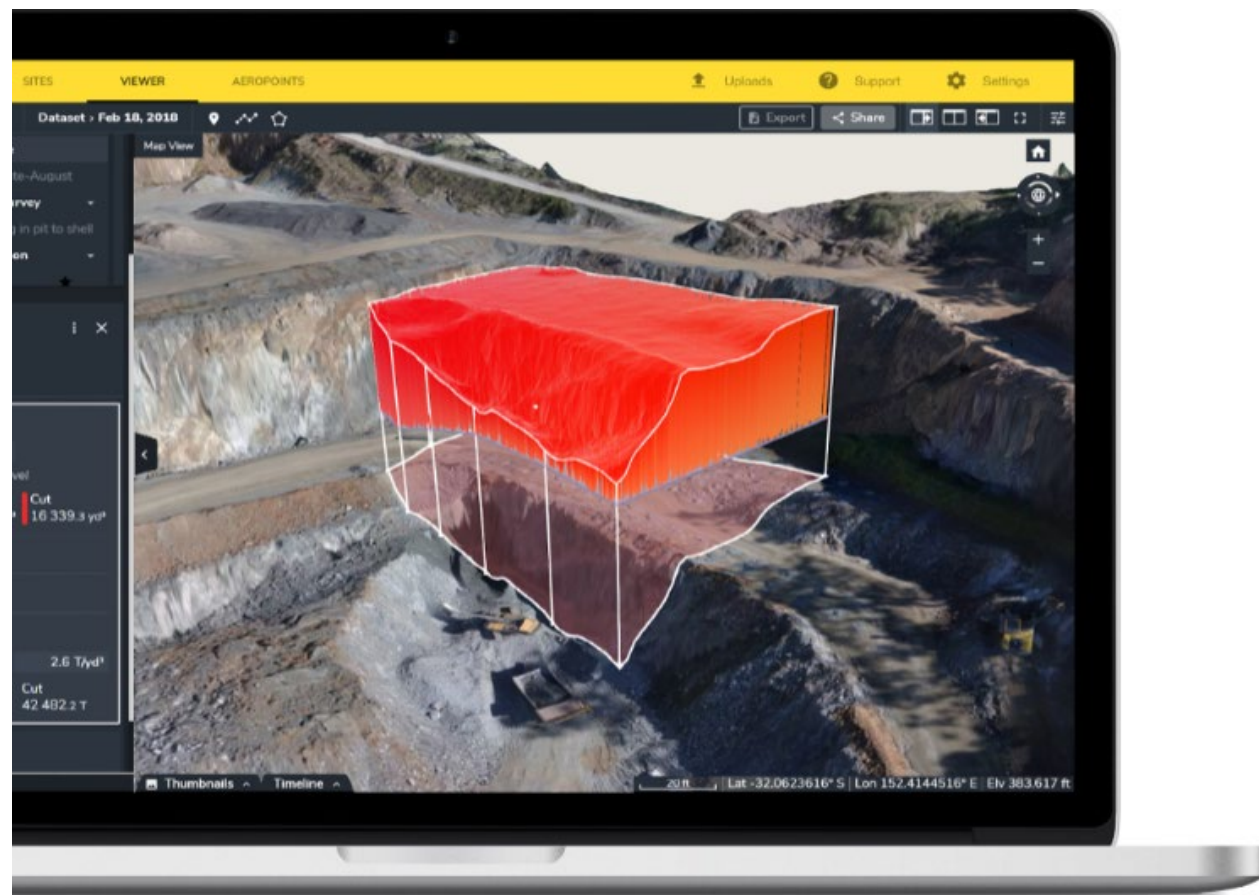
Streamline planning and building

- Better pit and dump design
- Build up visual record of site changes
- Weekly or monthly pit volumes and compare current pit conditions.



Benefits of using a drone on site.

- Save time on drilling and blasting
- Capture pre-blast rock type variation in bench, face angles, rock conditions and volumes.
- 3D survey to calculate drill depths and analyse blast area.
- Measure post blast volume, visual assessments of muckpile shape, back damage, distribution and fragmentation.



Questions

Has anyone used a drone with a software application for measuring stockpile volumes?

Is this more accurate than traditional methods?

Benefits of using a drone on site.

- Monitor roads more efficiently
- Better traffic management
- Measure road lengths, slopes, grades.
- Check against road design and safety requirements.

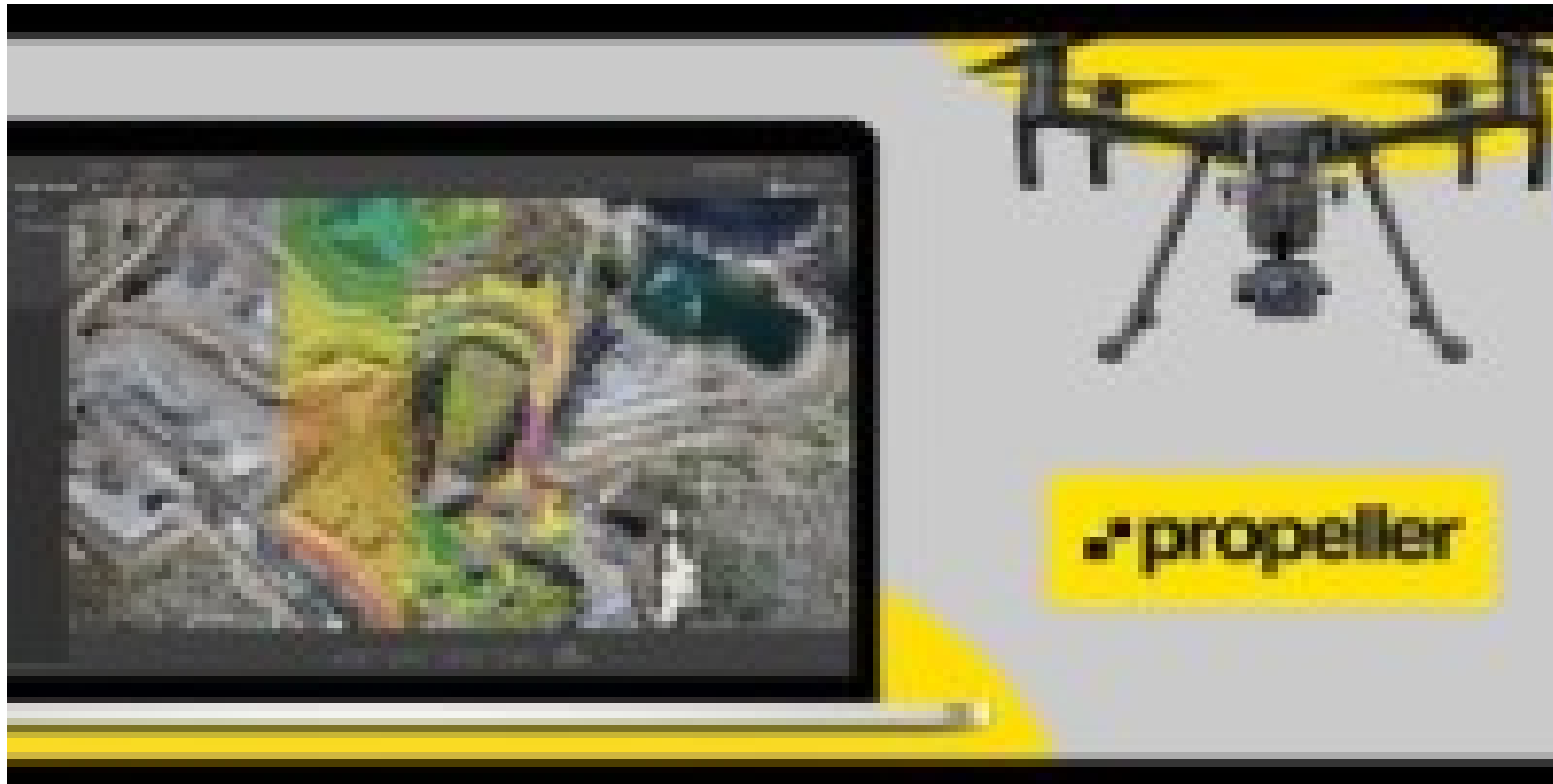


Benefits of using a drone on site.

Safety

- Eliminate survey staff from high risk areas.
- Monitor and manage worksite hazards.
- Assist in incident investigations





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Collision Avoidance Systems

Vehicle interactions make up a significant portion of incidents that are reported to the Central Assessment Unit.



Collision Avoidance Systems



Collision avoidance systems can reduce the risk of accidents between machines or pedestrians and machines.

Questions.

Has anyone implemented the use of a collision avoidance or proximity detection system on their site?

Has it had a positive affect on site or is just another annoying add on?

Hybrid Technology



Earthmoving equipment that accommodates hybrid technology is becoming more popular within the mining and quarrying industry



Hybrid Technology Case Study – Volvo 2020

Equipment List

- 50-ton diesel-powered wheel loader, replaced with a 20-ton hybrid loader.
- Three 40-ton articulated haulers replaced with eight 15-ton autonomous articulated haulers.
- 70-ton diesel-powered excavator replaced with a grid-powered excavator.
- A diesel-powered crusher was converted to draw power from the electric grid.



Date: February 2023

Explosion risk of battery units for underground battery electric vehicles

This safety alert provides safety advice for the NSW mining industry.

Issue

The use of lithium-based chemistries in battery design is rapidly increasing. There has been a corresponding increase in incidents involving equipment fitted with these batteries.

The NSW Resources Regulator has previously issued safety bulletin [SB21-05 Fire risk of battery units for underground battery electric vehicles](#) and [SB22-17 Fires on battery powered tools increase](#). Both of these bulletins have focused on the risks associated with lithium based batteries (LiBs) catching fire.

Areas of concern

In addition to the risk of fire, LiBs may also pose a risk of explosion resulting from the generation of explosive vapours from the chemical reactions which occur during thermal runaway of the battery cells.

Thermal runaway may be initiated by overcharging or short circuiting, or may result from physical damage, such as heating, penetration, crushing or vibration. Regardless cause, once a critical temperature is reached the cell will go into thermal runaway with the exothermic reaction causing cell temperature to continue to increase. At this point the reaction is self-sustaining and the only way to stop it is to cool the cell.

The internal pressures generated during the reaction can cause the cell casing to rupture, if it is not already damaged.

If a LiB cell goes into thermal runaway it may ignite. This normally consumes any flammable vapours generated by the exothermic reaction, however not all failures will result in ignition of the flammable vapours, especially if the battery has a low state of charge. In this case the vapours may freely vent to atmosphere and accumulate in locations where there are low levels of ventilation. Examples of this would include cabins of vehicles and inside enclosures, as well as stubs and cut-throughs in coal mines and cuddies in metalliferous mines. Smaller accumulations may also occur in roof or floor cavities.

The composition and the flammability of these vapours is dependent on the materials used in the electrolyte and the cathode of the cell. Some elements of the vapour cloud will be denser and will tend to sit at floor level, while other elements are less dense and will tend to sit at roof level. The composition and density of a vapour cloud will vary depending on the specific chemistry of the cells.

Flammable vapours generated during a thermal runaway event include:

- organic solvent vapour (small droplets)

Introduction of risks associated with Hybrid Technology

The NSW Resources Regulator has previously issued safety bulletins:

- [Safety Bulletin SB23-01 Explosion risk of battery units for underground battery electric vehicles \(PDF, 134.46 KB\)](#)
- [Safety bulletin SB22-17 Fires on battery powered tools increase \(PDF, 468.48 KB\)](#)
- [Safety Bulleting SB21-05 Fire risk of battery units for underground battery electric vehicles \(PDF, 207.26 KB\)](#)

Recommendations on introducing Hybrid Technology

Figure 1 - Damage to battery after being run over



Refer to all recommendations in Safety Bulletins

- Adequate ventilation
- Emergency management plans
- First responders trained in exposure to toxic and corrosive chemicals, awareness of potential electric shock and burns
- First responders trained and access to appropriate PPE
- Procedures required for storage and disposal of damaged batteries.

Assisted Reality Technology



Assisted reality technology

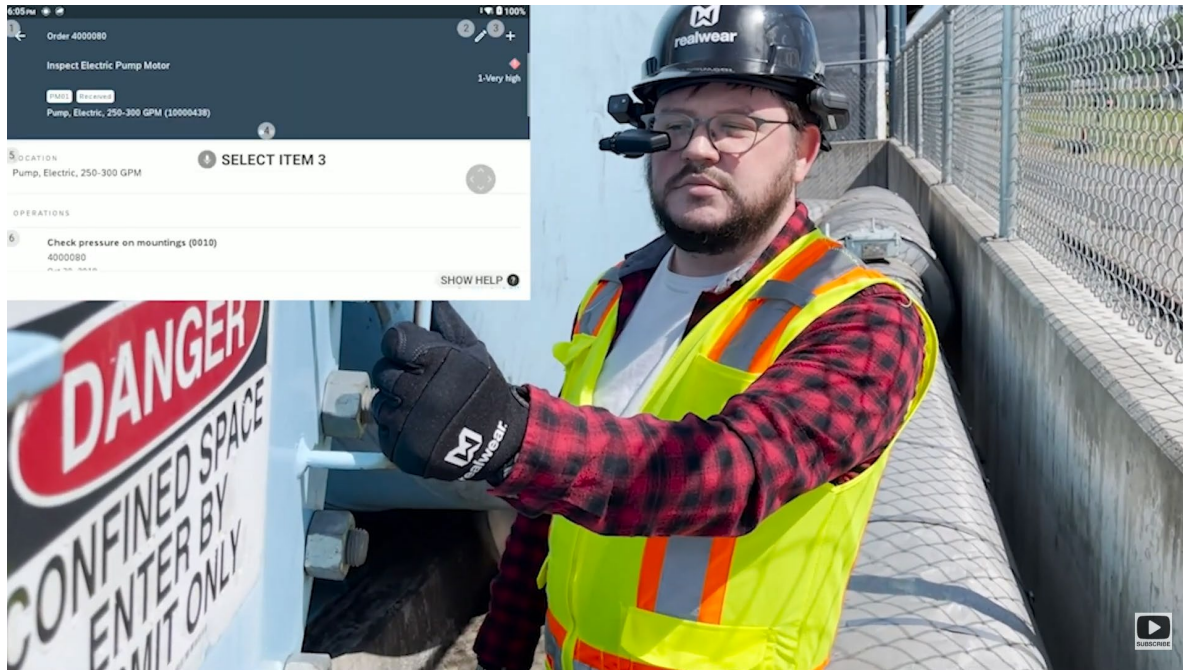


Real time inspections with remote engineers / technicians

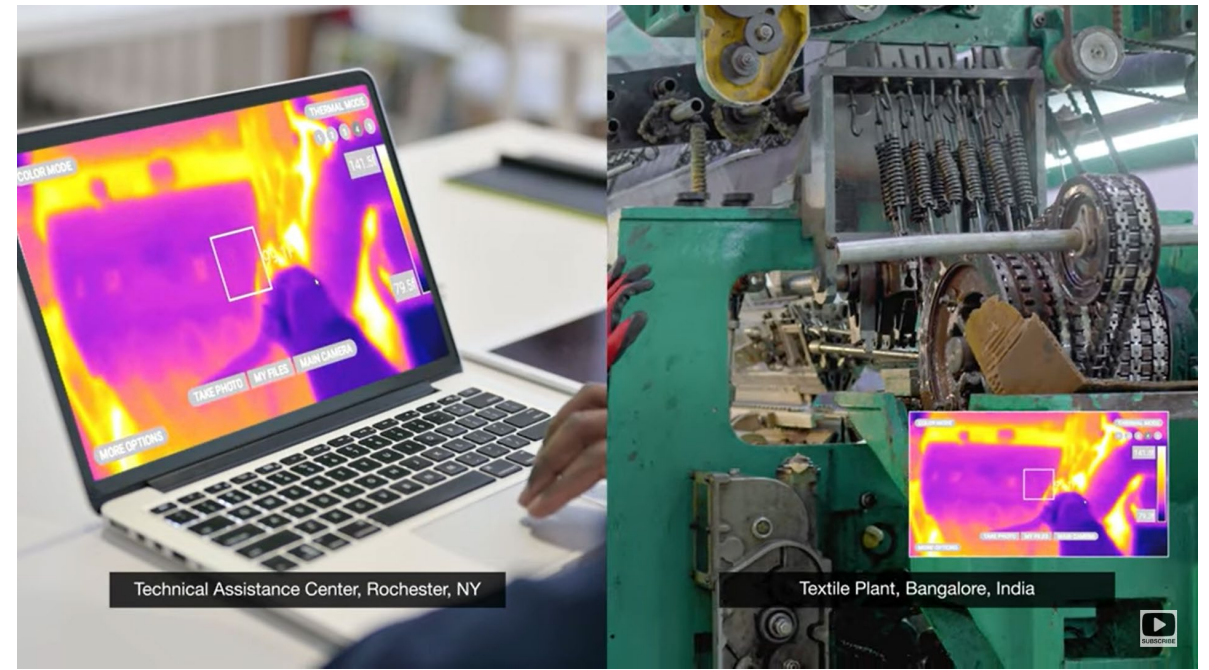


Receive or download schematics and technical documentation

Assisted reality technology



Document inspections and log faults

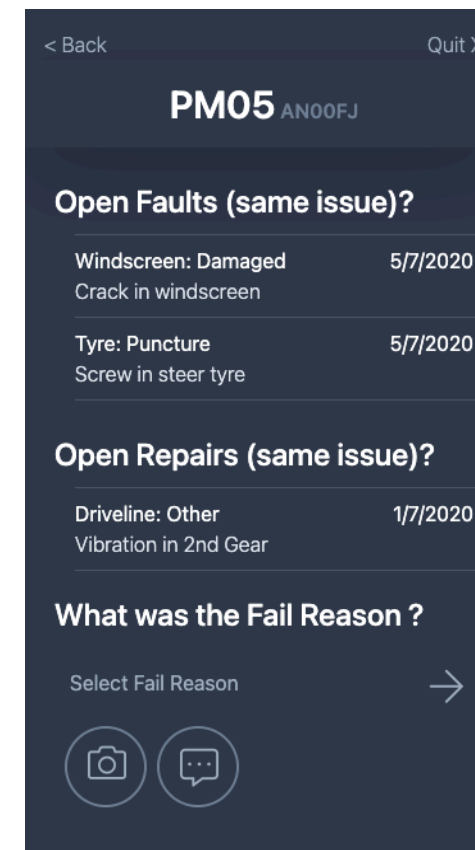
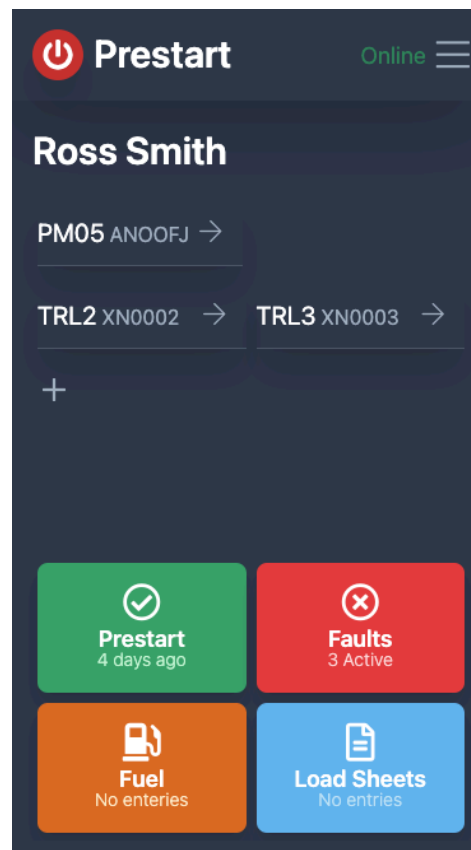


Thermal imagery to identify hot spots

Mobile Phone Technology

Pre-starts on mobile phones.

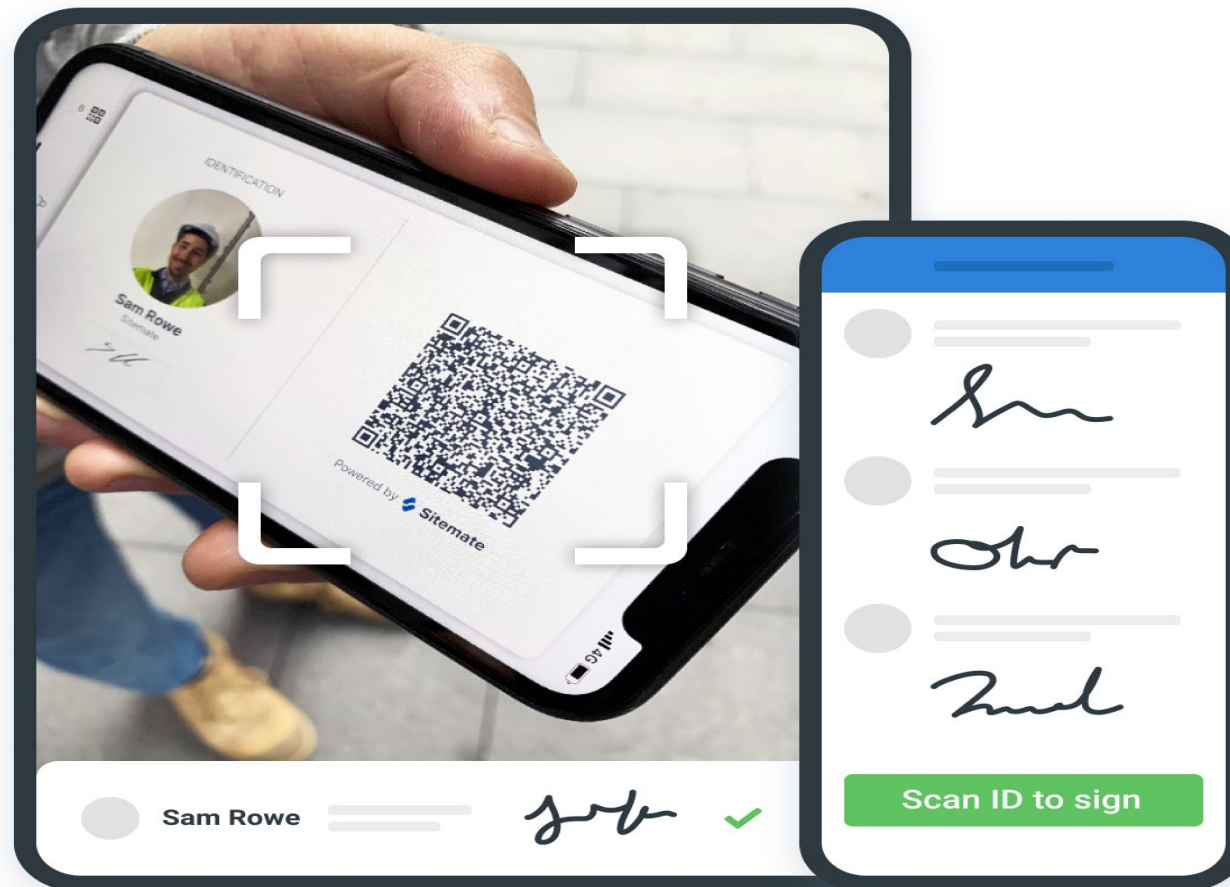
- Quickly report defects
- Create hazard reports
- Take photos of defects
- Store manage field inspection reports and site records.



Mobile Phone Technology

QR codes for logging in, meetings and digital signatures.

- Track participants
- Meetings conducted remotely.
- Sign off on any agenda that requires signature.



Question.

Does anyone here use a mobile phone or tablet to conduct a prestart on a piece of mobile equipment or fixed plant on site?

Has it increased the amount of defects reported?

Any questions ?