



BHP Mitsubishi Alliance

OCE Seminar Presentation

Goonyella Riverside - SATS Project





Agenda

- Overview
- What is SATS
- GRM SATS Dozer Fleet
- Dozer Components
- Remote Operating Station
- CCTV Cameras
- Interaction
- Benefits





Overview

Following a fatality at Saraji Mine in 2018 and a further significant dozer-related event in 2023, BMA has introduced Engineering controls and advanced technology to eliminate person-to-machine exposure during high-risk dozing activities at Goonyella Riverside Mine.



What is Semi-Autonomous Tractor System (SATS)

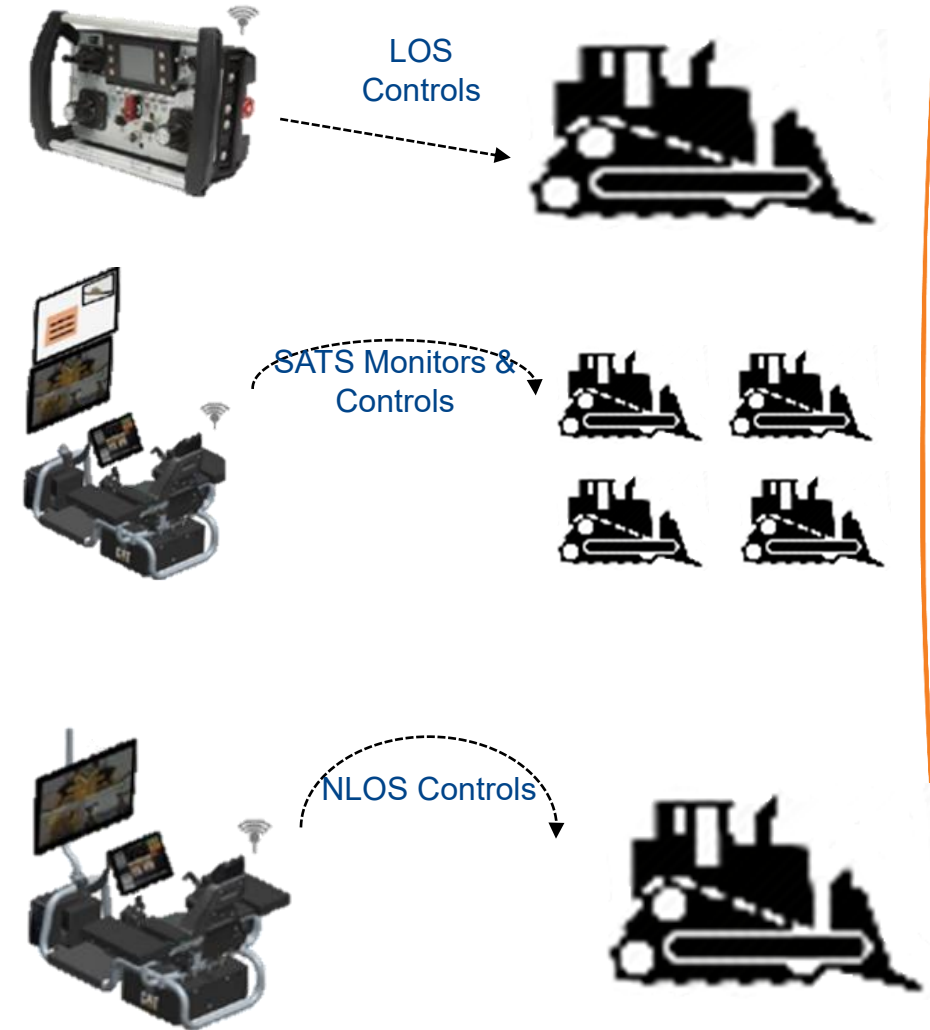
- The CAT Command Semi-Autonomous Tractor System (SATS) allows Coal Mine Worker (CMW) to remotely control multiple SATS dozers from a Remote Operator Station (ROS).
- SATS Dozer technology is designed for use in tasks where the CMW may be put at risk by traditional in-cab operational scenarios.
- By removing the operator from the dozer, we remove them from the hazard and reduce the risk associated with dozer operations
- SATS dozers are intended for use in high-risk operational scenarios within fixed locations, such as bulk push slot dozing, pushing over a high wall, working above water, equipment recovery & Drill prep
- One (1) Operator can control up to five (5) dozers from a single remote operator station



SATS Dozer Fleet

The Goonyella Riverside Dozer fleet consists of three levels of integration;

- LOS – Line of site dozing. 6 remotely controlled dozers were introduced at Goonyella Riverside to eliminate risks associated to working around edges and bodies of water. These are remotely controlled via a line of site trailer 500mtrs from the work area
- SATS – Semi-autonomous Tractor Systems – 5 Semi Autonomous Dozers were introduced at Goonyella Riverside to eliminate risks associated to voids, edges and whole body vibration associated to Bulk-Push Dozing
- NLOS – Non-Line Of Site Dozing. A future proposed project is looking to introduce remotely controlled dozers for stockpile operations operated from a remote location for risks associated to stockpile engulfment



Dozer and Componentry

The CAT Command for Dozing SATS system uses a combination of hardware and software to enable remote-control operation of a track dozer. New components are added to the machine, and work in conjunction with existing componentry. CAT Command for Dozing does not add any new functionality to the base machine or cause any changes to the dozer when operated in manual operation mode from inside the cab.

- Onboard Cameras
- Mode indicator lights
- A-Stop receiver
- Remote receiver
- Additional antennas
- Vision switch

In-cab components

- Manual override switch
- Remote-control system

Ground Level Service Centre (GLSC)

- Manual / Remote switch with lockout tab



Remote Operator Station (ROS)

SATS dozing utilises a Remote Operator Station (ROS), which allows dozer operators to remotely control the machine.

The ROS provides SATS dozer operators with the same functions as those that are accessed inside a dozer cab. The control layout mimics the controls of a standard track dozer and includes the hand controls and foot pedals.

The ROS connects to the SATS dozer via the site wireless network connection.

Multiple SATS dozers can be assigned to the work group of a single ROS and up to 5 SATS dozers can be operated simultaneously.

Remote dozer operations from a ROS remove environmental effects of stress, strain and vibrations on the body. SATS dozer operators are removed from the line of fire and fatigue can be better managed from the office environment.





CCTV Cameras

- CCTV cameras are placed on trailers around the SATS dozer operating area to provide situational awareness to SATS dozer operators.
- SATS dozer operators must ensure that the cameras adequately cover their work area for full visibility.





Interacting with SATS Dozers

Immediate Cease of Operations

The SATS dozer operators must cease SATS dozer operations in response to any of the following situations:

- 1 Unauthorised vehicles, equipment or pedestrians entering the SATS dozer operating area.
- 2 Personnel on foot entering within the 50 meters of the SATS dozer operating area.
- 3 Poor visibility occurs due to environmental reasons, impaired vision or loss of vision from the SATS onboard and/or CCTV. cameras
- 4 The mode indicator lights on the SATS dozer stop working or are displaying incorrectly.





Safety Benefits



Reduces Risk of incidents

- Reduced operator exposure to whole body vibration when operating dozers conventionally.
- Reduced operator exposure to Dust
- Reduced operator exposure to Noise
- Reduced operator exposure to personal injury through conducting high risk tasks e.g.,
 - Pushing over high walls
 - Pushing above water
 - Equipment recovery
 - Emergency access constraints



Capability

- Working through Lightning TARPS
- Working through Emergencies
- Working inside Blasting exclusion zones. (outside equipment blasting exclusion zones)
- Increased equipment utilisation throughout each shift





Safety Benefits



Example Drill Prep



Safety Benefits



Example Working above water



Safety Benefits



Example Maned Dozer Push (before SATS)



Safety Benefits



Example SATS Dozer Push

Media



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