

# IMA-Europe 2024 OSH Seminar

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## Autonomous ADT in the Industrial Minerals Sector

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# Why Autonomous?



- Automation of extraction process (27 to 39 Articulated Dump Trucks, (ADTs) in use)
- Safety
- Yield increase, removal of human error, increased repeatability
- Recruitment & retention of operators
- Operator geographics and competency
- Cost savings (no of people) Vs higher skilled roles
- Increased efficiency: uptime, no breaks, fuel burn, service costs (consumables & damage)
- Link into Sibelco systems (MES - Manufacturing Execution System)

# Kingsteignton Autonomous Journey



- Started discussions with Volvo 2020
- Kingsteignton (Ball Clay) analysed between Oct 20 and Mar 21
- Too many plant/ people interactions for early phase
- Fully Electric
- No plan B
- Load capacity 15t, compared to ADT's 25t or 30t
- New solution to work in Cornwood (Kaolin), less complex operation, 40t ADTs



# Autonomous Team for chosen solution



Bell



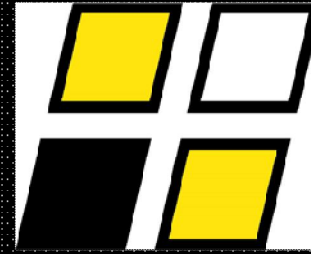
• 2017-2018: 200+ projects  
• 2019: 100+ projects  
• 2020: 100+ projects  
• 2021: 100+ projects  
• 2022: 100+ projects  
• 2023: 100+ projects

Xtonomy



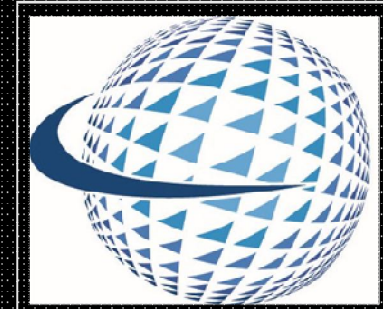
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CPI



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Sibelco

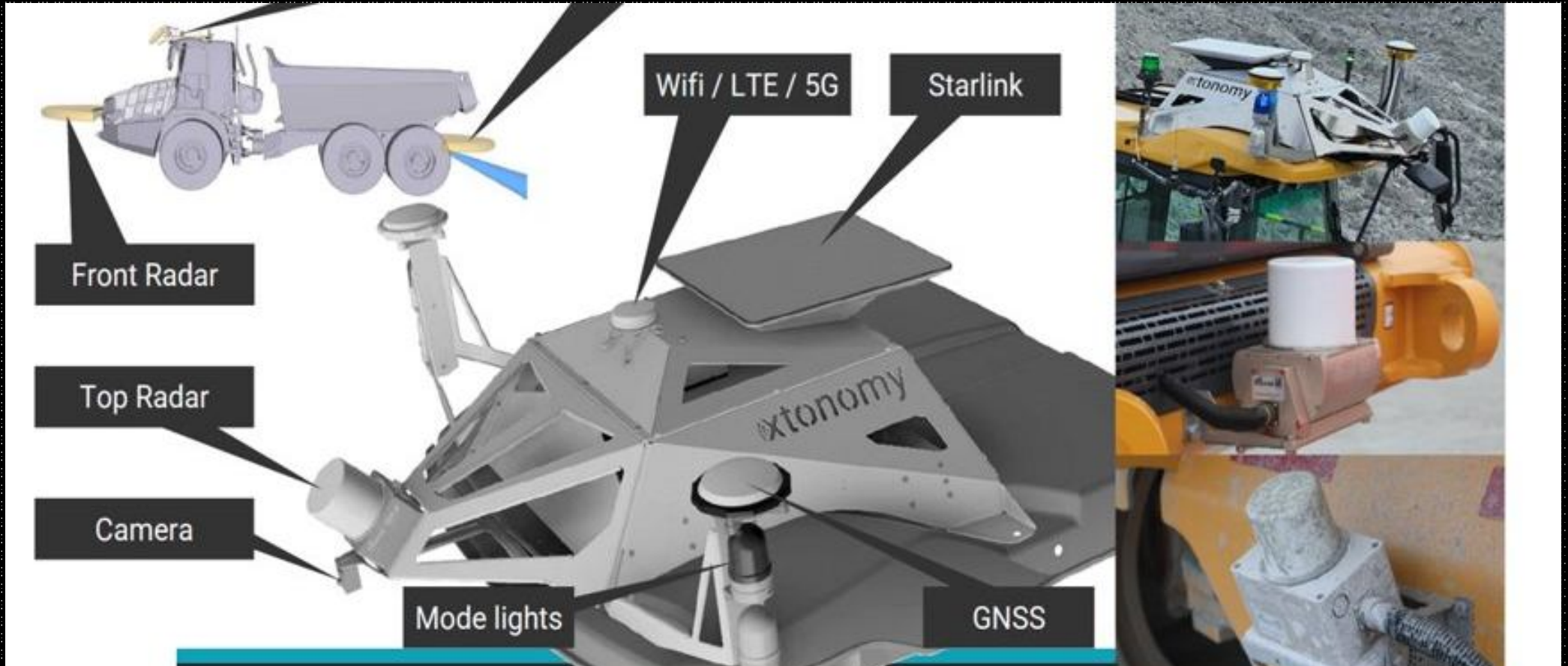


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# The Autonomous ADT



# ADT Autonomy Equipment



# Geofencing and AOZ interaction



AOZ = Autonomous Operating Zone

Radar based  
Technology

Dynamic, optimised  
route planning

Continuous Route  
Mapping of quarry

# Autonomous ADT in action



Video 1: Loading

[ceadb7e7-e182-430b-8c6f-d9ec843f88c4.MP4](#)

Video 2: Tipping

[e6af879b-1f35-407c-bd0c-09f42b220329.MP4](#)



# ADT Mapping & Cameras



# Safety: Emergency Stops

The respective e-stop systems is described in the following figure.

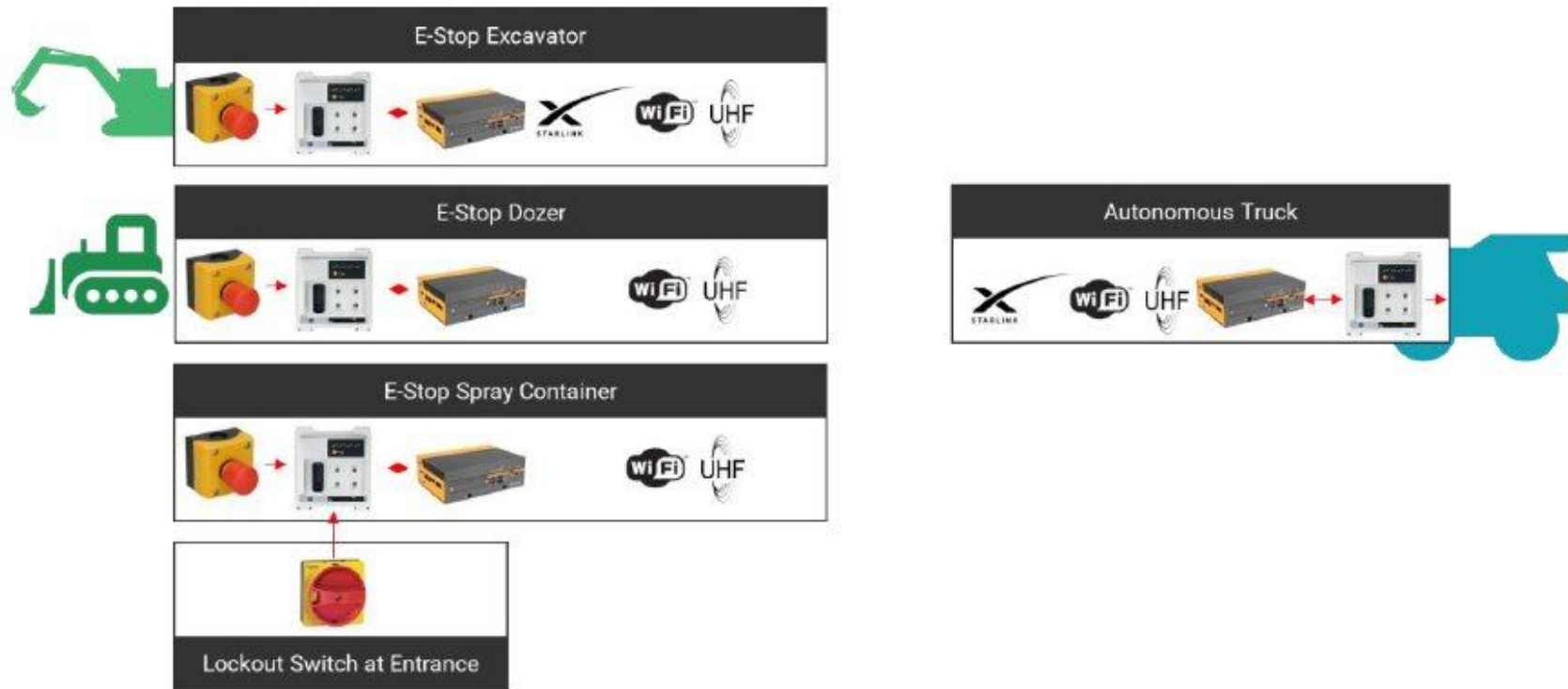


Figure 2-7: Simplified E-Stop infrastructure

# Safety: Risk Assessment



- Zoning
- Controllers & supervision
- Training & awareness
- Hardware & software components
- Safety communications and daily checks
- Consideration of isolation events – human/ autonomous interaction
- Ground condition maintenance
- Refueling



# Challenges

- People/ culture
- Stakeholder management
- Insurance
- Communication & connectivity
- Understanding complex / quarry controls
- Availability of zone time (for development)
- Environmental (HVO) Hydrated Vegetable Oil
- Geography
- Legislative framework
- Fear of the unknown.....



# Success



- Sign off for trial
- Agreed KPI's Vs manual operation
- Safety: working group, plus HSE (based on Australian COP)
- Communication to site (Operator retention & Buy-in)
- Plan B, machine can be operated in manual
- OEM/ Contractor can repurpose machine
- Solution seen as bridging technology
- First trial of Autonomous ADT in UK
- What does the future hold: Fully autonomous, mixture of technologies, remote working, different ways of working

# Useful Links



- **ISO 17757:2019(E) Earth-moving machinery and mining**
- — **Autonomous and semi-autonomous machine system safety** [ISO – Standards](#)
- **CODE OF PRACTICE Safe mobile autonomous mining in Western Australia**
- [dmp.wa.gov.au/Documents/Safety/MSH\\_COP\\_SafeMobileAutonomousMiningWA.pdf](http://dmp.wa.gov.au/Documents/Safety/MSH_COP_SafeMobileAutonomousMiningWA.pdf)
- **MIOSH - Mining Industry Occupational Safety & Health (South Africa)**
- [Leading practices - Mining Industry Occupational Safety & Health \(mish.co.za\)](#)
- **Earth Moving Equipment Safety Round Table (EMESRT)**
- <https://emesrt.org/>