



HEXAGON

empowering an autonomous future

**Hexagon Operator Alert
System (OAS) for Slag and
Steel**

Operator fatigue and distraction

An operator who is fatigued or distracted increases the risk in an already complex environment



Blind spots



Speed



Proximity



Poor visibility



High traffic



In 2023, World Steel's members reported 61 fatalities globally, representing a global fatal frequency rate (FFR) of 0.017, the lowest on record. Additionally, our lost time injury frequency rate (LTIFR) has risen slightly to 0.76 from 0.65 last year, but it remains below historical levels.



A dark industrial scene featuring heavy machinery. In the center, a large white wheel loader is positioned next to a yellow dump truck. To the right, a bright orange molten metal stream flows from a furnace. The background shows a large industrial building with a corrugated metal roof. The overall atmosphere is dimly lit with a blue tint.

One

Holistic
Solution

Bringing your people home safely

What is Hexagon Operator Alertness System (OAS)?



Smart Computer



Integrated Fatigue
Camera & Dash
Camera



Seat
Vibrator



Integrated with the Smart
Antenna



External
Speaker



Hexagon OAS - LV

Integrated Condition Sensor and IR Illuminators

Working in any light conditions (day and night) fatigue and distraction detection with or without sunglasses



LED Indicator

Current system status and feedback

2.4-5.0 Gzh Wifi

Wireless connection for fatigue alerts prioritization and device configuration

Internal Speaker, Accelerometer and GPS

Situational Alarming Schemes
Voice output 82 dB @ 1m, positioning GPS and speed



MicroSD Slot

Expandable memory management, extra offline data storage (Approx. 10 days @ 64GB)

SIM Card Slot

LTE cellular connectivity, monitor everywhere, even outside the mine

OAS-HV – Event Detection Algorithm

Vehicle Status

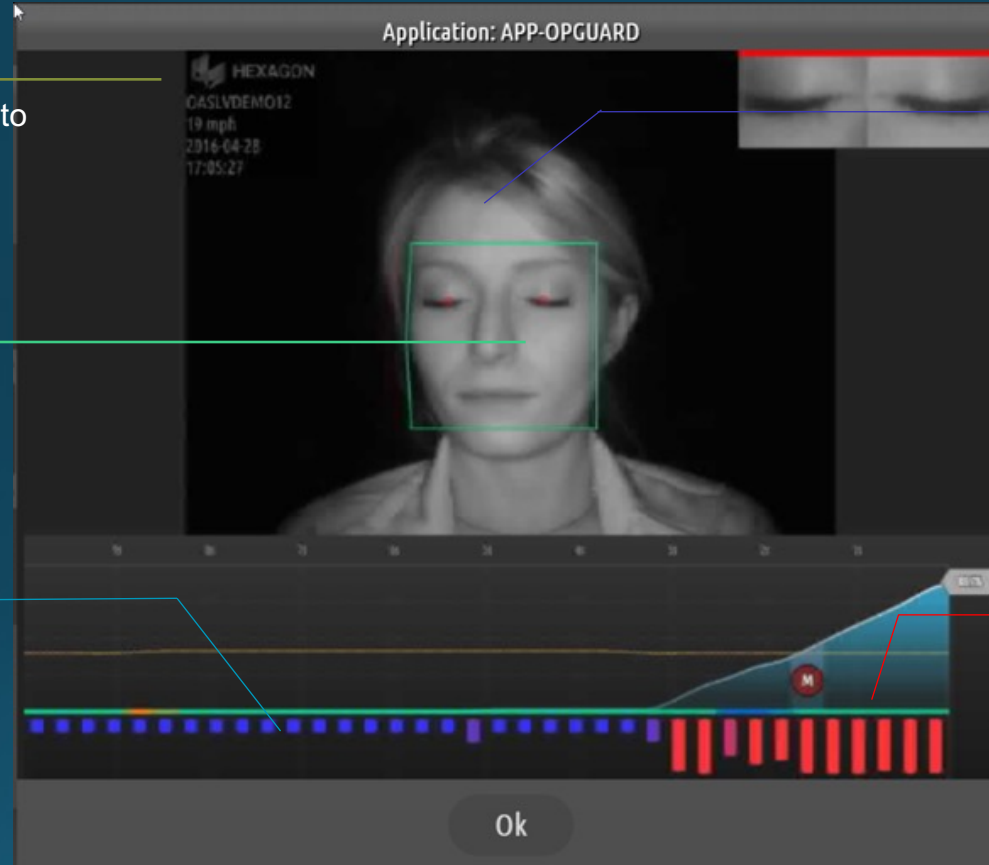
Speed and vehicle direction (Reverse) is taken into account.

Face positioning

Working on any light conditions, with or without glasses.
Algorithm detects face to locate the eyes

Blinking & Face Movement

Face position – Green: Looking to road.
Orange: Distracted.
Eye Closure – Blue: Normal Blinking
Red: Closed Eyes



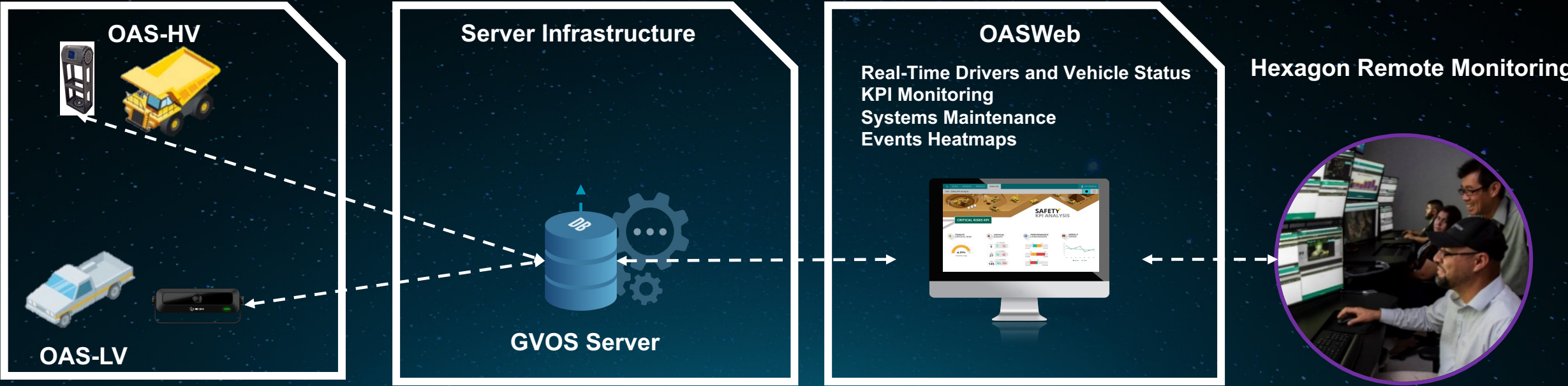
Eye Condition

Reliable and proven algorithms determines the state of the eyes. (Blue/Open – Red/Closed)

Value Above Threshold

Current Perclos: 94.6%

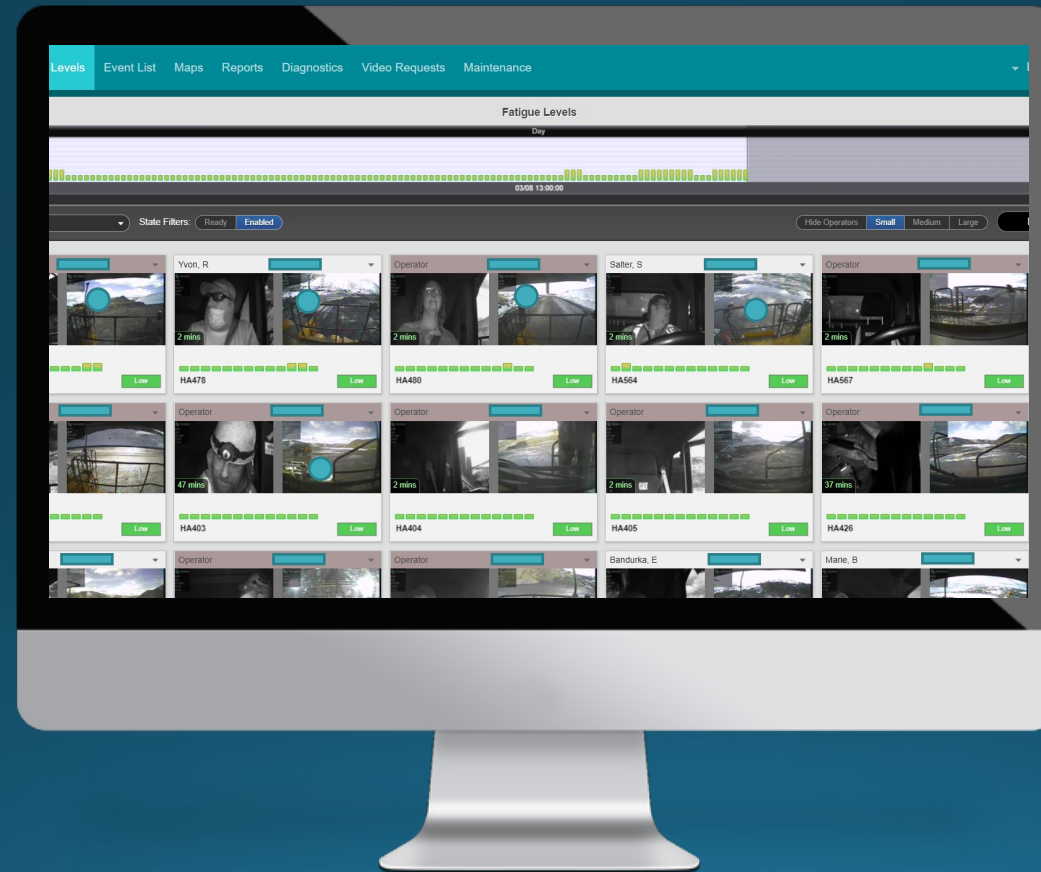
System Architecture OAS real-time



OAS Insights

Reporting and Analytics

- Analytics tool for review, reporting and analysis of events and data
- Web-based access
- Sorting of events, data and reports
- Individual logins



- Ensures equipped trucks are functional
- Customizable views
- Real-time operator status
- Real-time historical system diagnostics



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**Hexagon Collision
Avoidance System (CAS)
for Slag and Steel**

Hexagon Collision Avoidance System (CAS)

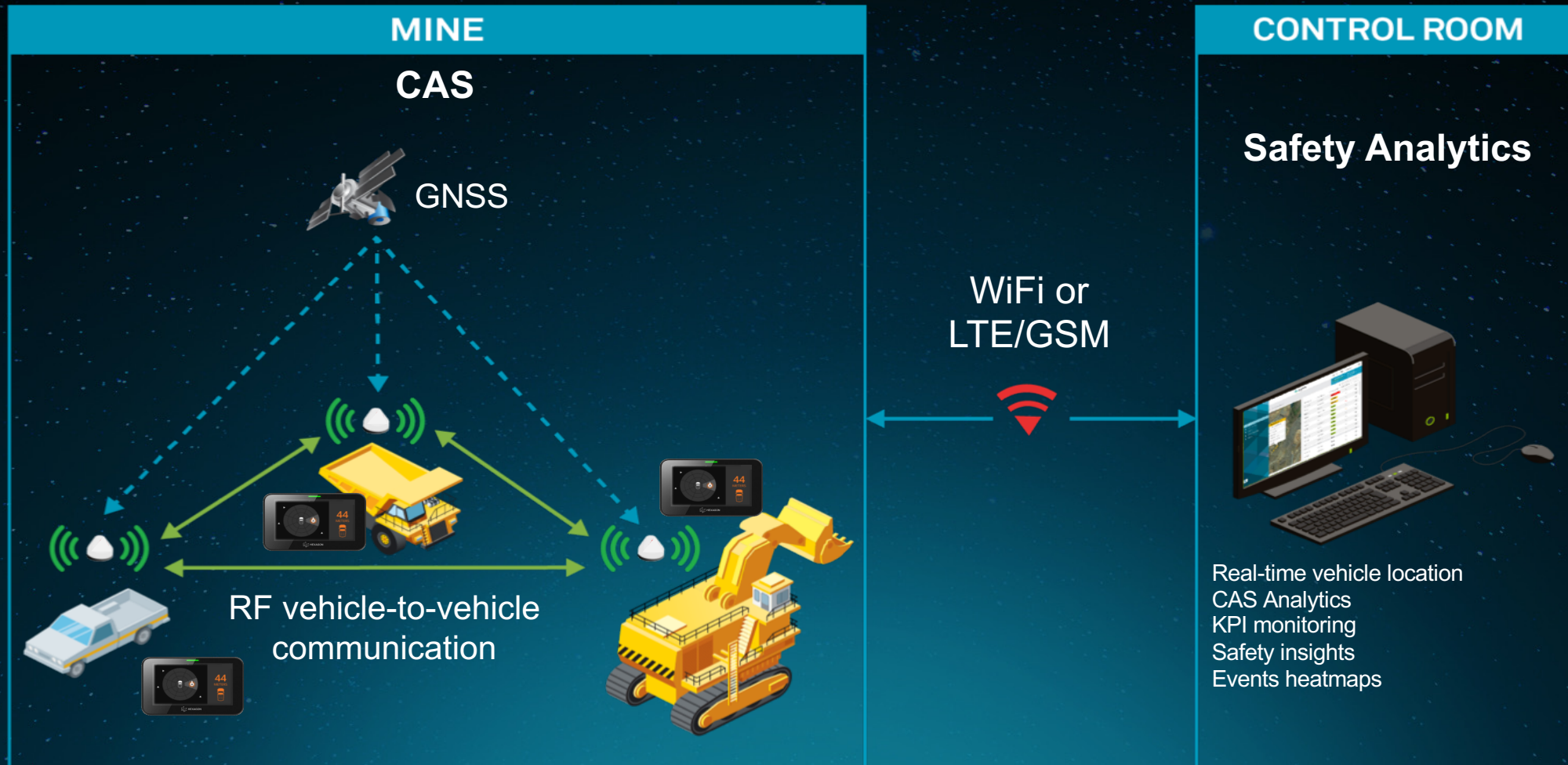
A reliable solution for a complex challenge



- GNSS (GPS) provides position, heading and speed
- V2V non-line-of-sight communication with all vehicles up to 500 meters
- A display provides alarms and warnings
- Advanced algorithms evaluate the threat level and trigger an audible alarm

Hexagon CAS - System Architecture

A stand-alone solution with reporting capabilities



Hexagon CAS – Hardware

Simple – multi-functional - fit for purpose



CAS Smart Antenna



CAS Smart Display 5

One set of hardware fits all vehicles

Designed for mining

Less hardware for less cabling

Latest technologies

Multi-function for easy scalability

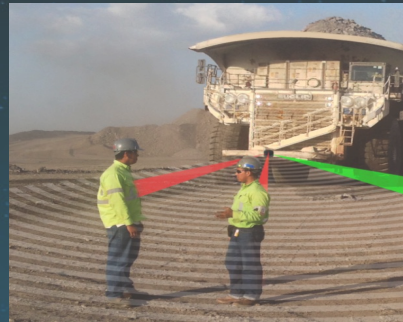
HxGN Mill-Protect CAS – Additional Features

A scalable solution

Pedestrian and obstacle detection enabled



Non-tagged obstacles
Visual + Audible



Pedestrian
detection



Added Value

- Seamless Personal Protection solution add-on with Personal Alert

HxGN Mill-Protect CAS – Additional Features

A scalable solution



Added Value

- Seamless Personal Protection solution add-on with Personal Alert

Hexagon CAS – Main Features

Features for all V2V challenges

Operator Awareness and Advisory Controls «L7 & L8»



Operator Awareness
visual



Collision Risk
visual + audible



Geofenced notifications



Contextual overspeed
notifications



V2V Safety

Hexagon CAS – Main Features

V2V Level 7 and Level 8 safety

Level 7: Operator Awareness

- **Visual info** = anticipate danger
- Based on **Proximity and Position**



[Traffic Awareness Video](#)

Level 8: Advisory Controls

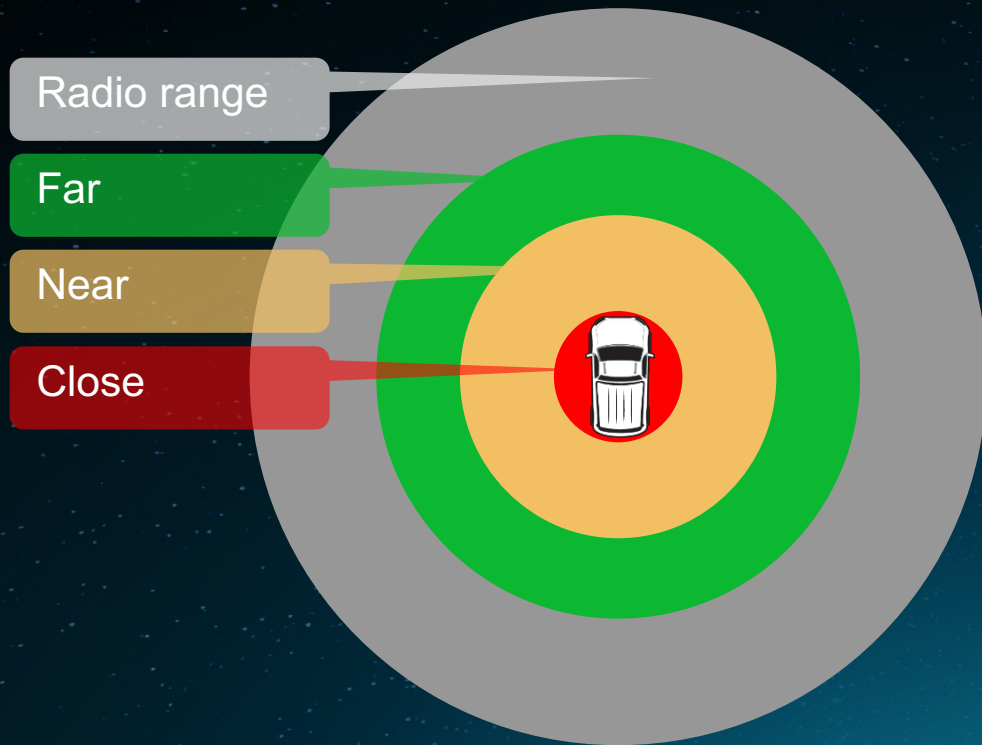
- **Audible alarm** = call to action
- Based on **Dynamic Safety Zones**



<https://www.youtube.com/watch?v=gkKNiYd8Qms>

Hexagon CAS – Proximity detection system

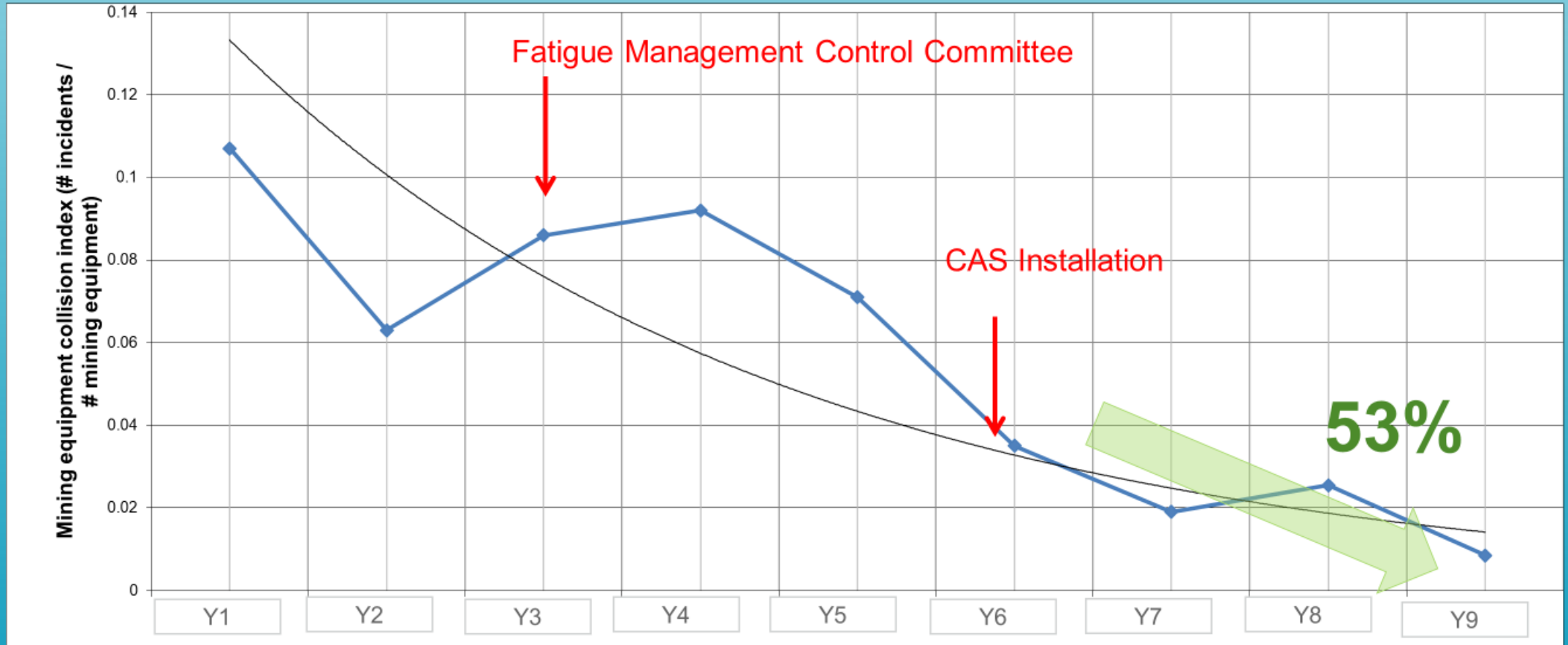
Level 7 Operator Awareness



- Provides awareness to the operator of ALL surrounding vehicles
- Real-time position, distance and heading of vehicles
- Three configurable warning distances are provided to the operator

Open Pit Mining Vehicle to Vehicle (V2V) Safety Challenges

Annual mining equipment collision index



53% reduction in machine-to-machine accidents at South American mine with 250+ haul trucks

Thank you.



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