

2014 Mine Occupational and Safety Summit

AACSA PDS Collision Avoidance

Presented by Julian Ford

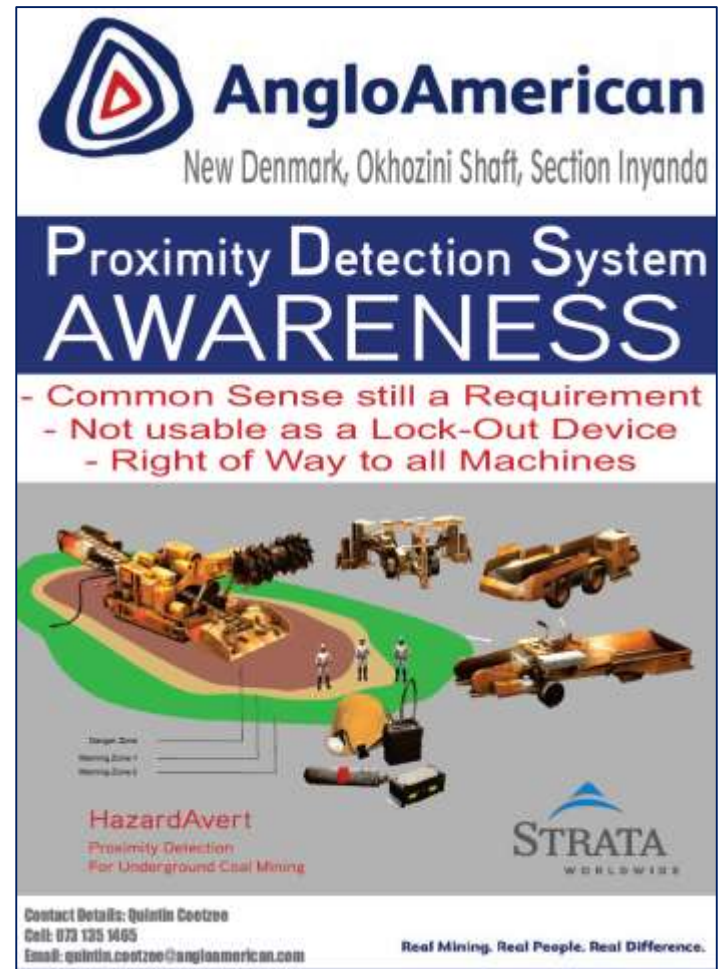
18 November 2014



- PDS Background
- PDS Technology
- PDS implementation
- Recommended Process for PDS Implementation
- Conclusion

Abbreviations

PDS = Proximity Detection System
NDC = New Denmark Colliery



AngloAmerican
New Denmark, Okhozini Shaft, Section Inyanda

Proximity Detection System AWARENESS

- Common Sense still a Requirement
- Not usable as a Lock-Out Device
- Right of Way to all Machines

HazardAvert
Proximity Detection
For Underground Coal Mining

STRATA
WORLDWIDE

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Real Mining. Real People. Real Difference.

The poster features a 3D rendering of a mining environment with various pieces of machinery (excavators, trucks, and a loader) and workers. A green circular area on the ground represents the proximity detection system's coverage. Labels indicate 'Target Zone', 'Warning Zone 1', and 'Warning Zone 2'. The HazardAvert logo and product name are prominently displayed in the lower half of the poster.

PDS Background

PDS Definitions


AACSA Definitions

- **PDS CW : Proximity Detection System – Collision Warning**

A system fitted to Trackless Mobile Machines (TMMs) and in cap lamps/other devices that is able to warn both operator and pedestrian of the presence of each other. The system is not interfaced to the machine to slow down or stop the TMM.

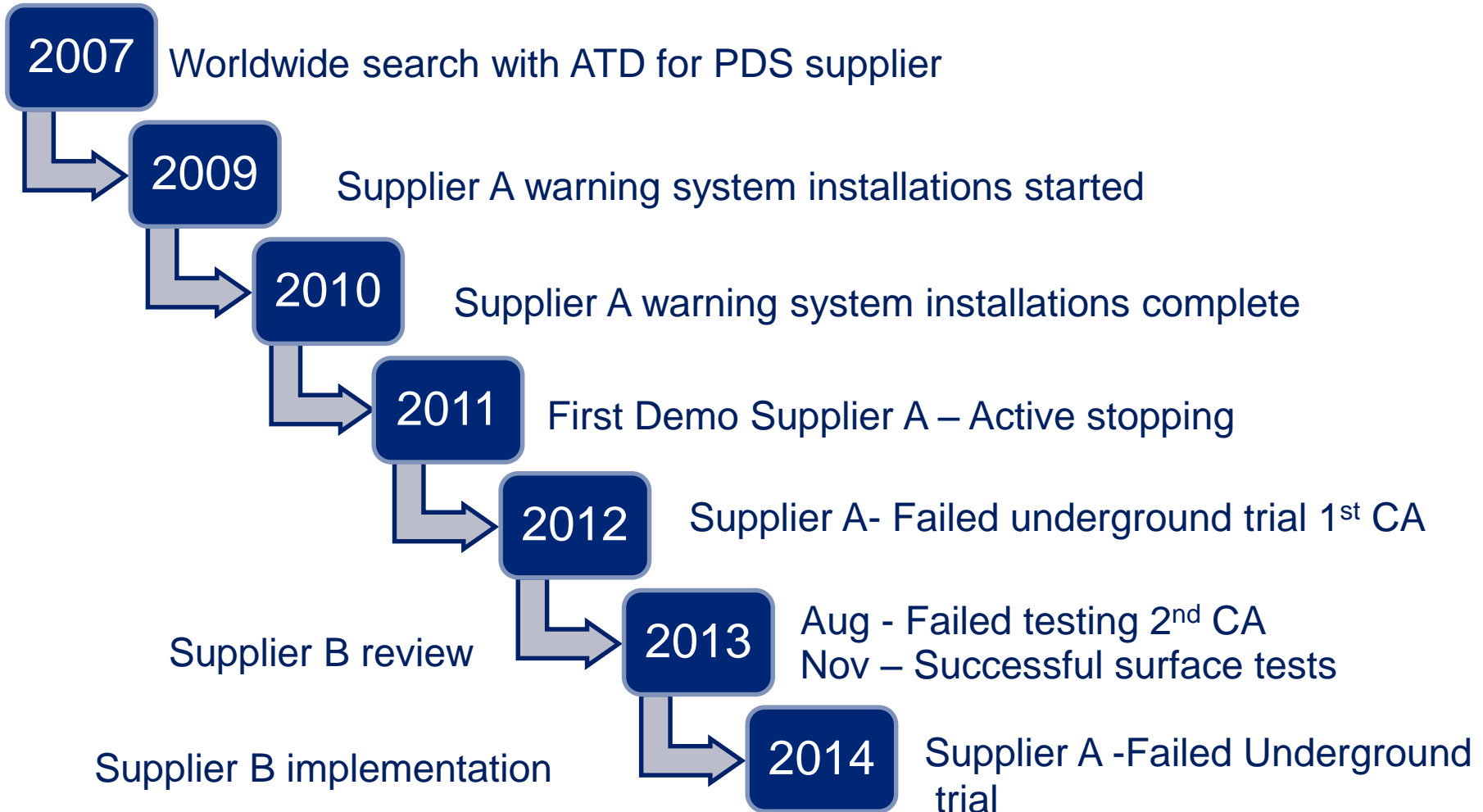
- **PDS CA : Proximity Detection System – Collision Avoidance**

A system fitted to TMMs and in cap lamps/other devices that is able to warn both operator and pedestrian of the presence of each other. The system is interfaced to the machine to slow down or stop the TMM if the pedestrian is within the boundaries of defined slow down or stop zones created around the machine.


Machine	Zone	Machine Reaction	Size of Zone
 Battery Hauler	Warning Zone 1	SLOW DOWN (BH 4x4 mode)	Side: ~2.0 m Front & Rear 5.0 - 8.0 m
	Warning Zone 2		
	Danger Zone	Machine STOP (pump trips)	Side: 1.0 - 1.5 m Front & Rear 3.0 - 4.0 m




AACSA PDS History




Continuous Miner Fatalities & Incidents

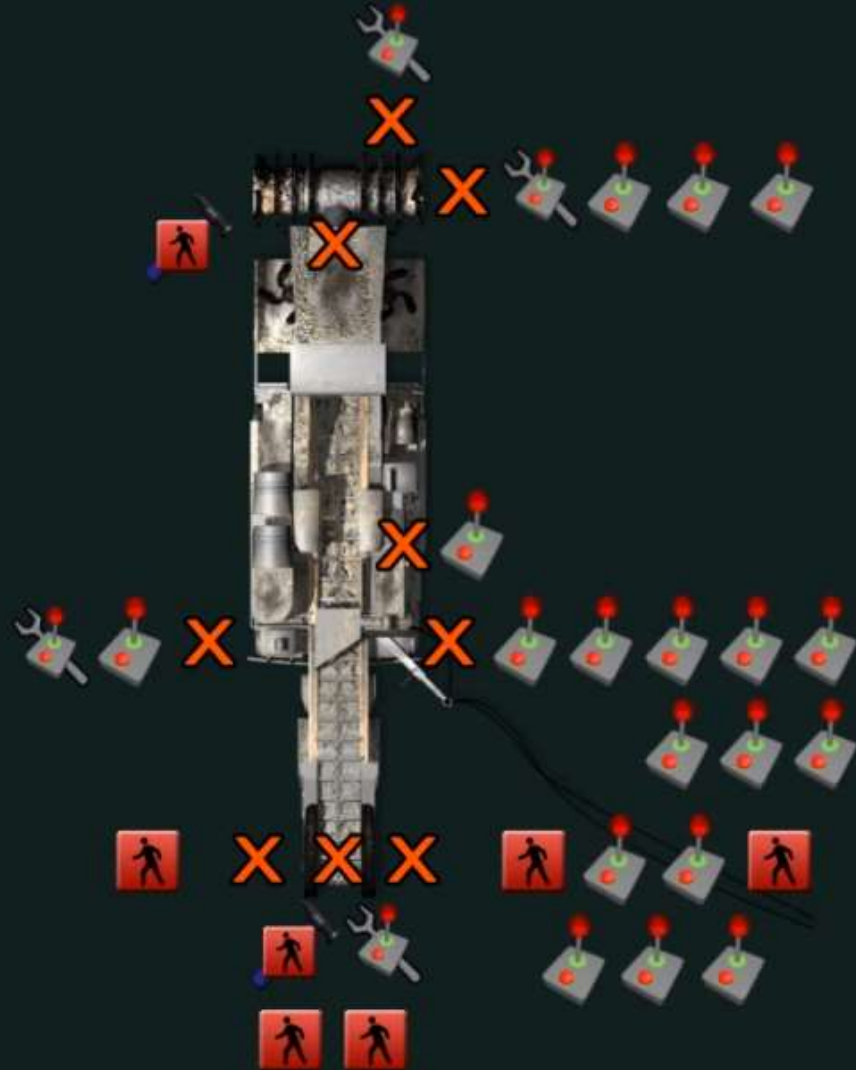
 - Incident Location

 - Operator

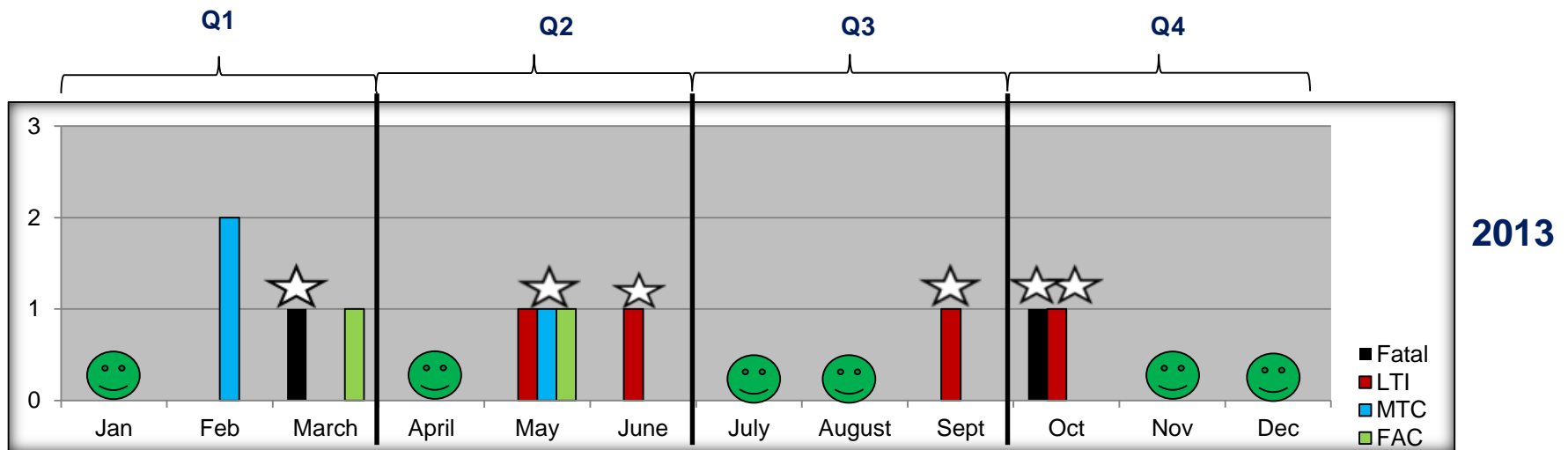
 - Other Miners

 - Maintenance
(Operator)

 - Maintenance
(Other Miners)



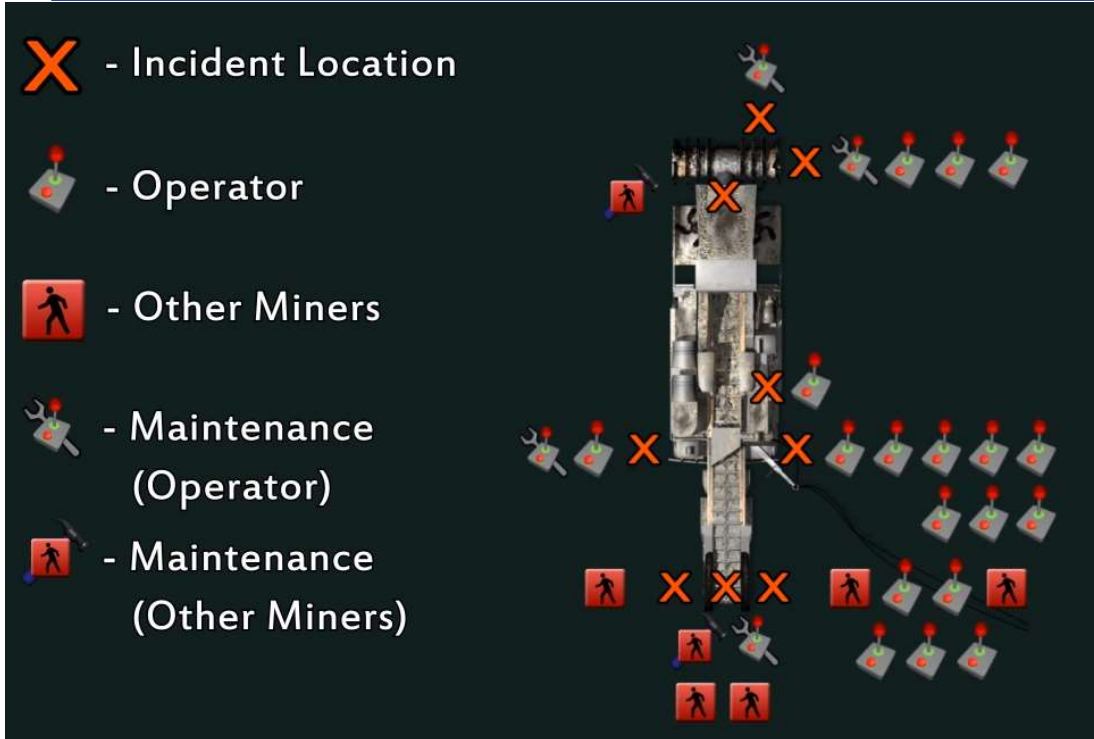
New Denmark Colliery – Case Study



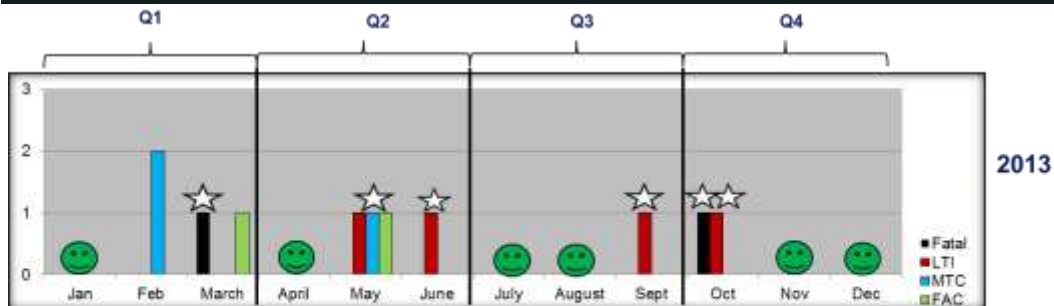
☆ - Moving Machinery Injuries

😊 - Injury Free Month

AACSA PDS View

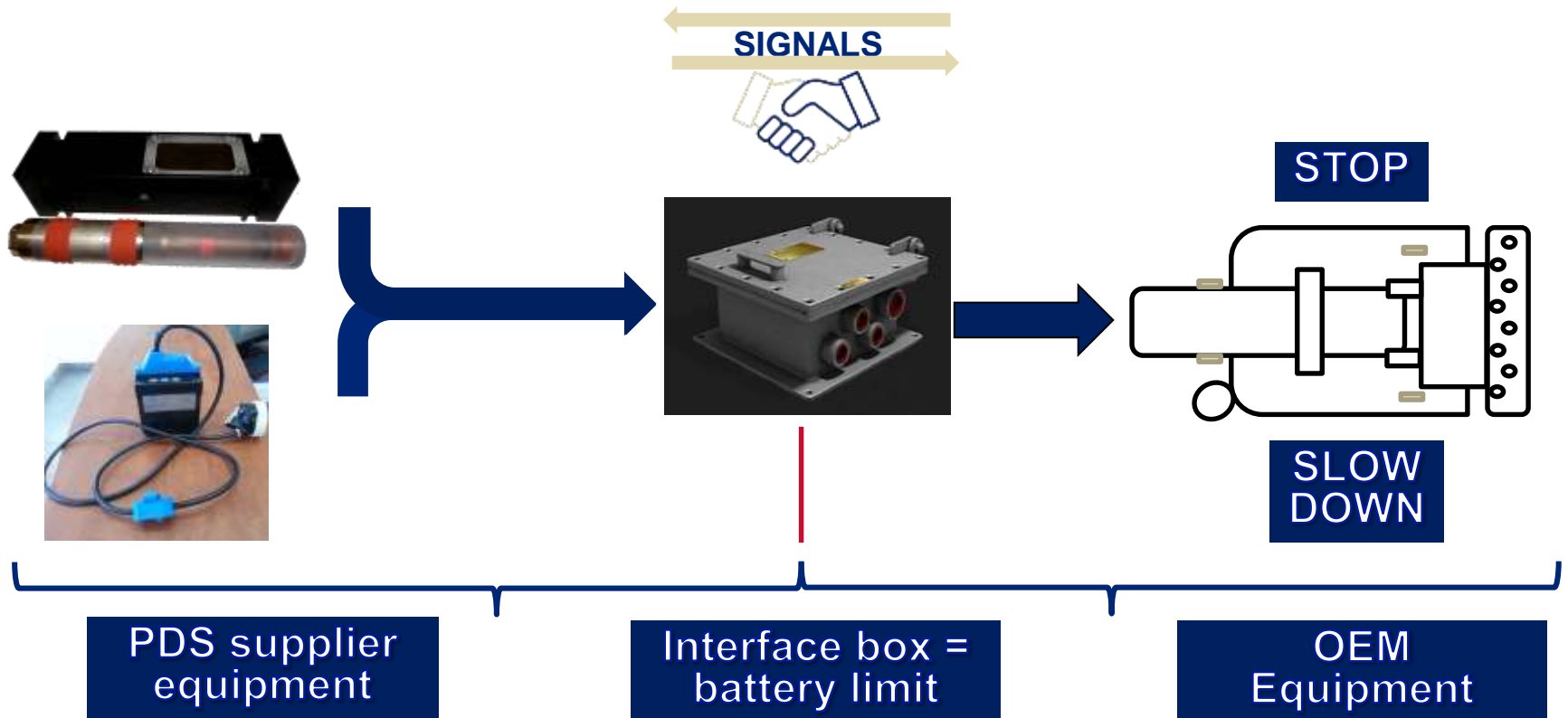


- AACSA had TMM fatalities in 2013
- Supports AA vision to Zero harm
- Forms part of fatality prevention framework
- We believe PDS will assist in preventing fatalities in the mining industry

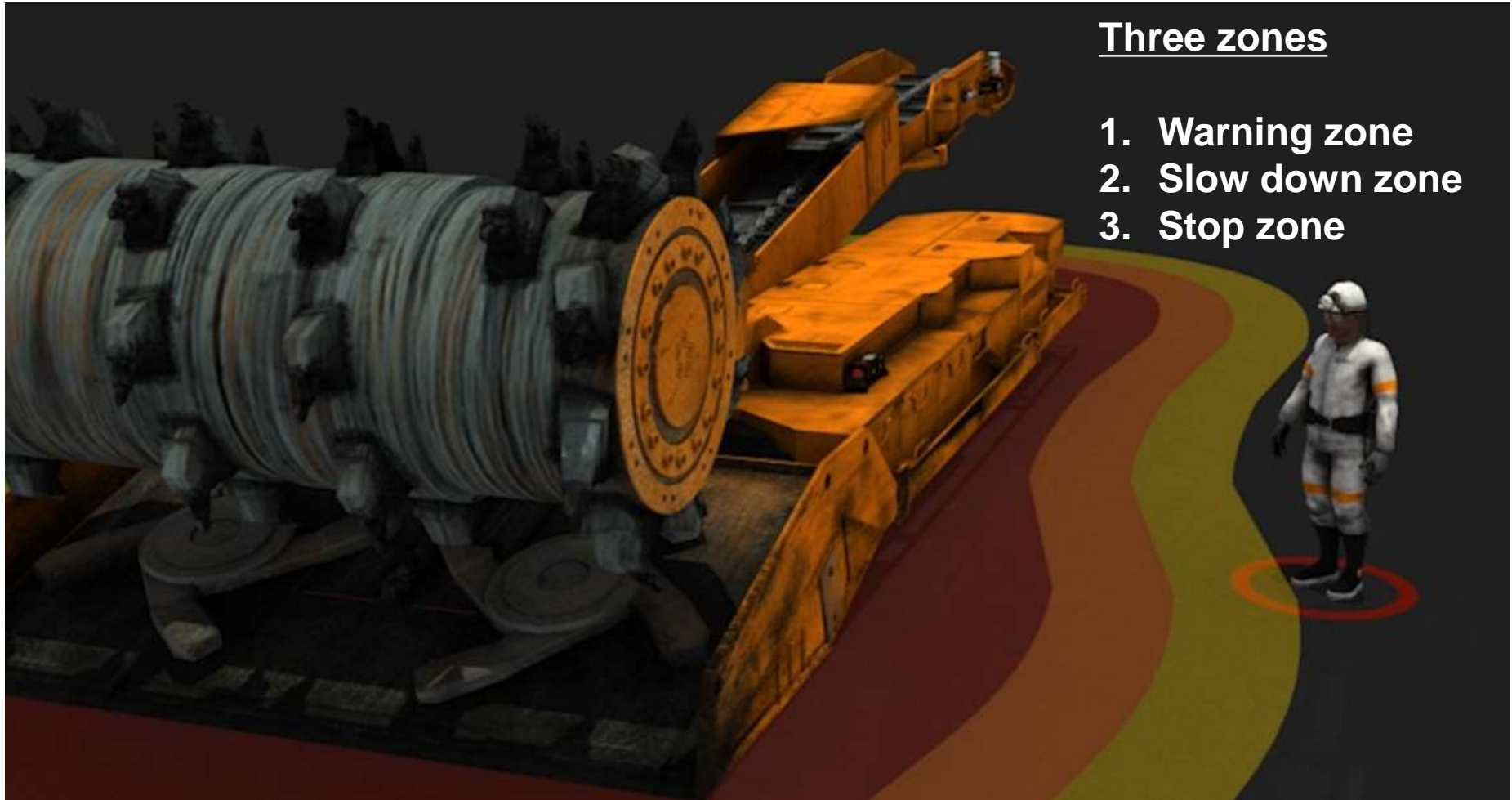


PDS Technology

Basic PDS Functionality

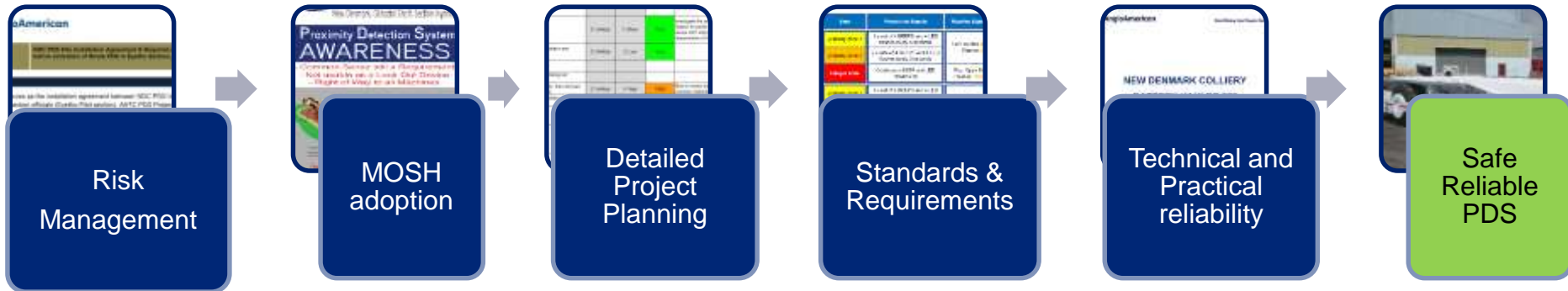


Basic PDS Zones



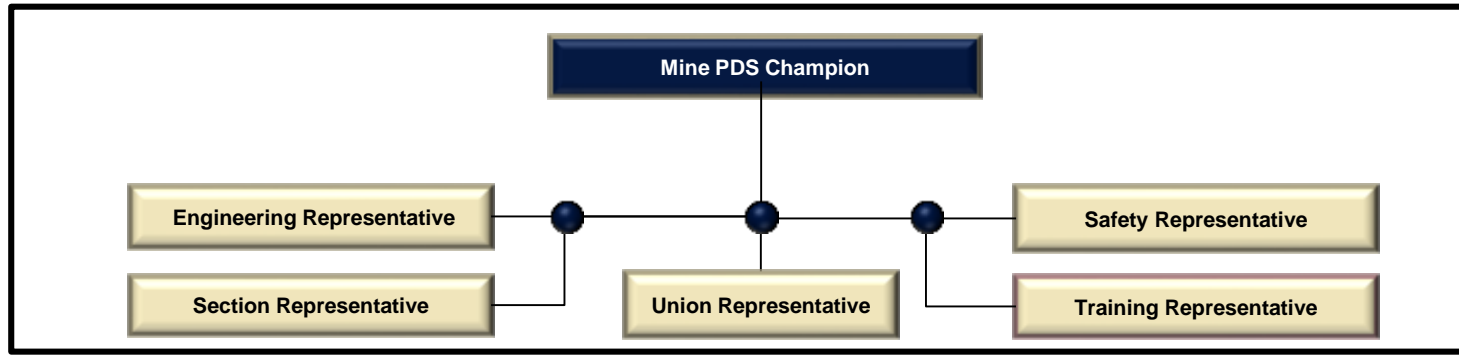
PDS Site Implementation

AACSA PDS Implementation Philosophy



The MOSH Process for PDS Adoption

AACSA PDS MOSH ADOPTION TEAM



PRE-IMPLEMENTATION PHASE

- Communication with workers before implementation phase
- Initiation of mine-wide awareness via management talks, posters and messages on the DSB
- Appointment of the correct MOSH Adoption Team

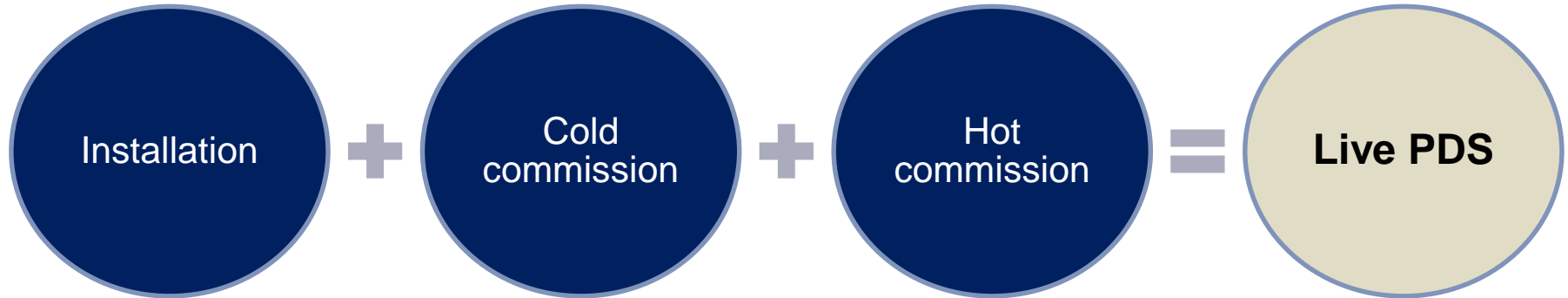
COLD COMMISSIONING PHASE

- Constant interactions with workers to monitor adoption progress
- Continue mine-wide awareness via management talks, posters and messages on the DSB
- Hold regular MOSH meetings and feedback sessions
- Analysing Interactions reports for coaching purposes and determining readiness to go to the next stage of implementation.
- Hold problem solving sessions with MOSH team & worker representative

HOT COMMISSIONING & LIVE PHASE

- Continuous monitoring of worker behavioural performance via interaction reports.

PDS Implementation Philosophy per Section



Installation

= Install PDS equipment and Interfaces; Set up fields; Test functionality (Typically 2 weeks)

Cold commission

= System is in warning only; Operational MOSH team and Supplier changes behaviour and measures success (Typically 4 weeks)

Hot commission

= System is functional on inbye electrical equipment; Continued intervention and Training (Typically 4 weeks)

MOSH Best Practice Adoption for PDS

- The CoM PDS MOSH best practice adoption guide was reviewed and the elements applicable to AACSA were followed. An AACSA MOSH guide was created
- The PDS MOSH guide is used to ensure that communication and engagement with all stakeholders form part of the implementation process
- A mock set up at each operation forms part of the MOSH handover to the mines

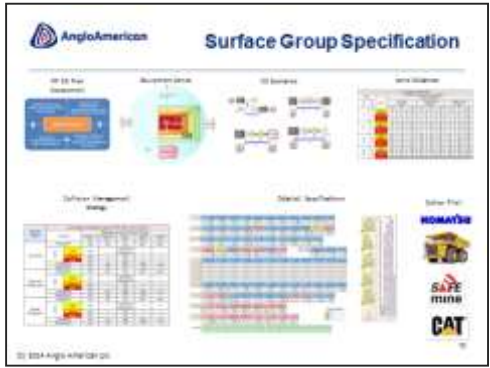
THE MOSH ADOPTION PLAN GUIDELINE			
Revision Number	01	Date of Formulation	10 February 2014
Document Author	S.MACIE	Date of Last Revision	10 February 2014
The following persons contributed towards the drafting of this document:			
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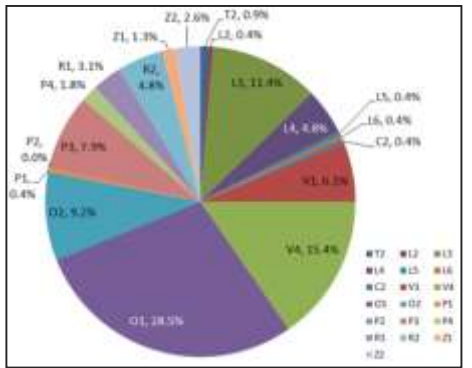
Recommended Process for PDS Implementation

Recommended Process For PDS Implementation

Use the Group Specification as the starting point



Incident Analysis



Site Risk Assessment and Safeguard Analysis

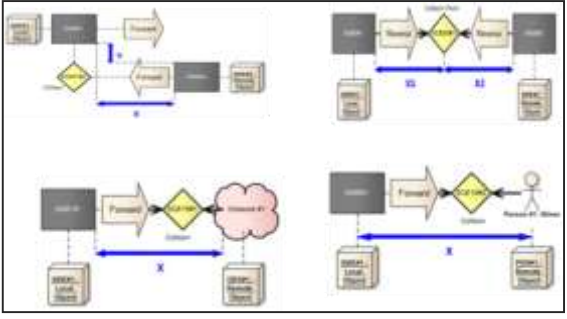
Risk Matrix

Define and Sign-off on Collision Management Strategy

Item	Requirement	Control
1. Site Requirements	Approved specifications, standards, codes design/proc	
2. Separation Controls	Physical, all access control, buffer, segregation	
3. Operating Procedures	CPDs, maintenance, repair rules, quality control, lockout	
4. Authority to Operate	Training, resource allocation, access control	
5. Fitness to Operate	Personnel checks, drug & alcohol, medical	
6. Equipment Operation	Inspection, safety tests, machine health, safety recording	
7. Walkway Assistance	Warning, handrails, mirrors, safety, lighting, delineation	
8. Accessory Controls	Warning, signals, barrier, safety, vehicle stability	
9. Intervention Controls	Warning, safety, stop, slow, back, reverse	

Implementation

Scenario Evaluation



Collision Management Strategy Implementation

Years - Weeks

1. Site Requirements

Equipment specifications, standards, mine design/plans

2. Separation Controls

Berms, pit access control, traffic segregation

3. Operating Procedures

Procedures & Standards, maintenance, road rules, lock out

4. Authority to Operate

Training, licences, induction, access control

5. Fitness to Operate

Fatigue state, drug & alcohol, medicals

6. Equipment Operation

Pre-start, safety tests, machine health, event recordings

7. Visibility Assistance

Cameras, live maps, mirrors, lights, visible delineators

8. Advisory Controls

Alerts: Proximity, Fatigue, Over-speed, Vehicle stability

9. Intervention Controls

Interlocks: Prevent Start, Slow down-Stop

Days - Seconds

ms

Safety Concern: PDS is not a first line of defence



Adding PDS CA reduces risk of an incident occurring

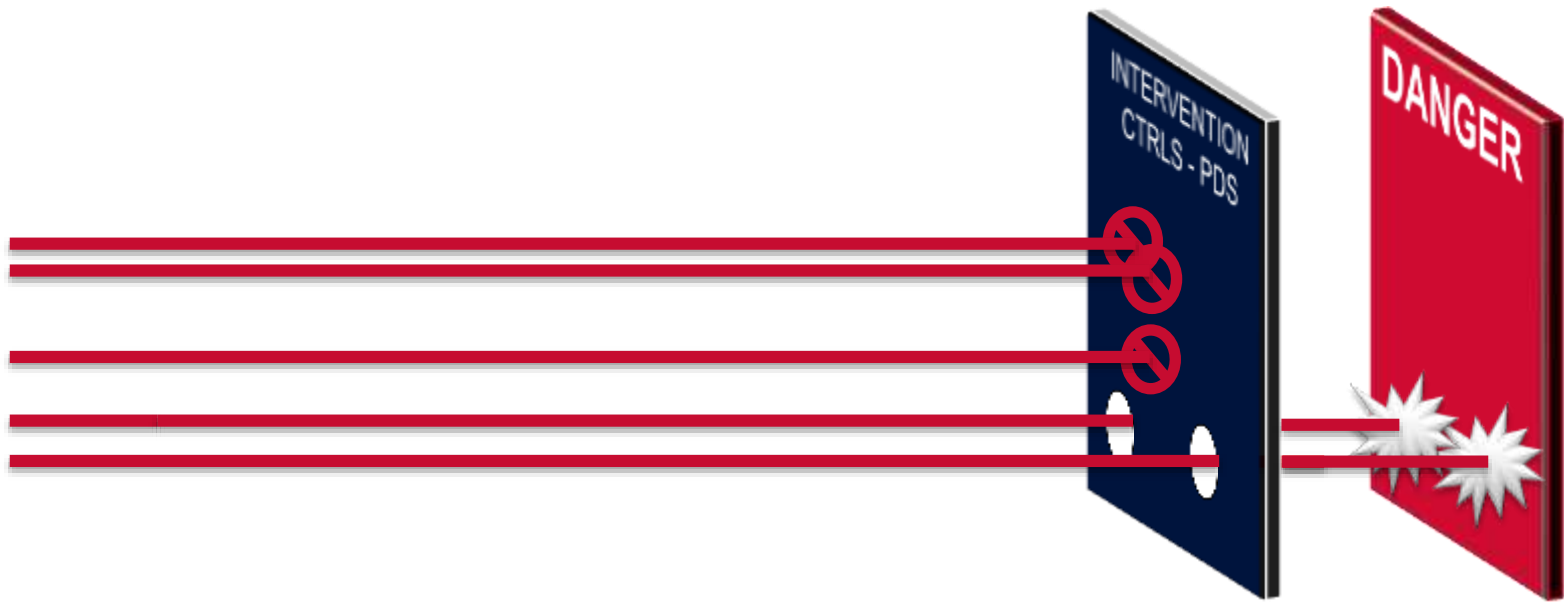
PDS CA cannot be the first or only layer

Need a full collision management system



**ZERO
HARM**

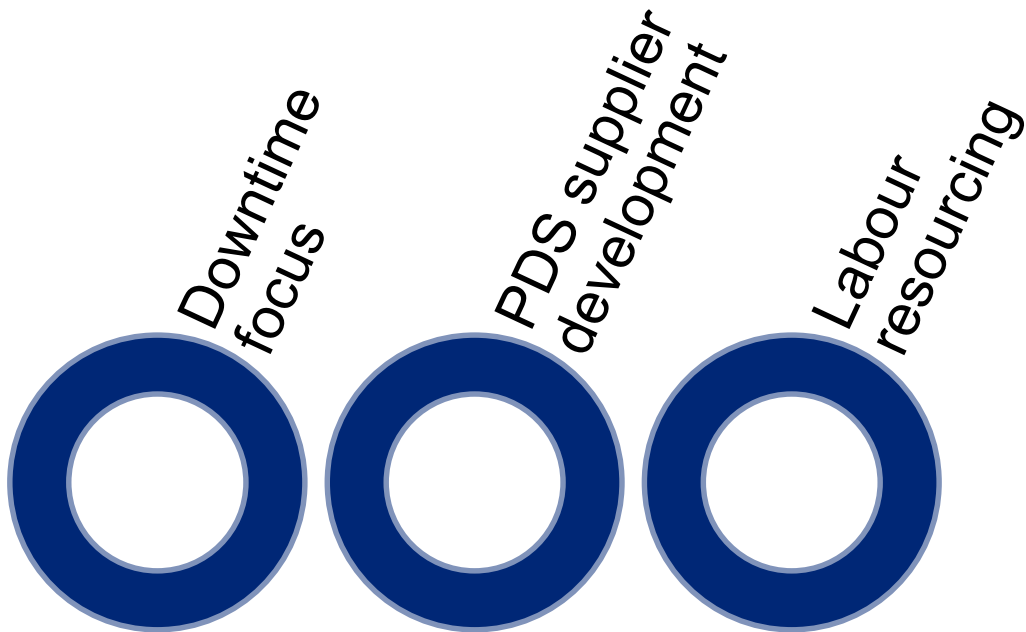
Safety Concern: PDS is not a first line of defence



Removing any
of the layers
increase risk

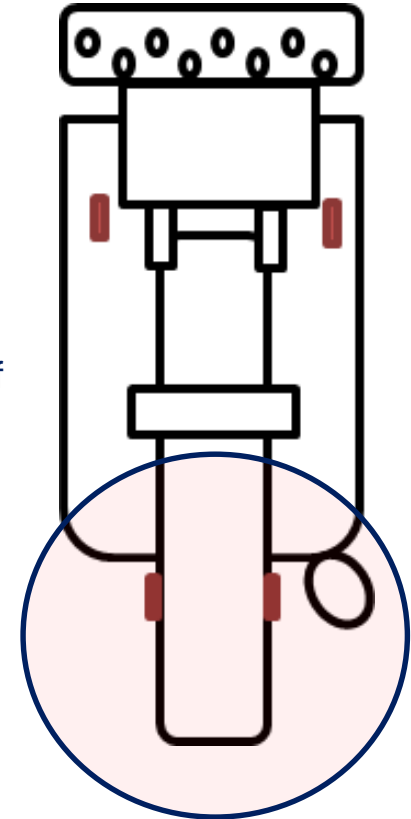
PDS is not the
only/ first line
of defence

Current Operational Concerns



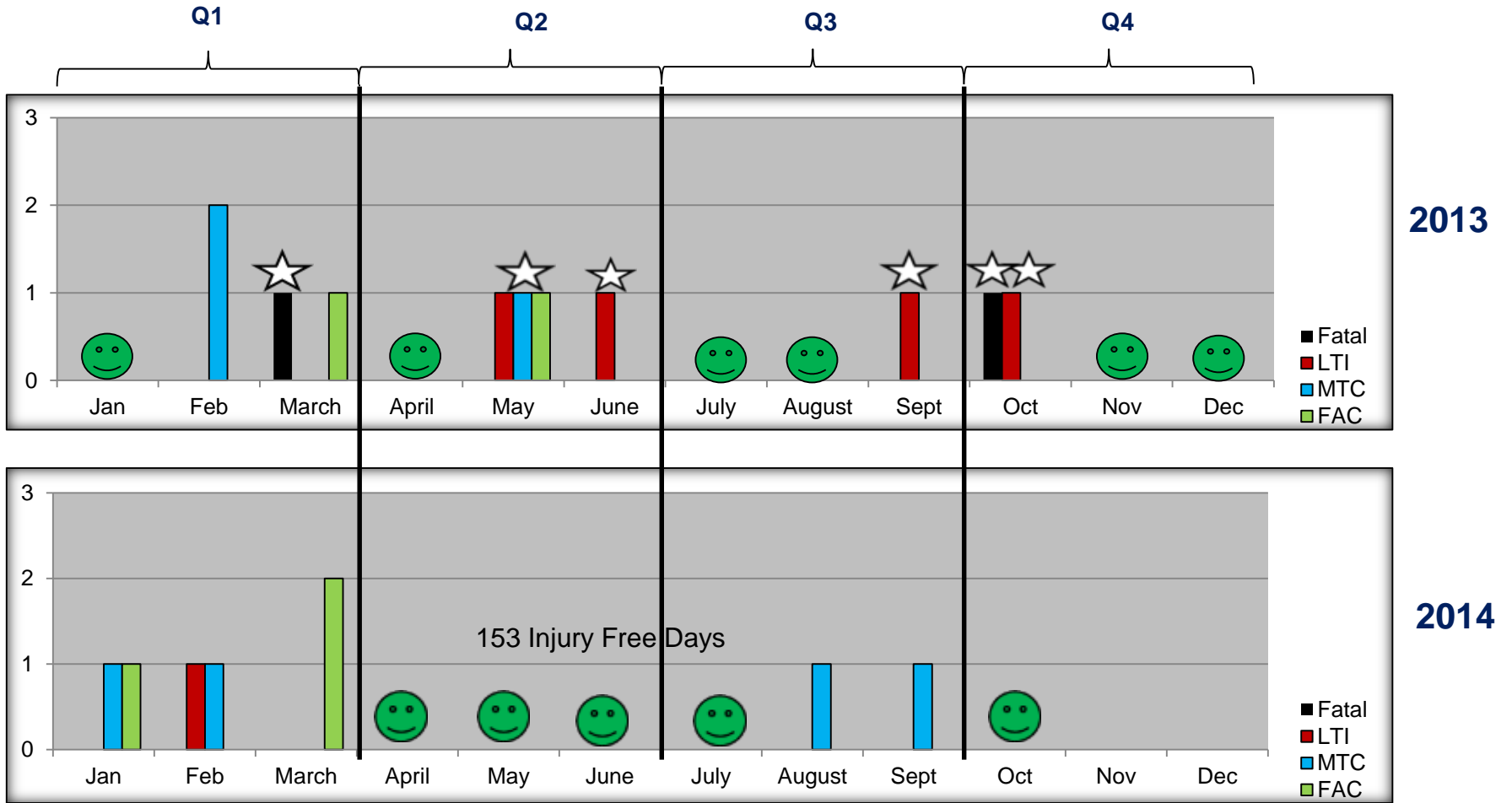
80%+ of all PDS downtime happens on the CM

CM PDS downtime accounts for 2-3% of production time



35-40% of all CM PDS downtime happens in this zone

Conclusion



 - Moving Machinery Injuries
  - Injury Free Month

Conclusions

- **MOSH learning: PDS will only be sustainable if adopted, accepted and managed by all stakeholders. Operational ownership is key to the long term sustainability**
- **PDS implementation at New Denmark was a big learning curve. Lessons learnt are being transferred to next implementation site.**
- **PDS technology is not mature yet.**
- **PDS is a new technology and installations on equipment is add-on and not integrated. This needs to be monitored and managed else there will be some affect on equipment availability and operational impact**
- **Follow a risk based approach for implementation and not prescriptive**
- **Implementation Risks**
 - **Surface collision avoidance prototype technologies only just being developed (2 years +)**
 - **Underground diesel equipment OEM slowdown & stop ability progress is slow – Mechanical older generation equipment will be a challenge**
 - **Significant cost and technical skills required**

Questions