

The Role of Defect Elimination in Reducing Hazard Exposure

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Callide Mine

Context

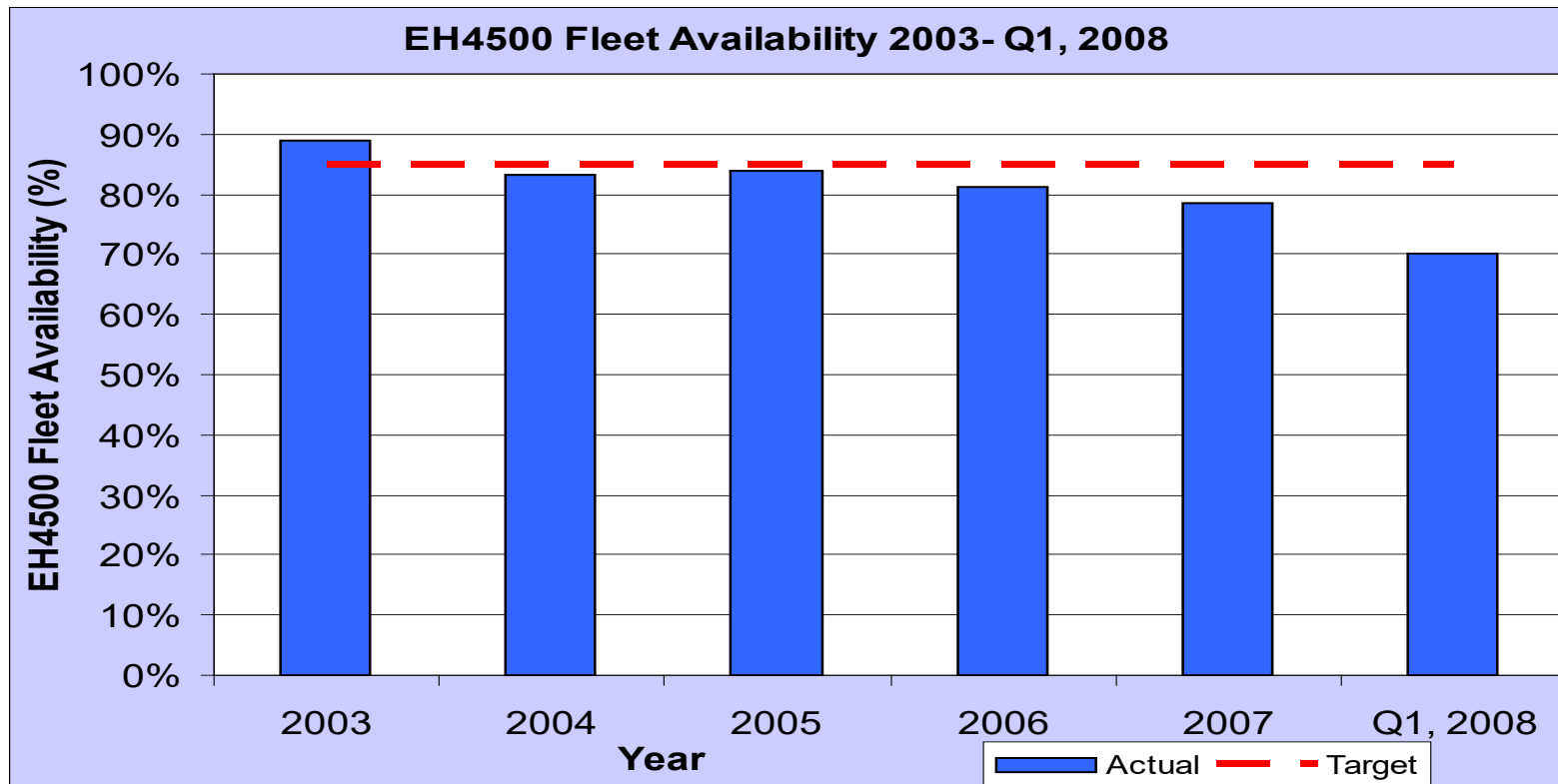
Callide Mine.....

- 10 Mtpa open cut thermal coal
- Located 1.5hrs S.W. of Rockhampton
- 450 full time employees
- Overburden is primarily removed by 2 draglines, 1 shovel & 1 excavator
- The excavator & shovel are supported by a fleet of 15 x 270t payload rear dump trucks (EH4500's)

This presentation discusses the EH4500 truck fleet improvement project & assesses the impact on hazard exposure

Truck Fleet Availability by Year

3 years of declining performance.....



.....required action

TARGET ZERO

**Zero fatalities & Zero lost time injuries
OUR STEPPING STONE TO ZERO HARM**



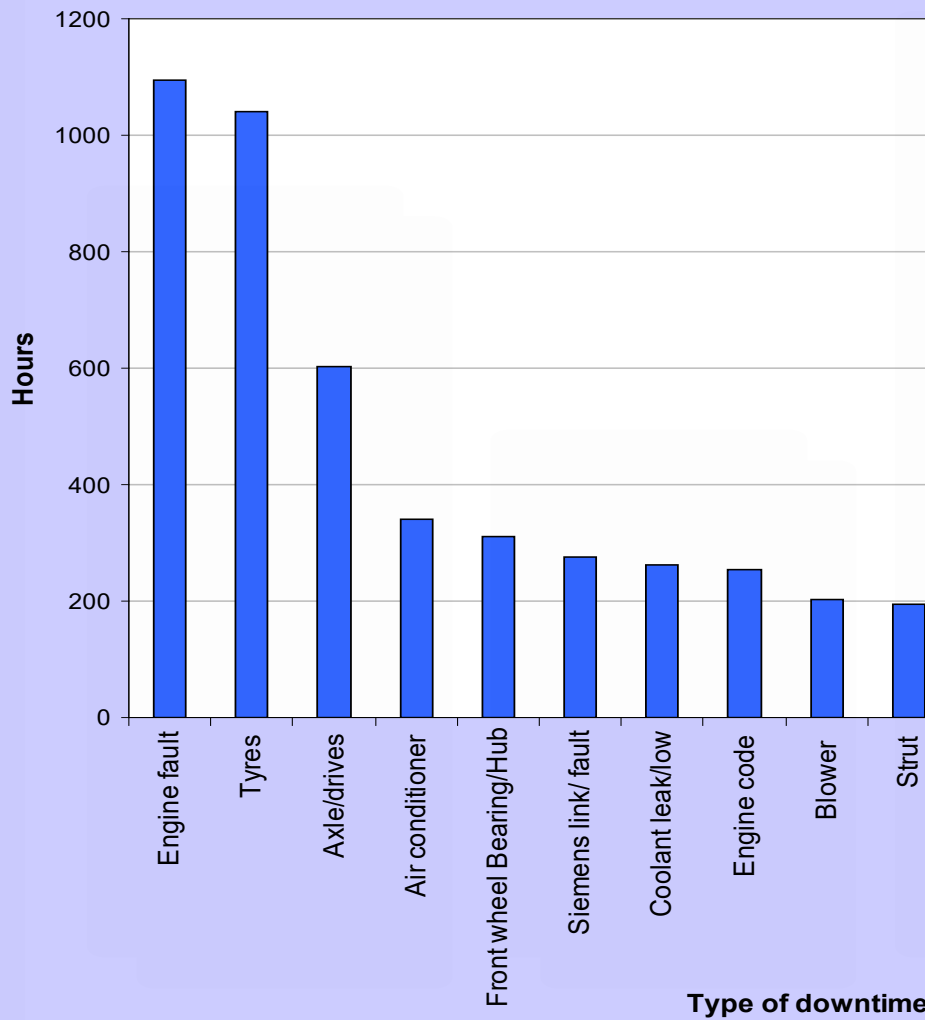
Taking Action

To reverse the trend a number of processes commenced to address the EH4500 availability:

- Reliability data analysis *
- Dedicated team assigned to plan and execute the defect backlog reduction*
- Scheduled service process review
- Defect elimination*
- Hitachi EH4500 users forum

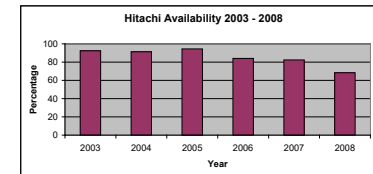
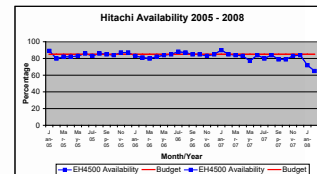
Reliability Analysis of EH4500 Downtime

Top 20 downtime components for EH4500 fleet July to Dec 07



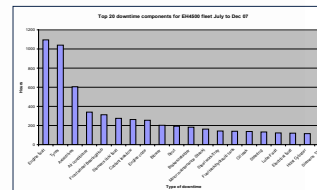
Hitachi EH4500 Rear Dump Improvement Plan

Current Performance



2003 included trucks 1151-1156
2004 included trucks 1151-1160
2005 - 2008 included trucks 1151-1164 (full fleet)

Pareto Analysis



Critical Issues

How to reduce "Wait Labour" delays for mechanical repairs to an acceptable level.
How to effectively manage the backlog, completing defects in conjunction with the PM schedule.
How to reduce "Wait Labour" delays for tyre maintenance to an acceptable level.
How to improve technical skills of workforce to reduce trouble shooting time on Engine Faults.
How to implement product improvements with minimal impact to production.
How to structure the department to support the truck fleet on TSM.
How to improve focus and urgency around the performance of the rear dump fleet.
How to engage Hitachi and improve their focus on improving fleet reliability.
Unique life of chassis.

Improvement Plan

Problem Statement	Action	Who	By When	Performance Measures	Status
Reduce downtime related to Tyre Management	- Re-Program Tyre life management - Engage Hitachi to update software to 7 days left - Schedule tyre changes integrated into Mobile Maintenance Schedule - Complete installation of double wheel area (2 Trucks) - Review Tyre Specification & Application for operation in Tug Duty	- Paul Mitchell - Stuart Tomlinson - Sam Grimsdale - Sam Grimsdale - Stuart Tomlinson	30/09/2008 30/09/2008 30/09/2008 30/09/2008 1/10/2008	1st Stop time life, 2 in tyres improve life of truck 1st Wait Labour delays - Availability - Availability 1st Stop time life	- Delayed - PMS Tyre expenses - Complete - Complete - Complete
Reduce downtime related to engine	- Engage one Detail Man-Pit for engine fault finding and maintenance - Conduct engine specific training improve the technical skills of maintenance personnel - Review the level of routine & PEX repairs held at site and Detail in life	- Stuart Tomlinson - Stuart Tomlinson - Stuart Tomlinson	3/10/2008 30/09/2008 1/10/2008	- Availability - Availability - Availability	- Complete - Not done yet - currently doing self training - Complete
Improve chassis reliability	- Regular performance plan for engine operator on Rear Dump 1154 - Implement continuous control for final drives by implementing an oil change process - Review final drive of specification with Hitachi & Shell with extending support life	- Stuart Tomlinson - Stuart Tomlinson - Sam Grimsdale	17/04/2008 1/10/2008 17/03/2008	- Availability - Availability - Availability	- Complete - Complete - Complete
Improve Air Conditioner system reliability	- Engage Hitachi OEM to improve Wheel motor and grid blower reliability - Independent A/C specialist to review OEM system - Conduct a review of A/C system testing results	- Sam Grimsdale - Sam Grimsdale - Stuart Tomlinson	1/10/2008 7/10/2008 1/10/2008	- Availability - Availability - Availability	- Modifications being tested - Failure A/C system has been replaced by OEM system - Complete
Implement 'Newer' EH4500 Product Improvements	- Implement the following electrical updates - Business Data Isolators, SPN bus upgrade to main alternative & Temp sensor upgrade to wheel motors - Implement bearing assembly upgrade to main motor - Improve front wheel bearing release plate upgrade	- Stuart Tomlinson - Stuart Tomlinson - Stuart Tomlinson	1/10/2008 1/10/2008 1/10/2008	- Availability - Availability - Availability	- Complete - Complete - Complete
Increase focus and urgency on executing the maintenance strategy	- Dedicated Supervisor allocated to EH4500 for two months period to drive scheduled maintenance tasks and generate focus on competing maintenance backlog - Engage dedicated training (2) for two month period - Conduct key training & Technical Work experience sessions identifying corrective actions (2 month period)	- Stuart Tomlinson - Stuart Tomlinson - Stuart Tomlinson	1/10/2008 1/10/2008 1/10/2008	- Availability - Availability - Availability	- Complete - Complete - Complete
Increase support and focus from Hitachi	- Conducting improvement plan & weekly fleet performance to ensure focus on Maintenance Structure to support EH4500 fleet operating on TSM - Review the overall Hitachi Project Managers role and expectations to align with Callide requirements	- Sam Haddley - Sam Grimsdale	1/10/2008 1/10/2008	- Availability - Availability	- Complete - Complete

Minor

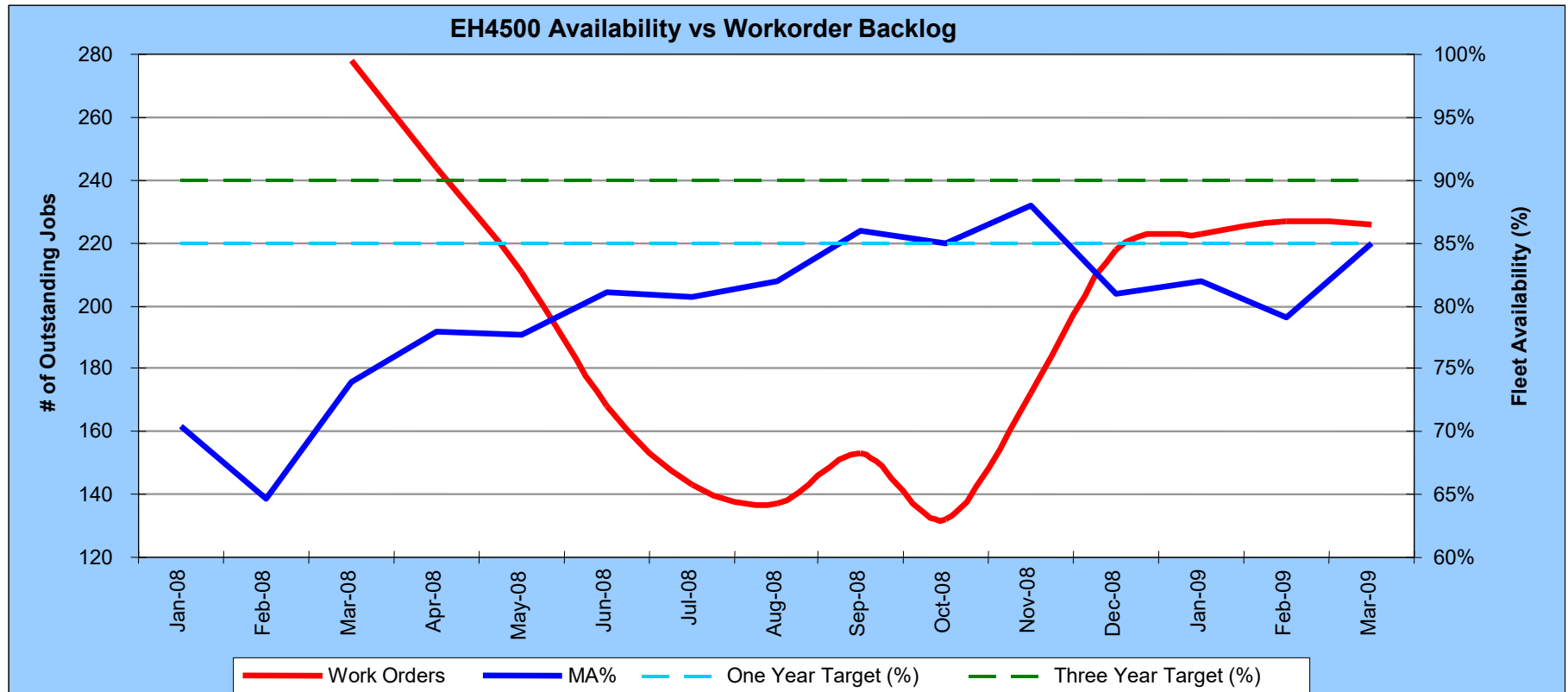
Fuel

TARGET ZERO

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Defect backlog reduction



Improvement Project Focused on.....

- Reducing Work Order backlog
- Implementing a number of improvements

This was done by.....

- Developing a plan
- Assigning a dedicated supervisor & labour resource
- Focussed effort to reduce backlog

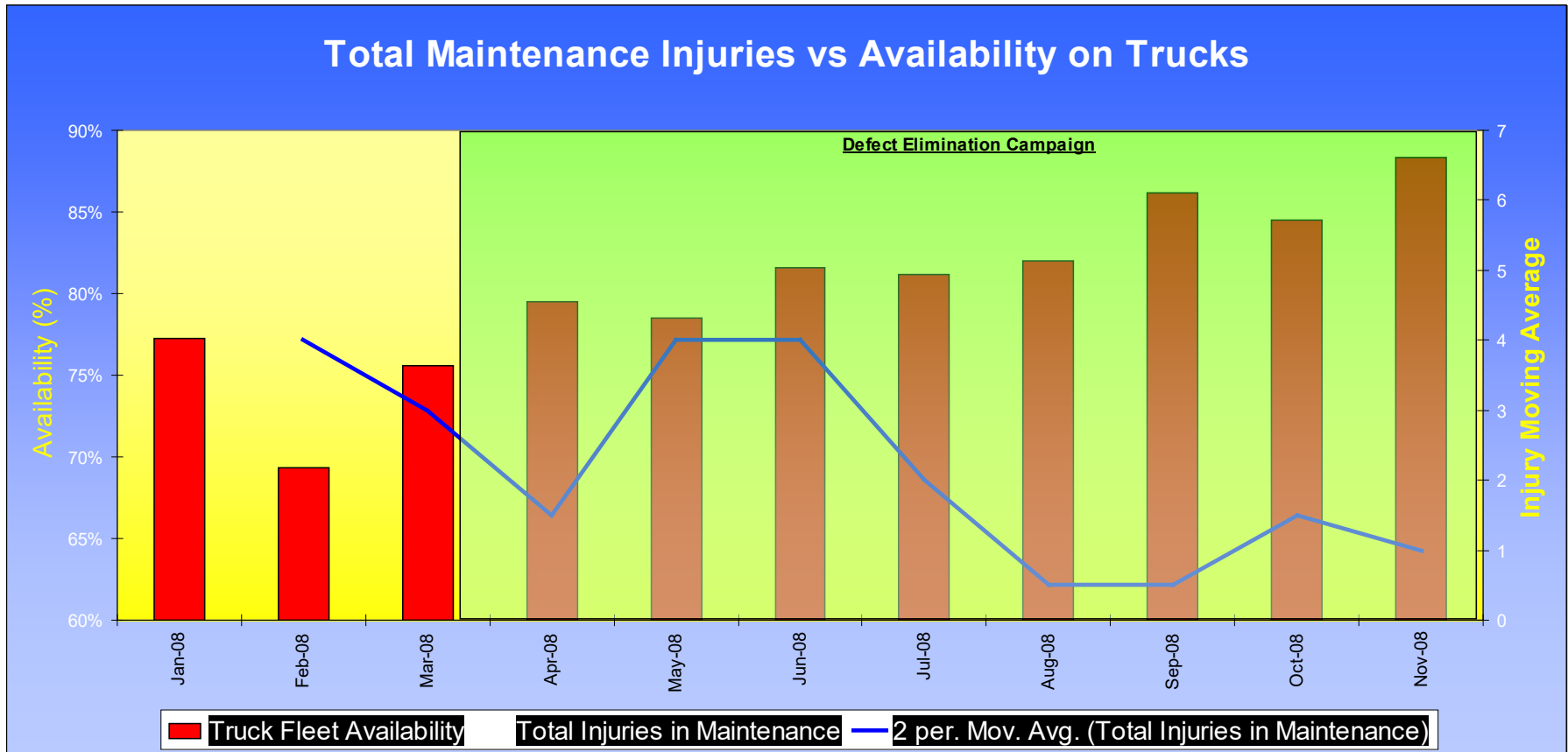
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Maintenance Injury Rates Through the Projects Duration

Total Maintenance Injuries vs Availability on Trucks



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Some perspective

2831 defects over 12 month period (EH4500)

Estimate at least 5 hazards per defect

14155 hazards on 1 fleet

Hazard exposure

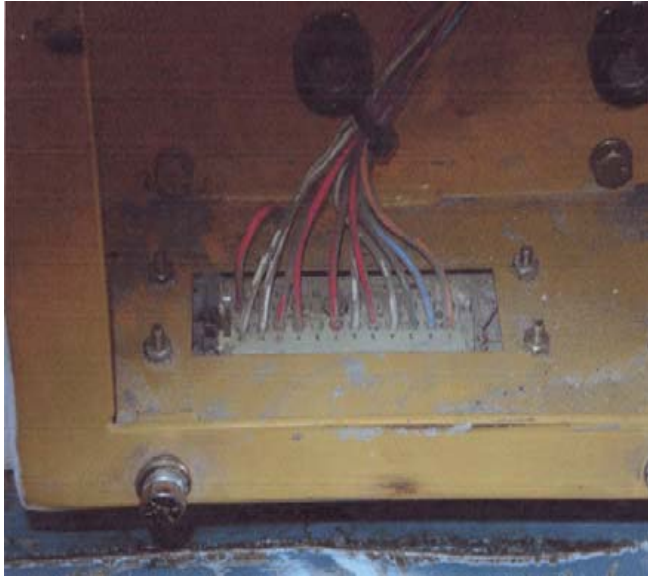
Risk = Consequence x Likelihood

Defect elimination  Reduced exposure



Example Defect Elimination Projects

Problem-5XH Alternator Plugs ground faults



Root Cause

Dust & water ingress from poor plug location & inadequate sealing



Benefit

- Reduced downtime (34hrs/yr)
- Reduce maintenance costs
- **Reduced hazard exposure**

Solution

- Hard wire cables into termination strip
- Replace plug with gland plate

Problem – Premature final drive failures



Root Cause

- Oil viscosity too low
- Wear metal generated causing wide spread deterioration



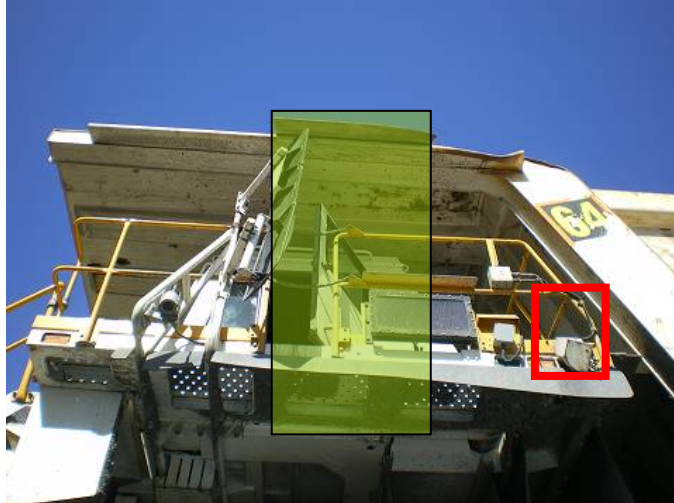
Benefit

- Reduced gear and bearing wear
- Maximise life of oil & final drives components
- **Reduce hazard exposure by extending the time between maintenance & reducing failures**

Solution

- Change to costly synthetic lube
- Implement kidney filtration

Problem – Reverse Light Damage



Root Cause

Poor light location



Benefit

Reduced downtime by 50hrs per yr

Reduced maintenance costs

Reduced hazard exposure fixing these lights

Solution

Relocate the light position to under the rock deflector shield

Problem – Starter Motor Testing Duration



Benefit

- Reduction of 40 hours servicing per year
- **Reduced hazard exposure**

Root Cause

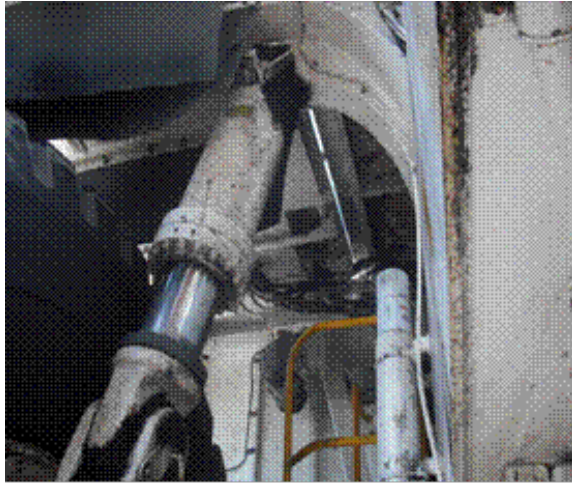
Extended service duration due to testing method required to ensure starter motors are both functioning



Solution

By installing 2 switches in the cab, the serviceman can turn one starter motor off via the new switches, test with ignition switch. Repeat for the second starter motor. The red guards give a visible indication of the position of the switch to overcome leaving in the wrong position

Problem – Difficult access to check pressure & re-charge front struts



Root Cause

The cause is due to the recharge points facing towards the rear of the truck. Access via a mobile platform is impeded by the steering arm



Benefit

- **Safer access of existing engine platform to check / recharge struts**
- Reduction of 15 minutes per service on each truck

Solution

By rotating the struts around 180 degrees, this then allows the access via the engine bay stairs/platform

Problem – Hydraulic contamination from lift cylinder seal erosion

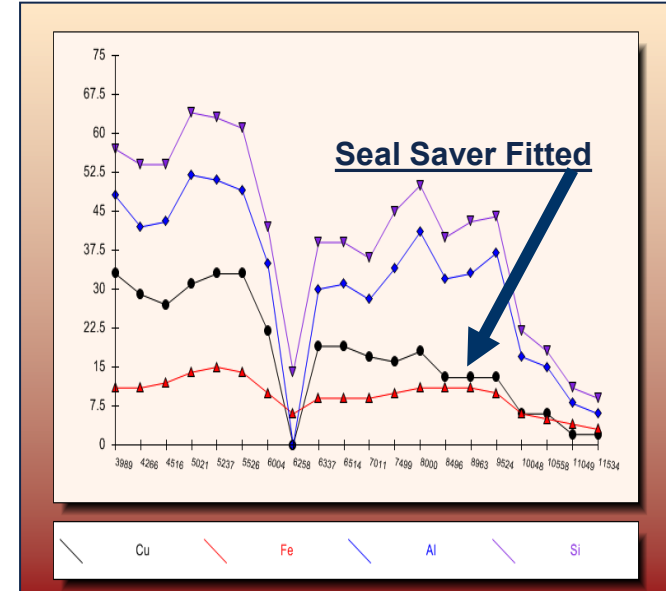


Root Cause

Design of radiator fan causes exhaust dust to erode cylinder rod & seals

Benefit

- Reduced contamination levels in the hydraulic system which will reduce the failure rate on the hydraulic pumps and cylinders
- **Reduced hazard exposure as change outs will occur less frequently**



Solution

Install Kevlar seal savers to the lift cylinders to prevent erosion and contamination

The benefits of the defect removal & elimination program are:

- Reduced unplanned callouts to equipment in the field
- Better hazard control in planned work situations
- Reduced exposure means reduced risk
- Reduced maintenance costs
- Increased asset performance
- Cultural shift
- Great teamwork and energy in finding solutions

Summary

- Defect backlog management and defect elimination are key factors in reducing hazard exposure for tradespeople
- Build momentum by involving your trades teams
- Solutions are generally inexpensive, simple & effective