# Application of Shearer Automation


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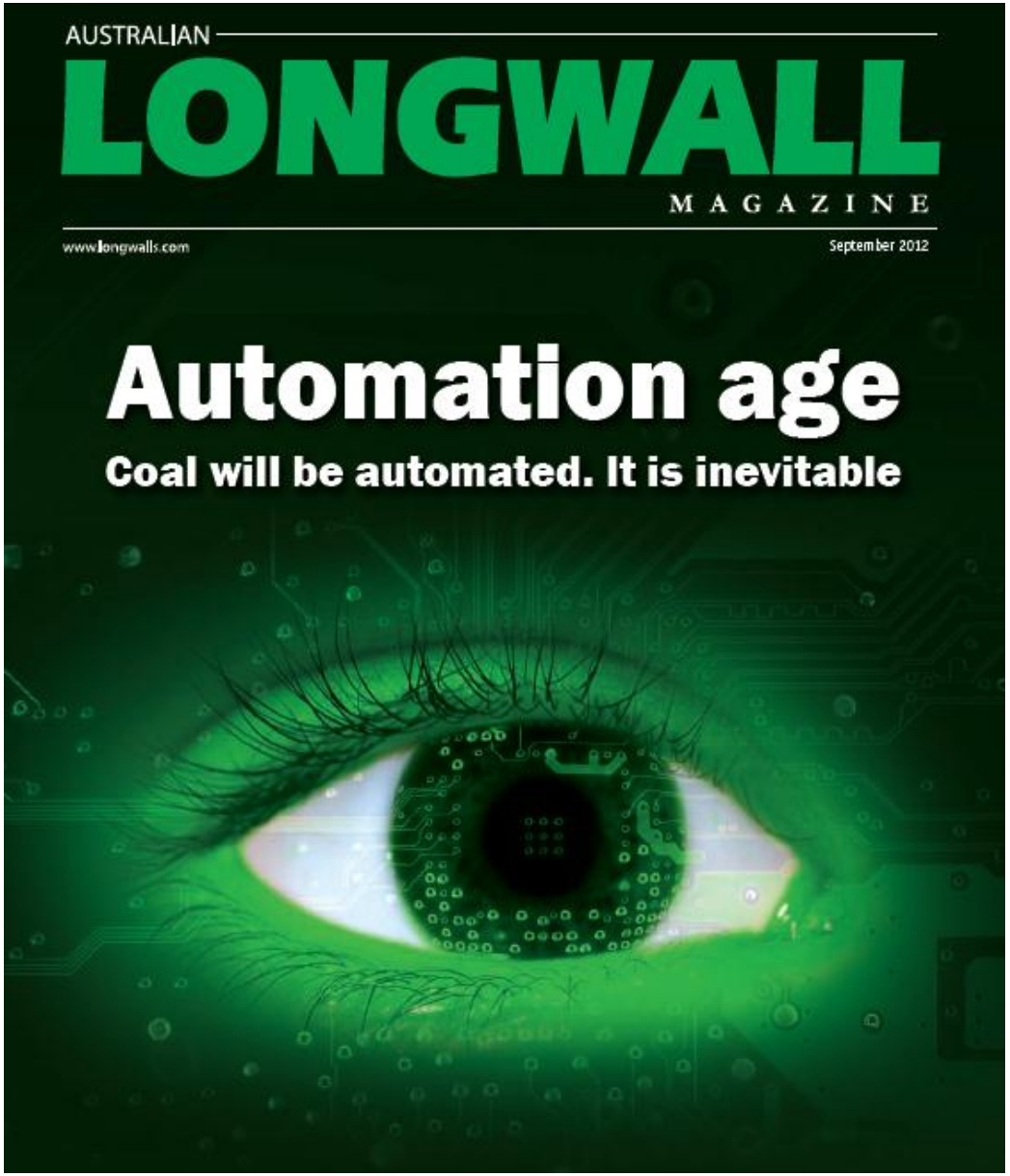
# Application of Shearer Automation

*Introduction*

**What is the direction of coal mining in Australia?**

***AUTOMATION AGE***
***"Coal will be automated. It is inevitable"***




*Courtesy Australian Longwall Magazine*

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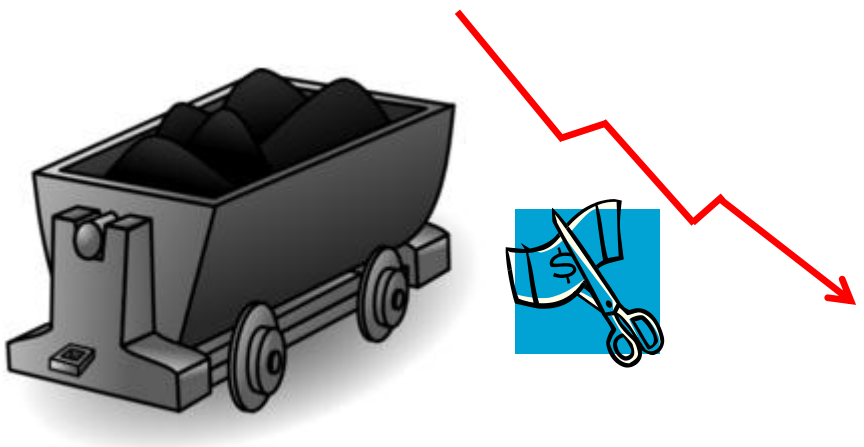
*Introduction*

**What has driven longwall automation in Australia to the level it currently is?**


**Ageing mining population potentially resulting in a shortage of experience**

**Coal price – Thermal and Choking**



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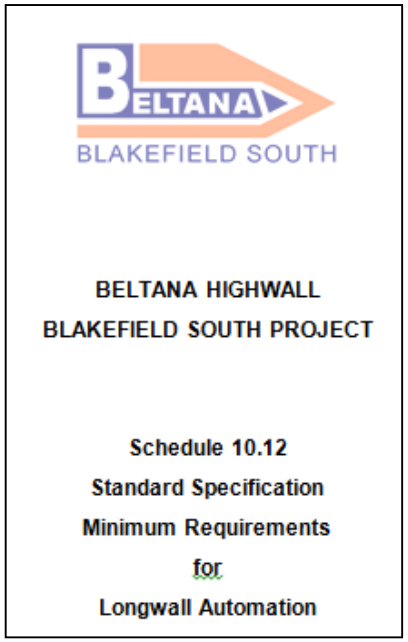
# Application of Shearer Automation

*Introduction*

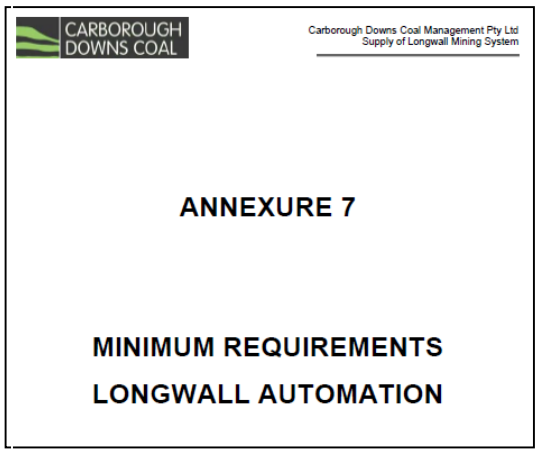
**How is the technologies driven to form part of the equipment?**

**CUSTOMERS PROCURING NEW LONGWALL EQUIPMENT**

**Each longwall tender has a clear specification which outlines "Standard Specification Minimum Requirements for Longwall Automation"**









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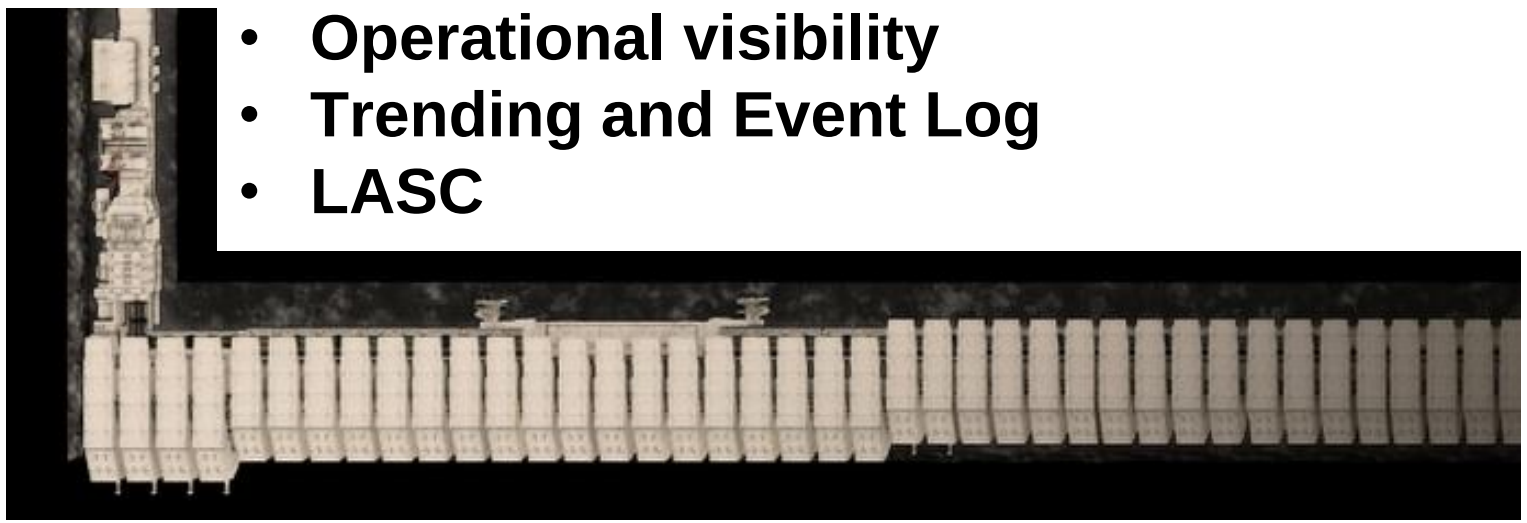
# Application of Shearer Automation

*Introduction*

**Aspects of longwall automation:**

- **Shearer State Based Automation**
- **Radar detection**
- **Shield Automation**
- **Ethernet Communication and**
- **EIP interface between equipment**
- **Operational visibility**
- **Trending and Event Log**
- **LASC**



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Integra Mine

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Grasstree

xstrata

Oaky Creek No.1
Oaky North Mine
Tahmoor Colliery
Ulan Coal

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# Application of Shearer Automation

*Introduction*

**Aspects of longwall automation:**

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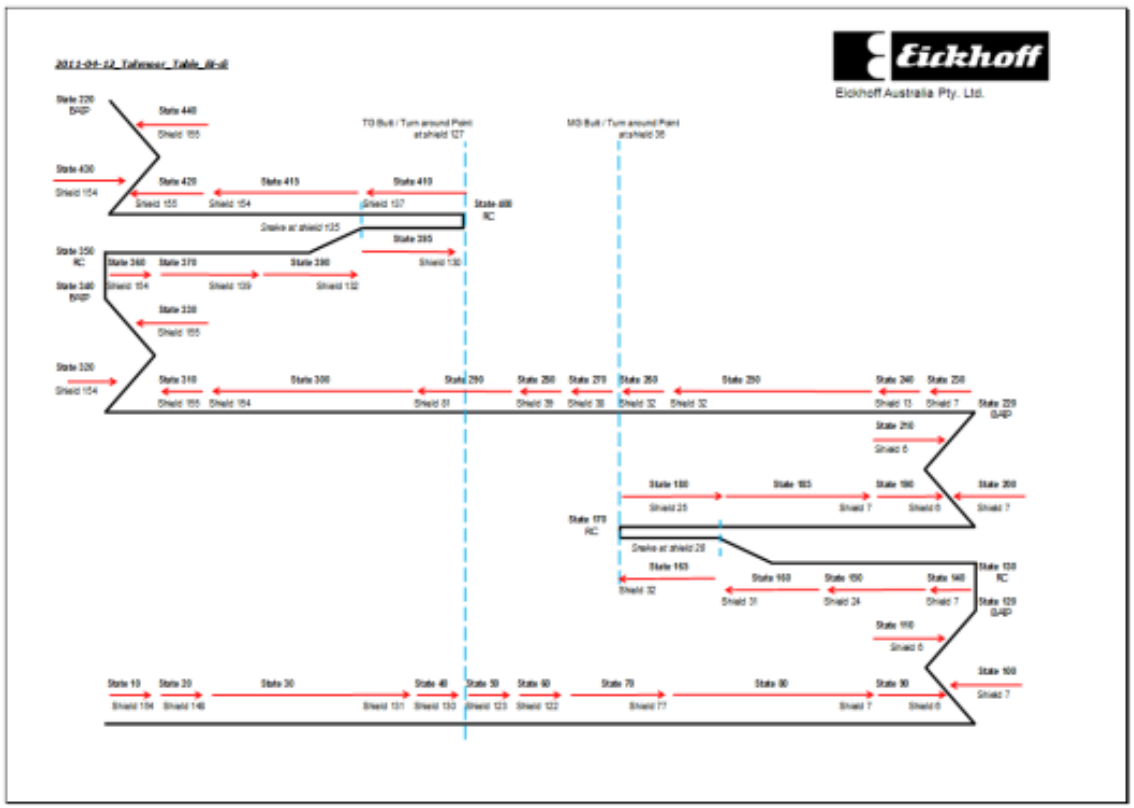
Tahmoor Colliery
Ulan Coal

- **Shearer State Based Automation**

**Shearer behaviour is defined to automate each state of a cutting cycle, irrespective of the cutting method used.**

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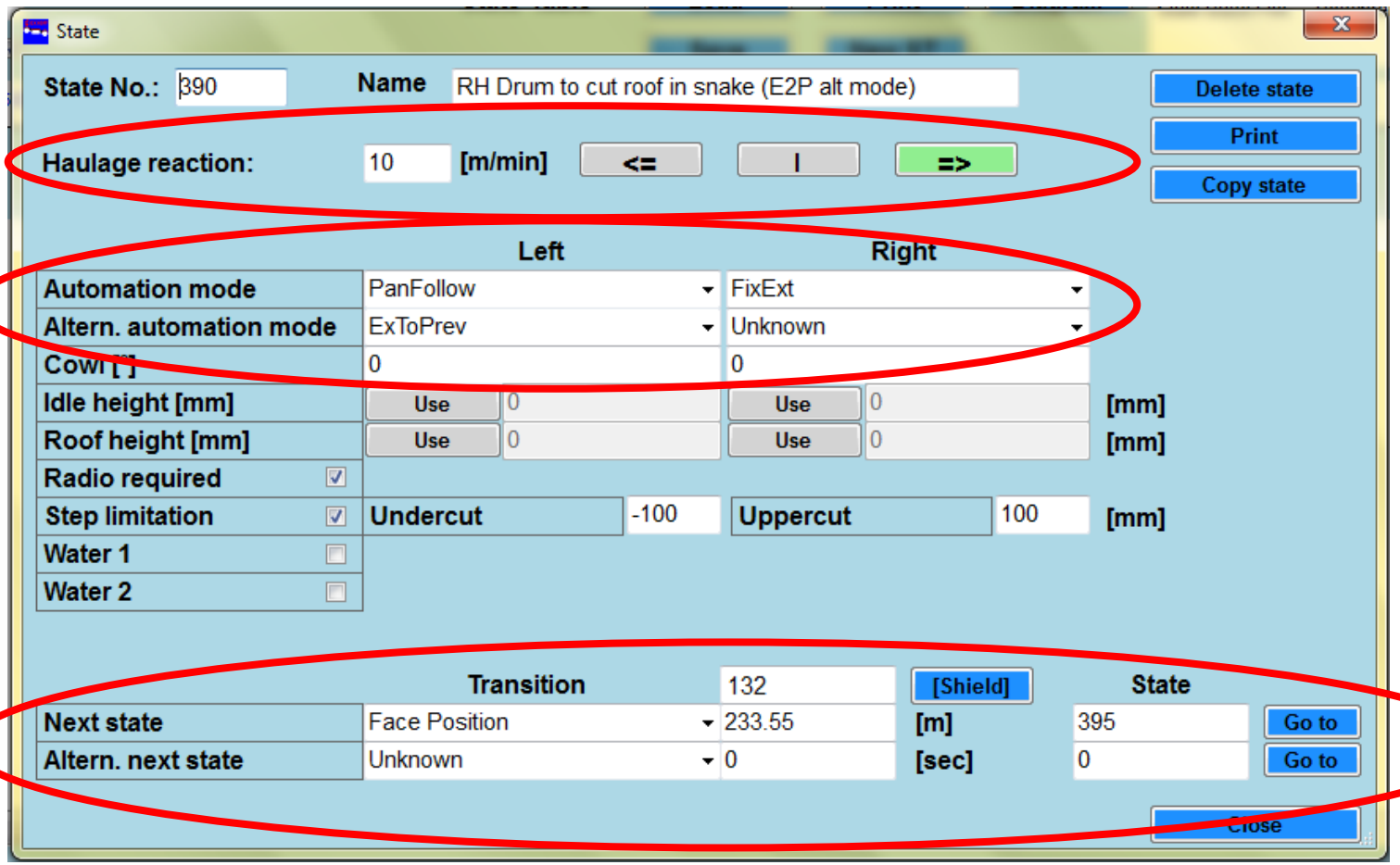
# Application of Shearer Automation

*Introduction*

**Aspects of longwall automation:**

- **Shearer State Based Automation**



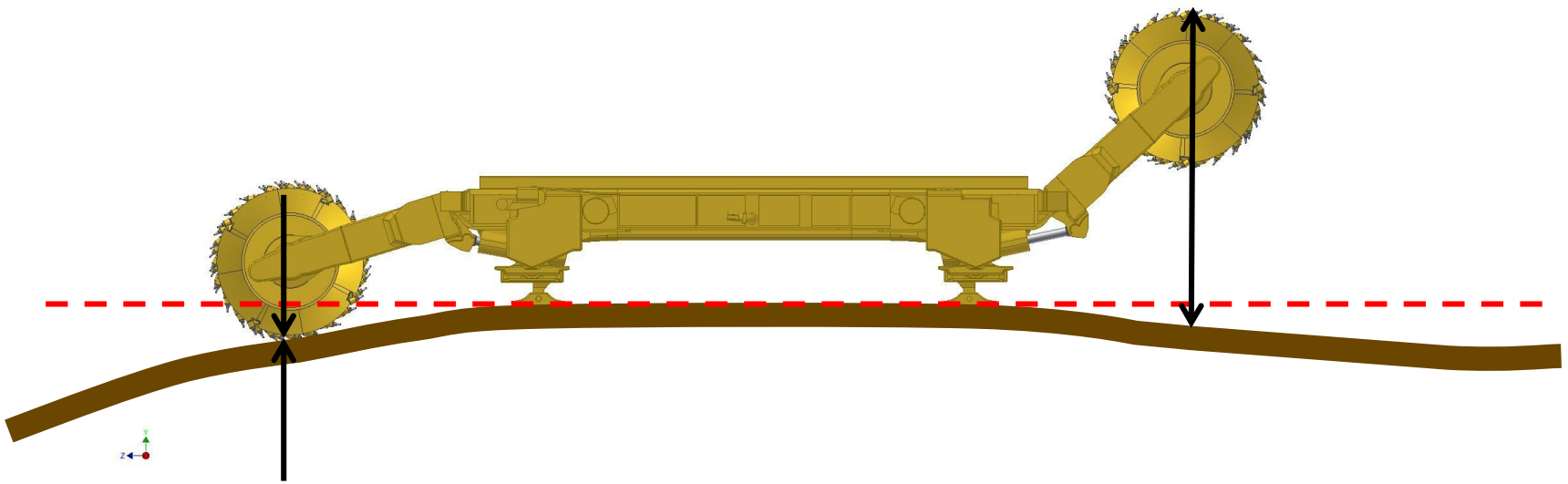
# Application of Shearer Automation

*Introduction*

**Aspects of longwall automation:**

- **Shearer State Based Automation**

***Drum height indication calculated and referred to the TRUE floor***



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# Application of Shearer Automation

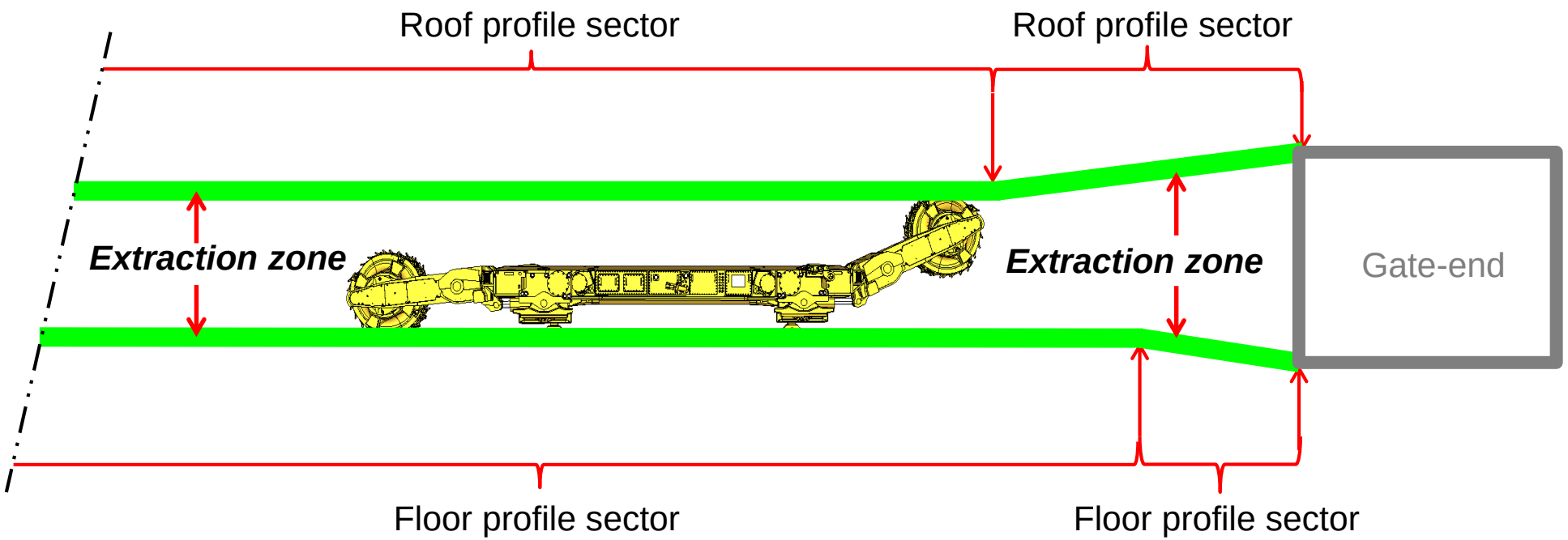
*Introduction*

**Aspects of longwall automation:**

- **Shearer State Based Automation**

**A parameterized roof and floor profile is defined into sectors to create an extraction zone.**

***- This becomes the reference to steer face horizon -***

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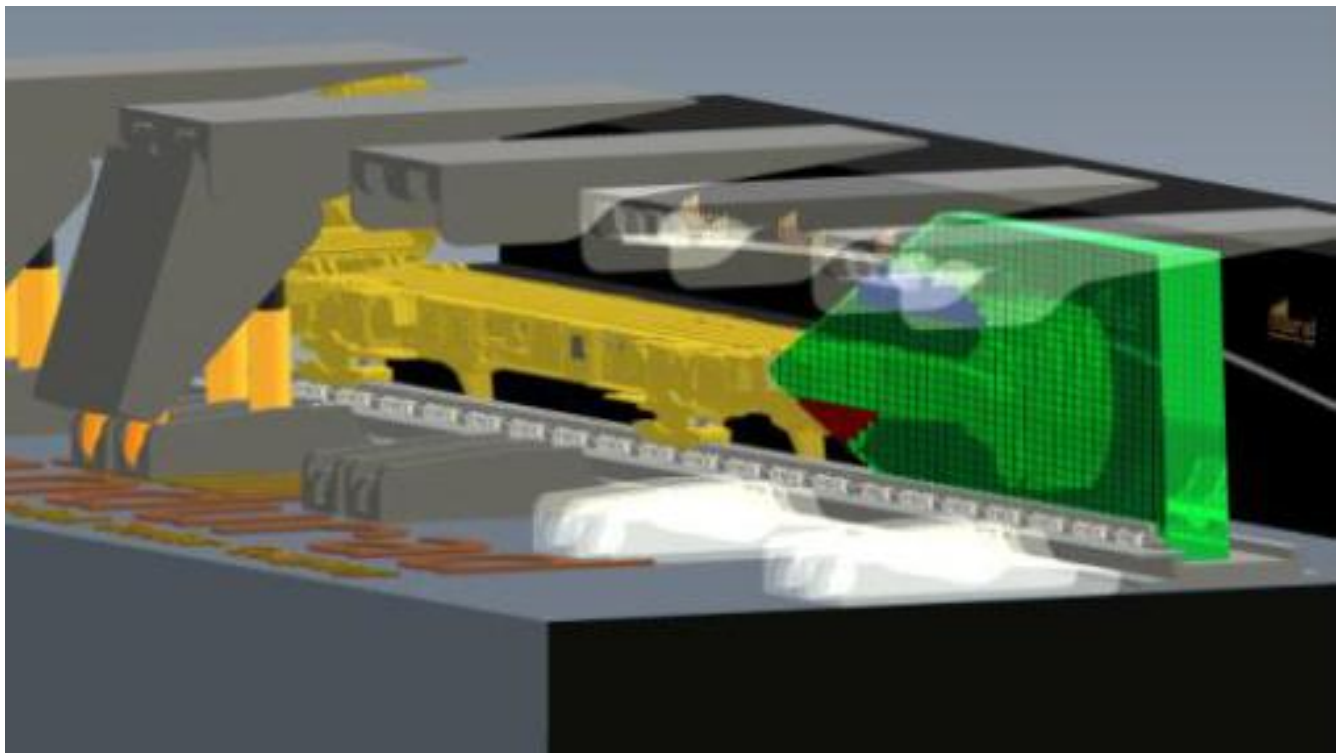
# Application of Shearer Automation

*Introduction*

**Aspects of longwall automation:**

- **Radar detection**

**Collision avoidance between cutting unit and shield canopies**



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*Introduction*

**Aspects of longwall automation:**

- **Shield Automation**

**By means of comms interfacing, shearer position is used for shield defined sequences which includes gate-ends.**

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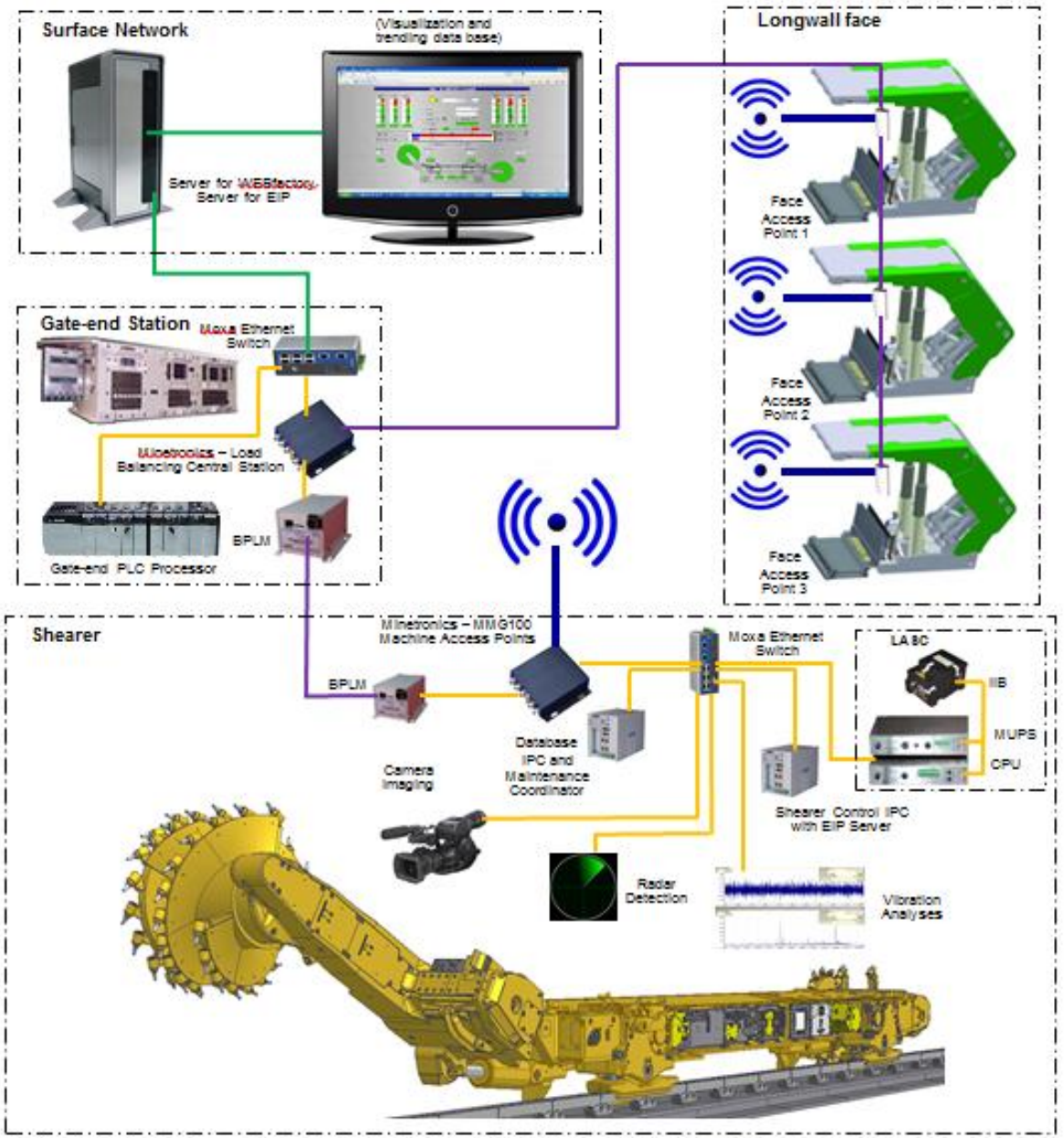
*Introduction*

**Aspects of longwall automation:**

**Ethernet Communication Fast and reliable communications set the platform for EIP interface, visualization & SCADA tools, trending of operational data & event logging and LASC**



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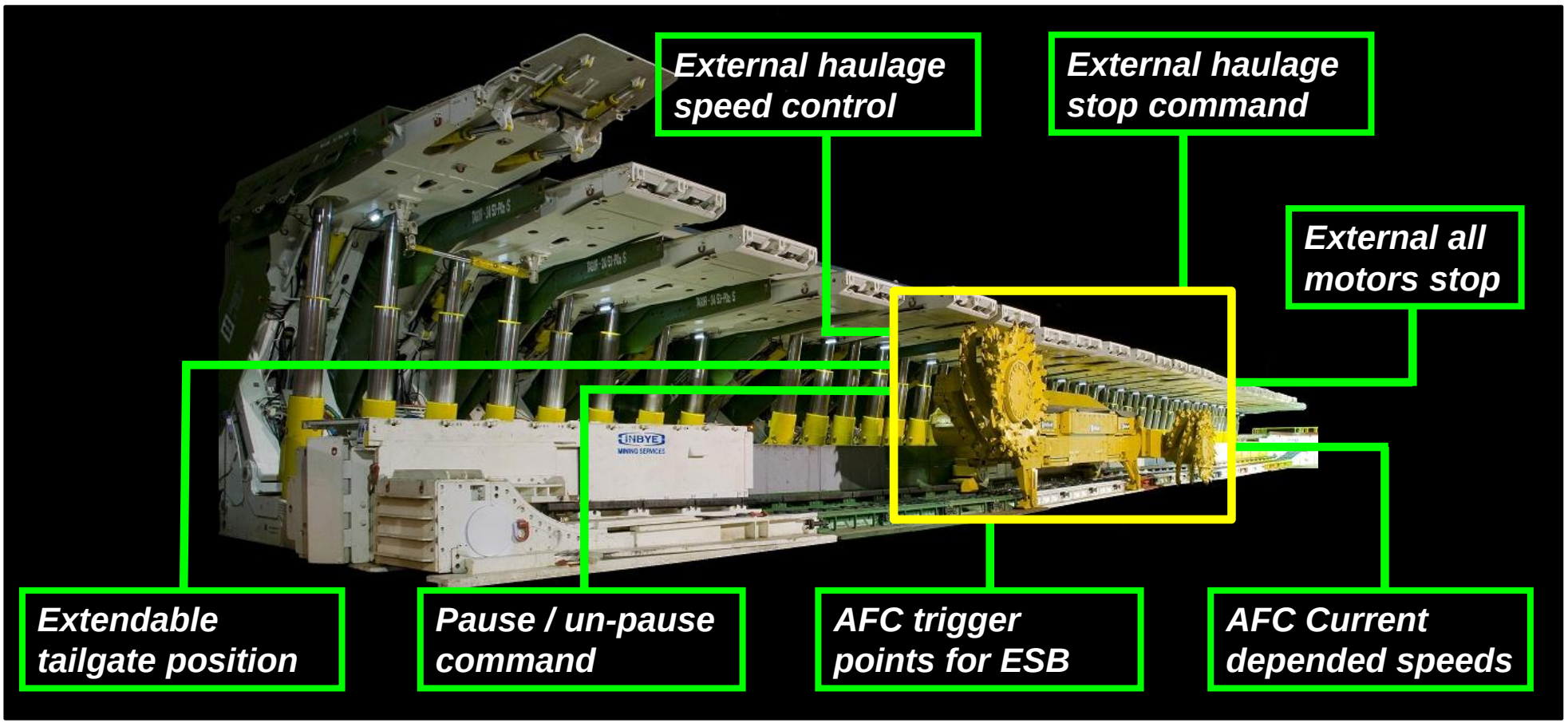
*Introduction*

**Aspects of longwall automation:**

- **EIP interface between equipment**



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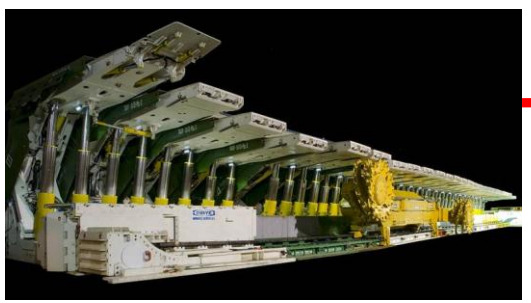
*Introduction*

**Aspects of longwall automation:**

- **Operational visibility**

***On-board cameras*** ***Web Visualization***

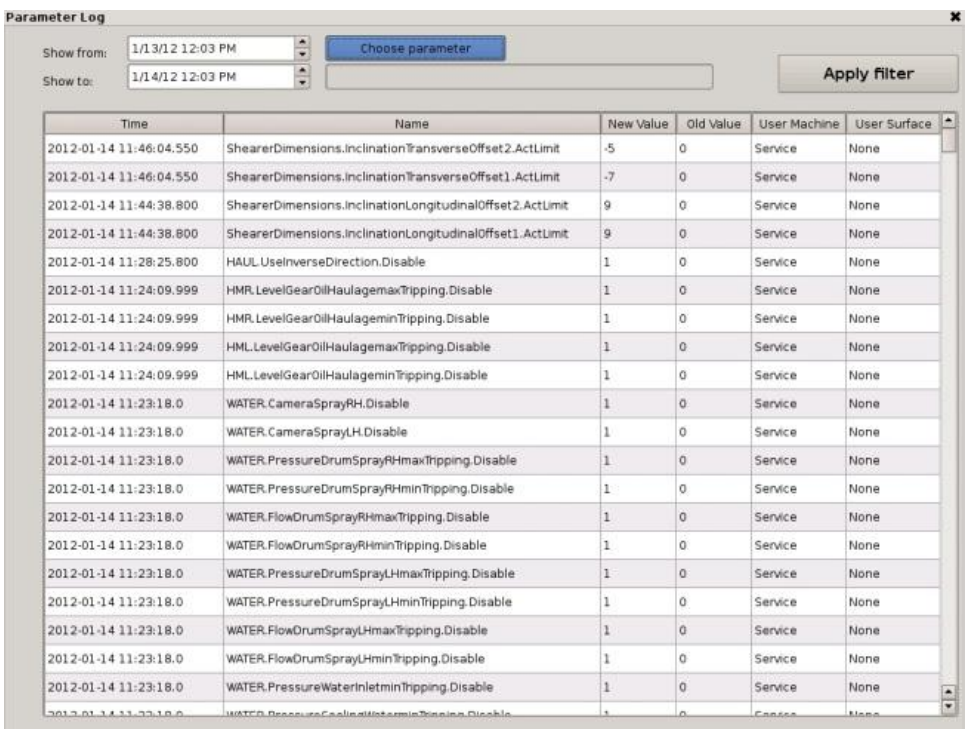


# Application of Shearer Automation

*Introduction*

**Aspects of longwall automation:**

- **Trending and Event Log**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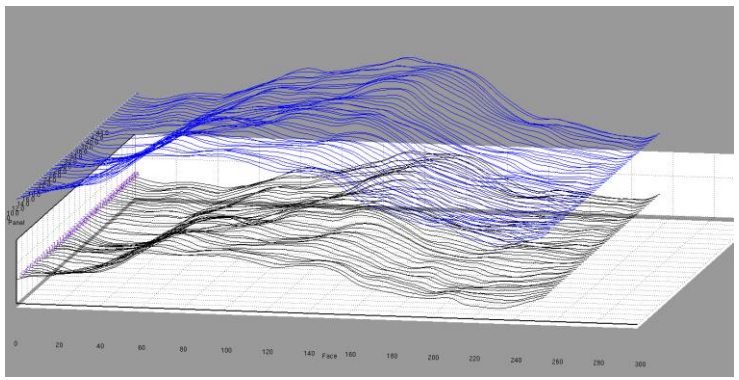
# Application of Shearer Automation

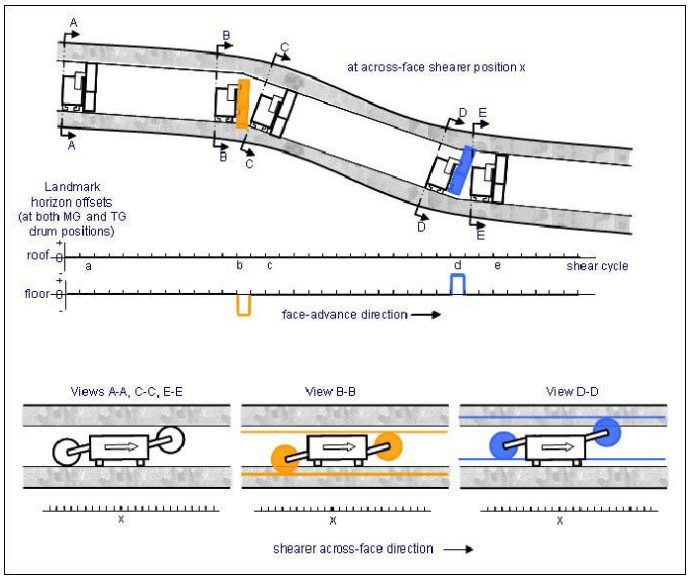
## *Introduction*

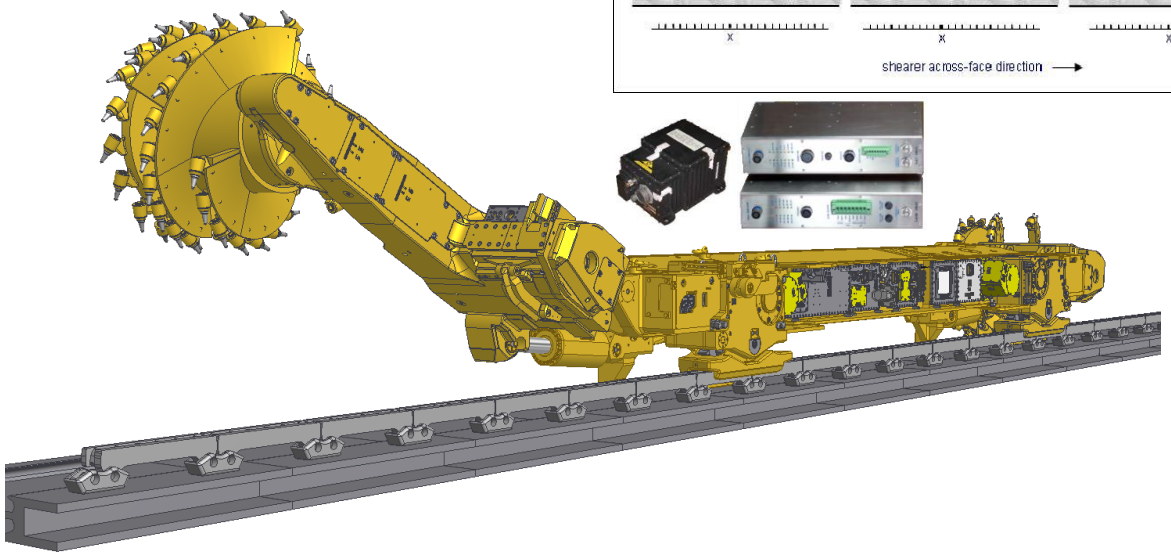
### Aspects of longwall automation:

- **LASC**

***A system created by CSIRO which provides data of the cut profile, which can be used to maintain horizon control in a longwall panel, as well as face alignment***

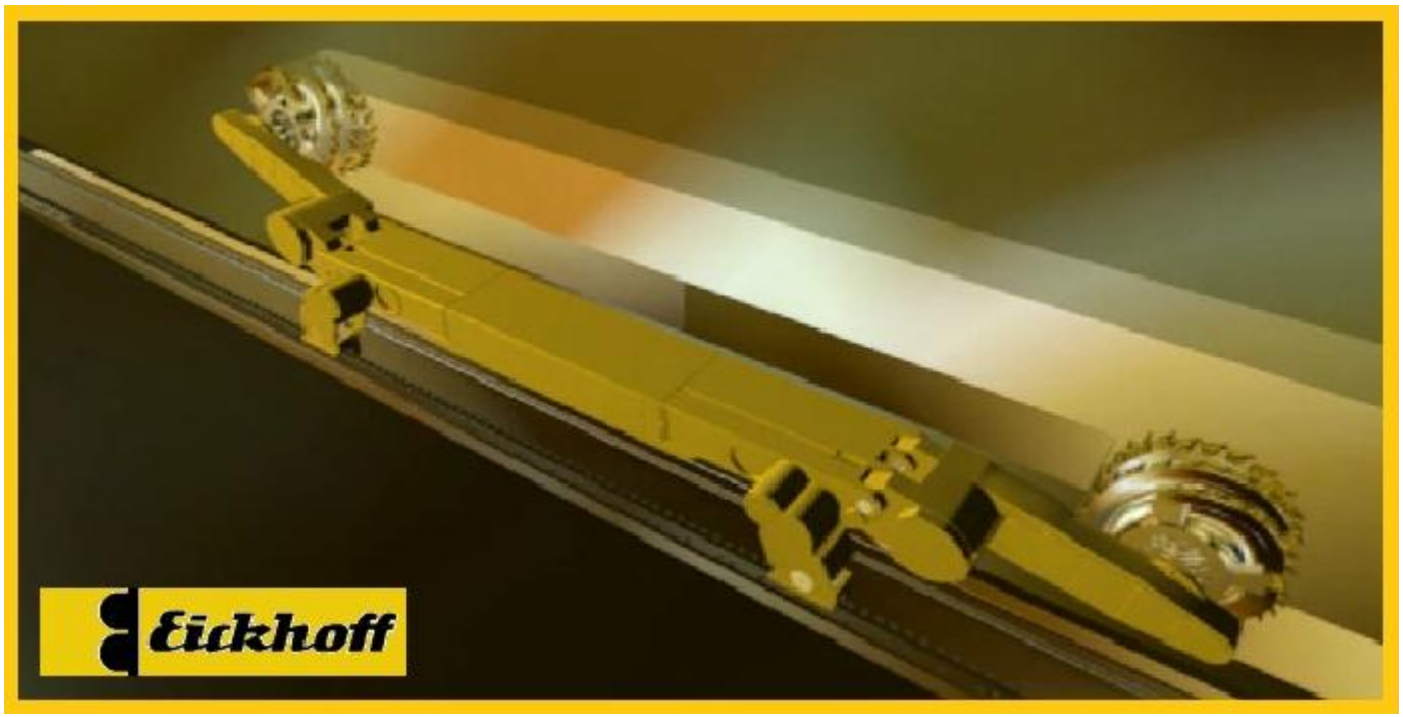




# Application of Shearer Automation

## Immediate objectives for automation

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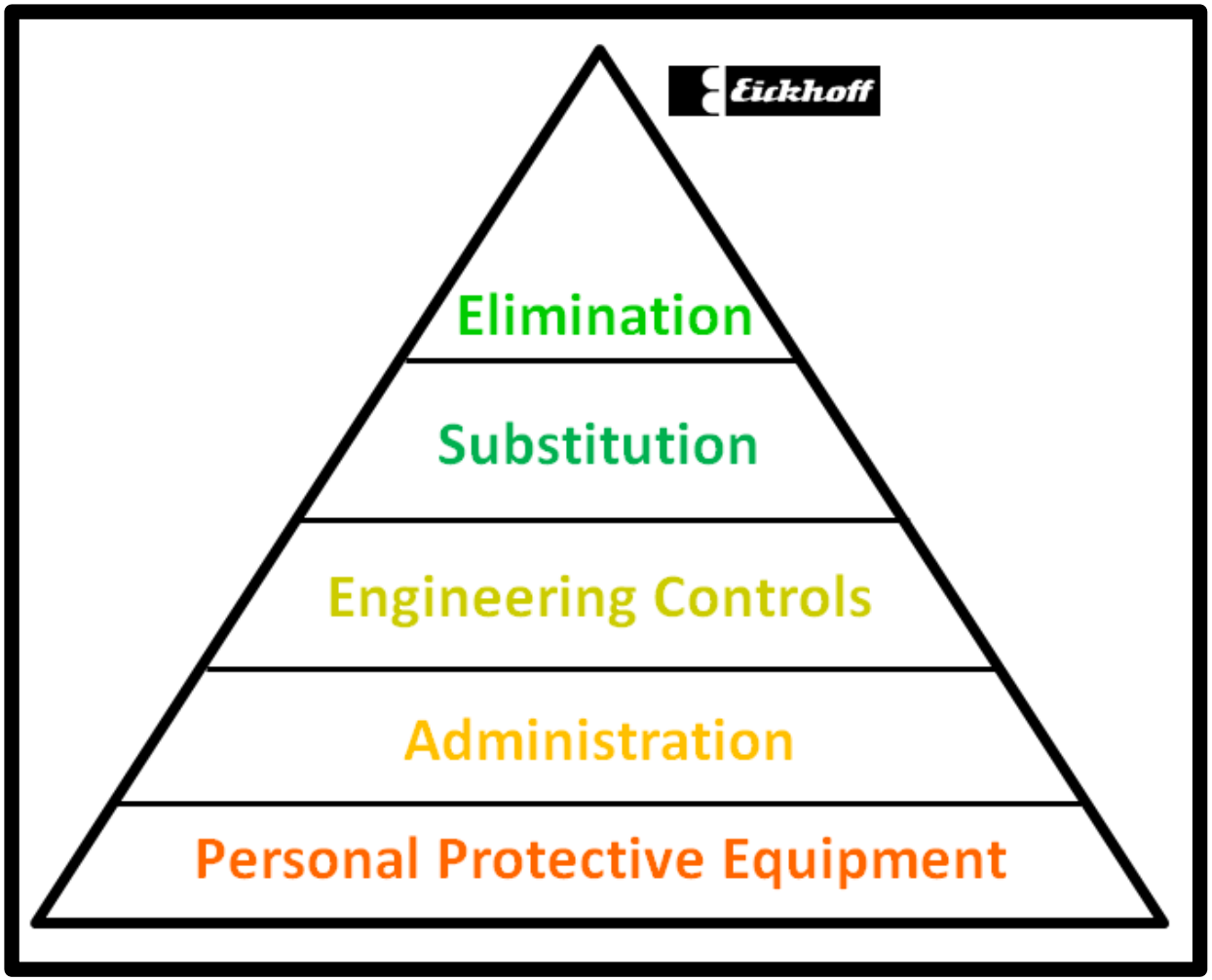
# Application of Shearer Automation

*Immediate objectives for automation*

**To reduce exposure to the risk and elements of longwall mining**



# Application of Shearer Automation

*Immediate objectives for automation*

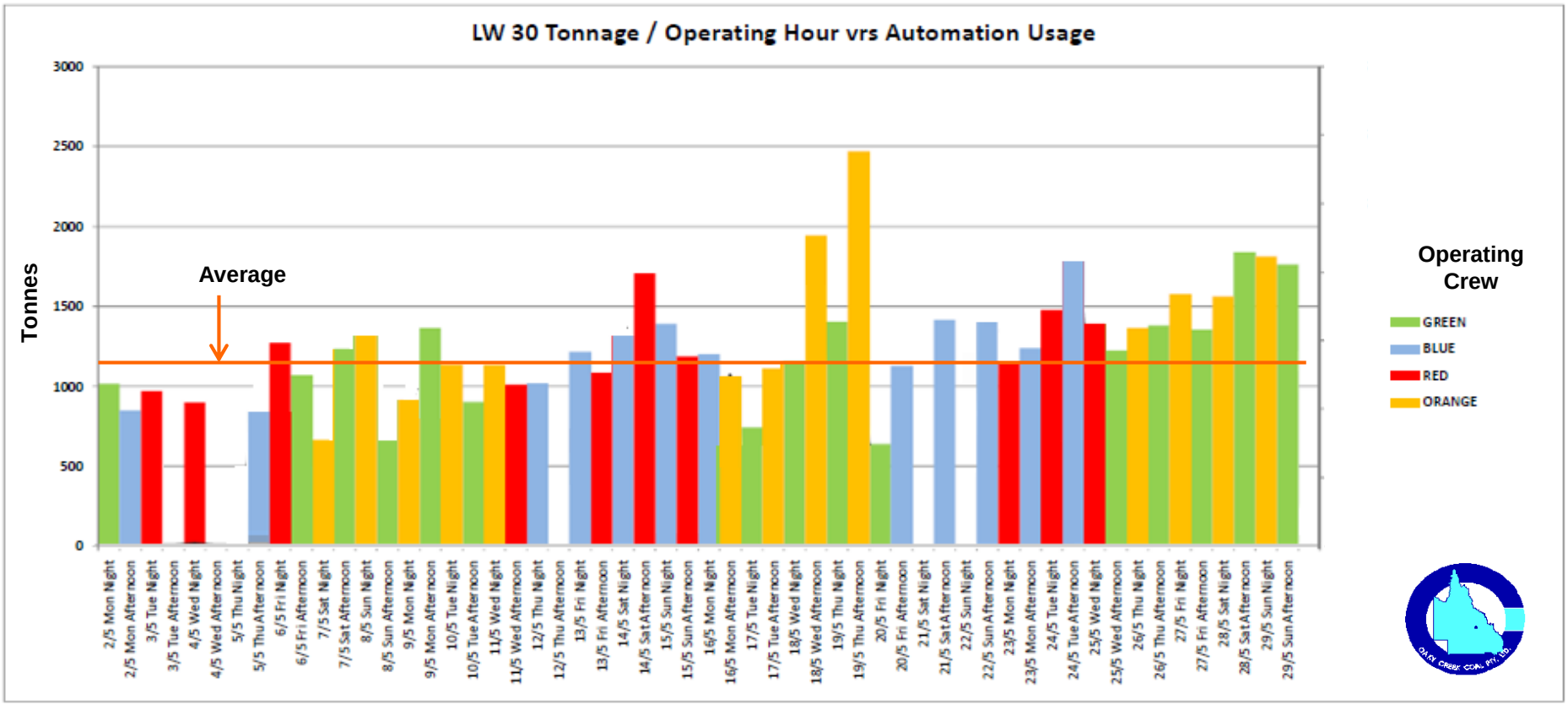
**To maintain consistency in longwall production**

Comparison in production at Oaky Creek No. 1 prior to the implementation of ESB and ESB in use.

*Courtesy Oaky Creek No.1 mine 2011*

# Application of Shearer Automation

## *Immediate objectives for automation*



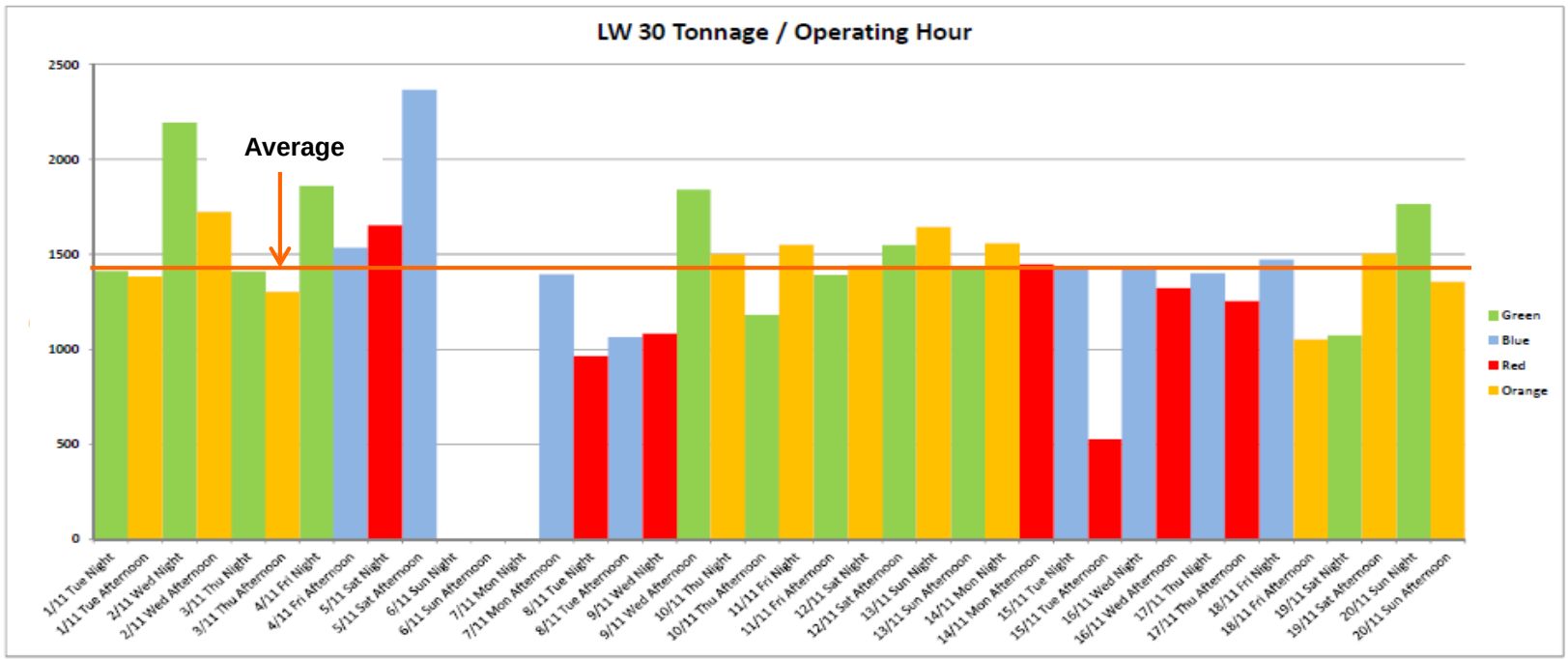

- OCC #1 Tonnes / Operating Hour (May 2011)

***Courtesy Oaky Creek No.1 mine 2011***

# Application of Shearer Automation

*Immediate objectives for automation*

**To maintain consistency in longwall production**




- OCC #1 Tonnes / Operating Hour (Nov 2011)

*Courtesy Oaky Creek No.1 mine 2011*

# Application of Shearer Automation

*Immediate objectives for automation*

**To maintain consistency in longwall production**

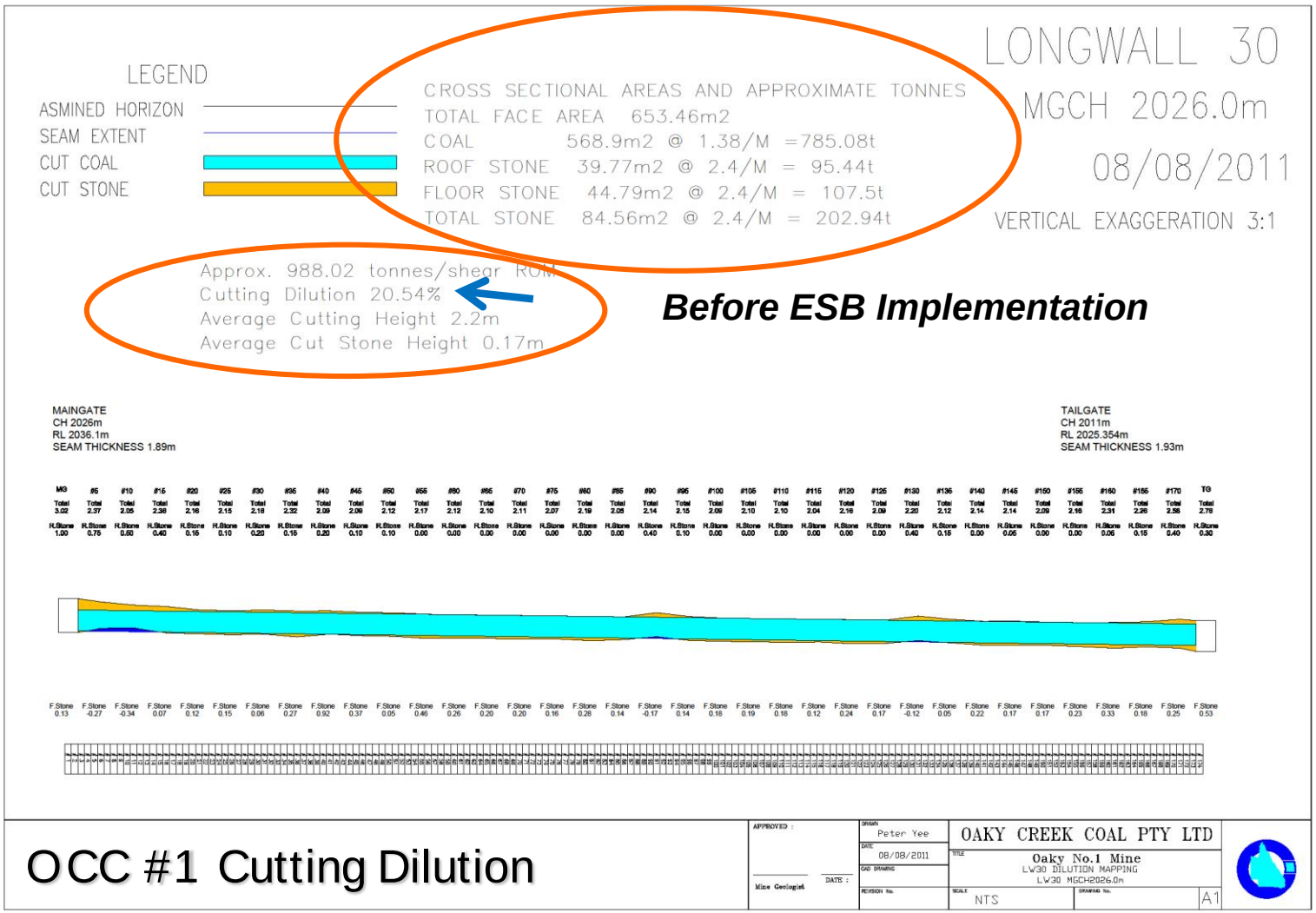

- OCC #1 SCADA TRENDS – Haulage speed reduction vs. Methane

*Courtesy Oaky Creek No.1 mine 2011*

# Application of Shearer Automation

*Immediate objectives for automation*

**To maintain consistency in longwall production**

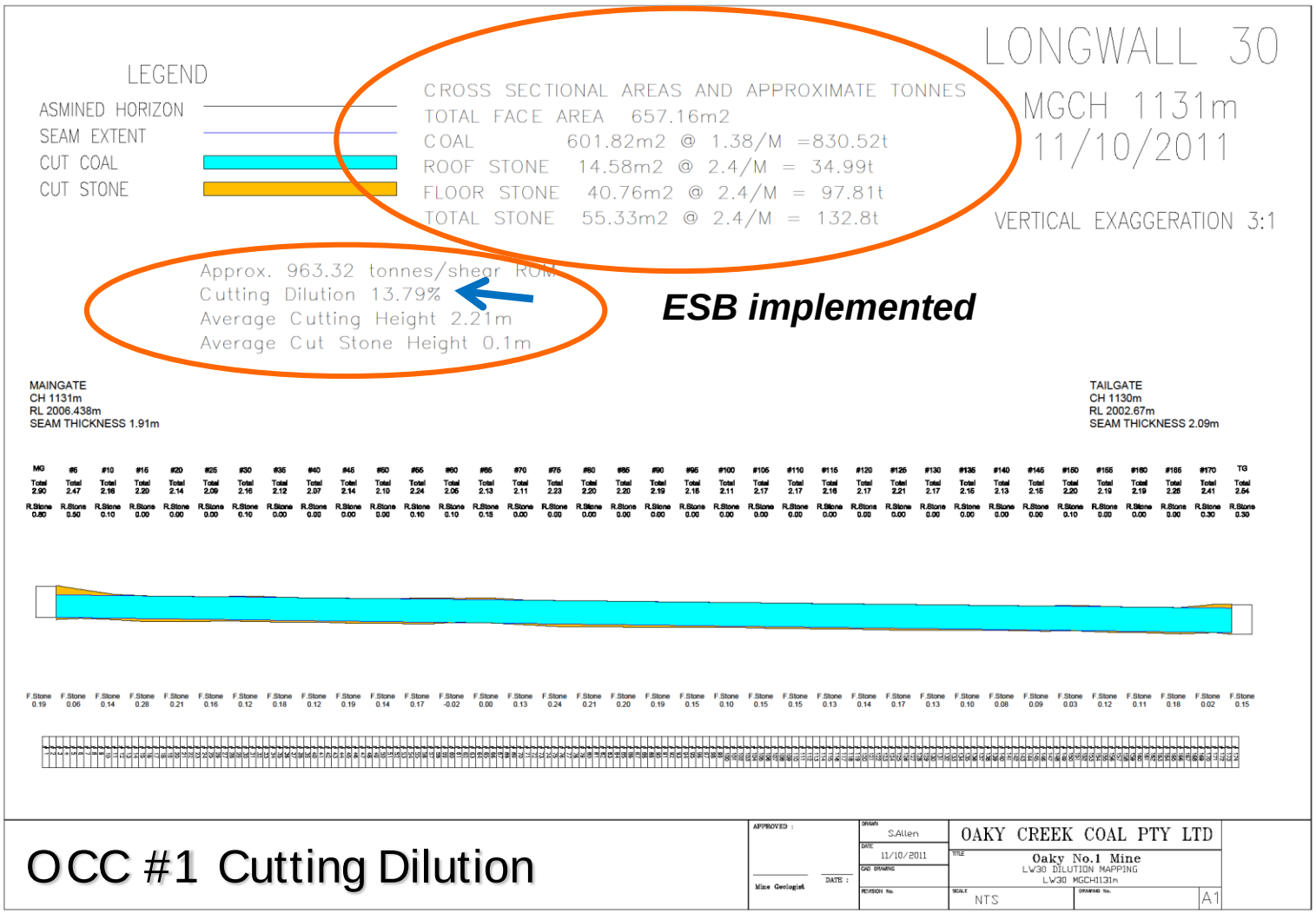



*Courtesy Oaky Creek No.1 mine 2011*

# Application of Shearer Automation

*Immediate objectives for automation*

**To maintain consistency in longwall production**




*Courtesy Oaky Creek No.1 mine 2011*



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# Application of Shearer Automation

*Immediate objectives for automation*

**To maintain consistency in longwall production**

**A positive impact has been observed particularly directly after implementation, in the availability of equipment at *all* mines where automation was implemented.**

***Reduce equipment downtime and it will positively impact production***

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*Courtesy Carborough Downs 2009*

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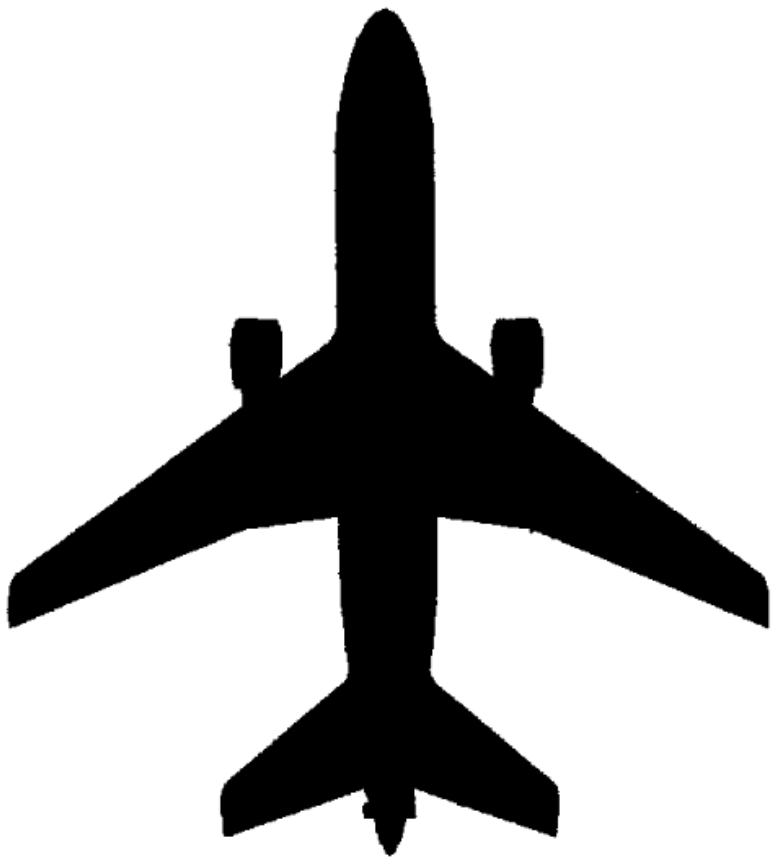
# Application of Shearer Automation

## Requirements for effective automation

# Application of Shearer Automation

*Requirements for effective automation*

**Redundancy of automation components**



# Application of Shearer Automation

*Requirements for effective automation*

**Redundancy of automation components**

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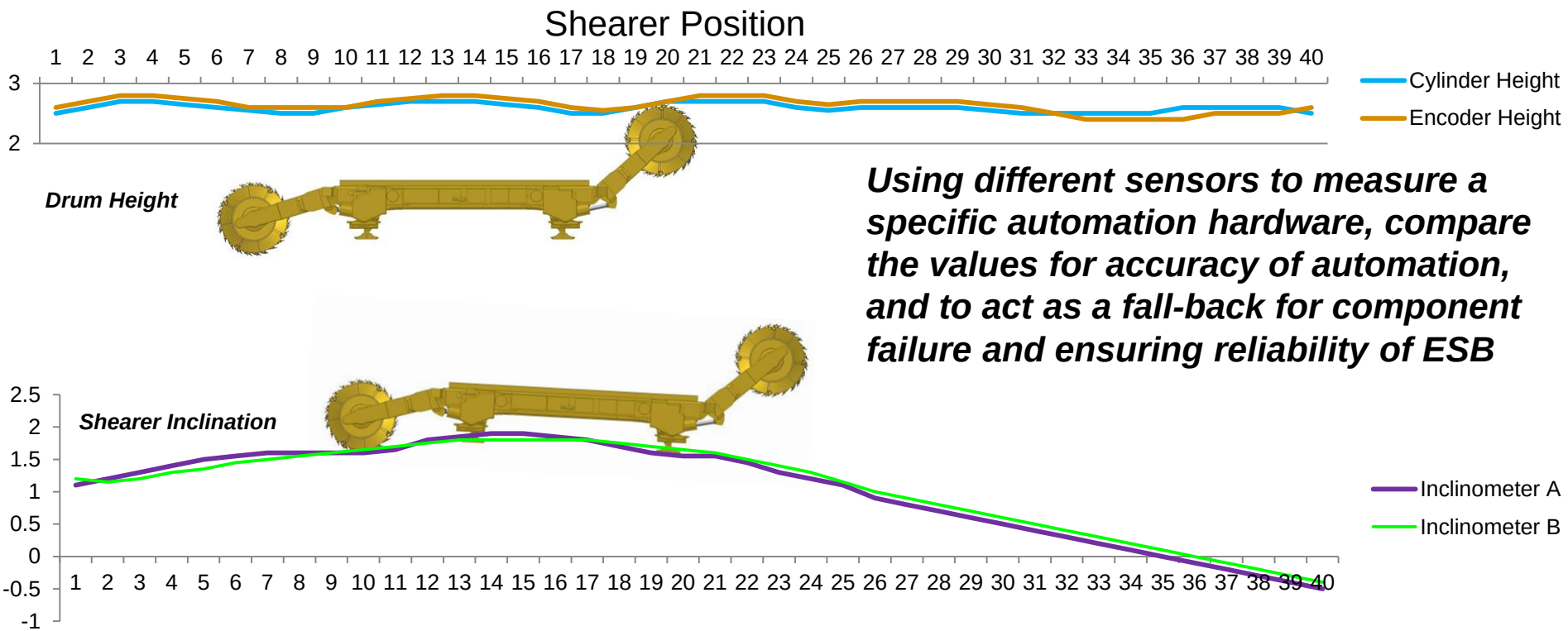
Tahmoor Colliery

- **Sensor redundancy**




***Using different sensors to measure a specific automation hardware, compare the values for accuracy of automation, and to act as a fall-back for component failure and ensuring reliability of ESB***

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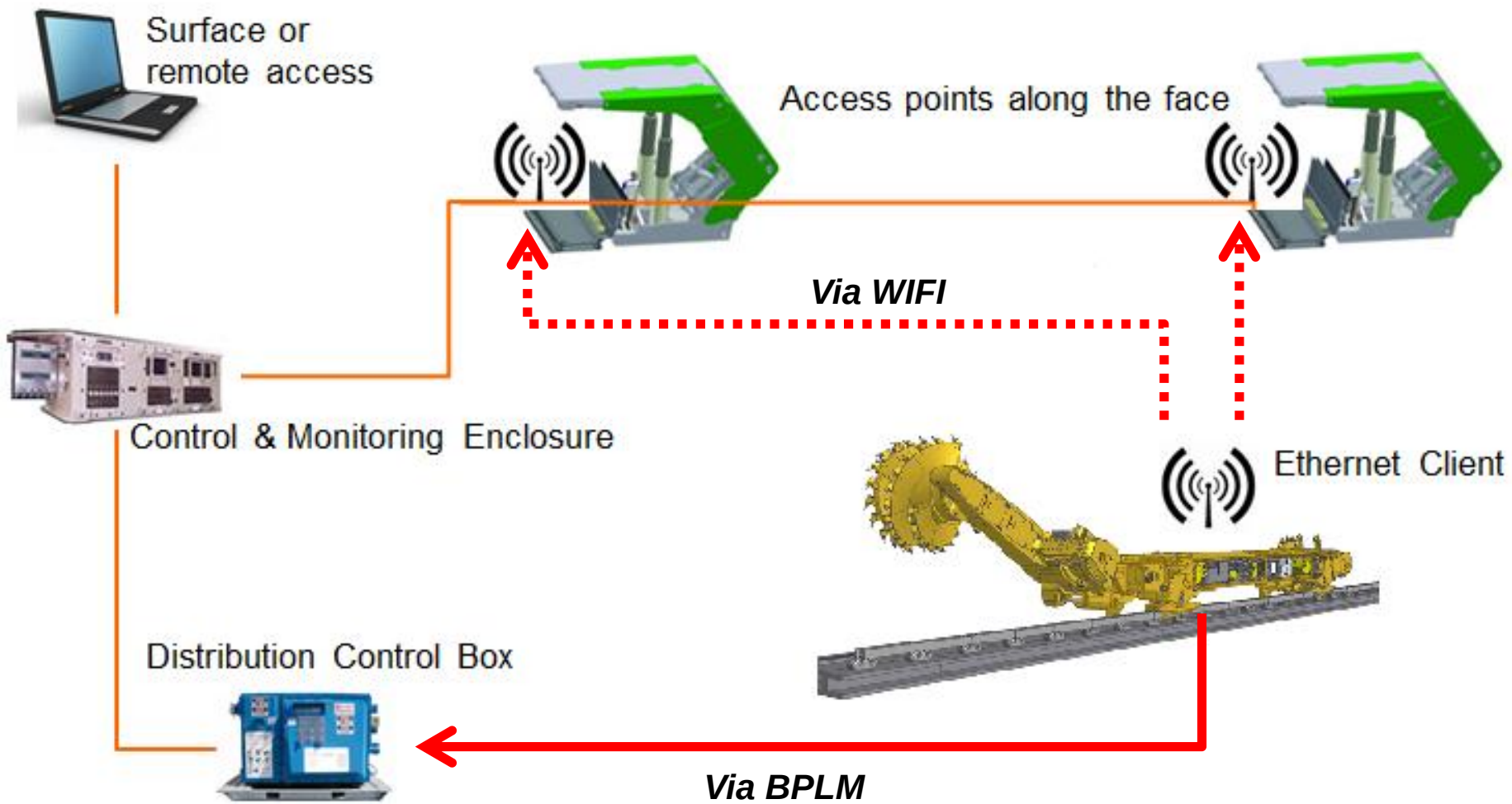
# Application of Shearer Automation

*Requirements for effective automation*

**Redundancy of automation components**

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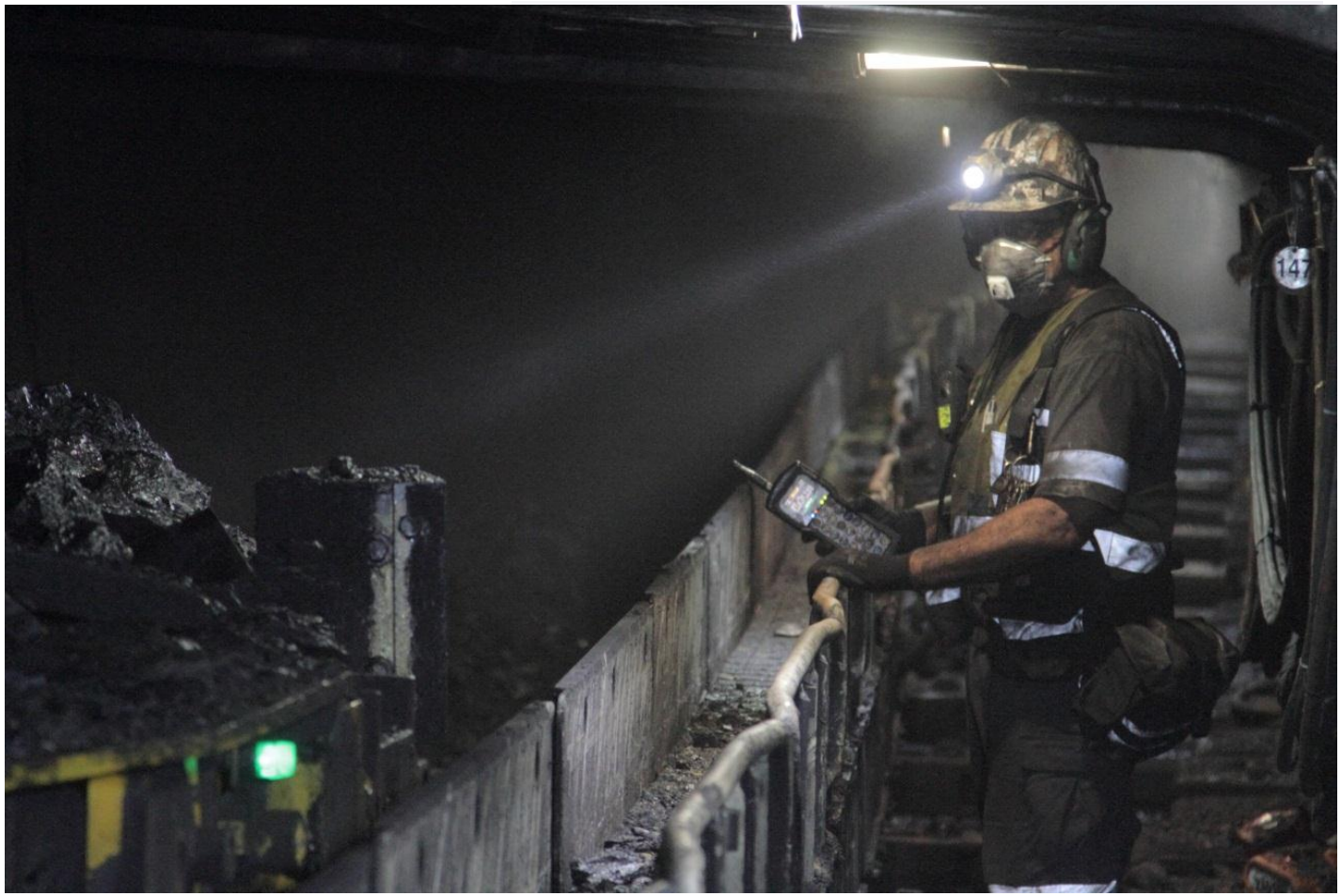
# Application of Shearer Automation

*Requirements for effective automation*

**Understanding each site's method of coal cutting PRIOR to implementation.**

**Avoid the "cookie mold" mentality.**

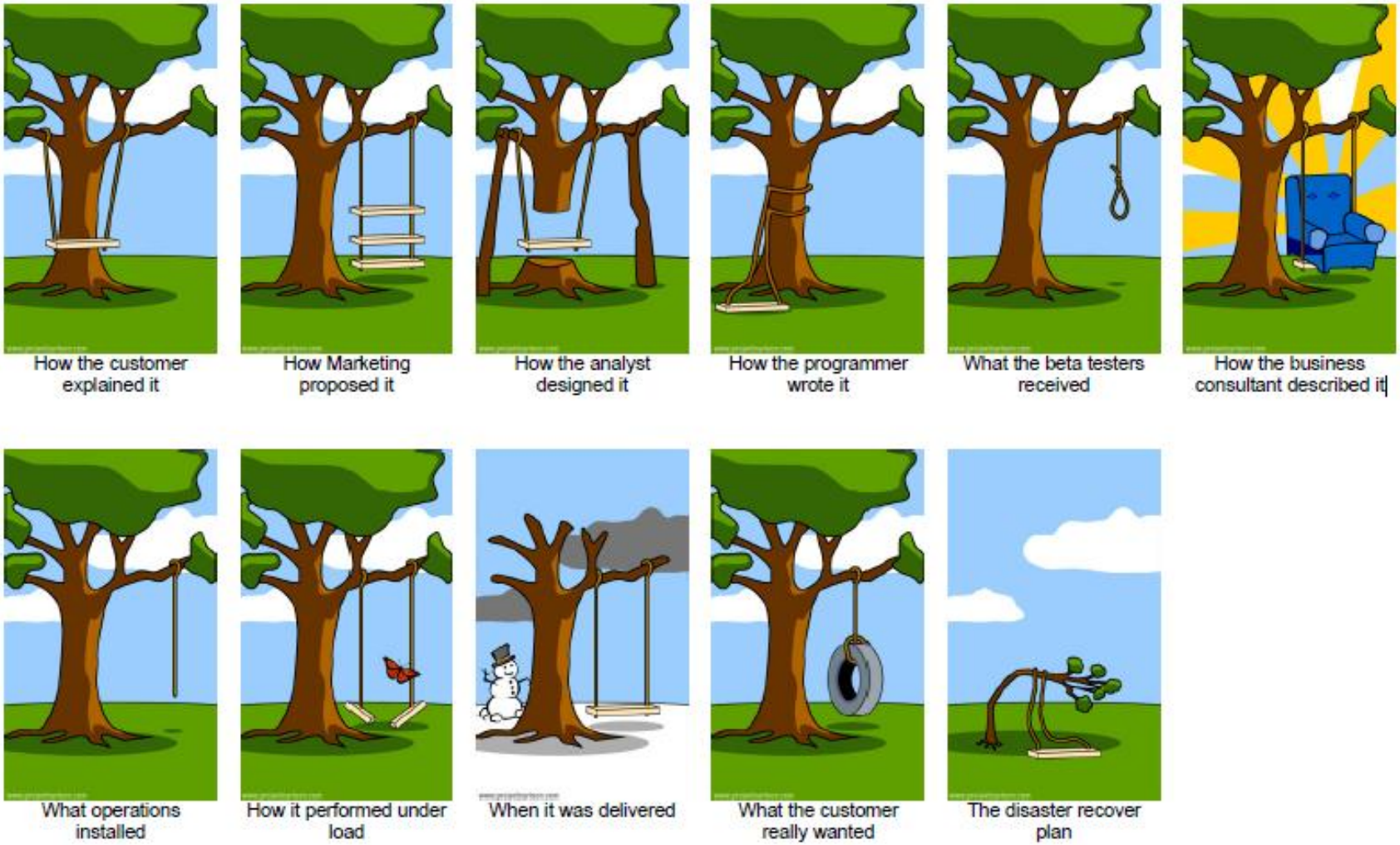
**Understand how automation needs to be applied.**



# Application of Shearer Automation

*Requirements for effective automation*

**Follow solid project practices when implementing automation**



# Application of Shearer Automation

*Requirements for effective automation*

**Follow solid project practices when implementing automation:**

***SAFELY ON TIME, WITHIN BUDGET AND IN SPEC***

- **Stay focused on the final outcome from the start.**
- **Planning should be broken down into stages.**
- **Set smaller targets in order to meet the COMPLEX one.**
- **Continuously manage your risk and have contingencies.**
- **COMMUNICATE, COMMUNICATE AND COMMUNICATE.**
- **Test in stages: BENCH → INTERFACE → FACTORY → COMMISSION.**
- **Measure the progress made and *capture the details.***
- **Review the good & bad and set the benchmark for the next.**

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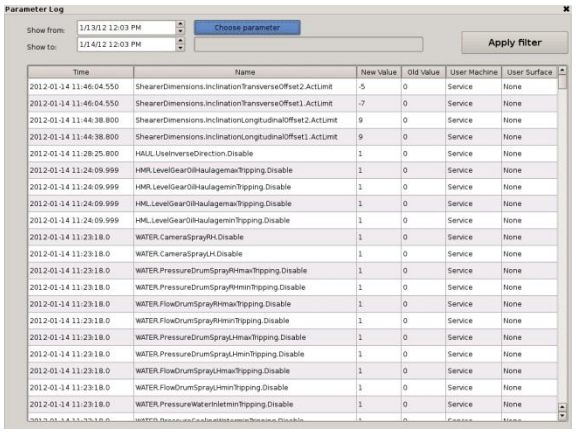
# Application of Shearer Automation

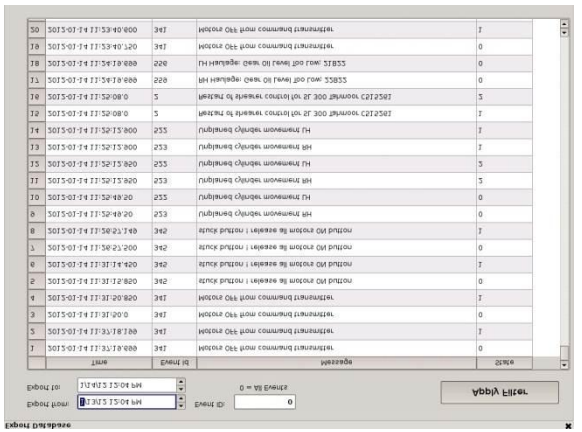
*Requirements for effective automation*

**Database applications and analyses to monitor behavior patterns**




Changes made to parameters


Trending shearer operational data and events




Event log

***Courtesy Tahmoor Colliery 2013***

# Application of Shearer Automation

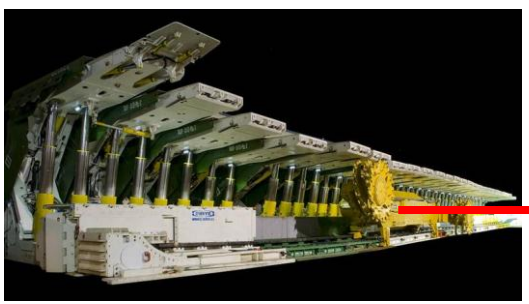
*Requirements for effective automation*

**Clear visibility of what exactly occurs in the longwall**

# Application of Shearer Automation

*Requirements for effective automation*

**Clear visibility of what exactly occurs in the longwall**



# Application of Shearer Automation

*Requirements for effective automation*

**Clear visibility of what exactly occurs in the longwall**

**Regular underground representation – Support agreements with the OEM**

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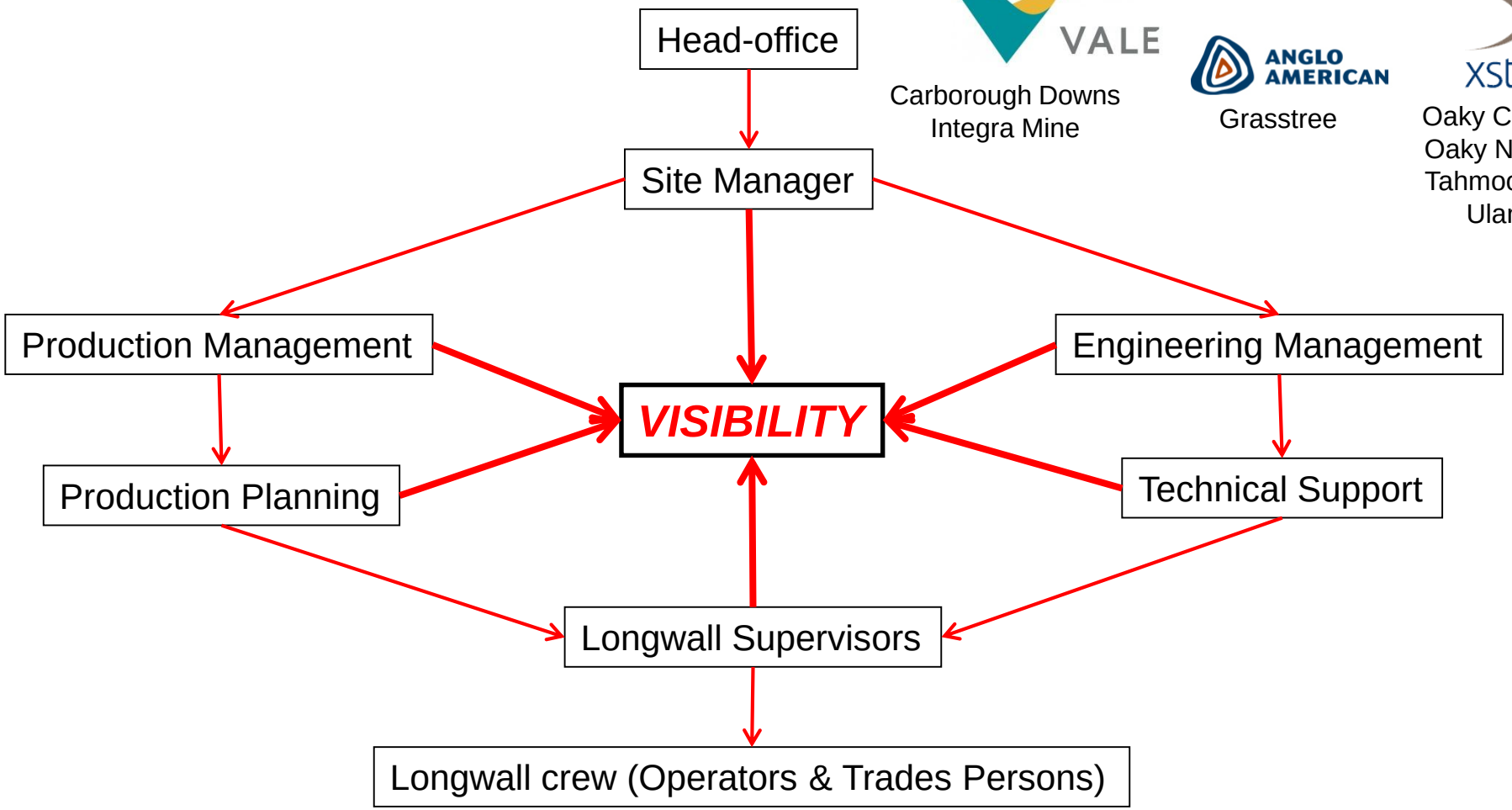
# Application of Shearer Automation

*Requirements for effective automation*

**Mind-set for automation – Involvement from management to end-users**

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*Oaky Creek North*
*Australian Record Breaker*

- Oaky North – 2009 Longwall Panel retreated a total of 4,985m
- Total metres travelled = 4,985m x 250m = 1,246,250m
- The Shearer travelled a total of 12,462 km
- 12hour shift - 29,642 tonnes from the Longwall
- 24 hour - 56,890 tonnes
- Weekly - 312,506 tonnes
- Monthly - 1,146,721 tonnes.
- In 2009 the mine produced 8.1M tonnes ROM (second highest producer)

**Was the highest producer of longwall coal in Australia for 2010, 2011 and 2012**

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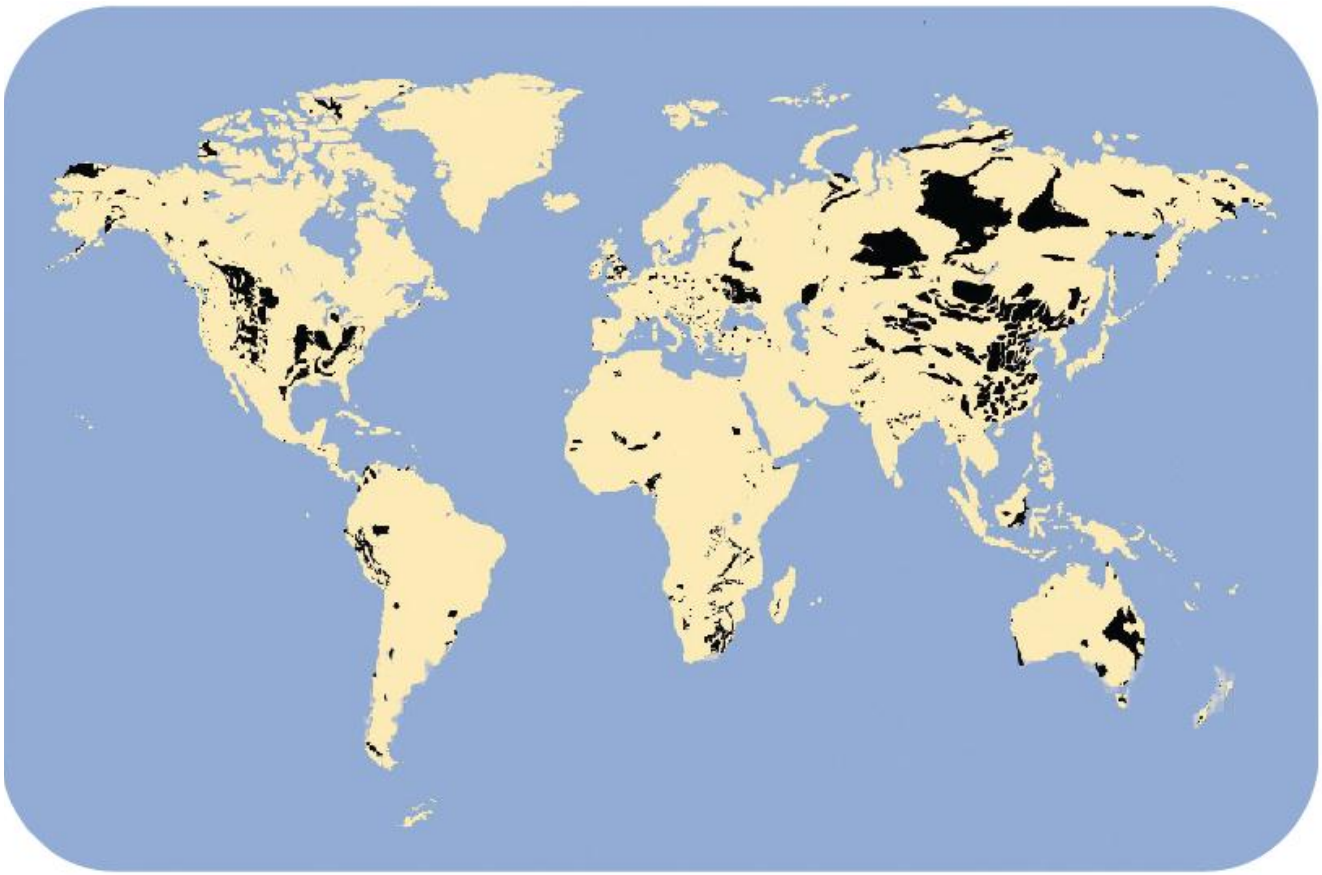
**The challenge we currently face!!**

# Application of Shearer Automation

*Challenges within automation*

**A large amount of shearers are installed in longwalls globally**



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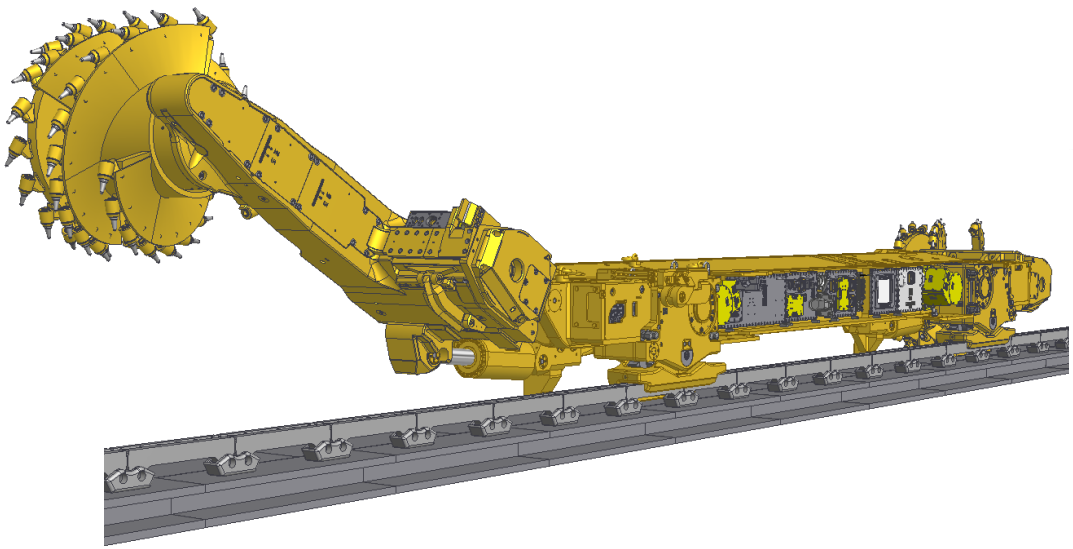
**Shearers equipped with class-leading technologies???**



***There is a lack in the application of automation referring to the global longwall mining industry.***

# Application of Shearer Automation

*Challenges within automation*

**This has an impact in the growth of longwall technologies when comparing with other mining industries.**

# Application of Shearer Automation

*Automated longwall systems **AND** adequately managing these systems has the potential to play a vital role in safe and consistent production.*

*By having more longwalls automated, will speed up the progress in advanced technologies and will contribute in the future of this great industry.*

***Courtesy Oaky Creek No.1 mine 2011***

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