
Cooperative Research Centres

An Australian approach to
research collaboration



What is a CRC?

- Collaboration between research users and researchers (universities and govt research organisations)
- CRCs established for a finite time (7 years) to undertake and effectively transfer a specific program of work
- Program established in 1991 and has evolved
 - Originally to build a critical mass of researchers and facilities to address big problems (researcher-driven phase)
 - Today, industry-driven.
 - Users define the problems to be addressed
 - Commercialisation of research outputs very important
 - Most Centres are established as incorporated companies
- Very successful program
 - In 1991, 15 CRCs – CRCMining was one of them
 - Today more than 60 CRCs

What is CRC Mining?

➤ Incorporated¹ Joint Venture
between:

- Anglo Coal
- Anglo Ashanti Gold
- BHP Billiton
- Rio Tinto Technical Services
- Hamersley Iron
- WMC
- Phelps Dodge
- Peabody Energy

- P&H MinePro
- Komatsu
- Caterpillar
- Lucas Group

➤ Universities of:

Queensland
Sydney
Newcastle
Curtin
(Arizona)



¹Tax-Exempt, Not-for-Profit Company Limited by Guarantee

CRCMining Vision and Mission

➤ Vision

- Recognised globally by the mining and equipment manufacturing industries as the leading research and development organisation delivering innovative technologies and systems to the mining industry

➤ Mission

- To deliver a stream of innovative solutions that substantially enhance both safety and productivity (capital and labour) – *the benefits* – to the global mining industry – *the beneficiary* – and have these technologies adopted by industry – *the measure of success*.

Research Partners

- University of Queensland
 - Mining and Minerals Processing Engineering
 - Mechanical Engineering
- University of Sydney
 - Australian Centre for Field Robotics (ACFR)
 - Mining geophysics
- Curtin University
 - Mining geomechanics
- University of Newcastle
 - Electrical Engineering – Power Electronics
- University of Arizona
 - Mining and Geological Engineering

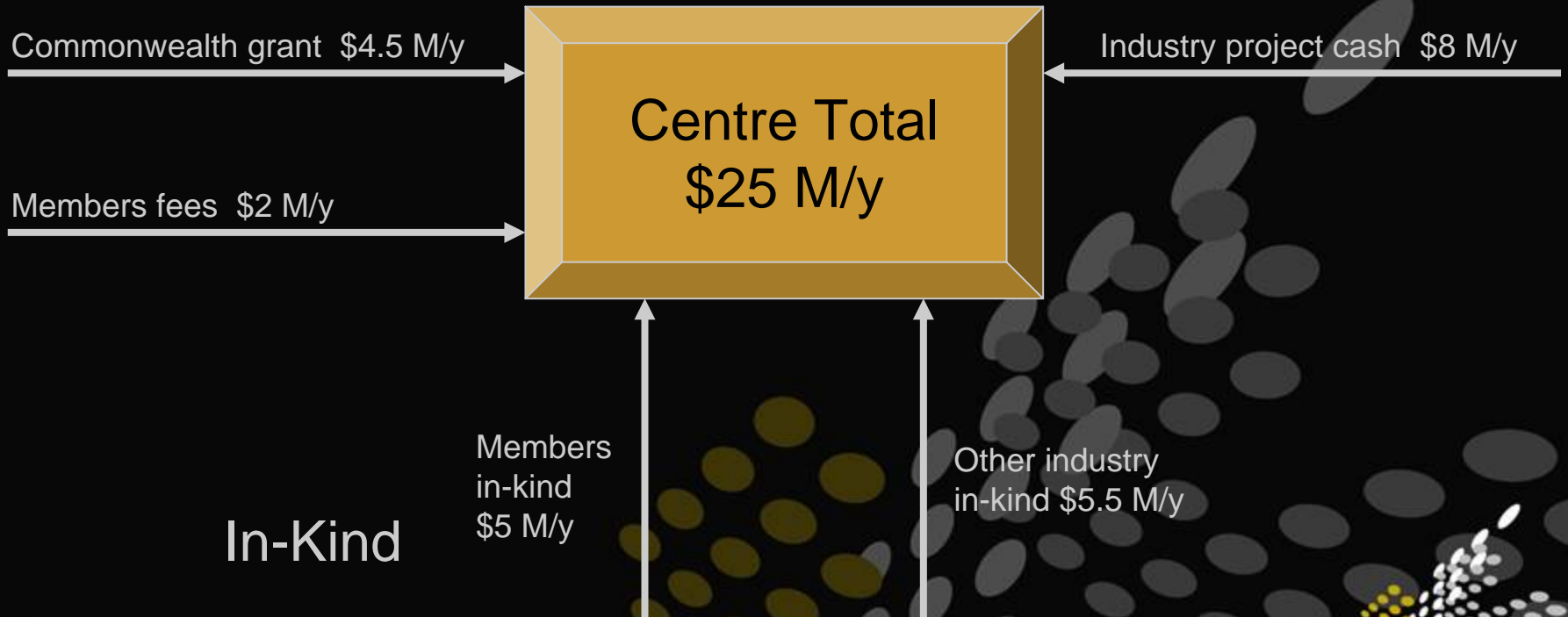
Research Staff

- 45+ FTE researchers
 - Many recognised world-leaders in their fields
- Plus 30 graduate students
- All employed by partner universities
- Combination of academic and full-time research staff
- Centre owns and manages IP
- 50 graduate completions in full-time employment

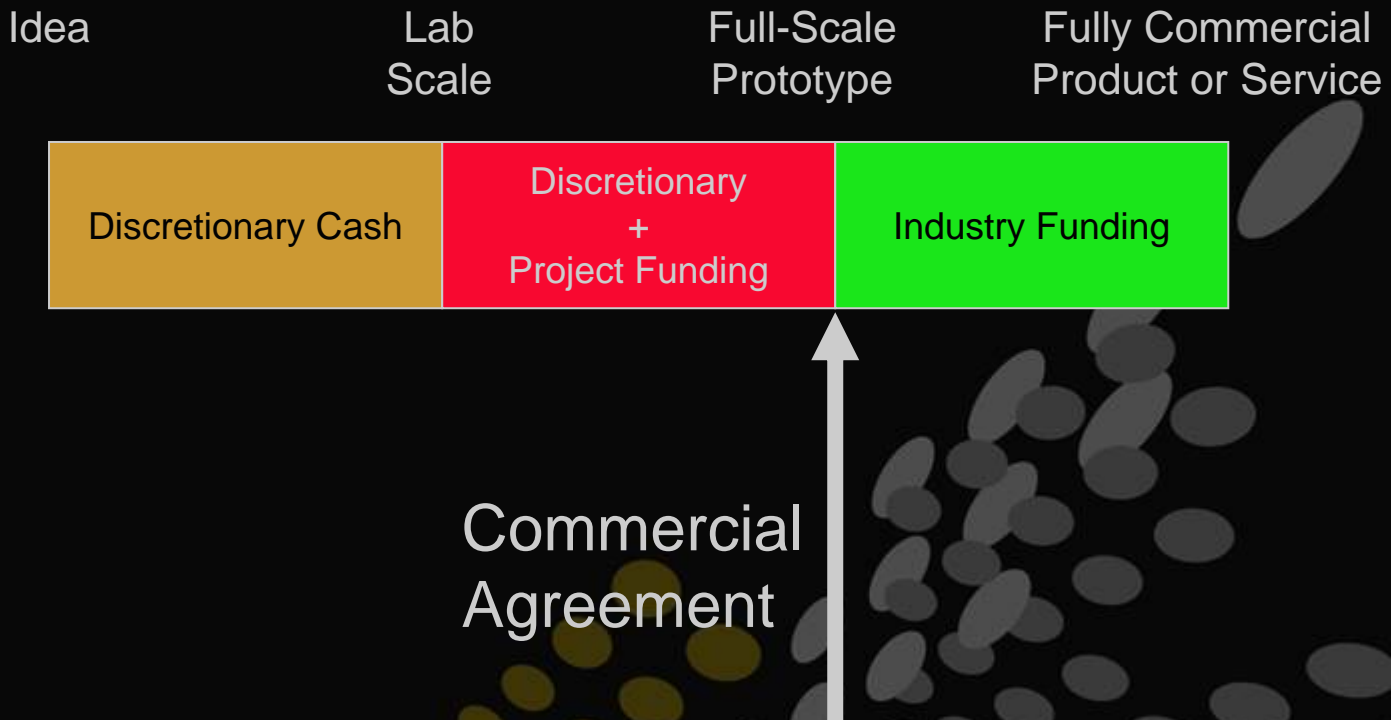
Centre Funding

Discretionary cash

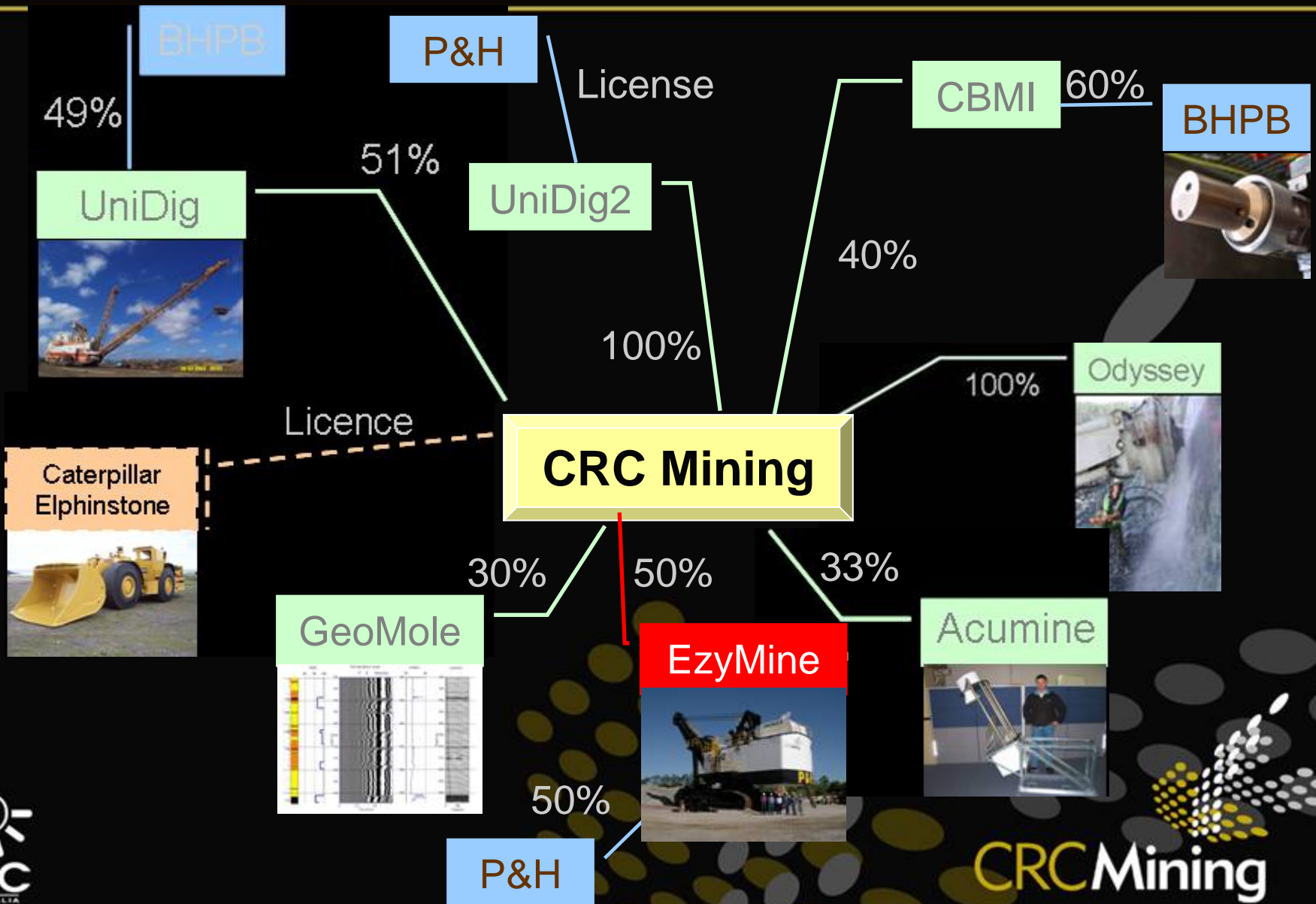
Project cash



Project Commercialisation



Commercialisation



User Driven!

Board sets general direction, policy, and determines commercialisation strategy

Board

CEO

VP Research & Education

VP Business Development

VP Commercial

Technical Advisory Panel

Technical Advisory Panel (TAP) determines and steers research portfolio

CRC Mining Board



Technical Advisory Panel



Technology making a difference

- Universal Dragline System
 - 25% + Productivity Improvement
 - For BMA equivalent to increasing production by 1 new mine (10 Mt/y) at 1/3rd capital cost of mine



Tight-Radius Drilling



Four synergistic techniques to lower forces

1. Undercutting

1. Promotes tensile failure

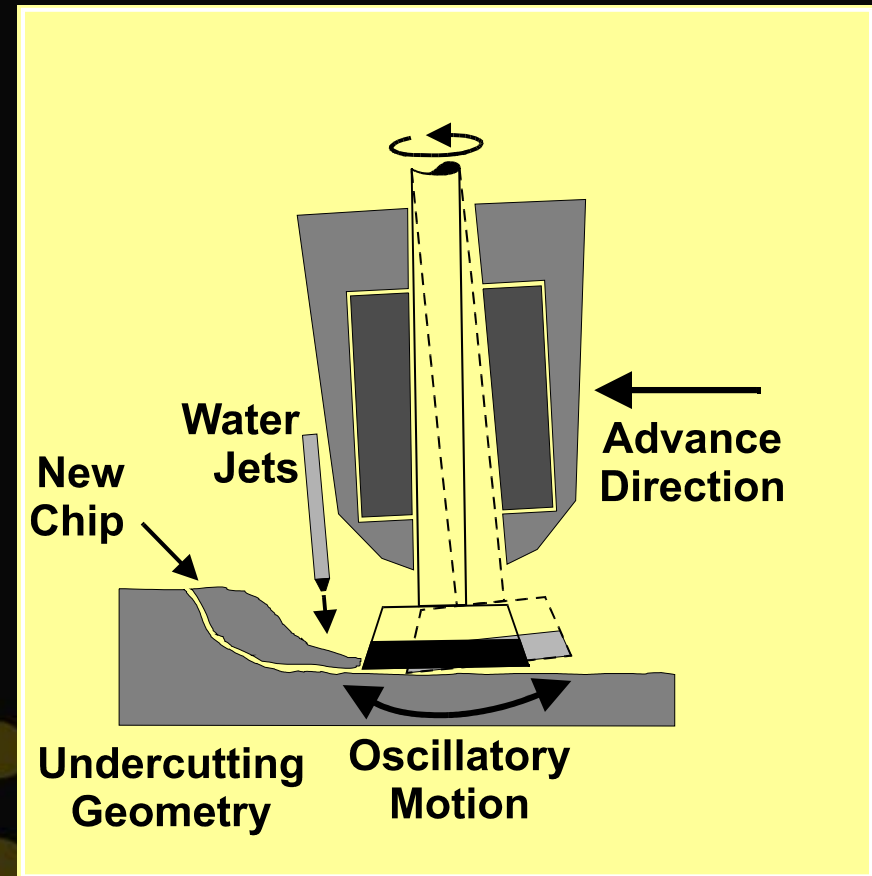
2. Oscillating

1. Fails rock in fatigue

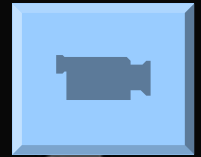
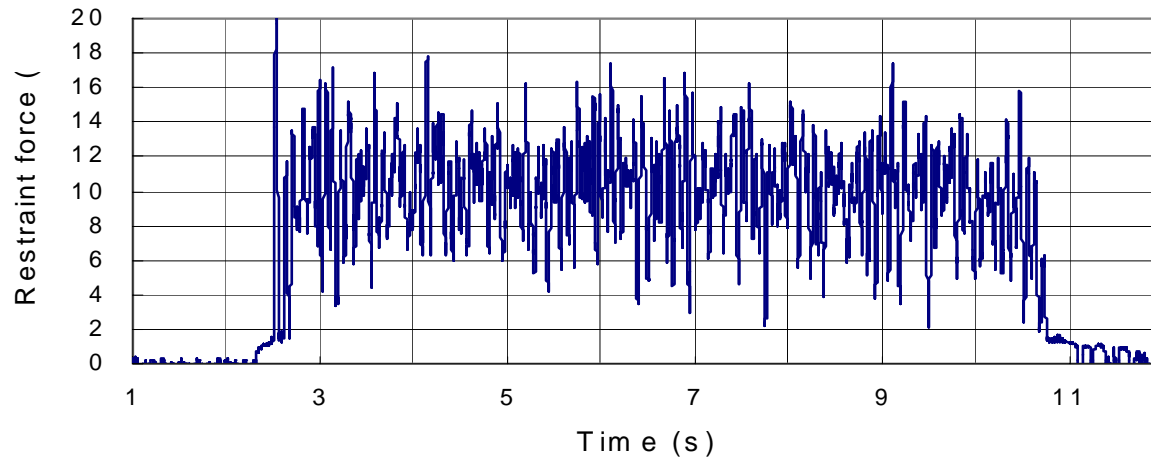
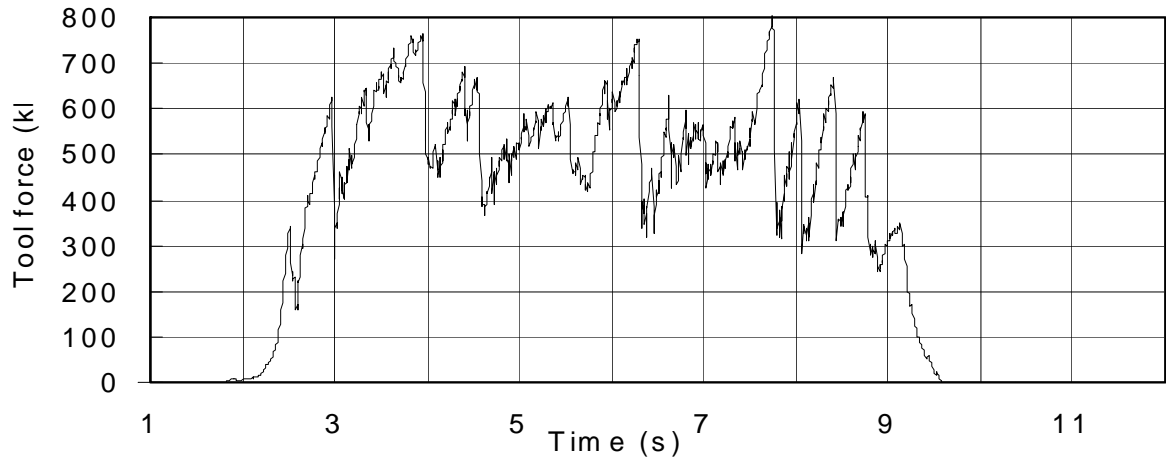
3. Water jets

1. Eliminates cushioning effect
2. Cools tool

4. Inertial mass



How effective is ODC?



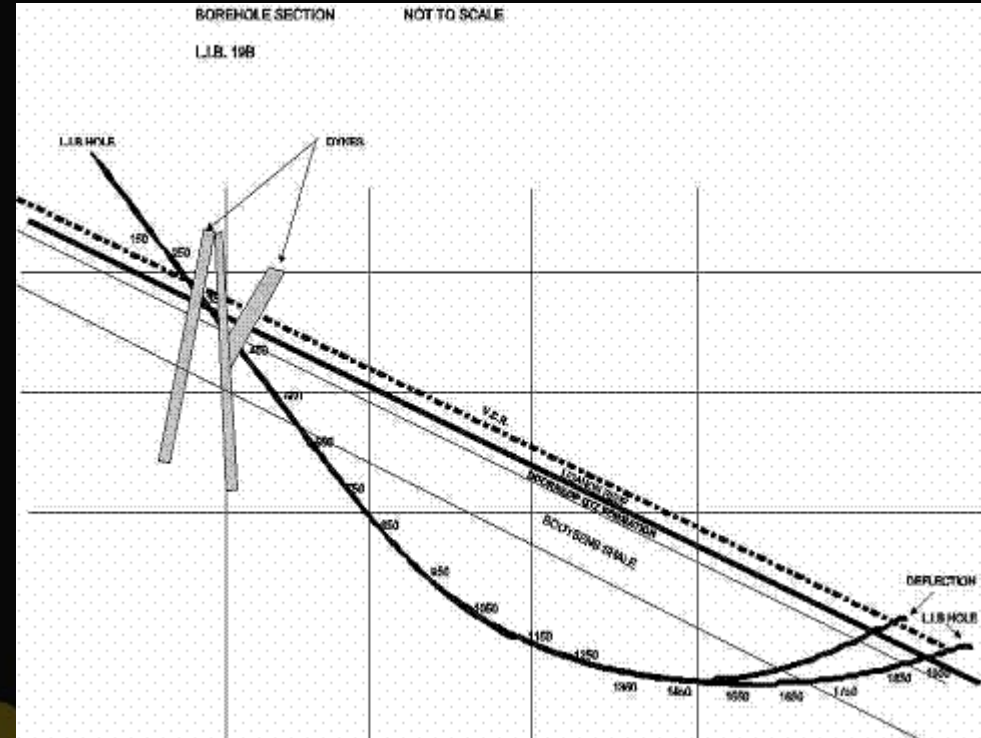
Shovels

- P&H and CRCMining are developing and commercialising a suite of technologies in the field of semi-autonomous operation of electric rope shovels (with applications in draglines) through a new 50:50 joint venture company, EzyMine



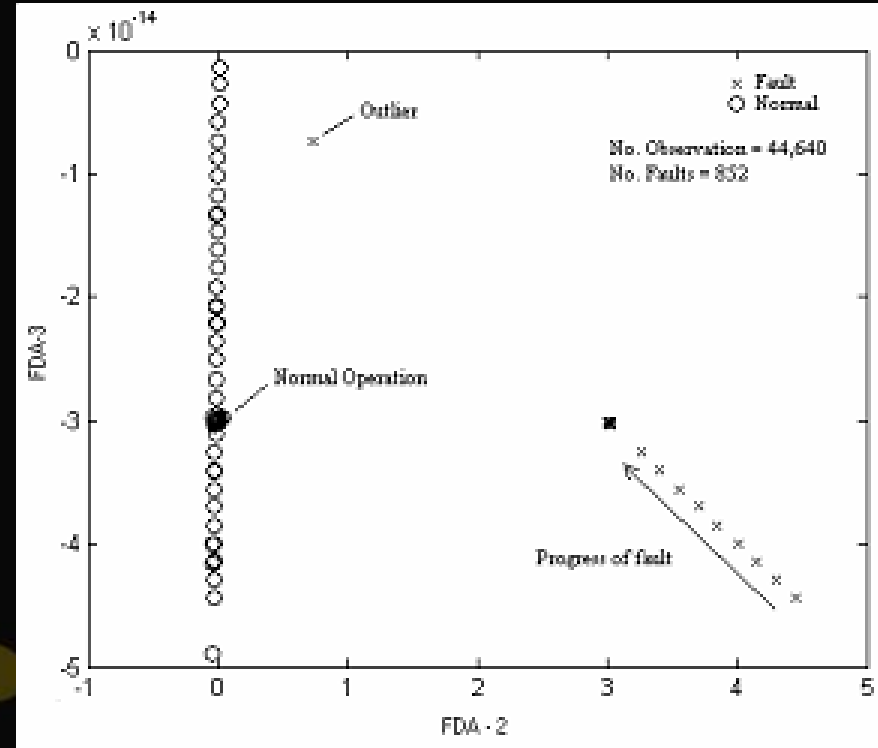
Geological Vision

- Borehole Radar
 - Slimhole radar systems capable of imaging reefs over distances of 50-100 m
 - Gives mine planners not only information on reef location but also disturbances: faults, rolls, washouts etc
 - Reduces geological uncertainty



eg Longwall Breakdown Prediction

- Some 5,000 measurements recorded every 30 s
 - Hydraulic prs, motor currents, etc
 - Data ignored and overwritten
 - Used Fischer Discriminant Analysis to transform data
 - Result can be used to predict a number of system failures
 - Fig shows impending stall of AFC tailgate drive
 - This information if available to face workers could have prevented stall
 - Data can also be processed to generate weekly downtime statistics for management
 - Can also be processed to optimise maintenance scheduling



Conclusions

- Cooperative research/education can achieve spectacular results
- BUT, has its own problems:
 - Trust
 - Money – takes funding to lubricate wheels of cooperation and build trust
 - Partners must want to cooperate, not just be in the venture for what they can get out of it
 - Users must be in charge

Where mining technology is going

- Real opportunities for step-change improvements
 - Mining suffers from poor planning and execution because of imprecise knowledge
 - Poor reliability and utilisation of expensive capital fleets
 - High levels of geological uncertainty
 - Whereas
 - Manufacturing/ Retailing = “Just-in-time”
 - Mining = “Just-in-case”
- Research Approaches
 - Smart Mining Systems
 - Smart Mining Machines
 - Step-Change Mining Systems

Smart Mining Systems

- Definition
 - Collecting and interpreting real-time data (from machines, from rock sensors, from personnel) as information, conveying this as knowledge in different forms to appropriate personnel.

