

First International Seminar on Safe and Rapid Development in Mining and International Forum on Development Productivity

The ACG's First International Seminar on Safe and Rapid Development in Mining was held in Perth, Western Australia, 6–7 May 2009 and attended by more than 75 local and international mining professionals. Prior to the seminar an International Forum on Development Productivity was held which included a workshop on how Australian mining can look to improve its productivity record while maintaining safety. For those who attended, the workshop proved to be highly successful. Speakers at the International Forum were Frode Nilsen, project director, Leonhard Nilsen and Sonner AS, Norway; Tim Gilbert, general manager, Australian Mine Assets, Norilsk Nickel Australia; Frank Greblo, principal mining engineer, AMC Consultants; Brett Ascott, senior mine planning and geotechnical engineer, Newmont Asia Pacific; Kobus Du Plooy, senior geotechnical engineer, SRK Consulting (Australasia); Chaim Sproles, mining engineer, Newcrest Mining – Cadia East; and Patrick Burke, group manager safety compliance, Macmahon Underground. The forum was facilitated by Tim Gilbert; Mark Adams, chief operating officer, Barminto; and Phil Dight, ACG.

Many issues were discussed during the forum and the associated workshop. Focus was placed on identifying and using appropriate equipment to maximise development productivity through maximising face utilisation. The key is to utilise the face to advance development. To achieve this, some Norwegian tunnelling operations use:

- Side tipping loaders.
- Trucks sized to the tunnel enabling drivers to perform a 3 point turn in the tunnel.
- Drilling equipment with navigation which is fully instrumented to implement a plan of the drill layout, including the survey of the hole collar and hole toe.
- Use of 5.8 m long drill steels (where ground is appropriate), logging of the drilling performance, blasting using emulsion, rapid setting shotcrete/fibrecrete (0.5 hr in freezing conditions).
- Most importantly, a dedicated, highly skilled workforce regularly achieving over 100 m of development per week in openings up to 38.5 m². The best week achieved 150.1 m of advance.

An important aspect of the tunnelling experience in Norway is the risk sharing principle (Figure 1).

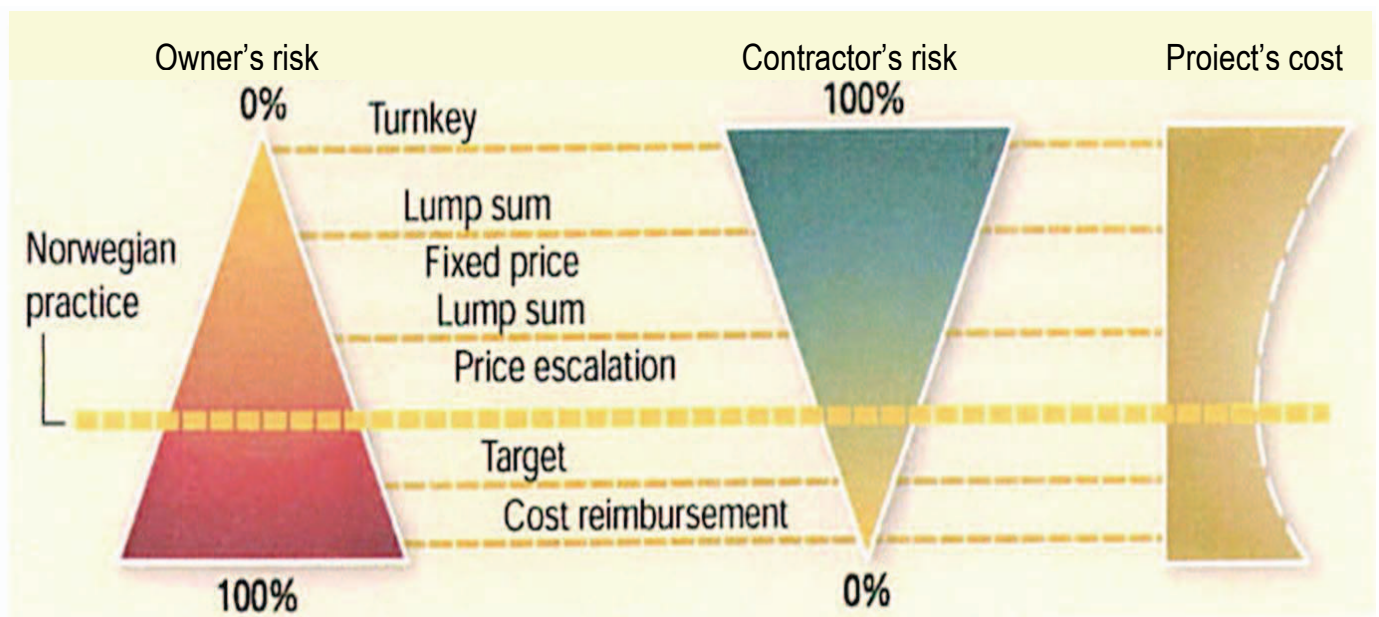


Figure 1 Leonhard Nilsen and Sonner AS risk sharing principle E. KLEIVAN: Publication No. 5, Norwegian Soil and Rock Engineering Association, 1987/O.T BLINDHEIM & E. GRØV: "Contract suitability-Unit or Fixed Price", Tunnels & Tunneling International, December 2003.

Tim Gilbert noted that tunnelling can often be considered in a different vein to mining. The big difference is often attributed to the role of the client (in tunnelling it is often government and in mining, free enterprise). So, notwithstanding that the development rate in tunnelling is often higher than in mining, the cost per metre is not considered as important as the overall total cost. The objective of the development needs to be well understood. In some cases the development of a decline to achieve early access to ore and satisfy shareholder expectations can often result in a development which is compromised because production cannot be achieved without further implementation of stockpile bays etc.

The five major reasons inhibiting development productivity are:

- Knowledge.
- Planning.
- Face size.
- Resources.
- Organisation.

A common point made by all attendees was the amount of time spent on ground support (27 to 35%). In one project, overbreak constituted 15%. Hence, reduction of overbreak by using appropriate drilling and blasting practices can save an enormous amount in development time. Much discussion revolved around using the Six Sigma process and the LEAN processes to improve productivity.

Frank Greblo presented the AMC benchmarking experience and the reasons behind why benchmarking has proved valuable to many operations trying to identify where they set within best practice. The development rate of 5.25 m per day was widely quoted by other presenters.

Brett Ascott provided a presentation on the MineGem implementation at Jundee. The success of the system was demonstrated through improved productivity, better working conditions, and less maintenance issues. Performance improvements have typically been 27 to 35%. It has also led to a reduction in the amount of equipment required to achieve the same productivity. Hot seating can be undertaken and the machines operated immediately following blasting which significantly improves utilisation. The approach is sensitive to good dust control and well maintained roads.

Chaim Sproles presented the Cadia East experience where they have adopted many of the techniques and equipment utilised by the Norwegian Tunnelling Society. Newcrest has achieved daily production rates of 9 to 11 m. While this is not as high as the 18 to 20 m per day achieved by the tunnelling people, it is up to double the rate identified in the benchmarking studies noted previously. Measurement of face utilisation at 15 minute intervals was one of the keys to understanding duration and variability of each portion of the development cycle with the aim of reducing the variation of each then minimising the duration. In many ways, the presentation by Chaim encapsulated the key points raised by the first four speakers.

Kobus Du Plooy from SRK made a significant contribution to the discussion by identifying what was necessary to reduce the 27% of time spent in ground support. This can be achieved by a properly developed ground control management plan. Picking up on the Scandinavian experience from Hakan Schunnesson where they have fully instrumented drilling equipment to record penetration rate, feed force, percussive pressure, rotation pressure, rotation speed, damp pressure, water pressure and waterflow, the ground conditions ahead of mining can be captured in real time allowing for changes to ground control requirements.

The last presentation was by Patrick Burke who challenged those present with the idea of alternative power supply (electric assist etc). The ideas were not necessarily new and indeed many have been adopted in coal mining. The main issue is the supply of diesel going into the future. The carbon footprint of open pit mines will become a significant issue if government succeed in implementing emission trading schemes. Underground mines have a significantly lower carbon footprint, however, it was suggested that mining companies with a long future should certainly be looking at alternative power supplies.

A workshop examined, "What does Australia need to do to improve productivity?". Key concerns were:

Planning

A strategic rather than a tactical mindset needs to be adopted. This includes retention of skilled personnel, looking for highly educated workers with a broad skill set, and moving from batch systems to continuous production systems.

People and systems

- Development appropriate key performance indicators to motivate operators — measurement analysis, interpretation and feedback.
- Development of robust cost benefit model to aid education and communication.
- Real-time analysis of information and communication.

Maximising face utilisation

- Use of equipment built for purpose.
- Utilisation of longer rounds.
- Development of longer range geotechnical mapping.
- Developing proactive maintenance.
- Design of ventilation to include smoke clearing and hence increased face utilisation.
- Identification of superfast acceleration for shotcrete.
- Monitoring road maintenance.
- Maintenance of design profile and accuracy.
- Embracing computer technology to improve quality and eliminate rework.

Measurement

- Undertaking benchmarking studies between the civil and mining industries to identify areas that could improve productivity.
- Develop appropriate key performance indicators to motivate operators — measurement, analysis, interpretation and feedback.

The overwhelming response from the participants was that the workshop was very valuable. Unfortunately, the global financial crisis meant some mining operation personnel were unable to attend the forum and seminar. Both the seminar and forum facilitated attendee interaction at a much closer level and provided an excellent opportunity to exchange experiences.

The ACG acknowledges the generous support of the forum and seminar sponsors: StrataCrete Pty Ltd, Dyno Nobel Pty Ltd, Geobrugg Australia Pty Ltd, SimMine, Geofabrics (Australasia) Pty Ltd, Maccaferri and Australia's Mining Monthly.