

# ACARP MATTERS

## INJURY RISKS INHERENT IN CURRENT UNDERGROUND COAL MINING EQUIPMENT DESIGN



Injury risks are inherent in current underground mining equipment designs. However, coal mining companies can take positive steps towards reducing injuries caused by poor design of underground coal mining equipment. That is the message from leading ergonomics researcher Dr Robin Burgess-Limerick, who recently completed a research project on reducing injury risks associated with underground coal mining equipment for ACARP — the Australian coal industry's research program.

The project documented current best practice in underground coal mining equipment injury risk management and provided information to help underground coal mining operations conduct better risk assessments in the form of a handbook. Some coal mining companies, including Xstrata Coal and Centennial Coal, have started using the handbook and are urging other companies to follow their lead.

"The handbook provides the information needed to accurately assess injury risks associated with underground coal mining equipment. It will assist both mining companies and manufacturers to document the effectiveness of current control measures and determine where additional control measures may be required," Dr Burgess-Limerick said. "It also enables them to identify modifications to existing equipment needed to create a safer working environment and to create specifications for new equipment that follow best practice."

He said underground mining equipment needed to conform to the operator, not the other way around. "Operators shouldn't have to turn themselves inside out to operate and maintain underground mining equipment."

## THE INDUSTRY VIEW

Xstrata Coal NSW Group Safety Manager Dave Mellows, who was instrumental in initiating and supporting the ACARP research, is implementing the best practice measures and risk assessments across all Xstrata Coal NSW mine sites and is urging other underground coal operations to follow his lead.

"Over the past 30 years few advances have been made to address the ergonomic issues related to underground mining equipment design," he said. "Much of our safety improvement work has been focused on improving safety systems.

"This risk assessment tool has given us a framework to assess the fundamental design and ergonomics of equipment. There are hundreds of tasks that we perform where equipment design has an impact. Using the risk assessment tool, our sites can prioritise and progressively work through these 'fixes'," he said.

Xstrata Coal completed a continuous miner risk assessment over several months involving operators from all its sites.

"We went through around 10 days of risk assessments — identifying all activities, all risks and all the controls that could be dealt with around a continuous miner. We're now taking that to the next level by working with the manufacturers to come up with a design specification for our future machinery. We will identify the risks and suggest types of solutions we are after but, at the same time, encourage them to provide innovative solutions."

Mr Mellows said the industry needed to move away from adhoc rebuilding of equipment when it arrived on site and find a way to have an impact on the equipment designers and manufacturers.

"Equipment manufacturers and mining companies need to work more closely to produce suitably designed equipment. Voest Alpine, for example, has worked closely with us on modifications to the ABM25S. Our engineers travelled to the Austrian plant and worked on a range of ergonomic issues to achieve the best end result."

Mr Mellows said the workforce had responded very positively to the risk assessment tool and the outcome was an improvement in morale.

"It's helped them understand the issues, think them through, and be guided to come up with practical solutions. They feel satisfied that we are actually solving some of the long-standing problems. For example, with regard to improving equipment access, all our continuous miners are having the bolting platforms on the side modified to a similarly common standard when they go for rebuilds."

He said the support of mining company senior level management was also critical to improving equipment ergonomics, with recognition required that additional up-front expenditure on making equipment ergonomically suitable could ultimately lead to cost savings on lost-time injuries.

Ergonomic modifications are made to the ABM25S at the Voest Alpine plant in Austria on behalf of Xstrata Coal.



## PROJECT SNAPSHOT

The ACARP research project, led by leading ergonomics expert Dr Robin Burgess-Limerick, involved analyses of New South Wales and United States injury narratives for equipment-related injuries and visits to 14 Australian underground coal mines and five equipment manufacturers.

The project resulted in the production of an easy-to-use handbook that provides a snapshot of current best practice for management of underground equipment injury risks, restricted primarily to roadway development equipment, as well as a generic ergonomics risk

assessment tool which aims to improve the assessment of injury risks related to the ergonomics of underground mining equipment generally. This is supplemented by a DVD-based training module.

Copies of the handbook, DVD and the final project report are available by contacting [www.burgess-limerick.com](http://www.burgess-limerick.com) or the final report can be purchased via the ACARP website [www.acarp.com.au](http://www.acarp.com.au) (Project C14016).

## NEW RESEARCH AIMS TO REDUCE CONTROL ERRORS DURING BOLTING OPERATIONS

Dr Burgess Limerick's findings have led to another ACARP research project which is examining the ergonomics of bolting operation controls. The aim of this project is to determine the likely effectiveness of three specific aspects of proposed changes to the MDG35. The research will examine:

- what the consequences are of mirrored and non-mirrored control layouts for error rates and reaction time
- what the effects are of location coding, shape coding and length coding on error rates and reaction time
- what the directional control-responses stereotypes in different planes are, and their relative strengths
- what the consequences of layout, coding and control-response relationships are on training time, error rates and reaction time during virtual reality and physical simulations of tasks analogous to bolting.

Centennial Coal Chief Risk Officer John Hempenstall is a strong supporter of this project.

"Bolting operations have resulted in a number of injuries and this research will provide an empirical basis for standardising bolting control design in terms of location, shape, and length coding; layout; and directional stereotypes," he said.

"If the standardisation of bolting controls can be achieved, the risk of injury associated with control error during bolting operations will be reduced."

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