

ACARP – Accepting the Safety Challenge

Ross McKinnon, Executive Director Australian Coal Research Ltd
Roger Wischusen, Manager Australian Research Administration Pty Ltd

ACARP

The transfer of the collaborative research effort for the Australian black coal industry from a Commonwealth Government administered scheme to an industry managed program took place in 1992. The program, Australian Coal Association Research Program (ACARP), has committed approximately \$110 million of direct industry funding towards over 670 projects in that time.

The “charter” for ACARP is identified in two forms, one being the undertaking to the Commonwealth Government in a Memorandum of Understanding (MOU) with respect to the overall objectives of the program, the other being identical contracts with each coal producer for the governance of program management and administering the levies collected.

The MOU states that the program was established for the purpose of;

- providing strategic leadership to industry R&D and to act as a catalyst to stimulate R&D interest within the coal and associated industries;
- improving the management and application of coal research in Australia;
- ensuring the more effective use of Australia’s black coal resources;
- increasing the economic, environmental, safety and social benefits to the industry and the wider community;
- promoting the competitiveness, sustainable use and management of Australia’s coal resources;

The emphasis within the objectives has changed in the period but the overall concept has stood the test of time and has sufficient flexibility within the boundaries to adapt to the industry’s needs.

It is this flexibility that allows the program to respond to the changing issues as they face the industry. Ten years ago the results of the then Moura Enquiry were at the front of the list. These outcomes continue to drive improvements to mine communication, exploration techniques and support for aided and self rescue. However the program is also responding to the community’s concern over greenhouse gas emissions. This area was certainly not considered to be a likely candidate for collaborative research dollars when ACARP was originally established.

The flexibility has increased over the past ten years as the administrative overheads were reduced and the industry formed technical committees became more confident in taking the reins from the research community and driving the direction of industry funded research.

The direct industry commitment of \$110 million represents about \$450 million of leveraged funding in total. This leveraged amount, traditionally about \$3 total to \$1 direct ACARP funding due to contributions from other sources (cash and in-kind support from industry employees/companies and research organisations), has been significantly increased in recent times as a result of formal participation in two Co-operative Research Centres, CRC for Coal in Sustainable Development (CCSD) and CRC for Greenhouse Gas Technologies (CO2CRC).

The program mechanism relies on its strength of technical and financial leverage provided by coal industry organisations at all levels of the process to achieve outcomes for the industry. It is ably supported by world ranking researcher competence to the extent that the level of Australian technical know-how as applied to all aspects of the exploration, production and use of coal is up with the best, if not the best, in the world. Fifteen to twenty years ago the Australian coal industry still relied heavily on imported technology. ACARP has played an important role in bringing about the changed position.

Australia is now seen by International OEMs as a credible source of technology. Equipment manufacturers have enthusiastically joined the reborn Co-operative Research Centre for Mining Technology and Equipment (CMTE) in its new format as the CRC for Mining, including P&H, Mine Pro Services and Komatsu Australia. The Longwall automation project, which is being driven by an ACARP steering committee, enjoys the strong and interactive support of both major longwall manufacturers, Joy and DBT. Whilst ACARP will never have sufficient funding nor a desire to pay fully for the necessary developments needed to ensure safer and more efficient equipment, the early investment of industry input through ACARP seed funding is ensuring Australia does get heard.

Late last year it was considered appropriate to have an industry assessment of the value of its own program and views were canvassed from those directly concerned. Some examples of testimonials provided include the following;

“The collaborative support of ACARP and AMIRA for blasting research at the JKMRRC has ensured that Australian mines have access to world-class blasting technology.”

Professor Don McKee, Director
SUSTAINABLE MINERALS INSTITUTE

“The application of the coal loss measurement techniques developed through ACARP has assisted our managers in understanding, measuring and reducing coal loss. If we’re to advance mining technology and continue to drive down the cost of producing coal, it’s critical that ACARP continues to support work on the more difficult problems faced by mining operations.”

Bob McKerrow, Mining Operations Manager
THIESS PTY LTD

“ACARP plays an important role in investing industry research funding in the future technologies. Without this investment Australia will inevitably lose the competitive edge that comes with having access to the most advanced coal treatment technology in the world.”

Russell Kempnich, Executive Chairman
SEDGMAN PTY LTD

“Our operations have benefited greatly from the sustained investment in developing the enabling technologies. The cumulative benefit of this ongoing investment is progressively improving plant efficiency while driving down costs.”

Dr Richard Peck, Coal Technology Manager
ANGLO COAL AUSTRALIA PTY LTD

“The ACARP program has produced a significant body of research that is of high quality by international standards—some of which is outstanding. Geomechanics practice in the Australian coal industry compares favourably with that of the civil engineering and metalliferous mining disciplines.”

Coal Geomechanics Review, September 2001
Professor Ted Brown AC
GOLDER & ASSOCIATES PTY LTD

“The developmental work and long-term commitment that ACARP has invested in erosion studies have led the industry. The research has provided the supporting science and confidence necessary to commit the large expenditure associated with reshaping dragline spoil piles.”

Rob McNamara, former General Manager—Environment
MIM HOLDINGS LIMITED

“Over the past 10 years, the performance of a 50m³ dragline has moved from an average of 11 million BCM to around 16 million BCM. This improvement is due to many factors. However, without the early investments in research made by ACARP and others, many of the wins with bucket and rigging design, operating control and productivity measurement would not have been achieved.”

Mal Lees, Chief Technologist
PACIFIC COAL PTY LTD

“Productivity increases can be attributed to the cumulative effect of ACARP projects in conjunction with supporting industry innovation and industrial rationalisation. The UDD dragline modification will

demonstrate the value of long-term investment in dragline research and the contribution that ACARP funding has played in developing this research capability.”

Cam Davidson, Project Development Manager

BHP BILLITON MITSUBISHI ALLIANCE COAL OPERATIONS PTY LTD

Safety Component of ACARP

Identification of occupational health and safety features of ACARP commitment and success is not simple to extract. Largely due to the structure for managing the process of project selection the usual method of reporting summary of funds commitments is by the five technical categories of the ACARP industry committees, underground, open cut, coal preparation, coal utilisation and greenhouse gas mitigation. However, the main difficulty arises because of the multi component content of many projects.

For example many (and perhaps the majority of) projects aimed at improving the application of technology towards solving a safety issue or production activity will potentially improve both because of the interrelationship of the two. Notwithstanding this difficulty it is estimated that approximately 25% of ACARP direct funding has had an occupational health and safety objective/impact. A brief overview of some ACARP projects is provided as an example with reference to this issue.

The key to successful underground safety and productivity is the measurement and management of both the geotechnical conditions and, increasingly, gas. Strata control and gas management forms a significant component of the underground portfolio of ACARP projects.

Strata Control

Underground coal mining is an operation involving bulk materials extraction and handling, with the resulting rapid development of large voids that are designed to collapse. The stress regime is quite different from most hard rock operations in that mine management must control strata above locations that are continuously changing/moving and responding to the significant stress changes caused by the mining of the targeted coal section of the strata. This means that they have to achieve maximum control of softer material for a minimum cost, which is certainly quite a challenge.

Project C11028 Self-Drilling Rock Bolt Technology - The automatic installation of rock bolts will improve operator safety and increase productivity. This project is assisting to develop a technique that is utilising an innovative self drilling bolt. A drill equipment manufacturer and a bolt manufacturer are working together with the researchers, Ground Support Services and CSIRO, to refine a prototype bolting system that is set to revolutionise future bolting operations and eliminate the source of many lost time injuries.

Project C11056 Geophysical Assessment of Fracture Grouting - The Oaky Creek Coal Mine is working with CSIRO to quantify the effectiveness of pre-grouting existing fracture zones in an attempt to improve the safe and efficient mining of coal that lies within this area. Again safety is a key driver of this important field of investigation, which, if successful, could lead to increasing levels of production when confronting difficult ground conditions.

Gas Management

The challenge is firstly to know where gas is located, the quantity present, how it will respond to drainage strategies, the rate of gas make during production and resultant operator exposure.

Outburst events are known to be associated with geological structure. ACARP projects C11038 Integration of Seismic Data for Mine Planning - being undertaken by CSIRO, and C10020 Investigation of Converted Wave Coal Seismic Reflection Data - by Velseis Pty Ltd are typical of the work being undertaken to advance the use of geophysical techniques for locating such structure. ACARP's investment in translating the techniques originally developed for the petroleum industry for coal exploration has led to Australia leading in the use of coal geophysics. 3D geophysical mapping

is now a standard process in the Bowen Basin. Six years ago the geologists employed a grid of exploration boreholes to delineate a coal reserve, with anomalies being checked by seismic. Today 3D seismic is routinely used first, with drilling then employed selectively to resolve anomalies. The better definition of geological structure is producing safer more productive operations.

Contained gas is currently used as the parameter for determining the propensity of specific coal to outburst. The techniques employed to drain this gas are challenging and necessarily vary with the different seam characteristics.

Project C10012 Coordination of In-Seam Drilling and Gas/Outburst Research - John Hanes, coordinates a number of workshops across the Queensland and New South Wales underground operations where those responsible for drainage, including the drillers, mining engineers, geologists and researchers report on recent experiences. This sharing of industry experience is a key to ACARP successfully advancing the state of knowledge in such a critical safety area.

Project C10017 Optimisation of Goaf Gas Drainage & Control Systems - Dr Rao Baluso, CSIRO Exploration and Mining, has successfully modelled the flow of gas through goafs and into workings. His modelling work provides management with a reliable tool to assist them contain and control gas.

Project C11030 Variability of Coal Seam Parameters as they Impact on Outbursts – CSIRO, has quantified all the parameters that can contribute to an outburst event. In doing so they are working toward a more accurate assessment of outburst potential beyond the simple and possibly over conservative use of only gas contained.

The Challenge

Most of the effort has been directed towards the safety component of occupational health and safety. This has probably arisen for a number of reasons including,

- operational/technical people can better identify with the more applied sciences than the so called “soft sciences” usually associated with occupational health issues,
- until fairly recently there was a hesitancy to delve into issues that may have an industrial relations connotation, and
- other organisations, either associated with the coal industry (e.g. the former Joint Coal Board) or with industry generally, were addressing such issues on a wider front.

When I first gained employment in the Australian coal industry almost fifty years ago the importance of safety was recognised, but at a very much lower level than today. This was evident in the level of training given to new employees (or lack thereof), the attention to protective clothing, pre-employment and periodic medical examination and, essentially, a reliance on an understanding of compliance with mining legislation.

There is no doubt that the technological features associated with mine safety have advanced enormously and that the appreciation of wider safety issues and attention to training are well beyond that era, and much more aligned to present day expectations. There is also clear evidence of improved results. While it may not be relevant to draw on statistics from the mid 1950s, for a number of reasons including different circumstances/bases adopted over the period, even more recent comparisons demonstrate that advances have been made.

The average lost time injury frequency rate (number of lost time injuries per million hours worked) for the black coal industry in Australia contributing to and covered by ACARP (operating in the four states of Queensland, New South Wales, Western Australia and Tasmania) has shown the following trend in the last ten years of available information

Lost Time Injury Frequency Rate, Black Coal Industry

State	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00	00-01	01-02
QLD	40	34	31	26	24	16	13	12	11	8
NSW	78	68	73	56	48	52	39	34	33	27
WA	130	78	91	61	41	32	29	16	28	17
TAS	37	10	29	30	19	14	0	7	35	20

The above information requires a number of observations, including the size and nature of the operations contained in each state total, to provide the basis for a full appreciation, but it is fairly clear that there has been a trend moving in the right direction.

While the same state based information is not at hand for duration rate (average lost time for every lost time injury) and severity rate (average number of days lost per million hours worked) it seems that the trend with respect to these two measures for the coal industry in total in Australia (which includes Victorian and South Australian operations) has been if anything worsening, in the case of severity rate in particular, or fairly static. The information on fatal injury frequency rate, while varying widely from year to year in relative terms, has not shown a substantially favourable trend.

Comparisons with overseas coal industries show that Australia is ahead of others in many respects. The conclusion from any objective analysis though is that we have no basis for complacency. In reality it could be argued that we have travelled the relatively easy distance towards what has to be the ultimate goal, however that is defined.

A New Direction

The program continues to adapt to changing demands. It is interesting to note that the industry's determination to achieve zero fatalities has caused the technical committees to begin to appreciate the importance and value of sociological science.

Advancing technology can not, and will not, guarantee zero fatalities. The industry must understand and address such issues as fatigue, training and propensity to undertake risks if this worthy goal is to be accomplished.

The approach to addressing issues utilising research disciplines in technical areas has been clearly evident within ACARP and this has been extended to a lot of safety issues, largely because of the clear association with production activities that needed a technical approach. There is still evidence of a reluctance to embrace the more occupational health and sociological aspects of the safety equation in the same approach. Recent experience within ACARP would indicate that the chances of a "softer science" proposal being finally approved is probably less than half that of the rest.

Understanding that there is an application for this science to safety is not such a large step for the industry to take as it is already seeing how this work can help achieve a sustainable coal mining industry on other issues. The industry recognises the imperative of community, environment and profitability. ACARP technical committees have currently evaluated 9 proposals with titles such as:

- Mining Future in the Bowen Basin: Criteria for positive Communication and Decision Making
- Coal Mining Dependant Communities in Central Queensland: Industry / Community Engagement Strategies

Just as technology cannot ensure a happy and mutually beneficial relationship with neighbouring communities and the regulatory bodies, technology alone will not solve all the safety issues.

Conclusion

Safety will always be a key component of the ACARP program. The way we go about solving the problems is quite obviously changing. Research is not, as the cynics would have us believe, the constant rework of old solutions. As mines get deeper and the resources become more difficult to mine safely and efficiently ACARP will continue to provide a base from which industry can confront difficult and demanding problems both technically and sociologically.

If we are to continue to make substantial gains in moving towards our ultimate goals in occupational health and safety we will surely need to apply proven research disciplines in new areas to assist. Technology and its advance will continue to provide part of the solution by access to improved machines, electronics controls, processes, etc., but the users of the technology are far more complex. The final steps will require an expanded approach to our research effort compared with the past. These will include application of disciplines not effectively used to date.

ACARP is a powerful facility. It is owned and directed by the Australian black coal industry. It has available to it valuable human resource skills, considerable financial leverage and access to excellent research competencies. The challenge is to gain maximum value from the opportunities available through its strengths.