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## OH&S RESEARCH IN COAL MINING: THE AUSTRALIAN PERSPECTIVE

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### ABSTRACT

OH&S research is generally expected to be made available in the public domain. Irrespective of who undertakes the work and where the work is done it can provide valuable information for the Australian coal industry. This paper reviews the direction and focus of international and Australian research and identifies some of the areas where additional research needs to be done specifically for the Australian environment.

### INTRODUCTION

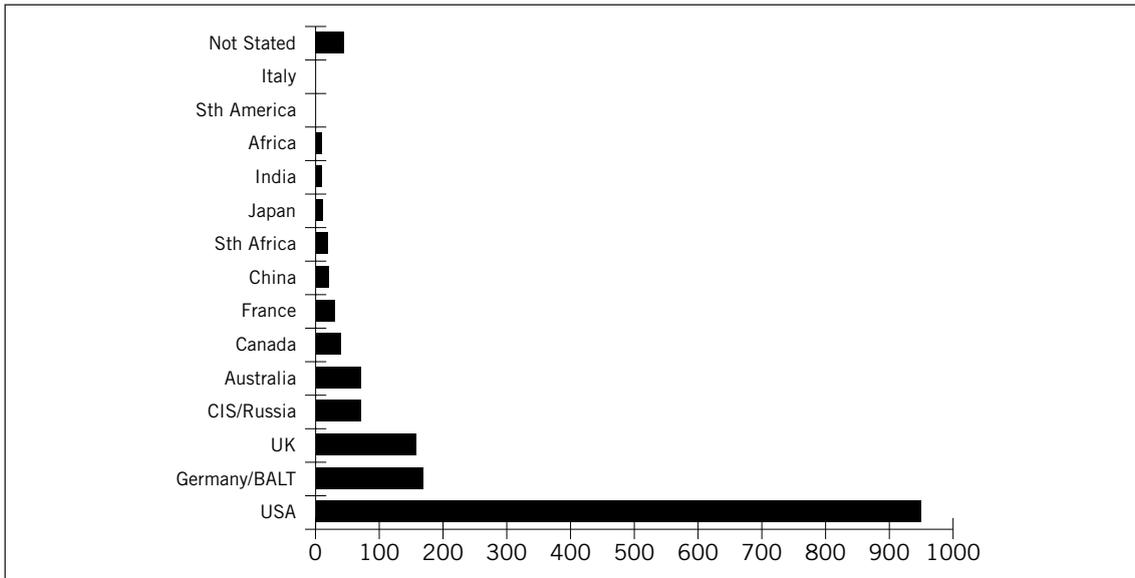
**Effective occupational health and safety in coal mines is essential for the well-being of the workers and for the productivity of the industry.** While the factors influencing the health, safety and well-being of miners are better recognised today than in the past, management of occupational health and safety in coal mines requires more than the ability to recognise problems. To be effective coal industry OH&S research projects need to deliver outcomes capable of reducing the risk to miners at the coal face. Applied research towards managing ever present hazards is essential. This paper reflects on the Australian and international experience relating to OH&S research in coal mining.

This paper stems from a commissioned study which included an extensive review of approximately 3500 reports and journal articles relating to OH&S issues inherent in coal mining (Mitchell and Larsson, 1994). The period of investigation included documents dating from 1909 to 1993, with most of the articles referenced being published in increasing volume over the past thirty years. Of these, only 1583 articles specifically related to research activities and therefore formed the basis of this paper. Sixty-eight published Australian OH&S research abstracts were separated from the international data set to compare the focus of Australian research with worldwide patterns.

### THE NATURE OF THE RESEARCH

#### Origin of Research

Figure 1 shows that US researchers account for the largest proportion (60%) of all published research articles relating to OH&S. Australia, by comparison, accounts for relatively few (4%) of the published research articles represented by bibliographical abstracts.



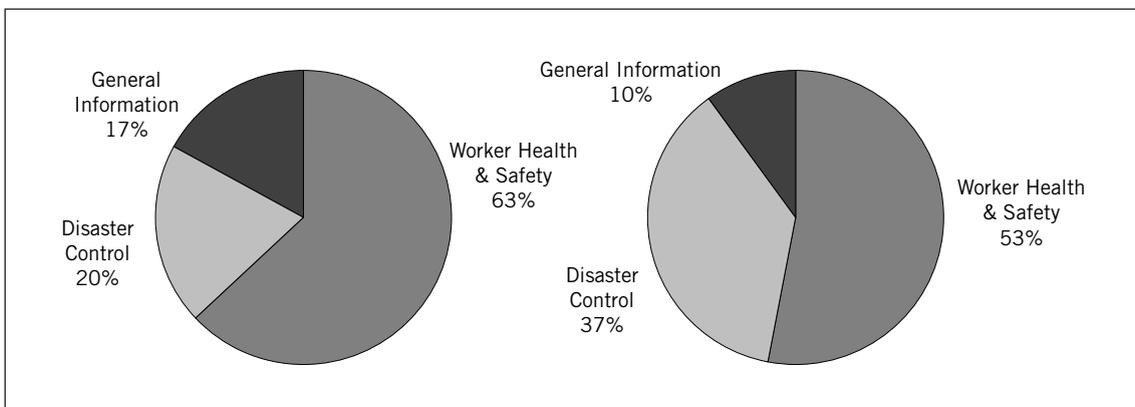
**Figure 1** Research abstracts (n=1583) analysis by country of origin of international research.

While this in part reflects the difference in size of the industry and the greater volume of research, there are other possible reasons for this disparity. US researchers tend to have the results of their research published in journals that have a high level of international exposure and therefore are more likely to be referenced in the electronic bibliographical databases.

This was confirmed by discussions with Australian research program coordinators who suggested that Australian researchers are undertaking more research than this analysis of abstracts indicates, but the reports of their efforts in many cases are not reaching the international research community. Therefore the disparity may indicate either a failure of Australian researchers to publish their findings or that the findings are being published in an inappropriate journal or forum to reach a wide audience.

## SUBJECT

The subject categories of research can be grouped into three broad headings that describe the purpose of the research within the industry: worker health and safety, disaster control and general information. As shown in Fig. 2, the dominant subject category is worker health and safety (63%). Disaster control represented a smaller component (20%) and general information makes up the remainder (17%). The Australian results were found to be consistent with the trend identified in the international data set. Fig. 2 shows that worker health and safety research was the most prevalent (53%), but there is a greater proportion of disaster control research in Australia than is represented in the international data set.

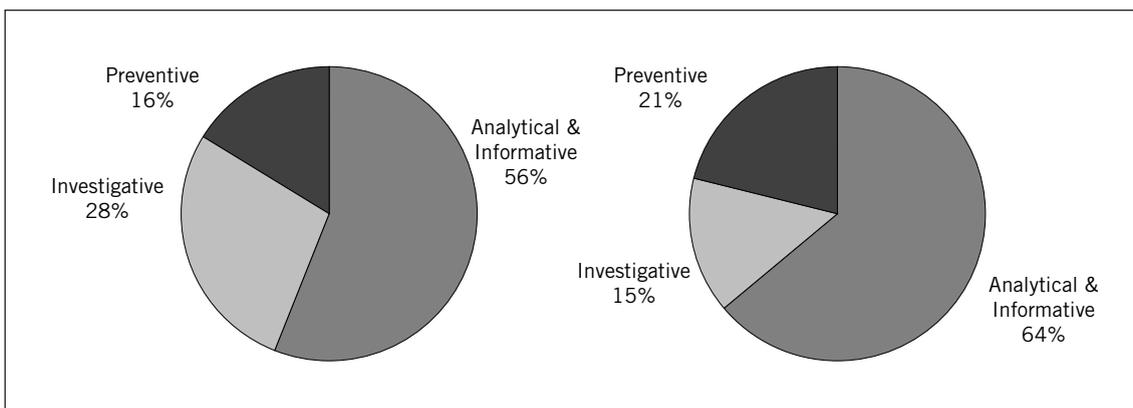


**Figure 2** Research abstracts analysis by nature of international research (n=1583) and Australian research (n=68).

## FOCUS

The focus of research projects was categorised as being analytical, informative, investigative or preventive. The definitions for these four categories are:

- Analytical - Research involving a known hazard is monitored, assessed, measured or analysed, e.g. dust concentrations produced in mining processes. In most research projects with an analytical focus only descriptive information is produced, and no controls are developed or introduced.
- Informative - Research involving the collation and interpretation of historic information. Again, only descriptive information is produced and no controls are introduced (e.g. accident analysis research).
- Investigative - Research involving the risk associated with a work activity, product or the work environment. As a result, research activities may be required to monitor, measure and assess the hazard in question. Research with this type of focus presents descriptive information and, depending on the degree of risk, control measures may result.
- Preventive - Research involving an identified hazard, where the risk associated with the hazard is assessed and steps are taken as part of the research project to develop, trial, demonstrate or implement control measures to minimise the risk. Research activities with this type of focus have the potential to contribute the most to industry.



**Figure 3** Research abstracts analysis by focus of international research (n=1583) and Australian research (n=68).

In Fig. 3, information relating to analytical and informative categories have been grouped as there is only a small number of abstracts with an informative focus. The results indicate that almost 60% of the research undertaken to date has an analytical and informative focus and it is probable that research projects in these categories may not have resulted in hazard control measures being implemented. Investigative research projects have been reasonably well supported in the international arena but Fig. 3 also indicates the disproportionately small amount of research with a preventive focus.

The Australian research analysis shows a greater proportion of analytical and informative research than identified in the analysis of the international data set. More positively, however, it should be noted that Australia has a greater proportion of preventive research projects.

## TYPE OF MINING ACTIVITY

The coal mining activities at the centre of OH&S research identified by the abstracts have been categorised as being either:

- Underground - All underground mining and underground support services,
- Surface Excavations - Relates to only opencut pit activities, stripping, haulage, and associated support services,

- Services and Processing - Includes all surface support for underground and opencut mining activities, workshops and coal processing, and
- General (non-operational) - Relates to coal mine research projects that may be indirectly related to coal mining activities, but generally have not been undertaken at or directly involving a coal mining operation (e.g. laboratory base research projects).

Fig. 4 shows that there has been considerable support for research projects on underground activities (55%) and very little support for research projects on opencut mines (4%) and services and processing operations (3%). It should also be noted that a large proportion of the research projects (38%) undertaken relate to other than specific mining operations.

Generally, the results of the analysis of the Australian research shows little difference in the proportions of research categorised by activity when compared with the international research. There is however, a noticeable increase in the proportion of research projects centred on services and coal processing in Australia.

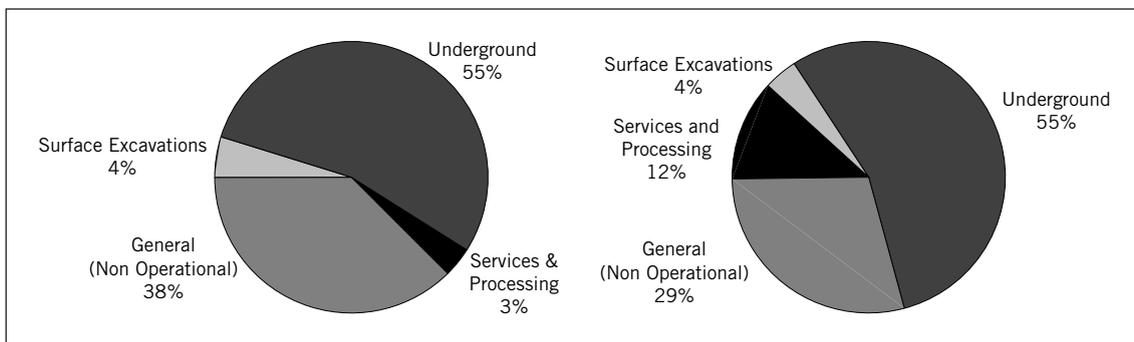


Figure 4 Research abstracts analysis by activity in international research (n=1583) and Australian research (n=68).

## TOPICS

Research abstracts were also categorised by topic. For this purpose, some common OH&S topic categories were established, e.g. noise, dust, etc. In addition, separate topic categories were established for research topics specifically related to the coal industry, e.g. ground support, explosion prevention and damage control.

Fig. 5 provides a summary of these results and shows that considerable emphasis has been placed on research related to dust and respiratory disease (30%). In comparison, two well known hazards associated with mining (noise and manual handling) collectively only account for 5.5% of the research.

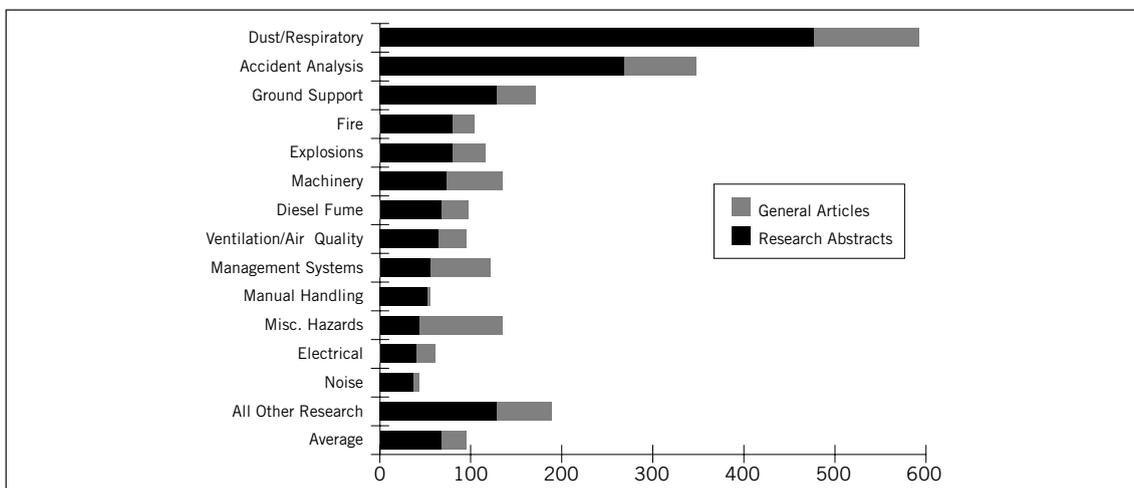
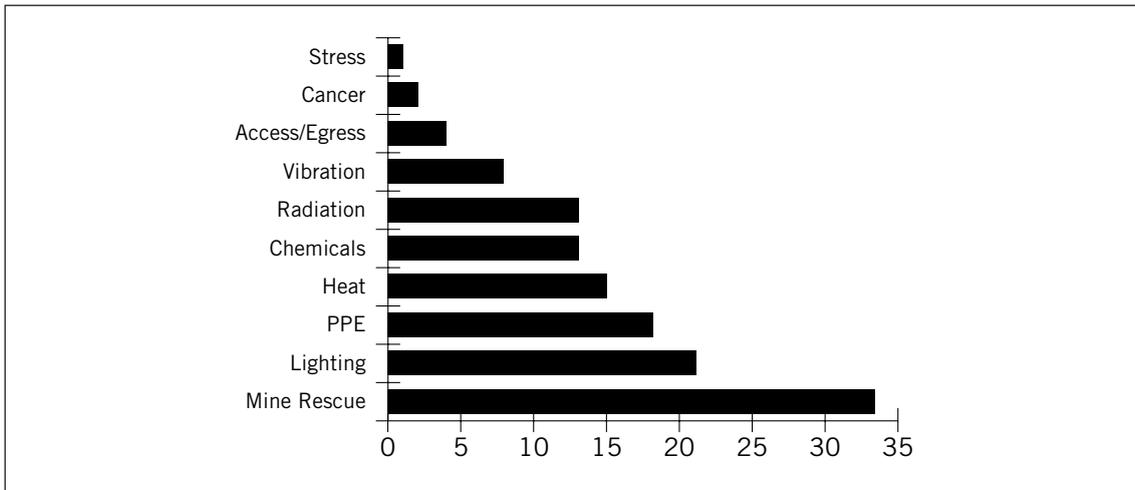


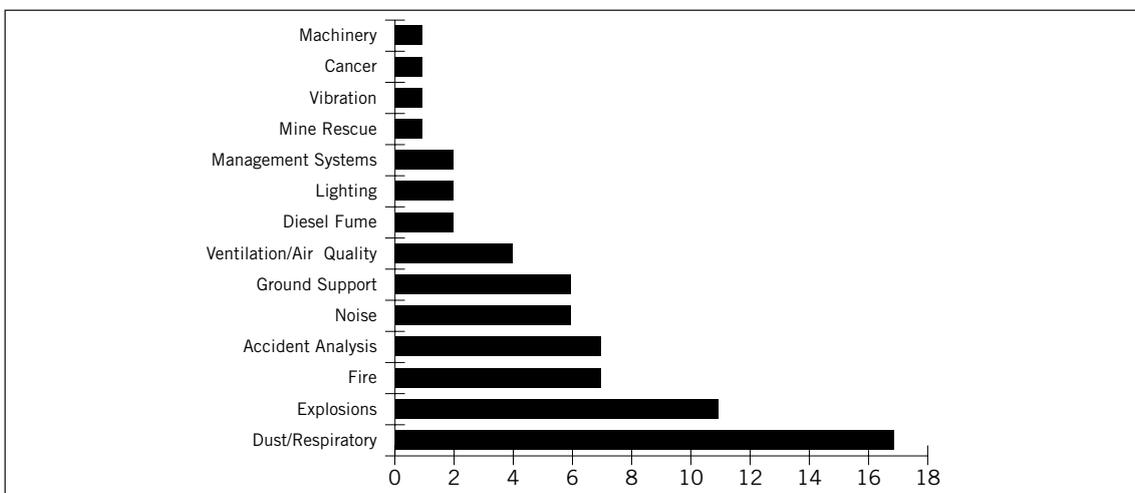
Figure 5 All literature abstracts (n=2275; 1583 research and 692 general articles); analysis by topic.

The category “All Other Research” represents 22% of the abstract data set and is a compilation of all research topics accounting for less than 4% of the total per topic. Fig. 6 shows a breakdown of these research topics.



**Figure 6** Breakdown of research abstracts; (n=128) in the "All Other Research" category of international abstracts.

The analysis indicates that the most prevalent research topic in the Australian data set is dust and respiratory disease (see Fig. 7). The distribution of the number of Australian research projects is similar to the international data set, however noise research has been given slightly higher representation in the Australian research. It should also be noted that many of the research topics covered by international research (e.g. stress, access/egress, chemical exposure, heat etc.) have received no attention by Australian researchers.



**Figure 7** Research abstracts (n=68) analysis by topic of Australian research.

## CONCLUSION

The analysis of 1583 abstracts of research relating to OH&S in coal mining indicates a strong growth in the volume of international research published on the subject in the past thirty years.

The US accounts for the largest proportion of research in this field and. Australian research appears to be under represented in the international research bibliographic databases. Anecdotal information suggests this is possibly due to either inadequate or ill-placed publication of Australian OH&S findings. **Australian researchers need to be encouraged to publish more effectively in the international arena.**

The subject matter of the research abstracts reviewed was mostly related to worker health and safety issues, but there was also a considerable proportion of disaster control research. While the main subject categories of research undertaken appear to reflect the risks to the majority of mine workers as perceived by the industry, the focus of research has been related predominantly to analytical and informative projects. Such projects have little potential to directly reduce worker exposure to risk at the coal face. Although projects focusing on preventive research are under-represented, it is encouraging that the proportion of such projects in Australia is slightly higher than those published internationally. There remains, however, a need to increase the proportion of research with a preventive focus.

The analysis also shows that underground mining is the most common activity on which OH&S research has been traditionally centred. In comparison, relatively few projects have considered OH&S issues relating to opencut mining, maintenance work and coal processing activities. This trend may be warranted overseas where underground mining remains the most common technique for coal extraction but the proliferation of opencut activities in Australia may justify a greater proportion of research relating to surface excavation, maintenance and coal preparation activities.

Of all the research topics categorised, dust and respiratory disease research was found to be the most common. In comparison, manual handling, noise and access to equipment, three areas that are recognised by the Australian mining industry as being major problems inherent in coal mining activities, are poorly represented in the Australian and international research literature. Again it is suggested that the priority placed on dust and respiratory disease research may be warranted overseas, but less so in Australia where improved mining techniques have significantly reduced the risk associated with this hazard. Therefore, the coal industry may benefit from greater emphasis on research related to physical hazards other than dust.

It is in the industry's interest to ensure the health, safety and well-being of Australian miners. While we can draw on overseas findings our own research must focus on the needs of the Australian industry. The direction of OH&S research priority setting in coal mining must continue to **be driven by strategic importance formed from scientific opinion** rather than perceived need or political response.

#### Reference

Mitchell, T and Larsson, T 1994, Commissioned Study into OH&S Priorities in the Australian Black Coal Industry. University of Ballarat, Ballarat.