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## **THE ROLE OF THE MINERALS INDUSTRY SAFETY AND HEALTH CENTRE (MISHC) IN THE AUSTRALIAN MINERALS INDUSTRY AND EDUCATION SYSTEM**

### **AVUSTRALYA MINERAL ENDÜSTRİSİNDE VE EĞİTİM SİSTEMİNDE MİNERAL ENDÜSTRİSİ GÜVENLİK VE SAĞLIK MERKEZİNİN ROLÜ**

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#### **ABSTRACT**

In order to prepare the next generation of specialist minerals professionals in a quickly changing, globalised and competitive mining industry, the integration of a risk management approach to safety and health topics in the engineering education course is fundamental. This paper introduces the Minerals Industry Safety and Health Centre (MISHC) and provides a broad explanation of the purpose of establishing the Centre by reviewing the Australian mineral industry's safety and health performance and legislative requirements, and outlining the reasons behind the improvement requirement of the minerals education system. The paper covers the significant role that MISHC plays in the Australian minerals industry and education system and overviews its current activities and future plans.

#### **ÖZET**

Tüm dünyada çabuk değişen ve oldukça rekabetli madencilik endüstrisine katılacak olan geleceğin profesyonel mühendislerini yetiştirmek için emniyet ve sağlık alanındaki risk teşhis ve analizinin mühendislik eğitime katılması kaçınılmaz hale gelmiştir Mineral Endüstrisi Emniyet ve Sağlık Merkezi tanıtılmaktadır. Böyle bir merkezin kurulmasını zaruri eden sebepler Avustralya'daki mineral endüstrisinin emniyet ve sağlık istatistik sonuçları incelenerek, bu alandaki kanuni gerekliliklere değinilerek ve madencilik eğitiminin geliştirilmesi zorunluluğunun nereden kaynaklandığı açıklanarak geniş bir şekilde belirtilmiştir. Mineral Endüstrisi Emniyet ve Sağlık Merkezinin Avustralya mineral endüstrisi ve eğitim sisteminde oynadığı önemli rol, şu anda merkezin yürüttüğü çalışmalar ve gelecekle ilgili planları anlatılmıştır

## 1. INTRODUCTION

Mining by its nature is a hazardous occupation in terms of safety and health and individuals are not immune from the likelihood of an accident or injury. The risk of death per year by a variety of causes has been noted by The British Nuclear Power Industry on a recent article published on the Internet as shown in Table 1.

Table 1 Risk of death by various causes

by lightning	1 in 10 million
by fire or explosion at home	1 in 1 million
in a 'safe' industry	1 in 100,000
in a road traffic accident	1 in 10,000
in mining	1 in 1,000

Mining has also been listed as having the most frequent and the most severe of injuries both as an industry and an occupation by the Industry Commission (Quinlan and Bohle, 1995). The Minerals Council of Australia (MCA), which is the national body that represents the exploration, mining and minerals processing sector of the Australian economy, declared its vision by the following statement: *"An Australian minerals industry free of fatalities, injuries and diseases"* and clearly stated its safety awareness as follows: *"The state of mind where we are constantly aware of the possibility of injury and act accordingly at all times"* (Minerals Council of Australia, 1997-98).

## 2. SAFETY PERFORMANCE STATISTICS IN THE AUSTRALIAN MINERALS INDUSTRY

### 2.1 Fatalities

Since 1989, the minerals industry in Australia has recorded 225 deaths, an average of more than 22 deaths a year (Minerals Council of Australia, 1999). The workforce in the industry is nearly 80,000 people (data obtained from Minerals Council of Australia). The risk of death among the Australian minerals industry workforce is approximately 1 in 3,500 per year. Compared with the UK risk of death in mining this is lower, but it is still higher than a 'safe' industry (Table 1).

In 1996/97 the Australian minerals industry recorded 33 fatalities. The number of fatalities dropped to 19 in 1997/98 and to 10 in 1998/99. Although this may represent a major progress compared with the number of the fatalities in the previous years, it still falls well short of the industry's only acceptable objective of zero fatalities. However, this highlights the increased safety awareness across the minerals industry.

In 1998/99, underground mining operations recorded seven of the 10 fatalities. Five fatalities occurred in metalliferous mines and two in coal mines. Of the remaining three fatalities, two took place in open-cut metalliferous mines and one in an open-cut coal mine.

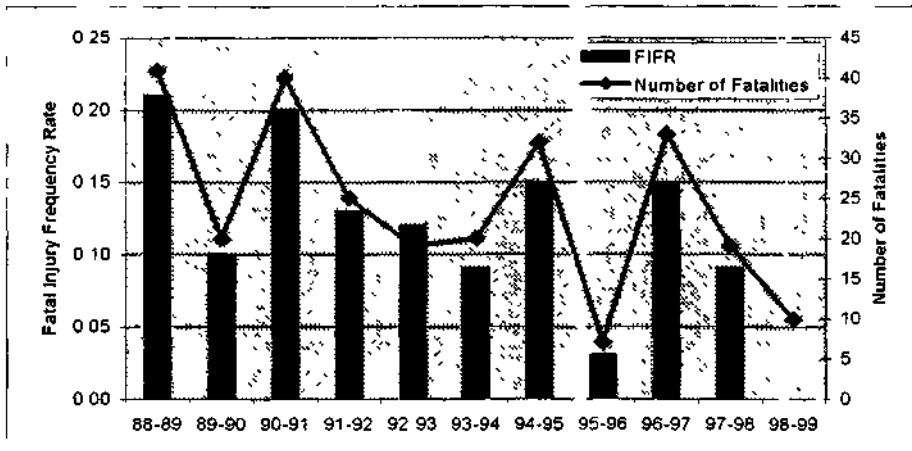


Figure 1 Australian Minerals Industry Fatality Statistics between 1988 and 1999 (Minerals Council of Australia, 1997-98 and 1999)

The 1997/98 Fatal Injury Frequency Rate (FIFR The number of fatal injuries per one million hours worked) of 0.09 is considerably less than the 1996/97 figure (0.15) and is lower than the ten year average of 0.13 as seen in Figure 1. Nevertheless, a continued pattern of improvement is not evident in fatality levels over the past ten years.

## 2.2 Lost Time Injuries

In the Australian minerals industry, there has been a significant improvement in the number of Lost Time Injuries (LTI An injury that results in a minimum of one full shift's absence) falling from 11,580 in 1988/89 to 3,206 in 1997/98. Similarly Lost Time Injury Frequency Rate (LTIFR The number of lost time injuries per one million hours worked) fell from 69 in 1988/89 to 12 in 1998/99 (Figure 2). This is a reflection of continuing improvement in the industry's LTIFR, but the severity of injuries in some sectors is a concern.

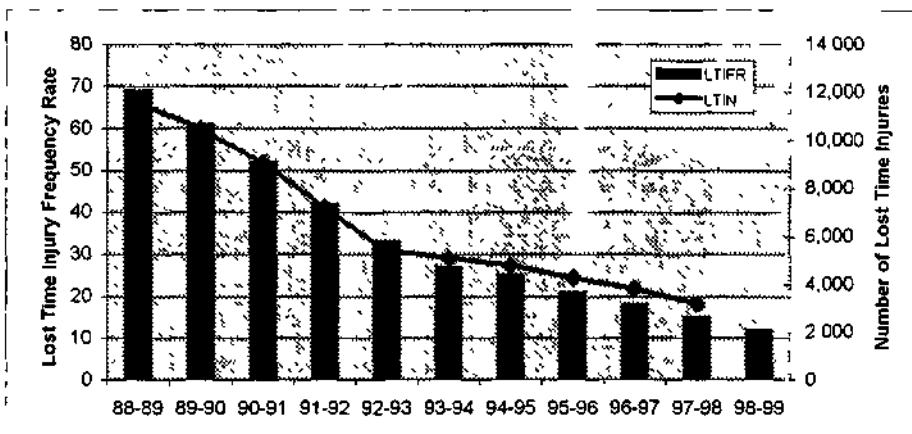


Figure 2 Australian Minerals Industry Lost Time Injury Statistics between 1988 and 1999 (Minerals Council of Australia, 1997-98 and 1999)

The highest LTI (1144) and LTIFR (57) were reported in the underground coal mining sector in 1997/98, which was 3.8 times more than the industry average and 3 times more than the underground metalliferous sector's recorded rate of 16. Although underground coal continued to have the highest LTIFR (41) in 1998/99, this rate is significantly less than the previous year. The analysis of these data reveals that to reduce the LTIFR throughout the industry further progress in the underground coal sector LTIFR will need to be achieved.

### 2.3 International Comparisons

When compared with some other nation's mining industry fatality rates, Australia has a comparable rate of fatalities with the USA but has much better statistics than South Africa where gold is mined at extreme depths and employs 75% of the metalliferous industry workforce (Figure 3).

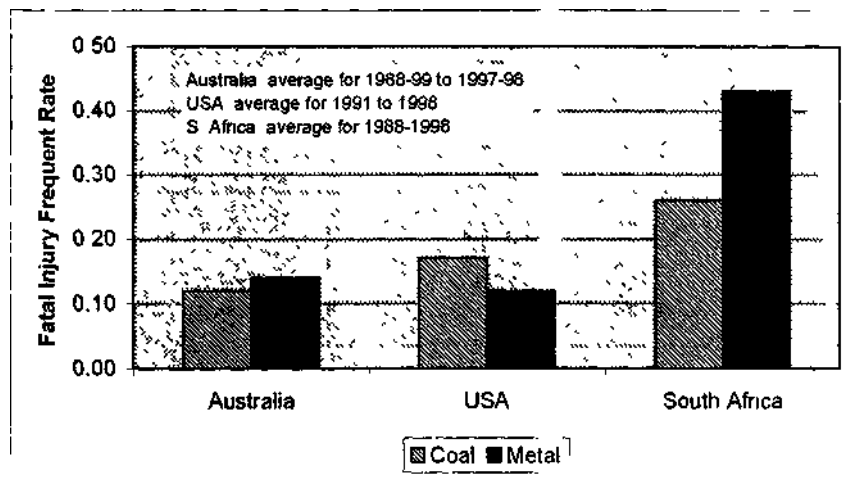


Figure 3 International Mining Industry Fatality Rates (Minerals Council of Australia, 1997-98)

### 3. THE COSTS OF FATALITIES/INJURIES TO THE AUSTRALIAN MINERALS INDUSTRY

The financial cost of fatalities/injuries to the mining industry is substantial. It was estimated that the direct (fatalities and injuries) and indirect costs (loss of productivity, investigation of incidents and claims, rehabilitation, damage to equipment and tools, employee turnover and training costs, etc) to the mining industry was some \$80 million in 1996/97 (Minerals Council of Australia, 1997-98). This figure was based on workers' compensation claims where total costs represented 16% of mining industry net profits of \$567 million in 1997/98 (Minerals Council of Australia, 1998a). The emotional cost to the injured persons and their families are the hidden costs that the statistics cannot show.

The 1996-97 workers' compensation claims data showed that coal mining recorded the highest injury/poisoning frequency (Minerals Council of Australia, 1997-98) and

incidence cases within the mining division compared with other mining sub-divisions This is consistent with the injury data obtained from State/Territory Mines Departments.

#### **4. LEGISLATIVE REQUIREMENTS FOR SAFETY & HEALTH MANAGEMENT**

Mining safety and health legislation in Queensland and some other states is now requiring organisations to have formal Safety and Health Management Systems (Alexander et al., 1999) The Queensland Mining and Quarrying Safety and Health Act of 1999 in section 55.(2) (Queensland Legislation, 1999a) and the Coal Mining Safety and Health Act of 1998 in section 62.(2) (Queensland Legislation, 1999b) states respectively;

*" A safety and health management system must be an auditable documented system that forms part of an overall management system that includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining a safety and health policy for managing risks associated with operations "*

#### **5 . WHY TEACH SAFETY AND HEALTH IN THE MINERALS INDUSTRY**

Any fatality due to workplace injury in the Australian minerals industry is unacceptable The elimination of fatalities has become a key challenge across the whole industry to achieve the industry's vision of zero fatalities and this has been stated by the National Tertiary Education Taskforce of the Minerals Council of Australia as follows (Minerals Council of Australia, 1998b);

*" Improvement in safety is the number one priority challenge for the national minerals industry. Thorough and relevant occupational health and safety education for minerals specialist professionals is one of the essential steps towards improving the safety performance of the minerals industry in Australia. The teaching of process safety and risk analysis as in chemical engineering courses is considered to be a good role model for minerals courses and should be coupled with other aspects of occupational health and safety including the statutory obligations imposed on employers and mine officials. "*

The industry is seeking minerals professionals equipped to deal with current and emerging challenges in occupational health and safety at the workplace The National Tertiary Education Taskforce established the following mission in response to industry's concerns,

*" The Development of World-Class Education for a World-Class Minerals Industry "*

Education at both tertiary and continuing education levels has a critical role in improving safety and health. However, formal education in Mining Safety, Health and Risk Management remains limited.

## **6. ESTABLISHMENT OF MINERALS INDUSTRY SAFETY AND HEALTH CENTRE (MISHC)**

In late 1996 and early 1997, recognition of the industry's changing requirements from a minerals tertiary and continuing education institution resulted in The University of Queensland proposing the concept of establishing the MISHC within the Sir James Foots Institute of Mineral Resources (JFIMR). The MISHC was formed on 1 January 1998 at the University of Queensland and launched in March 1998 at a ceremony held at the Customs House in Brisbane

The establishment of the MISHC represents a change in the Australian system of minerals education. Improvement of the education system by promoting safety performance will result in graduates who have a 'positive safety culture', equipped with the knowledge and skills necessary to implement effective safety programs, and redesign operational systems to maximise safety within the minerals industry

### **6.2 The Sponsors**

The foundation supporters of the MISHC are Shell Coal Australia Ltd, BHP Minerals, North Ltd, Rio Tinto Ltd, QCT Resources Ltd, WMC Ltd, QNI Ltd, with support from the Queensland Department of Mines and Energy through its research arm, SIMTARS

A Management Committee consisting of the representatives of the sponsors oversees operations of the MISHC to assist in determining future directions and strategies

### **6.4 Mission Statement**

By 2002 the MISHC will become the leading provider of mining safety and health risk management education, information and applied research services in Australia, as well as an internationally recognised "centre of excellence"

### **6.5 Objectives**

The principal objectives of the Centre are continuing development and integration of the Centre's risk management education programs at undergraduate, postgraduate and continuing education levels, and to initiate, coordinate and conduct research in topics relevant to safety and health in the Australian minerals industry

### **6.6 Current Activities**

#### **6.6.1 Engineering Education into the Future**

Formal and well-structured undergraduate lecture material in mining safety and health risk management have been developed and integrated into the Mining and Mineral Engineering courses at The University of Queensland. The education program ensures the industry will benefit from the strength and depth of future mining engineers filling their roles in the minerals industry. The Centre offers a world class safety and health program and is able to deliver it truly effectively

### **6.6.2 Educational Activities**

Maintaining the curriculum at the highest standards by regularly reviewing its coursework, course design and its delivery methods to ensure the course meets the requirements of the industry efficiently and effectively is a priority. Educational activities also cover the presentation of the Mining and Minerals Engineering Degrees and Continuing Education & Higher Degrees.

#### **A) The undergraduate education**

Undergraduate content has become an integral part of the University of Queensland's undergraduate curriculum. The courses cover relevant content areas within the fields of engineering such as ergonomics, human factors, significant safety components within engineering subjects, occupational hygiene, risk assessment and risk management, and projects, such as thesis topics in the safety area that are required by a modern professional in the minerals industry.

#### **B) Transfer/network**

The subject content for the undergraduates lecture material forms the basis of a series of '18. MISHC Safety and Health Risk Management Modules'. Effective course design for minerals professionals using these Modules at a website location is in the development stage. This will meet the future expectations and demands in safety and health tertiary and continuing education. The MISHC, in cooperation with participating universities is currently establishing a network of university mining departments. The Modules will be available to the participating universities as a complete package via the website. This innovative approach of delivering local, electronic, self-paced programs will enable access by many more students and professionals in the network to world class education in a broad selection of safety and health topics in the minerals industry around the country and possibly overseas than is currently the case.

The Centre is pioneering the important role of the culture of sharing of resources, expertise, teaching and capabilities amongst individual departments both within the university and between universities.

#### **C) Continuing education & Postgraduate courses**

The development of safety and health risk management competency is a major industry necessity. The Centre recognises the important role of continuing professional development and its effects on a company's continued and lasting success that will only become more significant in the future.

MISHC offers,

- postgraduate curriculum to cater for the industry professionals who wish to specialise during continuing education,

- risk management seminars for minerals professionals seeking to upgrade their skills in hazard identification and risk management in the minerals industry

### **6.7 The Mining Safety and Health Risk Management Database**

A database has been created and is being updated regularly. This provides 'best practice' information on safety and health risk management. It contains over 1,000 references and this has been made accessible via the Centre's website.

### **6.8 Links**

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MISHC sustains strong links with the minerals industry through the involvement of its Management Committee members both in Australia and overseas, and the Director's consulting work in the area of risk management and accident investigation.

The centre has also formed linkages with SIMTARS, the Queensland's Government's safety, testing and research centre in Ipswich, the Mines Inspectorate within the Queensland Mines and Energy Department, Queensland Workplace Health and Safety Network, Centre for Hazard and Risk Management, Centre for Human Factors and Applied Cognitive Psychology, Victorian Institute of Occupational Safety and Health (VIOOSH), The University Departments of Chemical Engineering, Human Movement Studies, Occupational Therapy and Psychology.

### **6.9 Applied Research in Mining Safety and Health**

Research projects currently being undertaken are as follows,

**Development of a Health Strategy:** A health strategy is currently being developed for identification, risk analysis and control of occupational health hazards in the mining and minerals processing industries for the Centre.

**Effects of Coal Dust Ingestion on Mine Workers:** This project represents the first part of a multi-stage research project related to the underground workplace to be conducted by MISHC. Its overall goal is to provide quantitative information on the extent and severity of dust ingestion related health problems in underground coal mining.

**Development of an Expert System for Risk Assessment in Underground Coal Mines:** The objective of this research is to develop a sophisticated expert system program that assists mine management and engineers in the assessment of risks associated with underground coal mines and development of necessary risk management procedures.

**Naturalistic Decision-Making of Mining Engineers:** The project is concerned with passive errors committed in the design of a mine that contribute to mine accidents, in particular, the decision-making of mining engineers. The outcome of the project will be a tool that mining organisations could use to guide or provide feedback to engineers.



## **6.10 Future Plans**

The Minerals Industry Safety and Health Centre is expected to become the focus of safety-related education programs and research for the minerals industry. By 2002, MISHC will operate as a self-sustaining business centre in the University of Queensland, deriving revenue from services provided to mining and other industry in Queensland, across Australia and throughout the world.

The following includes some of the future plans,

- A) Development of System Safety Accident Investigation Database (SSAI), Audit Database and Ergonomics Database
- B) The operation of a Technical Management Competency Program. To improve occupational safety and health competencies for industry professionals, 11 Competency Unit Learning Packages (CULPs) have been developed in areas such as ventilation, gas drainage, spontaneous combustion and risk management. Following discussions with the Department of Mines and Energy, it was proposed that MISHC plays an administrative role in the development and delivery of CULPs training for the minerals industry.

## **7. CONCLUSIONS**

The Minerals Council of Australia believes that, all tasks can be done safely by identifying the hazards and managing risks, everyone has a personal responsibility for the safety and health of themselves and others, and continuing improvement of safety and health performance is essential.

Strong and high quality course work programs are vital in the minerals education system for delivering excellent occupational health and safety in the minerals industry to ensure the continued prosperity of the industry.

Minerals Industry Safety and Health Centre (MISHC)

- has a vision and willingness to be innovative in delivery of minerals safety and health education, strong research capabilities and excellent quality of staff,
- is committed to promote and improve safety and health performance in minerals tertiary and continuing education,
- plays an essential role in forming an active partnership between industry, universities and government to ensure world class minerals education and that benefits both the minerals industry and its professionals,
- aims to establish the undergraduates' curriculum in mining engineering as the world's leading minerals education system in the risk management of occupational health and safety,
- encourages universities to move toward greater cooperation and to develop a priority for the development of teaching excellence,
- will be an integral part of any national initiative for tertiary education in the minerals sector.

Members of the MISHC see a challenging future. Their vision is to be and remain a world class Centre. Through strategic growth and collaboration with other university departments and institutions, and support from major national initiatives to enhance the quality of minerals education, they are confident that these goals are achievable.

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