Mine Health and Safety Council

MHSC

An investigation of the requirements for the development of an information management system and proactive monitoring of occupational health issues in the mining industry

Final Report

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Abbreviations and nomenclature

BSI	British Standards Institution
CHESS	Computerised Health and Environment Surveillance System
CMI	Centre for Mining Innovation
COP	Code of Practice
CSIR	Centre for Scientific and Industrial Research
DMR	Department of Mineral Resources
FACE	Fatality Assessment and Control Evaluation
FIOH	Finnish Institute of Occupational Health
FROD	Finnish Register of Occupational Diseases
HR	Human Resources
HSE	Health and Safety Executive
IHE	Institution of Higher Education
ILO	International Labor Organization
IMS	Information Management System
INPS	Instituto Nacional do Previdencia Social
ISO	International Standardisation Organisation
IT	Information Technology
MBOD	Medical Bureau for Occupational Diseases
MHSA	Mine Health and Safety Act
MHSC	Mine Health and Safety Council
MHSI	Mine Health and Safety Inspectorate
NGO	Non-governmental Organisation
NIHL	Noise-induced Hearing Loss
NIOH	National Institute of Occupational Health
NUM	National Union of Mineworkers
OHN	Occupational Health Nurse
OH&S	Occupational Health and Safety
OHSMS	Occupational Health and Safety Management System
OMP	Occupational Medical Practitioner
OREOHS	Organisational Risk Evaluation for Occupational Health Stressors
RMA	Rand Mutual Assurance
SAMODD	South African Mining Occupational Disease Database
SAMRASS	South African Mines Reportable Accidents Statistical System
SAMSHA	South African Mines Safety and Health Administraion
SASOHN	***South African Society of Occupational Health Nursing***
SAT	Seguro Acidente de Trabalho
SHARP	Safety and Health Assessment & Research for Prevention
TB	Tuberculosis
UK	***United Kingdom***
WISHA	Washington Industrial Safety and Health Act

Executive summary

Introduction

Efforts to quantify and ultimately prevent occupational diseases in the South African mining industry are faced with the challenge of limited access to quality data for analysis and interpretation of statistics that can drive a national preventative and proactive policy on occupational health. This project therefore aimed to investigate the system requirements for providing the information that the sector needs in order to act proactively with regard to occupational health issues. The recommended system requirements of an IMS as a result of this study are summarised in separate Green Paper that should be viewed concurrently with the final report.

The principle underlying proactive monitoring is that action is taken before diseases, illnesses or accidents happen. To facilitate such a system requires the availability of very regularly updated and accurate information for analysis so that regulators and decision makers can ensure that worker health is being safeguarded. An occupational health and safety management system (OHSMS) also requires reactive investigations of health and safety incidents to identify remedial measures based on the root causes identified by the investigation in order to implement improvements to the current practices. Also to facilitate the necessary reactive management and monitoring, accurate occupational health, occupational hygiene and safety data must be properly recorded and readily available.

In order to gather information to be able to define the system requirements the research team conducted a literature review, an expert focus group and a survey of the needs and current practices in the Mine Health and Safety Inspectorate (MHSI) and in a representative group of mining operations.

Literature review

An in-depth literature review was conducted in order to identify the current knowledge about the best practice for management systems for occupational health issues as well as the trends in both the international and South African occupational health field with regard to occupational health information management systems (IMSs). The aim of reviewing systems and case studies identified in the literature was to define the system requirements for an IMS that would facilitate proactive management of occupational health issues. The findings of the literature review were that efficient OHSMSs need to be in place at the mines and the systems must comply with the following summarised points:

- A clear definition of an OHSMS and its objectives is an important prerequisite for an efficient OHSMS;
- The integration of health with safety management in an organisation is essential;
- Successful OHSMSs require employee participation, senior management commitment and integration into the general management systems;
- In general the literature indicates that some of the barriers to the success of OHSMSs are:
    - Failure to customise the OHSMS to the needs of the organisation;
    - The imposition of the system without including the employees in the process of development;
    - Poor senior management commitment; and

    - The inappropriate use of audit tools by untrained auditors;
- The use of OHSMSs in small businesses and where contract labour is widely used has not been shown to be successful;
- Voluntary OHSMSs are most frequently found in large companies and are too complex for small companies;
- Voluntary OHSMSs are based on best practice; and
- Mandatory OHSMSs are based only on compliance with regulations.

The guidelines for best practice in OHSMSs as developed and reviewed by International Labour Organization (ILO) stakeholders are available in a useful checklist format that could be adapted for the South African mining industry. The three main areas that are elements of best practice OHSMSs are the organisational element, the consultative element and the specific operational element. The specific factors in each element could be adapted for the mining industry.

Some of the relevant locally available OHSMSs were also reviewed. The local systems identified were either licensed systems (e.g. the CHESS system), or proposed systems that have not been fully tested or implemented (e.g. the OREOHS system).

The deduction that could be made from the findings of the literature review was that an integrated, customised OHSMS must be in place in an organisation in order to generate information about the health and safety of the workforce, with a particular emphasis on customisation for smaller operations. In order for the information generated by such OHSMSs to be managed effectively and to provide data that can inform preventative policy, mandatory reporting to a specialised custodian organisation that analyses and reports on the status of the workforce's health to stakeholders must be in place, as is the case in the Finnish system.

On the basis of the findings of the literature review, the research team decided to use the ILO checklist as a survey tool in the next phases of the study. In order to ensure that the recommendations made by the study were relevant to the South African context the researchers convened an expert focus group to brainstorm and discuss members' views on the requirements for an IMS for occupational health issues.

Expert focus group

The focus group consisted of identified experts and stakeholders in the field of occupational health in the South African mining industry, and in other industries, and academics, and practitioners from large and small mines as well as from the regulators. The focus group was convened for a one-day brainstorming session. The objective was to draw on current knowledge and expertise in the field to identify the requirements for a system to monitor and manage occupational health issues proactively in the South African mining industry.

The focus group concluded that an ideal IMS for occupational health issues in the South African mining context must be made up of a two-level system. One level, which was termed the "Transactional database," should contain an electronic occupational health record of each worker, for the full duration of his/her career in the mining industry. The electronic record must link all the relevant worker information to relevant information about the worker's exposure to hazardous conditions, during his/her working life. It was envisaged that the ideal IMS must contain demographic data, personal exposure data and personal medical data and accident/incident data. The system should consist of these four interlinked units. There was consensus on the need to collect information in a tailored way in order to provide the best tool rather than creating a further burden of work.

The focus group further agreed that at a second level there should be the co-existence of a Master database that would inter-link with or flow out of the Transactional system would be a prerequisite for a future IMS. The purpose of a Master database would be to analyse data in the Transactional database and provide meaningful reports and information to enable improved strategic decision making, policy formulation and regulatory control at an industry level. This would be achieved through the creation of a central data repository which could be analysed to support research, epidemiological and public health needs. The Master database, it was indicated, should also have functional links to existing databases such as the Rand Mutual Assurance database, the South African Mining Occupational Disease Database (SAMODD), the Compensation Commissioner database, the Mineworkers Compensation System, the Medical Bureau for Occupational Diseases (MBOD), TEBA and the Mine Pension Fund. The successful functioning of a Master database would require high levels of management skills and capabilities for the following dimensions of the system:

- Data capture
- Information Technology (IT) infrastructure and support
- Report generation
- Statistics

The barriers to the success of the implementation of such a system were seen to be agreement on the custodianship of the database, capacity to manage the system, and quality of the input data.

Focus group delegates were asked to contribute further to the discussions after the brainstorming day. The post-focus group discussions provided further information about potential current systems and integration with current databases and their functioning that could be included in the recommendations of the study.

The research team concluded from the synthesis of focus group expertise and discussions that a portfolio of projects is required to take the outcomes of the focus group to the next level. These projects should address some of the issues raised in the discussions in a way that will facilitate widespread stakeholder participation and input. The stakeholder input should address issues related to custodianship of the database that will address both the technical and communication issues related to reporting of personal data and the issues around capacity to sustain a system envisaged by the focus group.

Furthermore, the stakeholders' input should address the accurate and acceptable definitions and methodologies for measurement and reporting per occupational health condition. The issues relating to the legislation required to enable the use of an integrated IMS must be investigated in consultation with the industry stakeholders. Also, the consultations within the mining industry should help to identify what is currently achievable to facilitate the implementation of an IMS in stages.

It became evident from the focus group discussion that the survey tool that had been previously drafted by the research team was not a suitable survey tool and that in its current form the proposed survey tool would not facilitate the collection of relevant information that would inform the requirements for an IMS. The reason for this conclusion was that the survey tool was very lengthy and was aimed more at evaluating if the OHSMSs used at mines complied with ILO standards rather than identifying the requirements of the content of both the proposed Transactional and Master database as well as obtaining the views of stakeholders not included in the expert focus group as well as the reaction of the stakeholders in the mining industry to the views put forward by the expert focus group. The research team therefore revised the survey tool

to include perceived local mining industry needs and piloted the use of the survey questions at one MHSI regional office.

Survey of current practices and systems in mining industry

The study then conducted widespread surveys and semi-structured interviews with a representative sample of occupational health and safety managers or occupational medical practitioners or consultant medical surveillance providers, where relevant, to identify the available IMSs in all sizes of mines in a representative sample of commodities. The objective of the survey was to identify the current IMS in use and the practices, types of data captured, methods of transfer of data, the IT infrastructure available and the reporting methods used in the mining industry, as well as the needs of the potential users of an IMS in the mining industry that would facilitate proactive monitoring and management of occupational health issues at various levels of management and users. The survey was conducted at mines in the commodities of platinum, coal, gold, diamonds, uranium, titanium, aggregate, copper and marble in four small, four medium and ten large operations. The survey represents a total of approximately 100 mines/business units and approximately 200 000 mine workers.

Findings

Two main types of systems were found to be the current practice in the mining industry. The consultant system was found to be operating in the small mines and some of the medium-sized mines. Mines that follow this system outsource the medical surveillance process and the occupational hygiene measurement process to consulting companies. The two types of consultants are usually from separate companies. The consultant companies provide annual medical surveillance in mobile units and visit the mines at least annually to take hazard measurements. The consultant companies provide the mine manager with reports on the results and in some cases draw up the required regulatory reports for the mine manager. The records are usually kept in paper format at the mine. The consultants also keep electronic records of the medical surveillance results and the occupational hygiene measurements.

The second type of system was found in some medium-sized and all large mining operations. This type of system is used where the mining operation has internal systems for both occupational health and occupational hygiene. In general these systems were found to be well managed but they had varying degrees of integration of data. All surveyed operations had an awareness of the need for integrated OHSMSs.

All sizes of mines and OHSMSs had adequate IT access and capabilities for participation in a Transactional database and all had access to the internet. Small mine consultants would, however, require assistance with the costs related to reporting to a national system, the costs of such programmes and costs of download time on internet access.

One of the pleas from members of the focus group as well as from the mines was that new systems should not be developed since there are many systems available that can be used or potentially extended to provide the industry with an IMS that will allow for proactive monitoring as envisaged. Two potential systems currently in use that may provide a well-developed platform on which the IMS could be based were identified.

Survey of current practices and systems at Mine Safety and Health Inspectorate

The current study also surveyed six of the nine regional offices of the MHSI. Interviews were held with the occupational health inspectors in each region or representatives of their departments. The objective of the survey was to determine the available systems and current practices in the MHSI as well as the needs of the users of such a system. The survey also aimed at evaluating the requirements for a proactive monitoring and management system that could be integrated into

the South African Mines Safety and Health Administration (SAMSHA) system and where necessary other relevant databases.

Findings

The type of information collected by MHSI staff includes information relating to legal compliance inspections and audits at occupational health centres on the medical equipment used by these centres and the practices related to their use. MHSI health inspectors also inspect exit certificate records, mine emergency preparedness equipment, policies and procedures, injuries on duty records, tuberculosis (TB)-related records, HIV-related records, and registration records of occupational medical practitioners (OMPs), and occupational health nurses (OHNs). Hygiene inspectors collect information relating to the hazards in the workplace environmental conditions of the workplaces.

Challenges experienced by MHSI inspectors included lack of standardised criteria and useful audit tools to be used nationally for uniformity; lack of verification systems, e.g. access to laboratories to verify samples from mines for reliability and validity; lack of human resources and skills; budget constraints for inspectors; lack of computer-updated infrastructure, e.g. 3G cards to access the trends and area of focus in mines easily via internet before inspections are undertaken; and difficulty in obtaining data from some of the mines (especially the small mines).

Lack of computer infrastructure and regular and reliable access to the SAMSHA system was a commonly reported challenge for MHSI inspectors. Reports from the system administrator and training department of the MHSI indicated that a campaign is underway to provide all inspectors with laptops and 3G cards as well as to upgrade the access to the SAMSHA system. Once laptops and 3G cards are distributed and operational a number of the challenges reported will be alleviated. Integration of an IMS system with the SAMSHA system with standardised audit tools available and uploaded directly onto the system from laptops while at the mines would be the most efficient system.

Recommendations

The recommendations from this study are for:

- The establishment of a **dedicated, independent, expert** custodian appointed by the tripartite stakeholders in the South African mining industry to establish an IMS. The role of the custodian would be to receive raw data from mining operations' Transactional databases and to analyse the data and report it to a Master database that would provide stakeholders with performance data on occupational health issues at sector level. One of the initial goals of the custodian would be to pilot the use of existing systems as the basis for the IMS;
- The extensive presentation at **stakeholder workshops** of the Green Paper and the research findings to provide an opportunity for consultation and further discussions of the issues identified by the focus group and to garner support for the proposed system and for the benefits;
- Development of **health-related audit tools** for use by the MHSI for compliance evaluation; and
- Further **research on the necessary support** for the various sectors of the industry towards improving the OHSMSs used by operations in order to improve the quality of the data provided to an IMS.

Chapter 1 Background

Introduction

The proactive management of occupational health issues in the South African mining industry is a challenge as a result of the large number of workers and of the many variables in the environment. In order for successful management to occur it is essential that there is a link between personal medical surveillance data and health hazard exposure information. It is also essential that the data is reliable and relevant and that the systems used allow for proactive reporting and feedback to regulators and stakeholders in the industry. A proactive occupational health system must also facilitate data analysis for periodic epidemiological studies that will allow the industry to track the trends in occupational health issues.

The Mine Health and Safety Council (MHSC) project in 2007, SIM040907, on the capacity of mine occupational health databases to inform policy makers and stakeholders, clearly indicated that there is an urgent need to improve and develop systems that allow for a proactive management of health care. The CSIR Centre for Mining Innovation (CMI), in its preliminary research of how to meet this need, undertook a project entitled “Optimal Miner” in 2008 and 2009. The findings of this project clearly indicate the need for an integrated, comprehensive occupational health management system that is accessible from remote sites for reporting of information by mine occupational hygiene managers and occupational health medical practitioners.

Furthermore, the Mine Health and Safety Act no 29 of 1996 (MHSA) stipulates that occupational hygiene data and occupational health data must be integrated in a way that will improve the prevention of occupational diseases and injuries. The SIM040907 evaluation of occupational health databases, the CSIR Optimal Miner project and the SIM060601noise and dust baseline project, highlighted the fact that compliance on this aspect of the legislation is poor in the industry and that systems are not in place to facilitate the integration of information.

The previous research therefore indicates that monitoring compliance of mining companies with the legislation and best practice for occupational health issues should be part of a comprehensive system to manage these health issues proactively. Fortunately, despite the fact that the mining industry has specific needs and that some of the problems encountered are particular to the harsh mining environment, the proactive management of occupational health issues is not unique to mining and many other successful systems already exist in other industries and are commercially available. Meeting the identified need to develop systems for the mining industry can therefore benefit from considering previously developed systems and drawing on the strengths of previous experience.

The users of the proposed system would be varied and at remote and widespread sites such as regional Mine Health and Safety Inspectorate (MHSI) offices, central Department of Mineral Resources (DMR) offices, mines of all commodities and all sizes in all regions of the country, and research institutions and policy-making institutions. For this reason, any such integrated systems would need to be highly flexible and take cognisance of the different systems currently in place. The users of the system would also be varied in their skills and abilities to use the system and in the sophistication of technologies available. An investigation of the development of a comprehensive occupational health monitoring and management system would therefore need to ensure that all potential users’ needs were included in a cost-effective, user-friendly system to ensure the use of the system by all stakeholders in the industry. The first step in this process is the aim of the current research namely to begin to identify the system requirements for such a system.

Hypothesis

The hypothesis of this study was as follows.

If an information management **system** was in place:

- that allowed for a **link** between information about the worker during **medical surveillance** and the health hazard **exposure and monitoring** of the working environment; and
- that had **reporting** facilities that allowed for proactive feedback and met the needs of **all sizes** of mining companies; and
- that facilitated the **MHSI's monitoring** of occupational health issues,

then the mining industry would

- have **access to relevant and recent data**;
- be able to have **proactive management** of occupational health issues; and
- be able to conduct periodic epidemiological studies that would highlight the **trends** in occupational health issues.

The target market for the study was the MHSI staff responsible for monitoring occupational health issues and mine occupational health practitioners in all sizes of mines and all commodities and all stakeholders in occupational health and hygiene monitoring and management. The planned outcome of the project was a prioritised strategic plan for the development of a functional monitoring and management system for occupational health issues that would provide research data and information for policy, legislation and best practice.

Objectives

- To conduct a literature review of both national and international systems for proactive monitoring and management of occupational health issues in the mining industry, with particular reference to developing countries and small- to medium-sized mines;
- To conduct a focus group with experts in the field of occupational health monitoring and management and mining stakeholders to determine the necessary requirements of a comprehensive system that will facilitate the proactive monitoring and management of occupational health issues in the mining industry;
- To conduct a comprehensive survey of the current practices and systems and processes in the South African mining industry to determine the available systems and the needs of the potential users of a system that will facilitate the proactive monitoring and management of occupational health issues;
- To conduct a comprehensive survey of the current practices and systems and processes in the MHSI to determine the available systems and the needs of the users of a system that will facilitate the monitoring of occupational health issues in the mining industry;
- On the basis of the outcome of the literature review, survey and focus group, to make recommendations for the development, piloting and implementation of an occupational health monitoring and management system for the South African mining industry;
- To report on findings and recommendations to the MHSC; and
- To compile a proposal and recommendations for the future of the project.

Chapter 2 Literature review

Introduction

SIM 10-09-03 had as the first enabling output a literature review that investigated the previous work conducted in this field that would inform the recommendations made on the best practice for proactive management of occupational health issues in the mining industry.

The activities related to this enabling output were:

1. Conduct a literature review of both national and international systems for proactive monitoring and management of occupational health issues in the mining industry, with particular reference to developing countries and small- to medium-sized mines;
2. Conduct an in-depth internet search and literary review and evaluation of occupational health monitoring and management systems available and in use nationally and relevant to the South African mining industry;
3. Conduct an in-depth internet search and literary review and evaluation of occupational health monitoring and management systems available and in use internationally that are relevant to the mining industry. In particular investigate systems used by the Finnish health department, Australian health department, WHO/Ottawa Charter and all relevant systems; and
4. On the basis of the literature review, develop a survey protocol for use in the next phase of the study.

In order to begin to achieve the planned outcome of a prioritised strategic plan for the development of a functional monitoring and management system for occupational health issues that will provide research data and information for policy, legislation and best practice, an in-depth review of the systems described and used both in South Africa and internationally is required. This chapter outlines the methodology and the findings of the national and international literature review.

Methodology

A desktop review was conducted of electronic databases of primarily peer-reviewed research journal articles The search terms used in the search were customised for each database. The search strategy keywords used were OHSMS terms such as “health and safety management system(s)”, “systematic occupational health and safety management”, “OHS programme(s)”, and “occupational health/safety standard(s)/legislation”. Other keywords included OHS terms such as “workplace injur(y/ies)”, “occupational exposure”, and “occupational accident compensation cost(s)”.

Different sources of published and unpublished research literature were searched to locate studies relevant to OHSMS requirements and interventions. Searches were conducted using the following core databases:

- Academic search premier
- Science direct
- Scopus
- Medline (Pubmed)

- CINAHL with full text
- Health source & Nursing: Academic Edition
- Google Scholar

Results of literature review

The literature review indicated some general theoretical concepts about systems to proactively monitor and manage occupational health issues in general which have been summarised in the background section.

The positive impact of introducing OHSMSs at the organisation levels, both for the reduction of hazards and risks and for productivity, is now recognised by governments, employers and workers. An OHSMS is a framework that allows an organisation to identify and control its health and safety risks, reduce the potential for accidents, and help achieve compliance with health and safety legislation consistently, and continually improve its performance.

Several definitions of occupational health and safety and occupational health services have been produced by professional bodies, international organisations such as the World Health Organization (WHO) and the International Labor Organization (ILO) and national bodies and authorities. From the definitions found in the literature, occupational health can be considered to consist of multidisciplinary activities that aim at:

- Protection and promotion of the health of workers by preventing and controlling occupational diseases and accidents and by eliminating occupational factors and conditions hazardous to health and safety at work;
- Development and promotion of healthy and safe work, work environments and work organisations;
- Enhancement of physical, mental and social wellbeing of workers and support for the development and maintenance of their working capacity, as well as professional and social development at work; and
- Enablement of workers to conduct socially and economically productive lives and to contribute positively to sustainable development.

The advantages of implementing an OHSMS in an organisation have been listed as:

1. A safer workplace – an OHSMS enables the organisation to identify hazards, assess risks and put in place the necessary risk control measures for preventing accidents;
2. Morale – implementing an OHSMS shows a clear commitment to the safety of the organisation's staff and can contribute to a more motivated, efficient and productive workforce;
3. Reduced costs – fewer accidents mean less expensive downtime for any organisation. In addition, having an OHSMS in place is likely to improve the organisation's insurance liability ruling;
4. Training – an OHSMS highlights whether or not the employees in any organisation are competent for the task they are performing, which impacts on teamwork and provides an indication of the type of training needed;
5. Monitoring – the regular assessment process will help in continually monitoring and improving the health and safety performance of the organisation;

6. Integration of systems – the OHSMS aims to be easily integrated with other management systems; and
7. Stakeholders' confidence – an independently assessed OHSMS tells the organisation stakeholders that the organisation itself has met a number of legal and regulatory requirements, giving stakeholders confidence in the organisation.

Different approaches to integration of the OHSMS, with various levels of ambition, have emerged and these range from increased compatibility of system elements to an embeddedness of an integrated management system in a culture of learning and continuous improvements.

In order for organisations to create competitive advantages for themselves and to remain sustainable the OHSMSs that are implemented have to include the whole product chain and all the stakeholders (Jørgensen, 2006).

The most important and relevant outcome of the literature review relating to the current project is the finding that recording, reporting, notification and investigation of work-related injuries and diseases, ill health and incidents are essential for proactive monitoring and should be undertaken to:

- Provide reliable information about occupational accidents and diseases at facility and national level;
- Identify major safety and health problems arising from mining activities;
- Define priorities of action;
- Evolve effective methods for dealing with occupational accidents and diseases; and
- Monitor the effectiveness of measures taken to secure satisfactory levels of safety and health.

Recording, reporting, notification and investigation of work-related injuries and diseases will form the basis of the management system for the South African mining industry being investigated by the current study.

The aim of the literature review was to identify and evaluate systems that are available and in use both on an international level and locally in South Africa. The findings of the literature review at these two levels are reported in the following sections.

Occupational health monitoring systems in South Africa

The review relating to occupational health and hygiene monitoring systems in South and Southern Africa highlighted the developing nature of the Southern African region and how increased world trade has generally benefited industrialised or strong economies and marginalised those that are weak. Occupational illnesses are often not adequately recognised as a problem in low-income countries. Particularly in poorer countries those outside the workplace are also affected through, for example, the impact of the occupational disease on the bread winner or work-related environmental pollution and poor living conditions. Lowenson (2006) advocates that in order to reduce the adverse effects of global trade reforms on occupational health, stronger social protection measures must be built into production and trade activities, including improved recognition, prevention, and management of work-related ill-health (Lowenson, 2006). Furthermore, the success of production and trade systems should be judged on how well they satisfy both economic growth and population health.

The in-depth internet search and literature review and evaluation of occupational health monitoring and management systems available and in use nationally, and that may be relevant to the South African mining industry, identified the systems outlined below.

Computerised Health and Environment Surveillance System (CHESS)

CHESS was developed by occupational medicine practitioners (OMPs) to provide companies that have a large diversity of hazards and operating complexity, and needs in the occupational health field with a proactive management system. Initially an occupational management system called Synergee™ was developed, which incorporated the "How to" and standardisation of occupational health variables as well as management and analysis of the occupational health data, and these methodologies were later built into the CHESS™ IT platform.

CHESS can be used as a "stand-alone" occupational health IT system; however, in order to deliver a complete occupational health programme the distributors advise the use of the extended Synergee Occupational Management Systems, which include training and auditing programmes. Synergee facilitates the alignment of the client's occupational health programme with the OHSAS 18001 Management System. Using CHESS facilitates the adoption of "best practices" as well as standardisation across business units. CHESS integrates inputs from occupational hygiene and safety programmes into the occupational medicine practice. Occupational health parameters are captured and value is added, not just in the high-end analysis of information and statistics but in the identification of issues, exception management, the closing of management loops, the directing of recommended/prescribed interventions, and the educating of employees and service providers through "Patient Information Leaflets" and other education packages.

CHESS requires the maintenance and integration of four key datasets: the "Organisational Structure" (usually the responsibility of the Human Resources (HR) Department), the "Risk Area Structure" (usually the responsibility of Risk Management or Operations), the "Tasks" and the "Hazards".

The first two datasets are the main hierarchical structures, to which other relationships are attached. The first main structure is the Organisational Structure database. This contains the list of positions (employees) in the company, by section and department. The positions are placed in a hierarchical structure along reporting and departmental lines. This provides the link between individuals and their positions.

The second is the Risk Areas database. This contains the list of "Tasks" in the company, maintained in a structure that is totally separate from the Organisational Structure. Instead of departmental reporting lines, the Risk Area Structure is determined by functional business processes. To these "Tasks", listed by "Risk Areas", are allocated the "Positions" (people) that perform them, and the "Hazards" to which these employees are potentially exposed while they perform the tasks.

The other two datasets are the Tasks and the Hazards databases. In the Tasks database are the activities that are performed by the Positions (people) in the various Risk Areas (business processes) of the company. It is these tasks that result in employees being exposed to hazards. Therefore, "Health Risk Assessments" are recorded against the Tasks to which they apply. In the Hazards database are the agents/circumstances that have the capacity to cause harm. These hazards are assessed through a two-phase process of "Hazard Identification" (a brief evaluation that evaluates the probability of an adverse event taking place) and "Risk Assessment" (a more detailed assessment of the nature of the exposure and the controls in place).

The CHESS system appears to contain all the necessary requirements for the development of an information management system (IMS) and proactive monitoring of occupational health issues in the mining industry; however, the fact that it is a licensed product will require collaboration on intellectual property.

Organisational risk evaluation for occupational health stressors (OREOHS)

A second occupational health monitoring and management system available identified as relevant to the South African mining industry is that developed by the CSIR, CMI, known as **Organisational risk evaluation for occupational health stressors (OREOHS).**

The first stage of the development of the OREOHS system took place in CSIR “Optimal Miner” project, and was aimed at the identification of all the factors that contribute to an employee's overall wellbeing (including medical, social and psychological wellbeing) and, therefore, his/her potential to contribute in a productive manner to the South African economy. The project investigated the possibility and required scope of a generic quantifiable strategy to address occupational health management in a holistic and multidisciplinary manner.

The background to the Optimal Miner project was that by 2008 when the project was begun internationally and nationally prolific amounts of research had been conducted on numerous occupational health stressors, but occupational diseases and injuries were still prevalent. The CSIR team hypothesised that this might be because occupational health stressors were being researched and addressed in isolation, but the human exposed to the risk still worked in the work environment containing all the other occupational health stressors.

The suggestion was that to manage occupational health risk effectively to within acceptable levels and hence optimise a worker’s output requires a holistic and multidisciplinary look at the workplace. Sciences such as medicine, hygiene, physiology, psychology, engineering, social, materials, information gathering, information management, and computational intelligence need to be incorporated into a holistic approach to worker performance and wellbeing in the workplace. Each of the individual intervention elements which will form part of the solution is potentially intricate, making their interactions multifaceted. This makes for a very complex interactive system, making it difficult to identify which intervention elements have an impact on the worker, and how this impact is achieved. The complexity of the system, a lack of funding, or an inappropriate focus of funding could be a reason that occupational health interventions have not had the desired impact in the past.

This project therefore aimed to develop a system/technology/tool/strategy to integrate all potential intervention elements of an occupational health stressor in such a manner as to provide an optimal quantified resolution to address the risk. The typical factors of specific intervention elements that are suggested by the research as needing to be taken into consideration are, for example, the cost of the intervention development and implementation, the impact (perceived or quantified), confidence in intervention impact measurement, the probability of success of specific intervention, interaction with other interventions and time from conception to having impact.

As a second phase of the Optimal Miner project, the OREOHS system was developed. OREOHS was developed mainly for small-scale mining managers with little knowledge of or expertise in occupational health stressors or safety issues. (The OREOHS tool has not been validated for large-scale mining industries.) OREOHS was aimed at managing information obtained from occupational hygiene measurements and occupational health results of occupational health stressors. The use of OREOHS assists a manager in the process of prioritising occupational health issues.

OREOHS is made up of checklists that evaluate the health stressor of occupational noise, respirable silica dust, thermal stress (heat and cold stress), and ergonomic stress factors. The OREOHS flow charts outline the factors that must be taken into account in an evaluation of interventions' effectiveness, based on appropriate key indicators and valid criteria. The system uses work task, workplace and the individual as a basis. The risks for five predominant health risks are then interrogated for the influencing factors. Figures 1.1 to 1.7 below give an overview of the OREOHS system.

The factors outlined in OREOHS could provide the necessary content for a mining IMS for occupational health issues.

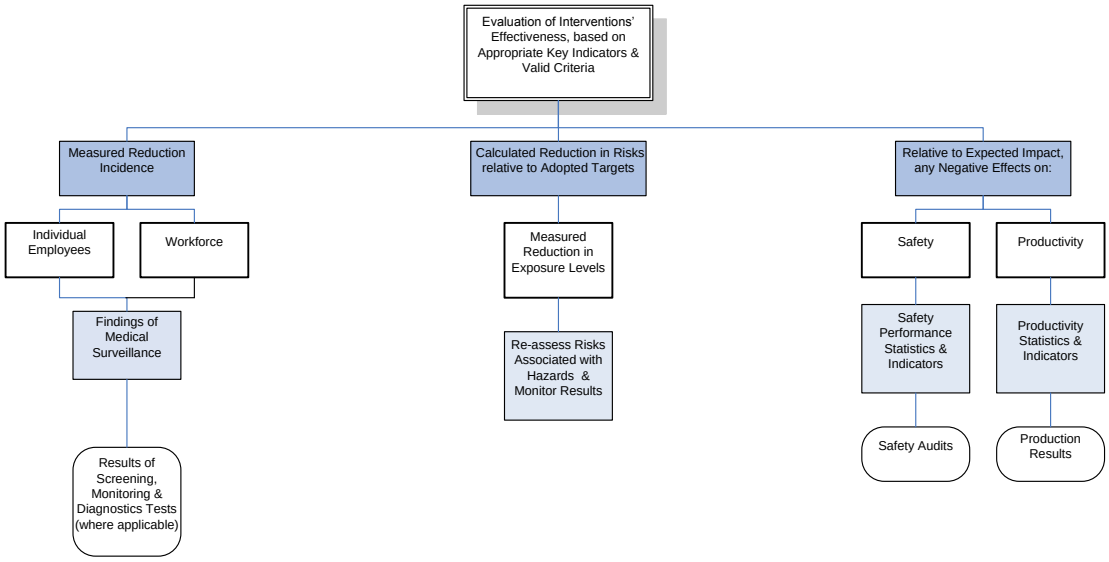

Figure1.1: OREOHS evaluation of intervention effectiveness based on key indicators and valid criteria

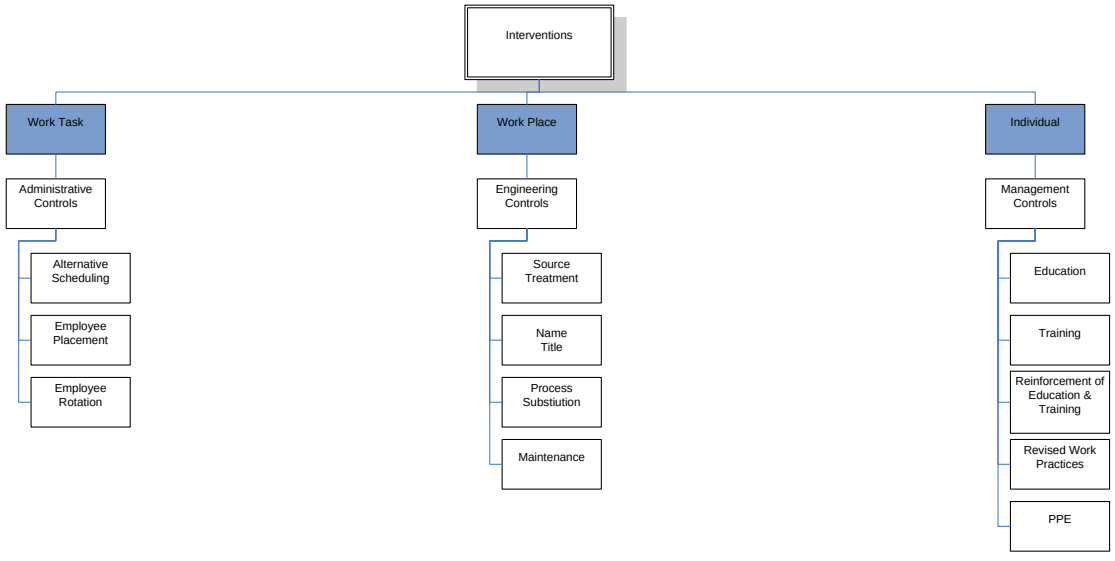

Figure 1.2: OREOHS flowchart of occupational health interventions

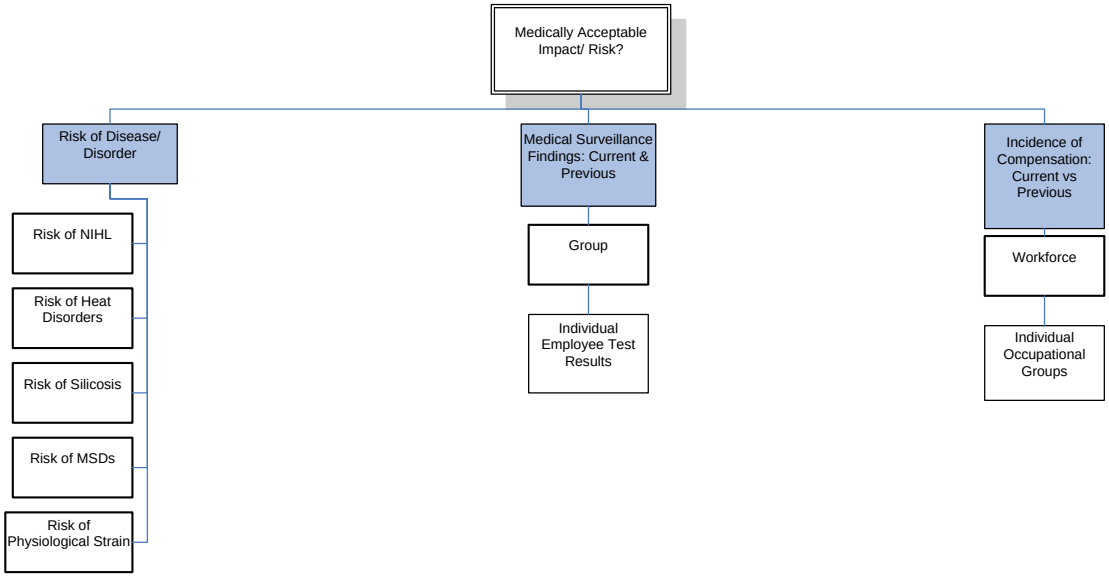

Figure 1.3: OREOHS flowchart of medically acceptable risk for occupational health issues

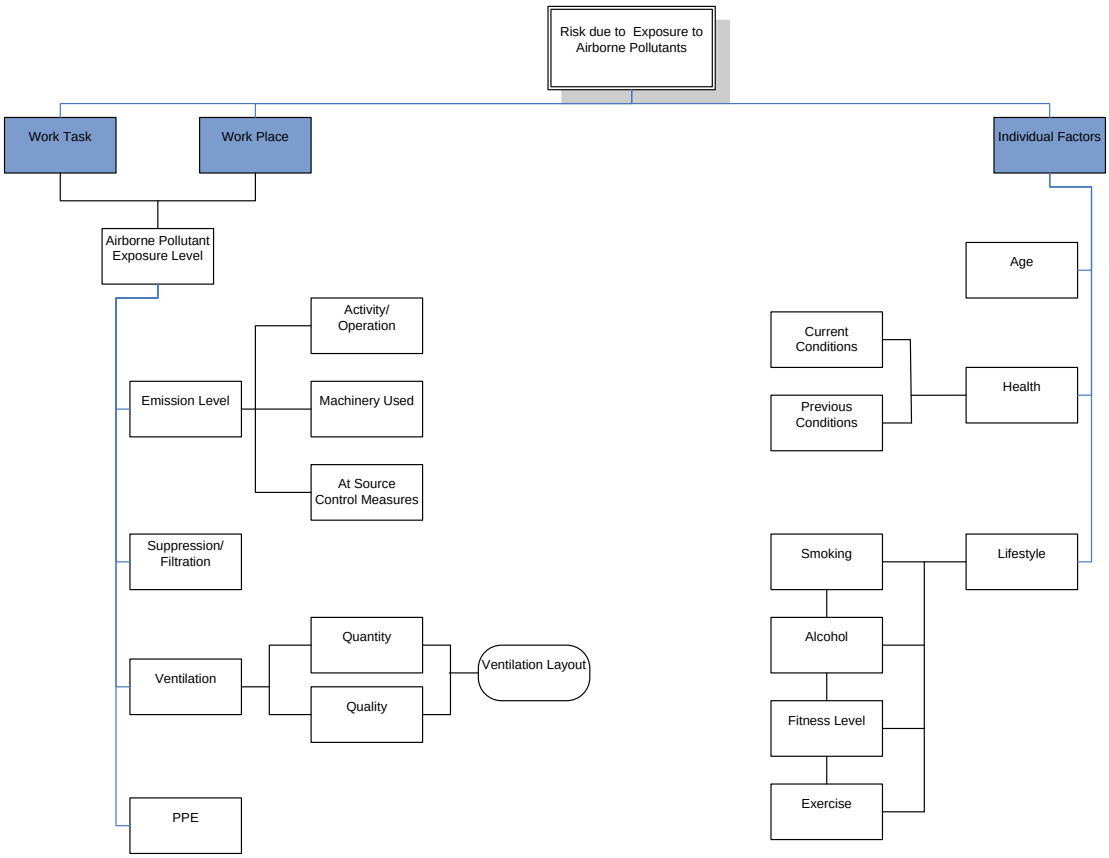

Figure 1.4: OREOHS flowchart on managing risks due to airborne pollutants

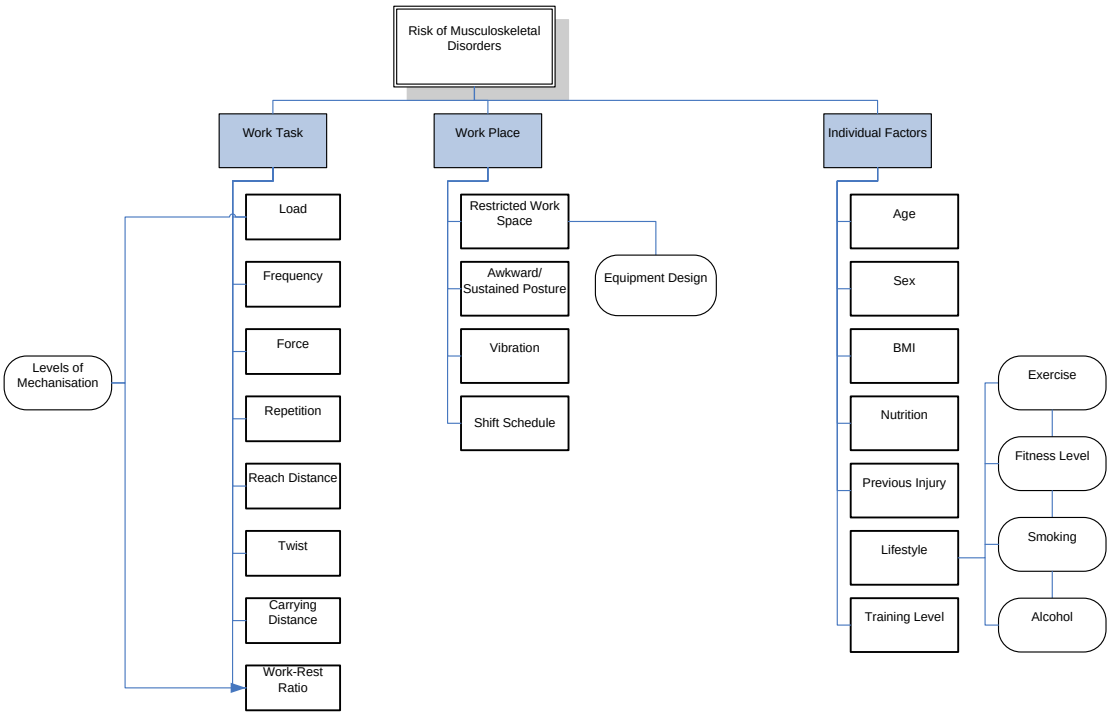

Figure 1.5: OREOHS flowchart of management of risks due to musculoskeletal disorders

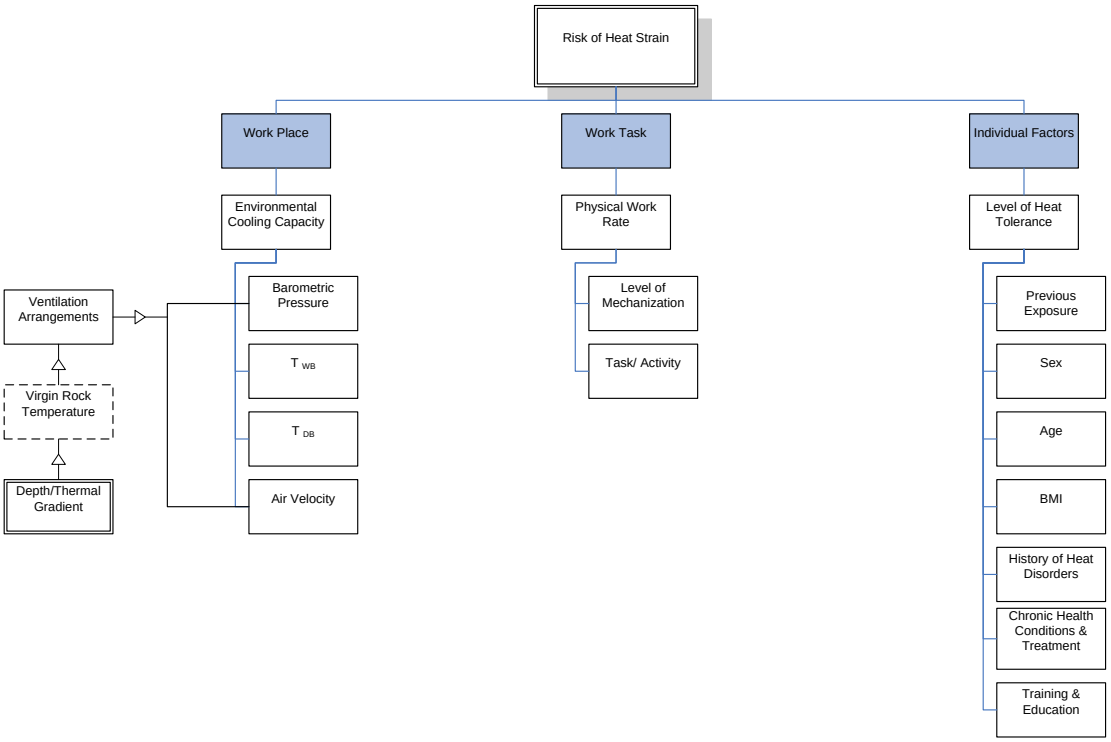

Figure 1.6: OREOHS flowchart of management of risks related to heat stress

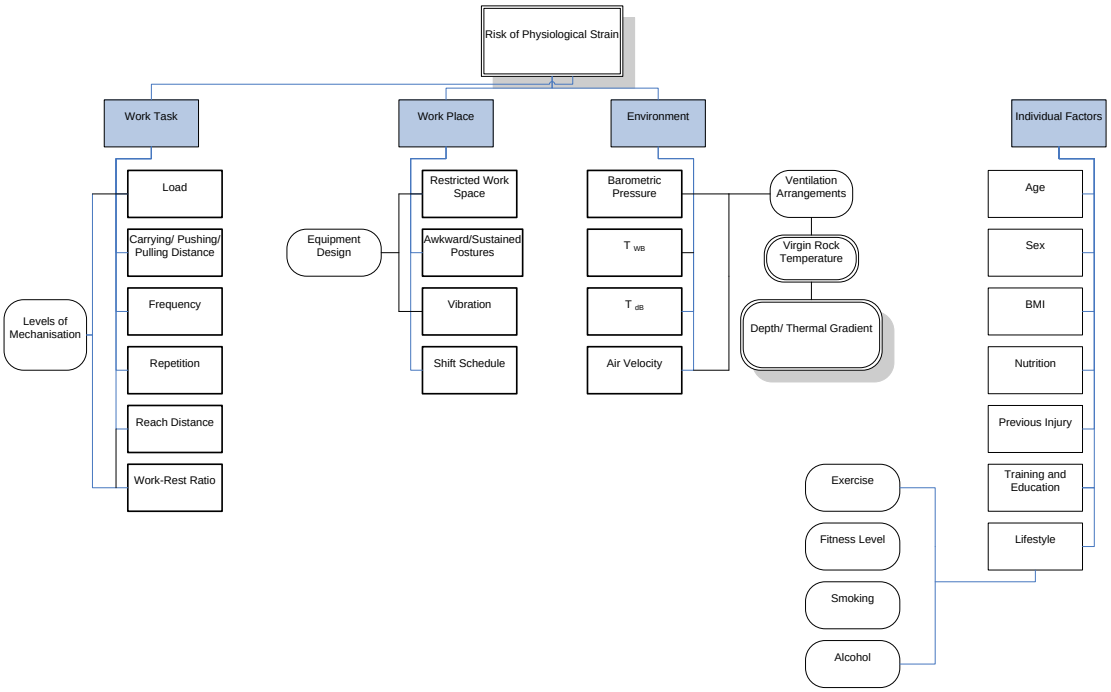

Figure 1.7: OREOHS flowchart of management of risk due to physiological strain

The checklist concepts that are available in the OREOHS system could provide the basis of audit tools for the MHSI to evaluate compliance on health-related issues and would provide information about where and how the DMR could support the industry to improve practices relating to the health of the workforce. The OREOHS system could prove especially valuable in the small- to medium-sized mines.

International occupational health monitoring systems

The following section reports on the main points obtained from the internet search and literature review and evaluation of occupational health monitoring and management systems available and in use internationally that may be relevant to the mining industry in South Africa. Much of the available literature does not pertain to the mining industry as such but highlights the factors and variables that should be noted for the requirements of an occupational health monitoring system.

World Health Organization

The Ottawa Charter for Health Promotion is a 1986 document produced by the World Health Organization. It was launched at the first international conference for health promotion that was held in Ottawa, Canada. The Charter encompasses health promotion in various settings, including the workplace, and the mining industry is no exception. The Charter identifies the prerequisites for health; methods to achieve health promotion through advocacy, enabling and mediation; as well as five key action areas.

The Ottawa Charter for Health Promotion states that “health is created and lived by people within the settings of their everyday life, i.e. where they learn, work, play and live” (WHO, 1998).For this

project the Charter can be used to provide a strategic framework within the working context in order to recommend processes and interventions that will facilitate the prevention of occupational diseases and injuries in the South African mining industry. The Ottawa Charter for Health Promotion through providing such a strategic framework generates living and working conditions that are safe, stimulating, satisfying and enjoyable. These conditions can be effectively achieved through the identification of key action areas/processes, possible barriers and relevant solutions and can only be achieved through an integrated and coherent system that promotes the health, safety and wellbeing of workers in the mining industry.

International Labor Organization

The literature review established that a process has occurred over the past number of years in international standards bodies that has contained the evolution of OHSMS on the international front. The evolutionary process is outlined in the following discussion. The literature review findings on the practices in various countries are then discussed in the ensuing sections.

Although there are formal international standards for managing quality (ISO 9000) and environment (ISO 14000), there is no recognised International Standardisation Organisation (ISO) certifiable standard for occupational health and safety management. ISO has been wary of becoming involved in occupational health and safety. At an ISO Workshop in 1996 it was concluded that the time was not right for an occupational health and safety management standard. Later in 2000 ISO rejected an approach from the ILO regarding an international standard. Consequently, reviewing over 20 national occupational health and safety management systems the ILO developed its own non-certifiable guidance, “Guidelines on occupational safety and health management systems – ILO-OSH 2001”.

The policy section of the ILO guidelines covers both the occupational safety and health policy and worker participation. The organising section covers responsibility and accountability, competence and training, and documentation and communication. The planning and implementation section covers initial review, system planning, development and implementation, safety and health objectives and hazard prevention (prevention and control measures, management of change, emergency prevention, preparedness and response, and procurement and contracting). Evaluation covers performance monitoring and measurement; investigation of work-related injuries, ill health, diseases and incidents, and their impact on safety and health performance; and audit and management review. Action for improvement covers preventive and corrective action and continual improvement.

Although the ILO did not intend to make the standard certifiable, the Chinese government has adopted the ILO system and has used it to develop a certification framework. The increasing pressure to report performance and demonstrate corporate responsibility coupled with the popularity of ISO 9000 and ISO 14000 has led to a growing interest in OHSAS 18001 as an OHSMS system. In the absence of an official ISO standard, OHSAS 18001:2007 has in effect become established as an “international certification standard”. International certification bodies and national standards bodies in the United Kingdom (UK), Ireland, South Africa, Spain and Malaysia are using OHSAS 18001 for certification purposes. It is estimated that currently some 32 000 organisations in 82 countries have adopted OHSAS 18001 as an OHSMS.

The choice of which system to adopt depends on the needs of individual organisations. However, organisations need to ensure that their chosen system includes provision for continual improvement, involves stakeholders and auditing and is well documented in order to demonstrate effectiveness. If an organisation already has accreditation under BS EN ISO 9001 and BS EN ISO 14001 it may consider adopting BS OHSAS 18001:2007 as part of an integrated approach.

BS OHSAS 18001:2007 is designed to be compatible with these standards for quality and environmental management systems.

By using one of the above occupational health and safety management systems, organisations are able to demonstrate legislative compliance and their commitment to health and safety and improved standards in the management and control of risk. As a direct outcome there should be a reduction in accidents, ill-health, insurance claims, and downtime, and an increase in overall cost savings.

Canada

In Canada, in 1996, a national registry for the surveillance of fatal farm injuries was established. Information regarding the deaths of farm workers was collected, coded and disseminated by means of a formal data collection protocol that allowed for the gathering of case report information and the insertion of grouped work-related death causes into provincial registries. Information for these registries was gathered from coroners' reports, Canadian police reports, and occupational health and safety agency investigation reports. Despite the assumed awareness among farmers of the importance of agricultural health and safety regulations, it was found that there was an inherent resistance to this implemented legislation, as evidenced by the number of deaths reported (Pickett et al., 1996). The reasons for this resistance was not reported in the article but may be an important factor to investigate with regards the effects of the perceived intent of the legislation and the resistance to implementing the legislation in the mining industry.

United States of America

Many American-developed OHSMSs have been reported over the years in the research and management literature. The reports that were evaluated by the research team to be relevant to the South African mining industry are reviewed below.

Fatality Assessment and Control Evaluation (FACE) Program

The Fatality Assessment and Control Evaluation (FACE) Program is responsible for the identification of work-related fatal injuries in Washington State, and the tracking of on-site investigation into and the distribution of information about these fatal injuries. Information collected by the programme is used to develop hazard-specific and root-cause traceable recommendations to help prevent work-related fatal injuries. This information is compiled from the Bureau of Labour Statistics, the Washington Industrial Safety and Health Act (WISHA), public safety officials, newspapers and medical examiners/coroners. After an incident investigation has been completed, the report is distributed to the employer, the deceased family, labour unions, health and safety professionals, National Institute of Safety and Health (NIOSH) and appropriate business associations.

Originally developed as an in-house operation at NIOSH in 1982, the programme aims to prevent occupational fatalities in industry through investigation of high risk work situations, followed by the formulation of interventions in the workplace. Although targeted at deaths associated with 18-year-old (or younger) Hispanic workers in the machinery and construction industry, there is capacity for inclusion of aspects of this system within broader occupational health and safety programmes. In 1989 FACE expanded its borders and is now a state-based programme. Nine state health and labour departments are now involved in the FACE Program.

Safety and Health Assessment & Research for Prevention (SHARP)

Safety and Health Assessment & Research for Prevention (SHARP), developed in 1990, is the primary research programme in the Washington State that receives federal funding to track

occupational illnesses and injuries. SHARP also conducts in-house, long-term, industry-wide studies to determine the relationship between workplace exposures and the occurrence of illness and injuries. SHARP aims to develop workplace interventions in partnership with business and labour.

SHARP has a set of MUSTCURE criteria which are taken into account when investigating the relevance of a problem in terms of its health and safety risk. Each criterion is ranked in terms of its importance: low, medium or high. These criteria are as follows: magnitude of the problem being addressed; urgency of the problem; seriousness of the hazard or injury; technology transfer opportunities; cost of the injury/illness being addressed; under reporting potential; research gaps; and emerging or growing hazard, illness or injury.

United Kingdom

Legislation in the UK requires that employers have appropriate arrangements in place for the management and control of health and safety at work. There are a number of OHSMSs which are recommended by the Health and Safety Executive (HSE), including the HSE Guidance Booklet HS(G)65 "Successful health and safety management", the British Standard BS OHSAS 18001:2007 "Occupational health and safety management systems – Requirements" and the International Labour Office ILO-OSH 2001 "Guidelines on occupational safety and health management systems". Each of these management systems is based on the "plan-do-check-act" management model and embodies the principle of continual improvement as exemplified in the British Standard for quality assurance systems.

The first published "Successful health and safety management" booklet, HS(G)65, in 1991, and the revised edition, published in 1997, take the "plan-do-check-act" management model and translate it into the five key elements of a successful health and safety management system. The five elements are:

- Policy
- Organising
- Planning and implementing
- Measuring performance
- Reviewing performance

These elements are interlinked and are subject to auditing. In this occupational health and safety management model the policy should set out a clear direction for the organisation to follow. It should demonstrate the organisation's intention to achieve and maintain high standards of health and safety and the commitment to continuous improvement. The policy should establish the health and safety management system and the responsibilities for achieving its objectives.

Organising for health and safety requires both management and employees to be actively involved and committed to the policy. This participation can be achieved by ensuring management control, the effective co-operation of employees and their safety representatives, the establishment of an effective safety communication system, the co-ordination of activities and the competence of all employees (HSE, 2009).

Following the introduction of the Management of Health and Safety at Work Regulations in 1992, it is reported that there was a demand for guidance on good practice for the establishment of occupational management systems. As a result the British Standards Institution (BSI) published the guidance document BS 8800:1996 "Guidance on occupational health and safety management systems", which was updated in 2004.

The publication of the guideline reportedly led to a need in commercial organisations for the preparation of a “specification” against which organisations could be audited and could obtain third party certification. As a result the British Standard Institute (BSI), in association with other national standards bodies, certification bodies and specialist consultancies, developed the Occupational Health and Safety Assessment Series document OHSAS 18001:1999 “Occupational health and safety management systems- Specification”.

The OHSAS 18001:1999 has been used extensively in over 70 countries worldwide and was revised in 2007 for worldwide application (OHSAS 18001:2007) and has been adopted in the UK as British Standard BS OHSAS 18001:2007 “Occupational health and safety management systems requirements”. Organisations are able to achieve accredited certification under this standard.

The management model used in BS OHSAS 18001 requires that the occupational health and safety (OH&S) policy must state the overall objectives and a commitment to the prevention of injury and ill health and to continual improvement in OH&S management and OH&S performance, all of which should be defined and authorised by top management. BS OHSAS 18001 stipulates that planning should include: hazard identification, risk assessment and risk controls; legal and other requirements; and objectives and components of the OH&S management programme. This programme should describe how the organisation establishes and maintains systems and procedures for achieving its objectives.

The standard also stipulates that implementation and operation of an OHSMS include: resources, roles, responsibility, accountability and authority; competence, training and awareness; communication, participation and consultation; documentation; control of documents; operational control; and emergency preparedness and response. Furthermore, BS OHSAS 18001 requires that checking and corrective action relates to: performance measurement and monitoring; evaluation of compliance; incident investigation, non-conformity, corrective action and preventive action; control of records; and internal audit. Finally, the management review for BS OHSAS 18001 requires the organisation’s top management to review the OH&S management system at fixed intervals to ensure its continuing suitability, adequacy and effectiveness.

BS OHSAS 18001 has two annexures which draw comparisons between BS OHSAS 18001:2007 and the standards for environmental management systems and quality management systems and the ILO-OSH Guidelines. The annexures demonstrate that there are no significant differences between any of these management systems. The requirements of the common elements used in all the systems show a large degree of overlap and most are common requirements. The differences between BS OHSAS 18001 and the environmental management systems and quality management systems standards relate largely to scope and the specific needs of OH&S requirements compared to those relating to quality and the environment. The distinction between BS OHSAS 18001 and ILO-OSH 2001 is mainly in the order in which the elements are addressed and seems to suggest common or similar content.

Detailed guidance on how to implement BS OHSAS 18001 is given in the second British Standard in the OH&S Management Systems Series, BS OHSAS 18002:2008 “Occupational health and safety management systems –Guidelines for the implementation of OHSAS 18001:2007”. A third British Standard in the OH&S Management Systems Series is BS 18004:2008 “Guide to achieving effective health and safety performance”. This new standard is a revision of the former guidance document BS8800:2004 and is based on BS OHSAS 18001. It contains guidance on occupational health and safety management systems and can be used either as a stand-alone document to help establish a management system or as part of a programme under BS OHSAS 18001 to seek accredited certification.

China

Shan Chunchang, cited in Pringle and Frost (2003), states: “workplace safety...is impeded by two broad deficiencies, the absence of rigor and the failure of implementation.” Chunchang is referring to the deficiencies of occupational health and safety in China, yet the stated enormity of the gap between what should theoretically be happening in industry in terms of workplace safety and what is happening in practice can be applied to the situation in the South African mining industry. Key laws and practices need to be implemented that, within reason, keep the particular focus on the rights and responsibilities of the workers.

Pringle and Frost (2003) write of a lack of clear demarcation of responsibilities within the Trade Union Law of China. Responsibility for the smooth functioning of the *san tongshi* system should lie with the local inspection department or the local government officials but there is no clear indication as to which department has this responsibility. The government leaders are reported to be responsible for ensuring safety in key focus projects and workplaces, while State Council is responsible for updating safety standards and requirements. Pringle and Frost (2003) report that perhaps the biggest problem lies in the fact that even the senior officials do not seem to grasp fully the planned reforms of the government bureaucracies.

Furthermore, it is the responsibility of both state-owned and private employing units to adopt managerial roles in the OHSMS in terms of planning, organising, directing and co-ordinating of activities; to ensure that all departments are linked to and administer a bonus-and-punishment system related to all aspects of occupational health; and to halt all production temporarily in order to rectify occupational health problems. China’s Company Law lists the chair of the board of directors as ultimately responsible for occupational health. If the chair in turn appoints a managing director, then he/she is responsible for the company’s occupational health.

Ultimately, the challenges that lie in occupational health implementation within China stem from an overload of laws and regulations enforced on employers and employees (Pringle & Frost, 2003). The complexity of the regulatory environment is proven by the very fact that during the period of 2000-2001, the State Council Central Office released 184 rules and regulations, the departments and ministries released a further 135, and the provincial departments released another 107 (Pringle & Frost, 2003).

OH&S in the construction industry are of grave concern around the world and the adoption of OHSAS 18001 is reportedly low in construction firms in China. A recent study (Zeng et al., 2010) investigated this hypothesis and found that the occupational health and safety status in the construction industry in China is not well implemented or integrated.

Lithuania

The Ministry of Labour and Social Affairs in collaboration with the Ministry of Health Care carries out the activities aimed at solving occupational health and safety problems in Lithuania. The occupational health care system in Lithuania consists of three levels: 1) primary occupational health centres in the industry; 2) general practitioners taking care of employees' health; and 3) the State Labour Inspectorate. The second level includes regional occupational medicine centres that are located in the three major cities of Lithuania: Vilnius, Kaunas and Klaipeda. Hygiene investigations of workplaces and prophylaxis of occupational diseases are performed by regional Public Health Centre Departments of Occupational Medicine. The third level is provided by the Lithuanian Centre of Occupational Medicine in Vilnius and the State Commission of Medical and Social Examination. The complicated cases of occupational diseases are treated in specialised departments of the university clinics. The real situation of work safety is not good. About 600 cases of occupational diseases and over 2 500 accidents, including 60 fatalities, are registered annually (Januskevicius, Vidmantas,Telksniene & Ruta,)

Japan

A recent study to investigate the status of OHSMS in Japan sent questionnaires to all listed company sites that had been certified to be following the guidelines on OHSMS of one of three accrediting bodies: the Japanese Ministry of Health and Labour; the Japanese Industrial Safety and Health Association, or the Occupational Health and Safety Assessment Series (OHSAS) 18001 (Mori et al., 2006). The study found that although comprehensive occupational health services were provided to workers in Japan, the rates at which they were operated within an OHSMS were quite different between programmes. The reasons given for low rates of implementation were low technical resources or low financial resources.

Brazil

Brazil is the world's fifth-largest and sixth-most-populous nation. The Brazilian economy is varied, with strong manufacturing, agriculture, mining, and service sectors. Therefore, a wide variety of workplace hazards confronts its work force. This section describes Brazil's occupational safety and health regulatory scheme, workers' compensation system, plant-level practices, training, and data collection. The Brazilian regulatory legislation and government and non-governmental organisation (NGO) activity in occupational safety and health were reviewed and analysed, as were the structure and function of the workers' compensation system. Available data on injuries and diseases from major sources was reviewed, including the now-defunct Instituto Nacional do Previdencia Social (INPS) and the workers' compensation scheme, Seguro Acidente de Trabalho (SAT). The review revealed that the incidence of workplace injuries has decreased in recent years and is now reported to be about five per 100 workers per year. Less than 6% of reported injuries are classified as "diseases". Brazil's rates are comparable to those of Mexico and Zimbabwe, and are two to four times higher than in most industrialised countries. Brazil has a high incidence of occupational injuries and diseases; these injuries and diseases are underreported; and Brazil illustrates the disparity that exists in many countries between legislation on the books and legislation that is actually implemented (Frumkin, de M. Camara & Volney, 1991).

Finland

In Finland, a combination of systems is used for collecting occupational disease data: physicians are legally obliged to notify the Labour Inspectorate and insurance companies of cases of occupational disease, and data from both of these sources is forwarded to the Finnish Institute of Occupational Health (FIOH), which maintains the Finnish Register of Occupational Diseases (FROD), which was established in 1964. The employer can apply for reimbursement for occupational health services' costs from state funding. The amount of the reimbursement depends on the content of services:

- 60% reimbursement towards the costs of workplace assessments, medical check-ups and other preventive activities; and
- 50% reimbursement towards the costs of general practitioner (GP)-level medical treatment.

The costs remaining after state reimbursement are tax deductible for the employer. Employees do not incur any costs for using occupational health care services.

The FIOH in Helsinki also functions as a national diagnostic centre for occupational diseases and as the occupational medicine clinic of the Helsinki University Central Hospital, in this way enabling the collection of large databases of occupational health data. The objective of the FROD is to serve as a source of statistics on occupational disease and to promote research on occupational health. Information from the two sources is combined and checked to prevent

duplication of cases (FIOH, 2004). The system is not involved with compensation, and therefore does not have to wait for compensation decisions.

Despite the sophisticated systems in Finland, there are challenges to drawing a complete profile of occupational diseases: cases are missed because a) many physicians are not trained in occupational medicine and fail to make the occupational connection, and b) despite the legislative requirement to do so many physicians neglect to report occupational diseases. Dr Timo Kaupinnen notes that the FIOH receives more notifications from physicians through the insurance companies than through the inspectorate (FIOH, personal contact, 2010) and suggests that this is because physicians are prepared to provide information for research purposes but not for enforcement purposes. Any data provided to the FIOH is treated confidentially, and follow-up to individuals or to organisations does not come from the Institute; the data is collected for statistical purposes only. The FIOH operates from an example list of diseases (categorised as diseases caused by physical, chemical, biological and other factors); however, it has an “open system”, i.e. the physician or employer notifying the case can report any disease that they consider occupational, and they are not confined to the prescribed list. ICD-10 codes are used. The same form is used for all purposes, i.e. physicians and employers use the same form, and the same form is used for reporting diseases as for reporting accidents. A change to electronic reporting since 2003 is reported to have compromised the reliability of the data for 2003-4 and data from 2005 cannot be compared with pre-2003 data.

The FIOH maintains a website that contains recent and regularly updated national and regional statistics on the occupational health issues, highlighting trends in different industries. The website has the option that on most topics the user can select the region and year, and generate their own statistical tables. Every three years the FIOH produces a book on “Work and Health in Finland” as a joint effort of experts. The FIOH also provides more statistics and interview-based surveillance information: statistics on working conditions and health, work force and employment, work organisation, work environment, perceived health and work ability, work accidents, occupational diseases, work absenteeism, work safety and occupational health services.

The Finnish system has been summarised in Figure 1.8 below:

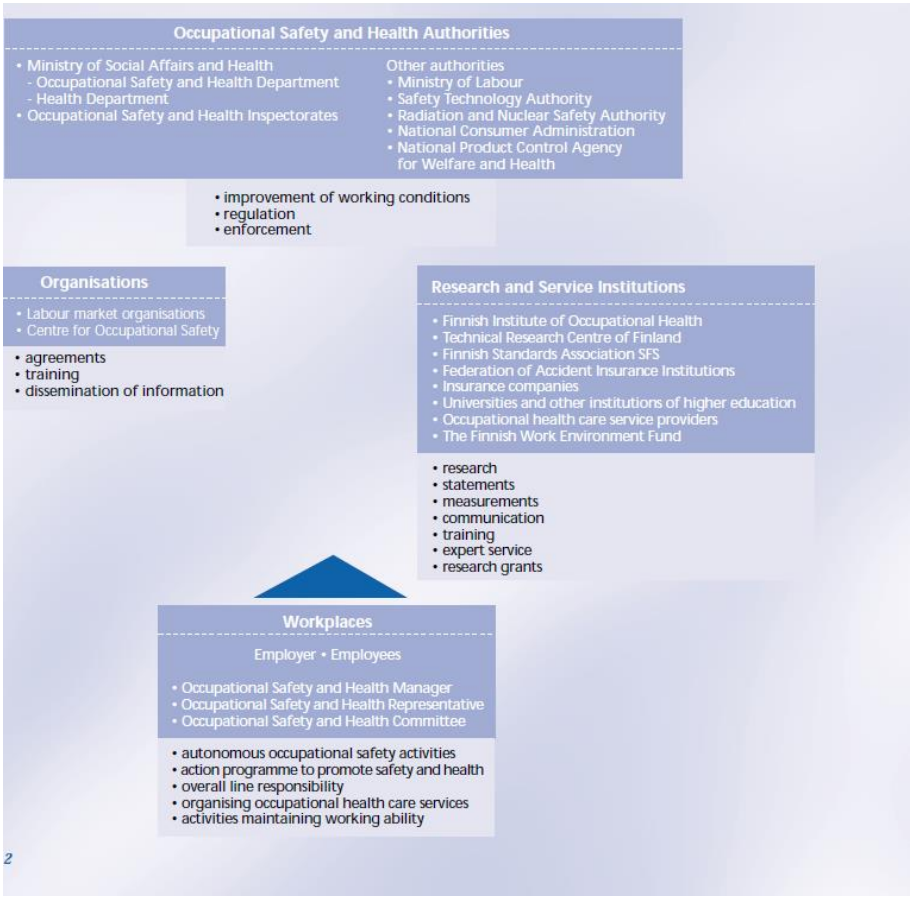

Figure 1.8 The Finnish occupational health and safety system

(Source: FIOH website www.fioh.tl)

Approximately one million occupationally related medical examinations are reported to be carried out annually in Finland. The FIOH website reports that there is a transition occurring in the Finnish system from companies with their own occupational health units to the occupational health services being more commonly provided by medical centres where large groups of medical centres offer services to an increasing number of employees, and the units have better availability of a wider range of services

In the Finnish system occupational safety and health inspectorates provide advisory services for employers, promote independent health and safety measures at the workplace, and oversee compliance with labour protection conditions. There are approximately 30 000 evaluations conducted at workplaces in Finland by the inspectorate each year relating to occupational diseases and occupational accidents. Occupational health services in Finland are a service positioned between health care services and the occupational safety system. As such, the service is simultaneously part of both primary health care and the occupational safety system.

The organisation of occupational health services is steered by legislation and supported with guidelines and manuals from the FIOH, which produces articles that highlight best practices and models for the service.

At any company which has even one employee, the employer has a legal duty to provide occupational health services to its employees. The objective of occupational health services is to promote health and work ability at workplaces and there are four different forms of organising occupational health services:

- Local health centres

- Private clinics
- Independently by the employer
- Jointly with other employers

In general the Finnish system is sophisticated and much can be learned from the system but it does cater for a much smaller and more sophisticated workforce.

Australia

According to the Australian work safety standards an OHSMS is a set of plans, actions and procedures to systematically manage health and safety in the workplace that is actively endorsed by a committed employer to achieve the provision of a safe and healthy workplace and the prevention/reduction of illness and injury equally for employees and contractors, identification of workplace hazards, assessment and control of all risks, active involvement in health and safety matters by managers, supervisors and employees and their representatives and provision of information and training for employees at all levels so they can work safely.

The Australian OHSMS aims to systematically eliminate the possibility of accident, illness, injury or fatality in the workplace by ensuring that the hazards in the workplace are eliminated or controlled in a systematic manner, rather than waiting for a crisis to occur. And as such employers have legal responsibilities to provide a safe workplace and systems of work, to consult with employees and to keep them informed about health and safety matters.

The benefits of OHSMS include the following:

- Research on the effectiveness of OHSMS has consistently pointed to the importance of top management having genuine commitment, to achieve and maintain an effective system that goes beyond mere legislative compliance.
- An effective OHSMS requires active involvement with an emphasis on activity at all stages of OHS operations. It includes broad consultation with the workforce and active involvement of 'key' people such as management, supervisors, health and safety representatives, and Safety Committees.
- The importance of having people to take on role of 'champion' such as a senior manager or union worker representative should not be underestimated.
- It is important to put effort into continuous improvement, which is building in ways of periodically checking how you are doing and how to improve your system, using feedback mechanisms, audits and inspections.
- Developing a structured training strategy, with the ability to meet different language and education needs is a significant factor to attaining success.
- An effective system is more than a paper chase. It is about making sure that relevant changes occur, to improve OHS. However, documenting what you do is good business practice.

Conclusion of literature review

The benefits of using an OHSMS are widely reported in the literature reviewed. Typically large-scale multi-site organisations are able to use an OHSMS most efficiently, while transferring the benefits to smaller businesses is reported to encounter difficulties unless the OHSMS is customised to the individual organisation. The OREOHS system can provide a potential framework for customising in small- to medium mining operations.

The accepted best practice for the OHSMS is outlined by the ILO and embodied in the OHSAS18001 and provides a platform on which to develop and evaluate the OHSMS that can be adapted for the mining industry.

The Finnish system of managing occupational health and safety data appears to be highly efficient and may have lessons for the mining industry. The data from an OHSMS requires expert analysis and management in order to provide detailed statistics and information that can inform proactive monitoring. A policy requiring mandatory reporting must underpin the implementation of and reporting from the OHSMS.

Development of survey tool

The following is a summary of the main headings identified in the literature review that were used to develop the survey protocol (Appendix 5).

This survey protocol included:

The elements outlined in the best practice guidelines for occupational health management systems developed by the International Labor Organization (ILO) as a framework of measurement;

The practical questions that need to be answered about the information systems hardware being used in the mining industry; and

The elements identified in the national and international OHSMS literature review as important for inclusion in a system for proactive monitoring.

The main headings of the survey protocols are as follows:

- Assessment
- Computer and environment assessment
- Planning and organising
- Occupational health and safety policy and objectives
- Worker participation
- Responsibility and accountability
- Hazard identification and risk assessment process
- Prevention, reduction and/or control measures
- Emergency prevention, preparedness and response
- Legislatory requirements and compliance
- Implementation
- Initial review of existing OHSMS
- OHSMS planning, development and implementation
- Occupational health and safety programmes
- Implementation procedure (standard operating procedures)
- Hazard elimination, control and risk management
- Competence
- Education, awareness and training
- Communication systems related to OHSMS
- Internal and external OHSMS

- Occupational health and safety management documentation
- Documents and data control
- Evaluation
- Performance monitoring and measurement
- Audit
- Management review

The survey tool (Draft 1 - Appendix 5) was reviewed after the expert focus group because from the discussions at the focus group researchers perceived that the survey tool would not gather the desired information as it was too formalised, too long and not relevant to the South African mining industry in its current form. Therefore, based on discussions with members at the focus group, a semi-structured interview survey tool was designed (Draft 2-Appendix 6). After the visits to the MHSI regional offices and before the mines were surveyed, additional sections were added to the semi-structured interview survey tool to evaluate the possibility of developing an audit tool on occupational health issues that could be integrated into the SAMSHA system.

Chapter 3 Expert focus group

Introduction

A focus group meeting of experts in the field of occupational health and safety management was conducted on 19 January 2011 at the CSIR CMI offices in Johannesburg. The aims of convening a focus group meeting with the key industry stakeholders were to:

- Identify the requirements for an IMS for proactive monitoring and management of occupational health and safety issues in the mining industry;
- Draw on the expert knowledge of practitioners and stakeholders in the field; and
- Identify and address the barriers relating to the implementation of a proactive monitoring and management system for occupational health issues in the mining industry.

A total of 70 professionals with different expertise in the field of occupational health were invited to participate in this focus group discussion (Appendix 1 and 2). Of those professionals who were invited, a total of 38 participated in the discussion, yielding a response rate of 55%.

Various stakeholders represented in the focus group discussion included the South African mining industry, such as occupational medicine and occupational hygiene, the MHSC and the DMR. Other sectors represented included regulators in the mining industry, Rand Mutual Assurance (RMA), the National Institute of Occupational Health (NIOH), institutions of higher education (IHEs) and representatives from the National Union of Mineworkers (NUM) and Solidarity as well as private consultants from small mining businesses (OHNs and OMPs) and other professional organisations such as the ***South African Society of Occupational Health Nursing*** (SASOHN).

Methodology

The discussion was facilitated by a CSIR senior management team member who has expertise in strategic planning and facilitation of brainstorming sessions. The approach used was to have small breakaway groups that engaged in general discussions about the requirements of an IMS for proactive management of occupational health issues in the mining industry. Each group had to nominate a chairperson who facilitated the group discussions and a scribe who recorded the key points that emanated from the discussions and then reported back on behalf of the group. The first topic was the requirements for a best practice OHSMS. The outcomes of the discussions were shared among the larger group and the key points that commonly emanated from each group were recorded.

The outcome of the discussions on the best practice related to occupational health management systems directed the next step, which was to discuss each of the areas of consensus among the three groups that were formed. One group was assigned to engage in discussions on what the requirements are for what was termed the “Master” level of occupational health management. A second group was assigned to discuss the requirements for what was termed the “Transactional” level of occupational health management and a third group was assigned to discuss the “barriers towards effective implementation” of a proposed occupational health management system. The same group was assigned to discuss possible solutions to the challenges identified.

Findings

Following the report back from the groups, a consensus was reached that it was envisaged that the management of occupational health issues had to take place at both the Master and Transactional levels. Common definitions of these levels were discussed and it was agreed that they referred to the following:

- A “Transactional level” refers to a national database that contains raw data from annual medical surveillance and from primary health care centres that is sent to a database on a very regular basis and that will be cleaned and analysed for primary occupational health research needs.
- A “Master level” refers to a database that contains information that has been obtained from the analysis of the transactional database and that has been filtered and analysed by expert IT custodians to provide relevant and reliable reports/information for use on a higher level for prevention strategies and decisions on policy, etc.

The expert group also acknowledged that there are specific barriers towards effective management of occupational issues at both levels as listed in the following section.

After the focus group discussion, participants were requested to forward any other relevant information to the project team for inclusion in the report on the outcomes of the focus group discussion. The outcomes were integrated into a document that was circulated to the delegates and others who had expressed a willingness to attend the focus group but who had not been able to attend. Any comments would be integrated into the final document. No comments were received.

Follow-up discussions

Focus group participants who contacted the research team for follow-up meetings were interviewed and information gleaned from these meetings was added to the recommendations that have resulted from the focus group discussion. Two meetings were held with researchers from the NIOH and from an independent occupational health group, KBC, who invited the research team to an introductory discussion about the system being developed for occupational health management of contractors in the mining industry.

The following report is a synopsis of the ideas and discussions from the focus group discussion and the follow-up meetings held.

Requirements of an Occupational Health and Safety Management System

The outcome of the focus group discussions is summarized in the following discussion.

Transactional occupational health system

The focus group concluded that one system for all operations should be established that would contain one electronic occupational health record, for the full duration of each worker’s career in the mining industry. The electronic record must link all the relevant worker information to relevant information about the worker’s exposure to hazardous conditions during his/her working life. It was suggested that the Transactional database must allow for proactive feedback by the line manager and senior management. It must also facilitate monitoring by the regulator. However, there was consensus on the need to collect information in a tailored way in order to provide the best tool rather than creating a further burden of work that potentially could lead to inaccuracies.

It was envisaged that the ideal IMS would contain demographic data, personal exposure data and personal medical data and accident/incident data. The system should consist of these four interlinked units.

Socio-demographic data for mineworkers

It was agreed that the recorded socio-demographic data for mineworkers should be as detailed as possible and should include personal data (i.e. identity number, date of birth, gender, age, address including home and postal addresses, contact telephone numbers, details of the next of kin and the number of dependants). Occupational/employment historical data should include

present occupational data (i.e. current occupation, category of work, department and dates of entry to and exit from the current mine); the business enterprise profile, with information regarding the type of mining based on the complexity of the mining (trackless versus conventional, underground versus surface); the shafts where the worker works and where he/she has worked previously.

Social and community background data should also be included in this section in order to create a holistic profile of each miner in the industry. The focus group experts strongly felt that an ideal "effective" occupational health management system must include the information details of ex-mineworkers. It was also suggested that an ideal system should include a link with information from the mine employee pension funds.

Personal health data

Another point discussed and agreed upon was that the Transactional database must include personal health data from both active sources (i.e. the annual medical surveillance) and passive sources (i.e. primary health care). It was decided that the individual miner's health data should therefore include information relating to fitness-to-work, based on the annual medical surveillance screening and reports such as hearing threshold levels, lung function testing, blood pressure findings, urinalysis, as well as any health information from other health evaluations relating to chronic diseases. Also psychosocial data, lifestyle practices and behaviour data (e.g. smoking, diet, and exercise) and data on non-work-related hazard exposures should be included. The health data must include both previous and current medical history. The health database must also include records of the compensation history for occupational diseases and occupational injuries for each miner in previous years.

Hazard exposure data

The Transactional database should be linked to an occupational hygiene database that records personal exposure history for all types of occupational hazards prevalent in the mining industry. The high priority occupational hygiene exposure data that requires statutory reporting must of course be included in the Transactional database. However, even occupational hazards not traditionally viewed as critical, such as ergonomics and workload, should be included to facilitate the future investigation of possible trends in hazard exposure and co-exposure as well as new emerging diseases or risks.

Mine accident and incident data

Another component of the proposed occupational health system that was discussed by the experts is what facilitates the development of an integrated OHSMS. In this case the database of accidents/incidents records or what is currently known as the South African Mines Reportable Accidents Statistical System (SAMRASS) was proposed as an integrated component of the OHSMS. The required contents of the database are well documented and legislated, and as an integral part of the safety management of mines is one of the areas that receive much attention in the mining industry. It was suggested that the required statutory reporting system must determine the input to the database.

Standardisation of the Occupational Health and Safety Management System

The experts suggested that the reporting facilities of the proposed OHSMS must facilitate improved statutory reporting or the reduction of the need for statutory reporting as well as facilitate proactive management of risk at operational level. In order for the proposed Transactional database to function efficiently, it was proposed that a systematic and standardised data collection format be developed.

Barriers to implementation identified

A factor relating to the standardisation of data collected that was raised by the focus group delegates and that could also be seen as a barrier to the implementation of a system is the need to repeat medical examinations every time a worker moves from one mine to another mine. This lack of inter-company acceptance of the credibility of health measurements, e.g. one mine not accepting the exit certificate from another mine, means that there is a constant need to re-evaluate fitness-to-work, which is time consuming and has cost implications. It also shows the lack of continuity of care and integration of occupational health services in the mining industry.

Suggested solutions to barriers to implementation

A suggested solution to the problem of re-evaluating workers and especially contractors that would enhance the usefulness of the Transactional database would be to investigate an accreditation system for service providers that may reduce the need to re-evaluate workers in certain time periods. It was suggested that the standardised construction of data must also take into account the ability to link to the national or Master database and vice versa. Standardisation and accreditation would need to be able to facilitate the level of accessibility to the system by the many and varied stakeholders so that the access can be configured to ensure ethical use of information.

Master occupational health system

The focus group delegates unanimously agreed on the need for the co-existence of a Master system that would be interlinked with or flow out of the Transactional system as a prerequisite for a future OHSMS.

The group indicated that the purpose of a Master system would be to collect and provide meaningful information to enable improved strategic decision making, policy formulation and regulatory control. This would be achieved through the creation of a central data repository which could be mined at different levels to support research, epidemiological and public health needs.

The critical data and indicators that must form the basis of the Master database must also enable the identification of leading indicators for the key exposures as well as the current challenges in occupational health (i.e. lag indicators).

It was further agreed that the Master database (system) must have easy interlinks with the existing databases such as the South African Mining Occupational Disease Database (SAMODD), Compensation Commissioner database, the Mineworkers Compensation System, the Medical Bureau for Occupational Diseases (MBOD) and any other databases that are currently functioning and available in the mining industry.

Management and resources

It was further envisaged that the successful functioning of a Master occupational health system would require high levels of management skills and capabilities for the following dimensions of the system:

- Data capturing
- IT infrastructure and support
- Report generation
- Statistics

Barriers to implementation of the proposed system

Suggested/foreseen/possible barriers to the implementation of a future OHSMS appeared to fall into three main categories and the notes and comments have been collated under these three categories below, followed in each case by possible solutions to the barriers.

Custodianship of the system

The expert group suggested that the successful implementation of an effective OHSMS would be dependent on the custodianship of the information provided. This is because the ownership of the data is a very sensitive issue relating to confidentiality both in a legal sense and in the sense of medical privilege. The accountability of the custodian and the ability of the mines reporting to the custodian to hold the custodian accountable will be a very important dimension to the process of successful implementation. The custodian and developer of the OHSMS would need to have a good understanding of the diversity of business processes for the different stakeholders in the industry and would need to ensure that all stakeholders are consulted at every level of development. Some suggestions of possible custodians included the regulator/DMR, a third party such as an academic institution, the MHSC, or a Centre of Excellence.

Another possible barrier to implementation relating to the custodianship of the OHSMS is the accessibility level of both the mine that inputs the data and other mines and regulators. The reputational risk and the fact that there is no benefit to the original owner of data would negatively impact the implementation process.

Possible solutions

The expert focus group suggested possible solutions to the challenge of custodianship of the proposed OHSMS system, which included the implementation of measures to ensure confidentiality of data captured by configuring settings for different levels of accessibility. Another suggestion as a solution to this barrier was to make health measurement reporting a mandatory requirement. Another suggested solution was the use of information security systems that make use of biometric security. Finally, the group suggested as a solution a legal confidentiality agreement between the custodian of the OHSMS database and the supplier of the data.

Capacity to manage the system

Grave concerns about the capacity of any current custodians of a database being able to manage a future integrated system successfully were raised by the focus group delegates. Another barrier to implementation was noted as that of company/mine resources, for example in the small mines, to use such a system successfully. Capacity concerns were also related to data capture, analysis of the data and generating reports by those who manage such a system. A final barrier was that of the capacity of the regulators to take action on the basis of results of reports or for non-compliance issues.

Possible solutions

A possible solution to capacity barriers suggested by the experts was to outsource the database management both at a national level and if necessary at company/mine level. Other solutions suggested were that the format for data collection be user-friendly and simple and that it be web-based, and that reporting of health-related measurements be made mandatory in order to ensure that the necessary data was available in a national database and could be analysed and interpreted by regulators, researchers and public health decision makers.

Quality of the input data

Another barrier identified by the experts to the implementation and success of the proposed OHSMS was that of the reliability and validity of the input data. One of the reasons given for poor quality data to input into an OHSMS was the lack of consensus in the industry on the definitions of reported data and the reasons for reporting. In order to ensure that good quality data is captured and imported into the proposed system, the experts believed that it would be essential to have widely accepted, standardised definitions that can be used accurately by all stakeholders

in the mining industry for the measurement methods, the analytical processes and the reporting format and purpose.

The need for consensus on definitions and determiners was identified for all aspects of data in an OHSMS, both in the health and in the hygiene sections of the system.

Another reason for the lack of reliability and validity of input data was lack of consensus within the industry concerning the need for compliance with regulations only or the need for best practice with regard to occupational health and hygiene management. This lack of consensus is further complicated by the fragmented legislation and management of occupational health issues by government departments.

Possible solutions

As a possible solution to the challenge of data quality, it was suggested by the experts that the definitions and agreement among stakeholders must be detailed; for example, in the exposure measurements, the input data should include information such as the source of data and even details of the date, time and place of sampling. In the case of health data, the definitions and agreement should go as far as baseline information of diseases and health measures.

The suggested solution to the challenge of lack of reliable and valid data was to improve legislation and to ensure and promote commitment to best practices. This was strongly applauded by all experts as it was regarded as the key factor that requires attention before successful implementation of the OHSMS can be expected or introduced.

Conclusions

It is concluded from this synthesis of focus group comments and discussions that a portfolio of projects is required to take the outcomes of the focus group meeting to the next level. These projects should address some of the issues raised in the discussions in a way that will facilitate widespread stakeholder participation and input.

The stakeholders' input should address issues related to custodianship of the occupational health database that will address both the technical and communication issues related to reporting of personal data and the issues around capacity to sustain a system envisaged by the focus group.

Furthermore, the stakeholders' input should address the accurate and acceptable definitions and methodologies for measurement and reporting per occupational health condition. The issues relating to the required legislation to enable the use of an integrated OHSMS must be investigated in consultation with the industry stakeholders. Also, the consultations within the mining industry should help to identify what is currently achievable to facilitate the implementation of an OHSMS in stages.

It is suggested that stakeholders' input should be a process that firstly uses a key core group to draw up a glossary of terms and definitions and then sees a series of widespread workshops convened to discuss and agree on the definitions for each occupational health condition. Furthermore the research team believes that there is a need for a research co-operative and a communication broker between stakeholders in order for the consultation to be effective.

Chapter 4 Survey of current practices and systems at the Mine Safety and Health Inspectorate

Introduction

The MHSI, which was established in terms of the Mine Health and Safety Act of 1996 (MHSA), is responsible for safeguarding the health and safety of people working at mines or affected by mining activities. The activities of the inspectorate are geared towards achieving the following strategic objectives:

- Reducing occupational injuries and ill health;
- Developing and maintaining an effective policy and legislative framework;
- Improving information management; and
- Supporting cross-cutting initiatives of government relating to economic empowerment, human resource development, employment equity, poverty alleviation and the combating of the HIV/AIDS pandemic.

However, the MHSI reports that efforts to quantify and prevent occupational diseases in the South African mining industry are a challenge owing to limited access to quality data for analysis and interpretation of statistics that can drive a national preventative and proactive policy on occupational health.

The 2008 Presidential Audit of mines ordered by minister of Minerals and Energy concluded that there is a pressing need for an integrated system of occupational health management for the mining and minerals sector that links occupational exposure to harmful substances and the effects on a worker (Presidential Audit, 2008).

Enabling output three of the study included activities for gathering information, firstly, to determine the available systems and, secondly, to determine the needs of the users of a system that will facilitate the MHSI's monitoring of occupational health issues in the mining industry. Finally, the enabling output aimed at evaluating the requirements of a system in order to facilitate integration into the SAMSHA system and other currently used processes, methods and databases.

Methodology

The current study used a mixed quantitative and qualitative research design. The qualitative section made use of semi-structured interviews at six of the nine regional offices of the MHSI to gather information about the needs of the MHSI for occupational health monitoring and management. A quantitative aspect was included by using a questionnaire to evaluate the computer infrastructure available to the MHSI that would gather data regarding the feasibility of using the envisaged IMS effectively in the MHSI. Interviews were held with the occupational health inspectors in each region or with representatives of their departments.

Interviews were also held with the CEO of the MHSC, and with the principal medical inspector of the DMR, to discuss and gather information in order to evaluate the requirements of a system that could be integrated into the SAMSHA system and other currently used processes, methods and databases.

Findings

The findings of the survey are discussed below.

Current practices regarding occupational health issues in the MHSI

Currently the type of information collected by MHSI staff includes information relating to legal compliance inspections and audits at occupational health centres on the medical equipment used at these centres and the practices related to their use. The health incident input form is used by the mines (completed by the OMP/OHN after the diagnosis of occupational diseases) to capture and report on health incidents and accidents that have occurred. The list of codes for occupational diseases that must be reported informs the coding by the OMP. The health incident reports are submitted by the mines to the regional MHSI offices and the information is then submitted to the central office. The new regulation effective from February 2011 categorises the reporting of medical ill health into three sections. This implies that the mines will be expected to report on all (occupational and non-occupational) ill health as long as it has or could have an impact on the health and safety of the worker and his/her co-workers.

- Section A – injuries from mine accidents;
- Section B – occupational diseases;
- Section C – other illnesses/diseases (including non-occupational, e.g. HIV/AIDS) that can have an adverse impact on the health and safety of the mine worker.

The information submitted to the DMR contains both the incident and accident investigations and at the end of the incident input form there is a space provided to be completed by the inspector who has conducted the investigation following the mine incident/accident. Then the DMR can generate a report, based on the information available on the system. Inspectors also inspect exit certificate records, mine emergency preparedness equipment, policies and procedures, injuries-on-duty records, TB-related records, HIV-related records and registration records of OMPs and OHNs. Leave registrations are also monitored and include the sick leave both due to occupational diseases and as a result of occupational injuries.

The information gathered by occupational hygiene inspectors during audits includes, health and safety policy; codes of practice; health and safety training records; occupational hygiene monitoring on noise, airborne pollutants, thermal stress, hazardous chemical substances, etc; and general inspections on compliance regarding statutory reporting, mine design and maintenance, legal appointments, safety risk assessments, mine explosive control, mine water quality management, and public health and safety.

Current systems relating to occupational health issues in the MHSI

The current system used by the MHSI staff includes investigations of accidents and incidents and audits of compliance with the statutory requirements of the MHSA.

The investigations of accidents result in reports drawn up by the inspectors and together with the information from the abovementioned health incident forms the information is captured at the regional offices and is stored in regional and mostly individual filing systems with each inspector. Some of these filing systems are electronic and use the services of a dedicated data capture staff member while others are paper-based filing systems at the regional offices. Information is collated at regional offices when the principal inspector approves the reports to the mines. This information is submitted to the central DMR offices.

The audits are conducted at mines to evaluate the compliance with legal requirements. Some of the regional offices have self-developed audit tools used to conduct the occupational health audits. Regions vary in the methods used and the management of the outcomes of the audits, from internal electronic filing and recording systems to paper-based recording and filing systems. The results of audits are not currently managed at a central level.

Challenges and needs of the potential users of an information management system

Challenges experienced by MHSI inspectors included lack of standardised criteria and useful audit tools to be used nationally for uniformity; lack of verification systems, e.g. having access to laboratories to verify samples from mines for reliability and validity; lack of HR capacity and skills; budget constraints for inspectors; lack of computer updated infrastructure, e.g. 3G cards to access the trends and area of focus in mines easily via internet before inspections are undertaken; and difficulty in obtaining data from some of the mines (especially the small mines), even refusal of mines to submit reports related to some aspects of the inspection requested. Inadequate computer infrastructure and regular and reliable access to the SAMSHA system was a commonly reported challenge for MHSI inspectors.

Reports from the system administrator and training department of the MHSI indicated that a campaign is underway to provide all inspectors with laptops and 3G cards as well as to upgrade the access to the SAMSHA system. Once this programme is functional a number of the challenges reported will be alleviated. An integration of an IMS system with the SAMSHA system that would require standardised audit tools being available and uploaded directly onto the system from laptops while at the mines would be the most efficient system.

Requirements of a system in order to facilitate integration into SAMSHA

The interviews held with custodians of the SAMSHA system revealed that SAMSHA is a Windows-based system. The newly appointed service provider is the Vodacom business centre. SAMSHA is currently in the process of being rolled out to all MHSI offices. Rolling out the system to all offices will enable regional offices to capture the required information onto SAMHSA immediately as opposed to using a paper-based system. Since not all aspects of the system are activated currently, SAMSHA cannot replace the paper-based processes and procedures but runs as an adjunct to most of the DMR systems. Some regional MHSI offices have experienced challenges with the SAMSHA system regarding speed and performance. This should be improved with the deployment of the new laptops and 3G data cards as well as the connection to the Vodacom business centre, which will improve speed and regular access to the central SAMSHA server in Gauteng. Once this phase is complete all inspectors in the regions will have online access to SAMSHA from the remote mine sites.

SAMSHA consists of the following sections: Audits; Change Request; Corrective Action; Document Control; Health Incident Report; Incident Investigation; Incident Reporting; Inspections; Labour Statistics; Leave Registration; Meetings; Mine Health and Safety Business Plans; Mine Records; and Project Co-ordinating. These sections vary in the degree to which they are populated but all sections have the potential to be populated by fully and adequately analysed data from the currently gathered occupational health data.

Conclusion

The conclusion of the research team regarding the requirements for an IMS for occupational health issues in the mining industry that is feasible and sustainable for the MHSI is that the IMS must operate on two levels, a philosophical and a practical level.

Firstly, on a philosophical or theoretical level, the research indicates that there is a need for a change of mindset regarding the point of access to information that can drive high-level decisions in the mining industry. The mindset change required is that the DMR, and in particular the MHSI, is not a data collection agency. The MHSI currently does not even have the required capacity to enforce the current legislation, not to mention the required HR capacity, IT infrastructure, skills and system to collect occupational health and occupational hygiene data efficiently from the industry. The capacity to manage the data adequately and analyse the large quantities of information required once the data is collected is also not currently available in the MHSI. The data currently collected by the MHSI is of lagging indicators and about compliance with legislation

and is not suitable for proactive monitoring and management. The MHSI's role is one of regulation, legislation, and facilitation towards best practice. In order to fulfil its role, the MHSI requires access to accurate, reliable data that will inform its decisions and thereby make its work credible, but the Institute need not and should not be the collectors of this information.

Reliable data collection and adequate management of the data through statistical and other analysis for relevant reporting is a highly specialised role and requires a programme, process, skills and system that facilitate the system. The role of occupational health and occupational hygiene information collection, management, analysis and reporting should therefore be separated from the role of the MHSI.

The second level of recommendations is on the practical level. The recommendation is that audit tools be developed for the MHSI that will facilitate standardised practice throughout the country at all regional offices. The proposed audit tools should be uploaded into SAMSHA as the audits are being conducted at the mines, which will facilitate the collection of standardised and good quality data as well as ease the staff shortages and skills' burden in the MHSI, by excluding the need to capture the information again once at the regional office.

At one of the MHSI regional offices the process of developing an audit tool for audiometry quality control was begun by the medical inspector as a result of the interviews conducted for this study and the process should be completed and extended for lung function, X-ray, heat tolerance, vision, TB and HIV programmes, policy and code of practice (COP) processes. All of the audit tools could be included in SAMSHA and these would enhance the role of the MHSI of enforcing compliance as well as provide indicators of the needs within the industry. An adaptation of the ILO best practice checklist for OHSMSs should also be included to ensure that mines in South Africa stay abreast of international standards and practices. The use of the recommended audit tools will facilitate improved management of compliance with legislation and provide a platform for improved co-operation from industry.

Chapter 5

Survey of current practices and systems at mines

Introduction

Surveys and semi-structured interviews were conducted in a representative sample of occupational health and safety managers or occupational medical practitioners or consultant medical surveillance providers, where relevant. The objective of the survey was to identify the current information management system in use by mines, the types of data captured, the methods of transfer of data, the IT infrastructure available and the reporting methods used in the mining industry, as well as the needs of the potential users of an information management system in the mining industry that would facilitate proactive monitoring and management of occupational health issues at various levels of management and users. The survey was conducted at mines in the commodities of platinum, coal, gold, diamonds, uranium, titanium, aggregate, copper and marble in 4 small, 4 medium and 10 large operations. The survey represents a total of approximately 100 mines/business units and approximately 200 000 mine workers.

Systems used in the mining industry

A wide range of implementation of OHSMS was found in the sector ranging from very simple paper-based/Excel spreadsheet based systems to highly complex, licensed and relatively well integrated systems. The integration between human resources information and health information and between hygiene information and health information appear to be the most difficult to implement successfully. The degree of integration does not appear to be related to the size of the operation.

Two main types of systems were found to be the current practice in the mining industry. The consultant system was found to be operating in the small mines and some of the medium-sized mines. For those using the consultant system, the mines outsource the medical surveillance process and the occupational hygiene measurement process to consulting companies. The consultant companies provide annual medical surveillance in mobile units and visit the mines at least annually to take hazard measurements. The consultant companies provide the mine manager with reports on the results and in some cases draw up the required regulatory reports for the mine manager. The records are usually kept in paper format at the mine. The consultants have access to their electronic records of medical surveillance and occupational hygiene measurements.

The advantage of the consultant system is that the required medical surveillance and occupational hygiene measurements are conducted in small operations where resources are limited and the workers in the small operations are at least receiving the required health related evaluations. The disadvantage of the system seems to be that, in general, the mine managers are not informed about the status of the health of their workers or of exposure other than to know that they are compliant with regulations. The system does not facilitate the use of best practice and confirms the literature review findings that systems that are mandatory requirements and are not adequately adapted for small operations, are not ideal.

The second type of system was found in some medium-sized and all large mining operations. This type is where the mining operation has internal systems for both occupational health and occupational hygiene. In general, these systems were found to be well managed but they had varying degrees of integration of data. Two potential systems currently in use that may provide a well developed platform on which the IMS may be developed are the AngloCoal system developed by Dr Jan Pienaar and his team that may prove useful for large mines and the KBC

system aimed primarily at contractor management and small operations. The developers of both these systems have indicated a willingness to share the developments thus far with the industry.

Types of data captured

The findings were that the raw health data captured by mines was predominantly the required medical surveillance health data for exposures to the hazards of noise and dust as well as for minimum standards of fitness to work in a mine. These include hearing threshold levels (converted into Percentage Loss of Hearing-PLH), lung function results and chest x-rays in various formats, vision results, blood pressure and in some cases heat tolerance results. Varying levels of detail was available concerning work history but in general demographics such as age, gender, occupation, and starting date in the industry were recorded. Records of compensation applications that had been initiated were also well documented, in general.

The integration of hazards exposure levels was found to be least successful at all the mines visited. In large mines where sophisticated systems were in place there was a degree of integration in that the medical practitioner was able to access a system that had the some of most recent exposures to the homogenously exposed groups recorded. Other large systems were in the process of developing the integration with the occupational hygiene records and systems. In the medium and small operations the integration of the data ranged from two sets of reports on the managers shelf to a monthly printout of the hygiene measurements on the occupational medical practitioners desk to no link between the information in the system. All surveyed operations had an awareness of the need for integrated OHSMSs.

Methods of transfer of data

The methods of capture/recording and transfer or analysis of health and hygiene data was found to be both electronic and in a paper format at all the mines and consultants surveyed.

IT infrastructure available

All sizes of mines and OHSMSs indicated that they had adequate IT access and capabilities for a national information management system and all had access to the internet. All mines and consultants surveyed used a Windows-based operating system. The various programmes mentioned that are being used by the larger mines include SAP, Fusion, Q Med, Musik, Palladium, Trimed, MS SQL, Everest, Pivot, Huris, Meditech, Electroserve and HEALTHSOURCE.

Consultation with telemedicine information management specialist, Dr Dirk Koekemoer, indicated that transfer of health data from satellite sites and from various programmes is commonplace in current technology by using a widely used export interface used in the health industry.

Discussions were held with KBC as to investigate one of the systems being used by consultants to the mines, in particular smaller mines. The purpose of the meeting was to understand the functionality of the KBC medical tracking system as well as ascertain the challenges experienced in the project. The KBC directors provided an overview of KBC's history and factors leading up to the commencement of the KBC medical tracking system and outlined the architecture and functionality of the system. KBC started as a safety training organisation with a specific focus is on prequalification of contractors before employment. The KBC clients expressed a need for a single database for occupational health information and the medical tracking system was developed and is currently in the piloting phase.

KBC representatives highlighted the key functionality of the system:

- Track employee health related information from the time he/she starts employment at any of KBC's clients until the time the employee exits at any of KBC's clients.

- Security is built into the system to check for duplicate identity numbers/passport numbers.
- Prospective employee information can be shared with authorised medical providers within the group indicating previous medical conditions of an employee.
- Prior to performing a medical check by authorised medical providers, employees must provide at least two of four successful identification methods. That is, biometric, proof of identification, password, or smartcard.
- Statistical reports can be made available to relevant legal bodies/institutions.
- Repository includes list of accredited doctors allowed to perform medical tests
- Should an employee leave an employer that KBC services and re-join an employer the "missing" medical records for the specific employee can be manually captured by authorised medical representatives.
- The data is transferred to the central database using a trickle method for regular transfer.

The diagram below depicts the architecture of the KBC medical tracking system at a high level. The system receives and stores information on a single database hosted by Internet Solutions (IS). IS are responsible for backups and recovery of the database. Information is accessed and recorded via the IS firewall, thus preventing hackers from accessing information. Authorised mining companies performing health checks on personnel are allowed to capture employee health information directly onto the database. Mining companies not having their own medical facilities could use independent medical providers with access to the occupational health database to capture employee health information. Alternatively, employers also use authorised Kmed providers to perform the required health checks on employees and capture the information directly onto the database. The end result is captured and updated onto a single secured database.

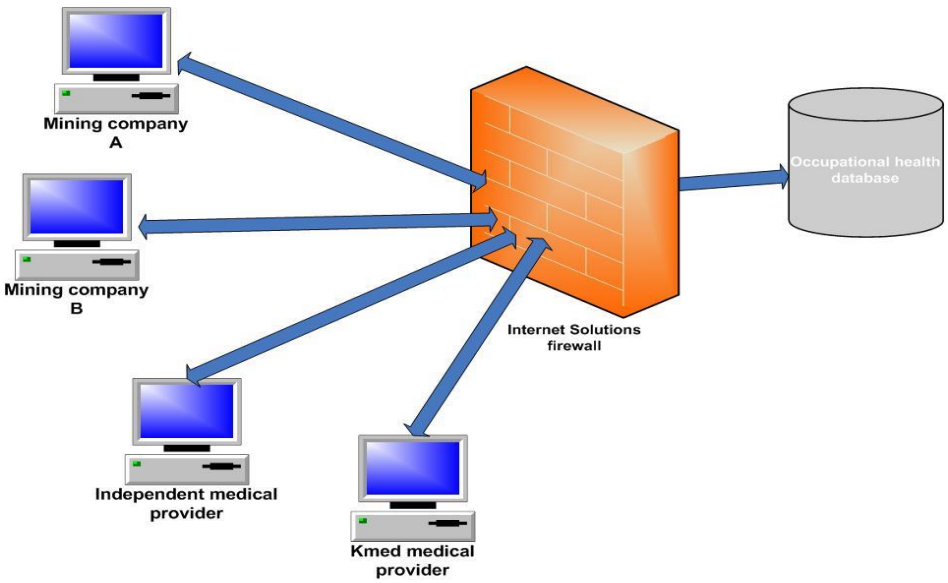

Figure 11: KBC occupational health database architecture

Reporting methods

The findings of the mines survey on the reporting methods currently used indicate that in small mines where consultants are used, the report to the mine manager is in paper format for each individual worker. At the larger mines the data for each worker is available to the consulting

occupational health practitioner or occupational medical practitioners electronically and in some mines also in a hard copy file as well. Reporting to senior management is generally conducted electronically.

Reporting to SAMMOD, RMA, MBOD and the annual medical report to the DMR is done in hard copy. A need to be able to do this reporting electronically was expressed by the majority of mines. A further need expressed was that any future system use the ICD coding system as a definition system.

Needs of the industry users of a future system

One of the pleas from managers at the mines surveyed was that new systems are not developed since there are many systems available that can be used or potentially extended to provide the industry with an information management system that will allow for proactive monitoring as envisaged.

Mine consultants to the small mining industry raised concerns about the potential costs of a national system and indicated a possible need for subsidies of costs related to reporting to a national system e.g. potential costs of programmes and of download time on internet access.

Approximately10% of the mines surveyed were against the idea of a national system as they saw no need or any benefit. The need is therefore to ensure that a future information management system provides added value and benefit to a mine and its workers.

A need widely expressed was that a future system has a facility that will facilitate the management of subcontractors easily. He call for “One electronic record per employee for life” was often heard during the survey. A further request was for a user-friendly system that was also efficient.

In general the mine survey found that reporting to a centralised system would need to be mandatory. It was evident from the survey that it would be important for a future system to accommodate current mine internal systems, as mines would not be willing to change their current systems if they are working, unless a new system is developed nationwide that can be proved better. Also if there is a cost related to a future system the general attitude was negative and indications that a system would not be accepted nor used were heard.

A need expressed by some mines was that in a future national system the mine should be able to choose what information is entered into the system and should also be able to obtain the data that they require. Mines indicated that a need would be to be able to compare their performance with other mines but with the identity being confidential Also that demographic details should be limited but that links with TEBA will be an important aspect of a system.

An in-depth discussion with Dr Jan Pienaar, at AngloCoal, about the HEALTHSOURCE system that has been developed by AngloCoal indicated that this system works on the approach of “one electronic record per worker for life” and that some of the other coal mining companies were in discussions about adopting this system. He indicated that AngloCoal had agreed that if the system were used more widely it could become the basis for a national system under an independent custodian. The system integrates the worker’s occupational health history and details and is in the process of developing an integrated link to the occupational hygiene system. The system functions in the same way as the KBC system described above.

Conclusion

The conclusions from the literature review are that there are many benefits to using efficient, integrated OHSMS. One of the benefits is that large amounts of data are generated that can be used for proactive management of occupational health issues. The findings in the mine survey

indicate that in general OHSMS are in place but that there is a wide range of efficiency of the OHSMS in use in the mining industry and relatively poor integration of the occupational health, occupational hygiene and human resources data. This also results in various degrees of quality of the data generated.

The conclusion is that the requirements of an information management system would be to improve the OHSMS in use in the industry in order to improve the occupational health data generated. Another conclusion is that there is adequate infrastructure in place and willingness in the mining industry to participate in a national system with some prerequisites in place such as confidentiality. Finally the conclusion is that there are systems in use that could serve as a basis for a national information management system.

Chapter 6 Conclusions and Recommendations

Conclusions

The conclusions from the literature review are that there are many benefits to using efficient, integrated OHSMS. This benefit is most noticeable in large scale organisations less noticeable in smaller businesses and operations. The difficulties encountered by small operations can be overcome if the OHSMS is customised to the individual organisation.

The well documented and widely accepted best practice for OHSMS as outlined by the ILO and as embodied in the OHSAS18001 provides a platform on which to develop and evaluate OHSMS and can be adapted for the mining industry.

The large amount of data generated by OHSMSs, require expert analysis and management in order to provide detailed statistics and information that can inform proactive monitoring. A policy that requires mandatory reporting underpins the implementation of and reporting from OHSMS. The literature review indicates that one of the barriers to successful implementation of OHSMSs is the incorrect use of audit tools.

The conclusions of the focus group were that some very important points of consensus must first be agreed to by all mining industry stakeholders before a sustainable system comes into being. Some of the main areas that require stakeholder consensus are:

- The custodianship of a future information management system.
- The challenges related to reliable data and how the mining industry can address these challenges.
- The issues relating to the reporting of personal health data and how a future OHSMS must manage these issues.
- How reporting of health measurements can be made mandatory and what the impact of mandatory reporting would be.
- The capacity of the mining industry to implement a future OHSMS with regards to resources and infrastructure for future development.
- The need for the integration of current and past databases.

The first conclusion from the survey of the needs of the MHSI, is that currently the inspectorate have an unstandardised method of evaluating the compliance of mines with requirements of the legislation. The few self developed audit tools being used are not widely used and a need for useful audit tools was identified.

Secondly, the conclusion was that the MHSI have many posts vacant and are do not have the human resources capacity to even manage the enforcing of regulations and investigations of health and safety incidents and audits of compliance that are necessary. The capacity to manage what is currently reported is insufficient and therefore the MHSI do not have the human resources capacity and expertise needed to successfully and sustainably manage an information management system

The conclusions from the survey of the mines' needs in relation to the use of a centralised information management system, was that the currently used two main systems should be used as a basis for two different systems for small and medium and large mines. It is feasible for both these systems to provide the necessary data for a centralized national information management system.

In general there is positive attitude towards the development of a national information management system that would provide high quality information to the industry for proactive monitoring and management of occupational health issues.

Recommendations

The recommendations from this study are:

- The establishment of a **dedicated, independent, expert** custodian to establish an information management system that is appointed by the tripartite stakeholders in the South African mining industry. The role of the custodian would be the receiving of raw data from mining operations' transactional databases and the analysis and reporting to a Master database that would provide stakeholders with performance data on occupational health issues at sector level. One of the initial goals of the custodian would be to pilot the use of existing systems as the basis for the information management system.
- The extensive presentation at **stakeholder workshops** of the Green Paper and the research findings to provide an opportunity for consultation and further discussions of the issues identified by the focus group and to garner support for the proposed system and for the benefits thereof.
- Development of **health-related audit tools** for use by the MHSI for compliance evaluation.
- Further **research on the necessary support** for the various sectors of the industry towards improving the OHSMSs used by operations in order to improve the quality of the data provided to an information management system e.g. based on the findings of the literature review and the mines survey, that separate systems be considered for small-to-medium mines and for large mines in order to facilitate the customisation of a system for the needs of smaller operations to ensure success of implementation.

References

DMR. 2011. http://www.dmr.gov.za/Mine_Safety/Overview.html accessed Feb 2011.

Ewles L, Simnett I (2005) *Promoting Health - a practical guide* Balliere Tindall: Edinburgh

World Health Organisation (1986) *Ottawa Charter for Health Promotion.* World Health Organisation, Copenhagen.

CSIR. (2007) Holistic management of Occupational Health stressors using heat stress and noise for case studies, CSIR NRE MCA: OH&E Research Group.March 2007 Project Number YMP0028 Report Number DMS13311.2 JHB CENT GEN

Dekker, JJ, Franz, RM, van Dyk, T, Edwards, AL (2008).Project on the status (base lining) of silica dust and noise exposure in the mining industry (Year 2) SIM 06 06 01 CSIR DMS 17289 Jhb Central

Guidelines on occupational safety and health management systems, ILO/OSH 2001 Geneva: International Labour Office, 2001, 27 p. ISBN 9 221 11634 4 http://www.ilo.org/public/english/protection/safework/cops/english/download/e000013.pdf.

NOHSC (2001).Gallagher, C., Underhill, E., Rimmer, M.Occupational health and safety management systems: A review of their effectiveness in securing healthy and safe workplaces.Sydney:, 71 p.ISBN 0 642 70981 5. http://www.nohsc.gov.au/Pdf/OHSSolutions/ohsms_review.pdf

European Agency for Safety at Work. The Use of Occupational Safety and Health ManagementSystems in the Member States of the European Union Experiences at company level. Office for official publications of the European community, Luxenborg.accessed October 2010 at h t t p : / / a g e n c y . o s h a . e u . i n t ,

Robson, L.S., Clarke, J.A,Cullen,K., Bielecky, A.,Severin, C.,Bigelow, P.L., Irvin, E.,Culyer, A., Mahood, Q. (2007) The effectiveness of occupational health and safety management system interventions:A systematic review. Safety Science, 45, 329–353.

SIMRAC (2006). Recommendations for improvements in the reliability, accessibility and usefulness of OHS data and statistics. SIM 04 09 07a. www.simrac.co.za

Januskevicius, Vidmantas,Telksniene & Ruta, OCCUPATIONAL HEALTH CARE SYSTEM AND ITS EFFECTIVENESS IN LITHUANIA

HSE, 2009. Note on: OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEMS.Version 2: 26 February 2009. Environment, Health and Safety Committee

Mori, Koji; Kameda, Takashi; Kobayashi, Yuichi International Congress Series; June 2006, Vol. 1294, p35-38, 4p Status of occupational health elements in occupational safety and health management systems in Japan.

Zeng,S.X.;Tam, Vivian W.Y.;Tam, C.M. 2008 .Safety Science; Vol. 46 Issue 8, p1155-1168, AMERICAN JOURNAL OF INDUSTRIAL MEDICINE 53:84–94.
Frumkin, Howard.de M. Camara, Volney. American Journal of Public Health; Dec91, Vol. 81 Issue 12, p1619-1619,

FIOH accessed February 2011.http://www.ttl.fi/fi/tilastot/Sivut/default.aspx
http://www.ttl.fi/en/publications/Electronic_publications/Pages/default.aspx
http://www.ttl.fi/en/health/Occupational_diseases/Pages/default.aspx

Kauppinen, Timo. 2011 (email communication).Team leader, Surveillance of Working Conditions and Health. Finnish Institute of Occupational Health Topeliuksenkatu 41aA FIN-00250 Helsinki, Finland

Makin, Anne-Marie, Applying the "safe place, safe person, safe systems" framework to improve OHS management: a new integrated approach Safety Science, Faculty of Science, UNSW PhD Thesis

Occupational Safety and Health Management Systems: Guidelines on occupational safety and health management systems, ILO/OSH 200. Geneva: International Labour Office, 2001, 27 p.ISBN 9 221 11634 4
http://www.ilo.org/public/english/protection/safework/cops/english/download/e000013.pdf

UNEVOC Annotated Bibliography of TVET

1. Occupational health and safety management systems: A review of their effectiveness in securing healthy and safe workplaces. Gallagher, Clare; Underhill, Elsa; Rimmer, Malcolm Sydney: NOHSC, 2001, 71 p. ISBN 0 642 70981 5http://www.nohsc.gov.au/Pdf/OHSSolutions/ohsms_review.pdf
2. Occupational health and safety management systems: Review and analysis of international, national, and regional systems; and proposals for a new international documentThe International Occupational Hygiene Association
   1998, 133 p.
   http://www-ilo-
   mirror.cornell.edu/public/english/protection/safework/cis/managmnt/ioha/index.htm
3. The use of occupational safety and health management systems in the Member States of the European Union: Experiences at company level Reports, Issue 307. European Agency for Safety and Health at Work Luxembourg: Office for official publications of the EC, 2002, 66 p. ISBN 9 295 00759X
   http://agency.osha.eu.int/publications/reports/307/en/OSHManagement.pdf

Appendix 1 Example of letter of invitation to focus group delegates

Centre for Mining Innovation
Human Factors Research Group
P.O.Box 91230
Auckland Park, Johannesburg
2006
Tel 011 358 0190
Fax 011 482 3267

Our Ref: DMS 19871
25th November 2010

SIMRAC Committee members
Mine Health and Safety Council

Dear SIMRAC member

Expert focus group for Mine Health and Safety Council Project SIM 10-09-03

As you will be aware, the CSIR Centre for Mining Innovation is currently conducting Mine Health and Safety Council funded research that investigates the system requirements for the proactive monitoring and management of Occupational Health issues in the mining industry.

One of the enabling outputs of the project includes conducting a focus group with experts in the field of Occupational Health (both from the mining industry and from other industries) to identify the requirements of a comprehensive system that will facilitate the proactive monitoring and management of occupational health issues in the mining industry. The purpose of the expert focus group is to draw on current knowledge and expertise that will enhance the recommendations made to the MHSC regarding the development, piloting and implementation of such a system.

You may already have received an invitation to participate in this focus group in you individual capacity, but this invitation is directed to all members of SIMRAC, and you are therefore invited to participate in the focus group and give your valuable input. The expert focus group will take the form of a one-day workshop planned for the 19th January 2011. The venue will be the CSIR campus in Emmerentia, Johannesburg from 9 a.m.

Please let me know if you will be available to participate in this focus group as soon as possible. A brief overview of the issues in Occupational Health Management Systems that have been identified in the literature review will be circulated to all participants during December in preparation for the focus group in January. Further details and directions to the CSIR, Johannesburg will be sent to you in January 2011.
Please feel free to contact me should you have any questions relating to the planned focus group.
Yours sincerely
Dr Anita Edwards
Senior Researcher
Project leader SIM10-09-03 aedwards@csir.co.za Cell: 0832307704

Appendix 2 List of invited delegates for focus group

	Title	Name	Affiliation	Discipline
1	Dr	Cas Badenhorst	Anglo Platinum	Occupational hygiene
2	Mr	Peter Bailey	NUM	Labour
3	Dr	Thuthula Balfour-Kaipa	COM	Occupational medicine
4	Dr	Andy Beke	University of Pretoria	Occupational health
5	Mr	Morne Beukes	Anglogold Ashanti	Occupational hygiene
6	Dr	DB DeVilliers	Anglogold Ashanti	Occupational medicine
7	Dr	Rob Dowdeswell	Private consultant	Occupational medicine
8	Dr	Zahan Eloff	Anglogold Ashanti	Occupational medicine
9	Dr	Markus Fourie	Anglo Platinum	Occupational medicine
10	Mr	Petrus Fourie	Private consultant in small mining businesses	Occupational health
11	Mr	Koos Steyn	Private consultant in small mining businesses	Occupational health
12	Dr	Vanessa Govender	Construction industry-Aveng	Occupational medicine
13	Dr	Linda Grainger	SASHON	Occupational health
14	Prof	May Hermanus	Wits university	Occupational medicine
15	Dr	Greg Kew	Private consultant	Occupational medicine
16	Dr	Spo Kgalamono	NIOH	Occupational medicine
17	Dr	Deodat Kritzinger	Rand Mutual Assurance	Occupational medicine
18	Mr	Dries Labuschagne	COM	Occupational hygiene
19	Mr	Paul Maldon	Solidarity	Labour
20	Ms	Nkhesani Masekoa	DMR	Occupational health
21	Dr	Charles Mbekeni	Anglo Platinum	Occupational medicine
22	Ms	Gugu Mchunu	University of KwaZulu Natal	Occupational health
23	Dr	Mel Mentz	Lonmin	Occupational medicine
24	Sr	Karen Michell	Private consultant, SASHON	Occupational health
25	Dr	Dipalesa Mokoboto	DMR	Occupational medicine
26	Prof	Jill Murray	NIOH	Occupational medicine
27	Dr	Koos Oosthuizen	Murray and Roberts	Occupational medicine
28	Dr	Jan Pienaar	Anglo Coal	Occupational medicine
29	Mr	Martin Prinsloo	Anglo Platinum	Occupational hygiene
30	Prof	David Rees	NIOH	Occupational medicine
31	Prof	Mary Ross	Private consultant	Occupational medicine
32	Mr	Schu Schutte	CSIR	Ergonomics
33	Prof	Geoffrey Setswe	Monash University	Occupational health
34	Ms	Joyce Shirinde	Tshwane University of Technology	Occupational health

35	Mr	Andrew Thomson	Anglo Coal	Occupational hygiene
36	Mr	Nico van Wijk	Anglo Platinum	Occupational hygiene
37	Prof	Lindwe Zungu	UNISA	Occupational health
38	Mr	Paul Geldenhuys	CSIR	IT
39	Ms	Lesedi Milanzi	CSIR	Ergonomics
40	Mr	Norman Khoza	CSIR	Occupational hygiene
41	Dr	Anita Edwards	CSIR-	Occupational audiology
42	Dr	Peggy Sekele	Rand Mutual Asssurance	Occupational medicine
43	Dr	Busi Madolo	SIMRAC, Exxaro	Occupational medicine
44	Mr	Mziwakhe Nhlapo	SIMRAC, NUM	Labour
45	Ms	Renee Koen	CSIR	IT
46	Ms	Sonali Das	CSIR	IT
47	Ms	Felicity Blakeway	CSIR	Facilitator
48	Mr	Eric Gcilitshana	NUM	Labour
49	Mr	Leigh MacMaster	Solidarity	Labour
50	Dr	Beauty Senabe	DMR	Occupational medicine
51	Mr	Nanu Mukhonoana	DMR	Occupational hygiene
52	Mr	Tsweunyana Motitimi	DMR	Occupational hygiene
53	Dr	Kanyile Baloyi	COM	Occupational medicine
54	Dr	Ansie Bruwer	Private consultant in small mines	Occupational medicine
55	Dr	Danie Viljoen	Private consultant in small mines	Occupational medicine
56	Dr	Gerhard de Kock	Private consultant in small mines	Occupational medicine
57	Dr	V Ela	Private consultant in small mines	Occupational medicine
58	Dr	Elton Dorkin	Private consultant in small mines	Occupational medicine
59	Mr	Amos Rikhotso	SIMRAC	Labour
60	Mr	Israel Sakala	SIMRAC, UASA	Labour
61	Dr	Brian Chicksen	SIMRAC, Anglogold Ashanti	Occupational medicine
62	Mr	Idris Ally	SIMRAC, COM	
63	Ms	S Verster	SIMRAC,COM	
64	Mr	Navin Singh	SIMRAC, MHSC	Engineering
65	Mr	Thabo Dube	SIMRAC, DMR	Occupational hygiene
66	Mr	Anthony Coutinho	SIMRAC,DMR	Occupational hygiene
67	Dr	Audrey Banyini Mulaudzi	SIMRAC, MHSC	Occupational medicine
68	Mr	Andy Brown	SIMRAC Angloplatinum	Occupational hygiene
69	Dr	Bharath Belle	SIMRAC Anglo American	Occupational medicine
70	Mr	Harry Mothiba	SIMRAC DMR	Occupational hygiene

Appendix 3 Programme for focus group

Centre for Mining Innovation

Programme for Expert Focus Group Workshop to be held on 19th January 2011

SIM 10-09-03 Project title: An investigation of the requirements for the development of an Information Management System (IMS) and proactive monitoring of Occupational Health Issues in the mining industry

9h00 - 9h30	Delegates arrive at CSIR Carlow road campus: CSIR Centre for Mining Innovation Registration Tea/Coffee
9h30 – 09h40	Welcome to Centre for Mining Innovation *Declan Vogt – CMI Director*
9h40 – 09h50	Welcome to focus group Anita Edwards- Project leader Introduction of focus group facilitator *Anita Edwards- Project leader*
9h50 – 10h00	Introduction to Focus Group process *Felicity Blakeway - Facilitator*
10h00 - 11h00	Session 1 Best Practice in Occupational Health Management *Felicity Blakeway*
11h00 - 11h30	Tea and Comfort break
11h30 - 12h30	Session 2 – Focus Groups Current practice in the mining industry *Felicity Blakeway and participants*
12h30 - 13h15	Lunch
13h15 - 14h30	Focus Groups – Session 3 Gap analysis *Felicity Blakeway and participants*
14h30 - 14h45	Tea and Comfort Break
14h45 - 15h45	Session 4 The way forward *Felicity Blakeway and participants*
15h45 – 16h00	Conclusion

Appendix 4

Background reading sent to focus group delegates

The executive summary of the literature review that follows was drawn up by the research team as the background reading document that was circulated to the delegates to the expert focus group and is included here as an outlined of the findings of the literature review.

Definition of Occupational Health and Safety Management System

The literature review found that there are many definitions of what an Occupational Health and Safety Management System (OHSMS) is and its scope is potentially wide. Previous investigations indicate that OHSMSs can, in some cases, include only management components, or OHSMSs may also include technical/operational components (Nielsen, 2000). The research literature concludes that OHSMSs are not a well-defined set of factors and that there are not clear boundaries between occupational health and safety activities, management and systems. As a result of this lack of definition and clarity on the roles, a variety of OHSMS-based standards, guidelines, and audits have been developed over the last twenty years within the public, private and not-for-profit sectors and many have been adopted by workplaces. However, the effective and relevant OHSMSs are commonly understood to be distinguishable from traditional Occupational Health and Safety (OH&S) programs by being more **proactive**, better **internally integrated** and by incorporating elements of **evaluation** and **continuous improvement**.

Best Practice

The review found that the internationally accepted guidelines for best practice in the field of OHSMSs are those developed and reviewed last in 2007, under the auspices of the International Labour Organization (ILO). These guidelines were developed by the ILO according to internationally agreed principles that reflect ILO values of the protection of workers' safety and health. The guidelines are intended for use by all those who have responsibility for occupational safety and health management.

Another best practice document is the OHSAS 18001 standard that was created by a number of the world's leading national standards bodies, certification bodies, and specialist consultancies to try to remove confusion in the workplace from the proliferation of certifiable OH&S specifications. In the development of OHSAS 18001 a number of older documents were used and it was developed to be compatible with the ISO 9001 (Quality) and ISO 14001 (Environmental) management systems standards, in a way that would facilitate the integration of quality, environmental and OHSMS.

Some of the elements of best practice OHSMSs that are listed in the various documents can be summarised as:

- management commitment and resources;
- employee participation;
- occupational health and safety policy;
- goals and objectives;
- performance measures;
- system planning and development;

- OHSMS manual and procedures;
- training system;
- hazard control system;
- preventive and corrective action system;
- communication system;
- evaluation system;
- continual improvement;
- integration; and
- management review (Robson et al.; 2007).

A consolidation of the elements of an OHSMS as outlined in the research and theoretical literature, include three main areas, namely the **organisational element**, the **consultative element** and the **specific operational elements**. Gallagher et al. (1997) outlined these areas and the factors relating to the elements. Their summary
is seen in Table 1.

Table 1 Elements of an OHSMS (Gallagher, Underhill, and Rimmer, 2001).

Elements of an OHSMS	
Organisation, Responsibility, Accountability	Senior Manager/involvement Line management/supervisor duties Management accountability and performance measurement Company OHS policy
Consultative arrangements	Health and Safety Representatives(HSR) – system resource Issue resolution- HSR/employee and employer representatives Joint OHS committees Broad employee participation
Specific Program Elements	Health and safety rules and procedures Training programme Workplace inspections Incident reporting and investigation Statement of principles for hazard prevention and control Data collection and analysis/record keeping OHS promotion and information provision Purchasing and design Emergency procedures Medical and first aid

	Monitoring and evaluation Dealing with specific hazards and work organisation issues

Reviews and research on the factors that contribute to the effectiveness of OHSMS, as well as the factors that are barriers to the effectiveness of OHSMS is summarised in table 2 (NOHSC, 2001; Robson et al, 2007). These elements are all relevant to the South African mining industry and their use and value will be investigated in the survey that will take place in the next phase of the project, and will form the theoretical framework for the discussions at the expert focus group.

Table 2 Summary of factors contributing to the effectiveness of OHSMS and barriers to their effectiveness (Gallagher, Underhill, and Rimmer, 2001).

Factors Contributing to Effective OHSMS	Barriers to Effective OHSMS
A. Type of System	
Customised to organisation's needs	Off-the-shelf system imposed without modification
Developed with support and involvement of all organisation stakeholders	Imposed by senior management without consultation
Safe place/Innovative system	Safe person/Traditional system
B. Internal Organisational Factors	
(i) Management Commitment	
Strong senior management involvement	Delegation of OHS responsibility to line & OHS management positions
OHSMS introduced to improve OHS	Introduced & supported for non-OHS reasons
Provision of adequate resources	Inadequate resources
OHS integral to management performance appraisals	Limited accountability mechanisms
Leading by example	Words unsupported by practice
(ii) Integration into Management Systems	
All organisational functions incorporate OHS	OHSMS activities marginalised
(iii)Employee Involvement	
All employees encouraged and capable of participation	OHS restricted to 'technical' experts Inadequate training of employees in OHS & in consultation
Independent representation of employees encouraged and supported	Selective employee involvement at management's discretion
(iv) Workforce Characteristics	
Stable workforce	High labour turnover, extensive casual and part-time workforce Reliance upon and exclusion of labour hire employees from OHSMS
C. Nature of Organisation	
Larger organisation familiar with systems and with adequate resources	Small business, with limited resources and unfamiliar with systems concept
Stable workplace	Labour hire company with employees working between multiple client sites Disorganisation of work associated with presence of labour hire employees and contractors
D. Contractor Relations	
Principal contractor works with subcontractor to develop compatible OHSMS	Principal contractor simply requires subcontractor to have OHSMS Principal contractor simply imposes their OHSMS on subcontractor Sub-contractor's OHSMS inconsistent with principal's OHSMS
E. Audits and Audit Tools	
Appropriately used audits can verify and validate OHSMS and facilitate continuous improvement	Inappropriately used audits encourage 'paper systems' and an instrumentalist approach to OHSMS
Adequate audit tools are tailored to organisational needs and reflect key OHSMS success factors	Inadequate audit tools support mediocre OHSMS
Audit processes are robust and auditors are technically competent	Quality-style audit processes and inadequate auditor skills limit audit comprehensiveness
Audits are integrated within a comprehensive approach to measurement	Use of audits as the primary measurement tool

Conclusions

The literature review indicated that a clear definition of an OHSMS and its objectives is an important prerequisite for an efficient OHSMS. Also, in general, the integration of health with safety management in an organization is widely supported, but often neglected. The evaluation of the **success** of OHSMS indicates that **employee participation, senior management commitment and integration into the general management systems** of a company are essential.

The **barriers** to success of OHSMSs appear to be a **failure to customize** the OHSMS to the needs of the organisation, the **imposition of the system without consultation** or involvement of employees, as well as **weak senior management commitment**. The **inappropriate use of audit tools**, where they become an end in themselves, is reported to be another barrier to the

success of OHSMS and this is caused when the objectives of the OHSMSs are not clear and the auditor skills are not well developed or the criteria for evaluation are not clear. The use of **OHSMS in small businesses** and where contract labour is widely used is also reported to be an unfavourable environment for OHSMS. The distinction between mandatory and voluntary OHSMS is also made in the reports found in this review. Voluntary OHSMSs are most frequently found in large companies and are reported to be too complex for small companies. The **voluntary systems are based on best practice** while the **mandatory OHSMSs are geared to only be compliant with regulations.**

The aim of this research is to make recommendations on the requirements for the development of an Information Management System for the proactive monitoring and management of Occupational Health issues in the mining industry. The above information will guide the brainstorming session to be held on the 19th January 2011, which you have agreed to participate in. All suggestions on the use and implementation of OHSMS in the South African mining industry and other industries, based on your expertise and practical experiences, will be welcomed on the day. The outcome of the focus group will be combined with the ILO guidelines for best practice for the use of OHSMSs, to develop a survey protocol that will be used to further investigate the current practices in the South African mining industry and to obtain information that will inform the recommendations made in the final report.

Appendix 4 Draft 1 survey protocol

SIM 10-09-03
Draft survey protocol
Project title: ***An investigation of the system requirements for the development of an Information Management System (IMS) for proactive monitoring of Occupational Health Issues in the mining industry***

This survey protocol has been drafted to include

- the elements outlined in the best practice guidelines for occupational health management systems developed by the International Labour Company (ILO) as a framework of measurement;
- the practical questions that need to be answered about the Information Systems hardware being used in the mining industry;
- the elements identified in the national and international OHSMS literature review as important for inclusion in an IMS for proactive monitoring.

Research team members will interview managers and persons responsible at the different mines and MSHI regions and complete the survey based on responses to questions, observations and inspections of documents. Yes/No answers will be required and comments and observations will be recorded.

A. ASSESSMENT

Computer and Environment Assessment

Name: _____
Surname: _____
Company name: _____
Province: _____
Nearest town/city: _____
Email: _____
Centre for Mining Innovation Researcher: _____
Date: _____

The purpose of this part of the questionnaire is to establish the level of computer access as well as to ascertain how you manage health and safety issues in your organisation. Please include any additional information you feel would assist in gaining a better understanding of how you manage health and safety issues.

- *Try to respond to all the items.*
- *For items that are not applicable, use NA.*

Section A

1. How many staff members are responsible for keeping a record of your organisation's health and safety numbers? _____
2. Are all of the staff members that are responsible for keeping health and safety records up to date computer literate (i.e. can use Microsoft Windows or similar)? | Y | N |
3. If no, how many of them still require computer training. _____
4. Does your company have a fixed building or office for your operations? | Y | N |
5. Does your company have access to computer(s)? If yes, complete Section B. | Y | N |

Section B

1. How many computer(s) do you have access to? _____

2. Does your computer(s) have access to the Internet? Y | N

3. Is the computer(s) on a local organisational network? Y | N

4. Which operating system are you using? Please circle the relevant operating system.
   1 = Microsoft Windows,
   2 = Ubuntu (Linux),
   3 = MAC,
   4 = Other, please specify _____

5. How many employees use the computer(s) to do their work? _____

6. Please indicate which of the following software your organisation use:
   - Microsoft Word ☐
   - Microsoft Excel ☐
   - Open Office Spreadsheet (Calc) ☐
   - Open Office Writer (Document) ☐

Section C

1. How do you currently keep a record of health and safety issues and numbers? Please tick (√) all appropriate options.
   ☐ our health and safety records are maintained via **paper-based** methods **only**, (***complete question 2 of this section***),
   ☐ our health and safety records are stored and maintained **electronically only,** (***complete question 3 of this section***),
   ☐ our health and safety records are maintained both **electronically** and **paper-based**, (***complete question 2 and 3 of this section***),
   ☐ currently we do not keep a record of health and safety issues and numbers.

2. Please attach copies of your paper-based health and safety records. Please tick Yes (√) if the copies are attached. Y | N

3. Which computer system do you use to capture health and safety issues?
   - Microsoft Excel ☐
   - Microsoft Word ☐
   - Internal system ☐
   - Other, please specify _____

Section D

1. PLANNING AND ORGANIZING

1.1 Occupational health and safety policy and objectives

1.1.1 Does your company have an Occupational Health and Safety Management System?

1.1.2 Is the Health and Safety (H&S) policy a declaration of the intention of the company to safeguard the health and safety of employees, customers, and suppliers/contractors?

1.1.3 Is the H&S policy:
- Appropriate to the nature and scale of the company's H&S risks?
- Documented, implemented and maintained?
- Communicated to all employees so that employees are made aware of their individual H&S obligations?
- Available to interested parties and the public?

- Reviewed periodically to ensure that it remains relevant and appropriate to the company?

1.1.4. Does the H&S policy:

- Include a commitment to continual improvement?
- Include a commitment to at least comply with current applicable H&S legislation and with other requirements to which the company subscribes?

1.2 Worker participation

1.3 Does your H&S policy:

1.3.1 Include worker participation?

1.3.2 Include health and safety concerns and issue resolution processes?

1.3.3 Provide for broad employee participation?

1.3.4 Include joint management and worker committees?

1. Responsibility and accountability

1.1 Does the company maintain and document procedures involving responsibility and authority in terms of handling and investigating accidents, incidents and non-conformances?

1.2 Is responsibility assigned in terms of taking action to mitigate any consequences arising from these accidents, incidents or non-conformances?

1.3 Are the roles, responsibilities and authorities of personnel, who manage, perform and verify activities relating to H&S risks in the company's activities, facilities and processes, defined, documented and communicated in order to facilitate H&S management?

1.4 Has the company appointed a member of top management (e.g. in a large company, a Board or executive committee member) with particular responsibility for ensuring that the H&S management system is properly implemented and performing to requirements in all locations and spheres of operation within the company?

1.5 Does management provide resources (human resources and specialized skills, technology and financial resources) essential to the implementation, control and improvement of the H&S management system?

1.6 Does the company's management appointee have defined roles, responsibilities and authority for the following:

1.6.1 Ensuring that H&S management system requirements are established, implemented and maintained in accordance with this OHSAS 18001 specification?

1.6.2 Ensuring that reports on the performance of the H&S management system are presented to top management for review, as a basis for improvement of the H&S management system?

1.6.3 All those with management responsibility shall demonstrate their commitment to the continual improvement of H&S performance?

2. Hazard identification and risk assessment process

2.1 Prevention, reduction and/or control measures

2.1.1 Which operations and activities, associated with identified risks, require control measures?

2.1.2 Has the company established and maintained documented procedure/s for the ongoing identification of hazards, the assessment of risks, and the implementation of necessary risk-control measures? Does the scope of these procedures include the following:

2.1.2.1 Routine and non-routine activities?

2.1.2.2 Activities of all personnel having access to the workplace (including subcontractors and visitors?

2.1.2.3 Facilities at the workplace, whether provided by the company or others?

2.1.3 Has the company constructed a list that include all work hazards, risk assessment of each hazard, and the required measures for controlling the risk of each hazard. Does this list include the following:

2.1.3.1 Hazards reported by the manufacturers of all material, equipment, and tools used at the company?

2.1.3.2 Hazards reported by workers?

2.1.3.3 Hazards identified by incidents/accidents?

2.1.3.4 Hazards identified by any non-conformances to safety standards, regulations or other requirements?

4.1.4 Has the company established and documented a procedure for the systematic assessment of risk through the assessment of both the severity and probability of each hazard? Does the assessment of hazard-severity include the direct and indirect cost/impact to/on all stakeholders of the company?

4.1.5 Does the company ensure that the results of these assessments and the effects of these controls are considered when setting its H&S objectives and does the company document and keep this information up to date?

4.1.6 Is the company's methodology for hazard identification and risk assessment defined with respect to its scope, nature and timing to ensure it is proactive rather than reactive?

4.1.7 Does the company's methodology provide for the classification of risks and identification of those that are to be eliminated or controlled?

4.1.8 Does the company's methodology provide input into the determination of facility requirements, identification of training needs and/or development of operational controls?

2.2 Emergency prevention, preparedness and response

2.2.1 Are emergency prevention, preparedness and response arrangements, appropriate to the size and nature of activity of the company established, maintained and documented? These emergency arrangements should address first-aid medical assistance, firefighting, and evacuation of all people at the worksite.

2.2.2 Do these arrangements identify the potential for accidents and emergency situations, while addressing the prevention of health and safety risks associated with them?

2.2.3 Do the company's emergency arrangements ensure that necessary information, internal communication and coordination protect all people in the event of an emergency in the workplace? This should involve training all members of the company, at all levels, through regular exercises in emergency prevention, preparedness and response procedures.

2.2.4 Do the company's emergency arrangements ensure provision of information to, cooperation, and communication with the relevant competent authorities and external emergency services?

2.2.5 Does the company review its emergency preparedness and response plans and procedures, in particular, after the occurrence of incidents or emergency situations?

3. Legislatory requirements and compliance

3.1 Has the company established and maintained a documented procedure for identifying and accessing the legal and other H&S requirements that are applicable to it?

3.2 Has the company kept this information up-to-date and is this communicated on legal and other requirements to its employees and other relevant interested parties?

3.3 Has the company established and maintain documented occupational health and safety objectives, at each relevant function and level within the company, including objectives for the company as a complete entity?

3.4 Have H&S objectives established and are they consistent with the H&S policy based on the initial or subsequent assessment? Are they measurable in line with the following objectives:

3.4.1 Specific to the company, and appropriate to and according to its size and nature of activity?

3.4.2 Consistent with the relevant and applicable national laws and regulations, and the technical and business obligations of the company with regard to H&S?

3.4.3 Focused towards continually improving workers' H&S protection to achieve the best H&S performance?

3.4.4 Realistic and achievable?

3.4.5 Documented, and communicated to all relevant functions and levels of the company?

3.4.6 Periodically evaluated and if necessary updated?

3.5 When establishing and reviewing its objectives, an company shall consider its legal and other requirements, its H&S hazards and risks, its technological options, its financial, operational and business requirements, and the views of interested parties. Are these objectives consistent with the H&S policy, including the commitment to continual improvement?

B. IMPLEMENTATION

1. Initial review of existing OHSM systems (if no system exists, then the next bullet will be applicable)

2. OHSM system planning, development and implementation

3. Occupational Health and Safety programmes

3.1 Implementation procedure (Standard operating procedures)

3.1.1 Has the company established and maintained (an) H&S management program(s) for achieving its objectives? Do/es these program(s) include documentation of:

3.1.1.1 The designated responsibility and authority for achievement of the objectives at relevant functions and levels of the company?

3.1.1.2 The means and time-scale by which objectives are to be achieved?

3.1.2 Is the H&S management programme(s) reviewed at regular and planned intervals?

3.1.3 Where necessary is the H&S management programme(s) amended to address changes to the activities, products, services, or operating conditions of the company?

3.1.4 Are there procedures which are established and maintained to deal with the H&S risks of goods, equipment and services purchased and/or used by the company? Are the relevant procedures and requirements communicated to suppliers and contractors?

3.1.5 Are procedures established and maintained for the design of workplace, process, installations, machinery, operating procedures and work company? Further, do these procedures take human capabilities into account in order to eliminate or reduce H&S risks at their source?

3.1.6 Does the company implement and document a risk control program for Permit-Requiring tasks/jobs? These may include non-routine construction, new installations, maintenance and/or entry to confined spaces.

3.1.7 In terms of the company's Procurement procedures, are documents established and maintained for inclusion into purchasing and leasing specifications in order to ensure compliance with safety and health requirements?

3.1.8 Have the company's own H&S requirements being identified in compliance with national laws and regulations?

3.1.9 Are these safety conformance requirements implemented prior to the procurement of goods and services?

3.1.10 Are equivalent health and safety requirements established, maintained and applied to contractors and their workers while on site at your company?

3.1.11 Are H&S criteria included in procedures for evaluating and selecting contractors?

3.1.12 Are effective and ongoing communications coordinated between appropriate levels of the company and contractors prior to commencement of work? This should include provisions for communicating hazards and the measures to prevent and control these hazards.

3.1.13 Are arrangements in place for the reporting of work-related injuries, ill health, diseases and incidents among the contractor workers while performing their work for the company?

3.1.14 Is relevant workplace safety and health hazard awareness training given to contractors prior to the commencement of work and as their work progresses?

3.1.15 Is the H&S performance of contractor activities on site regularly monitored?

3.1.16 Are procedures in place to ensure that on-site H&S arrangements are followed by contractors?

3.2 Hazard elimination, control and risk management

3.2.4 Are investigations of the origin and underlying causes of work-related injuries, ill health, diseases, and incidents undertaken, such as to identify any failures in the H&S management system? Are these findings documented?

3.2.5 Are these investigations carried out by competent persons, with the appropriate participation of workers and their representatives?

3.2.6 Are the results of these investigations communicated to the safety and health committee? Does the committee, where necessary, make appropriate recommendations?

3.2.7 Are all proposed corrective and preventive actions reviewed through the risk assessment process prior to implementation? Any non-conformances identified through this risk assessment process should be eliminated only when appropriate. Are

any changes implemented through this corrective and preventive action recorded in the document procedures?

3.2.8 Are investigation results and recommendations from the health and safety committee communicated to appropriate persons for corrective action; included in management reviews; and/or considered for continual improvement activities? Remember: the corrective action resulting from such investigations shall be implemented in order to avoid repetition of work-related injuries, ill health, disease and incidents.

3.2.9 Are reports produced by external investigative agencies, such as Inspectorates and social insurance institutions acted upon in the same manner as internal investigations? Are issues of confidentiality taken into account?

4. Competence

4.1 Education, awareness and training

4.1.1 Are personnel competent (appropriate education, training and/or experience) to perform tasks that may impact on H&S in the workplace?

4.1.2 Has the company established and maintained documented procedures to ensure that its employees working at each relevant function and level are aware of:

4.1.2.1 The importance of conformance to the H&S policy and procedures, and to the requirements of the H&S management system?

4.1.2.2 Their roles and responsibilities in achieving conformance to the H&S policy and procedures and to the requirements of the H&S management system, including emergency preparedness and response requirements as listed in 4.7?

4.1.2.3 The H&S consequences, actual or potential, of their work activities and the H&S benefits of improved personal performance?

4.1.2.4 The potential consequences of departure from specified operating Procedures?

4.1.3 Do training procedures take into account differing levels of: responsibility, ability and literacy; and risk?

4.1.4 Does the training programs include the following:

4.1.4.1 The H&S policy awareness?

4.1.4.2 The H&S management system awareness?

4.1.4.3 Awareness of potential consequences of nonconforming to the company safety standards?

4.1.4.4 The emergency preparedness and response requirements?

4.1.4.5 Proper use and selection of Personal Protective Equipment (PPE)?

4.1.4.6 Are all training records documented in the employees' personal Files?

5. Communication systems related to OHSM

5.1 Internal and external OHSM systems

5.1.1 Does the company have documented procedures for ensuring that pertinent H&S information is communicated to and from employees and other interested parties?

5.1.2 Are employees:

5.1.2.1 Involved in the development and review of policies and procedures to manage risks?

5.1.2.2 Consulted where there are any changes that affect workplace health and safety?

5.1.2.3 Represented on health and safety matters?

5.1.2.4 Informed as to, who is their employee H&S representative(s) and specified management appointee?

5.1.3 Are employees' involvement and consultation arrangements and documented and interested parties informed?

5.1.4 Does the employer ensure, as appropriate, the establishment and efficient functioning of a safety and health committee and the recognition of workers' safety and health representatives, in accordance with national laws and practice?

5.1.5 Does the employer ensure that workers and their safety and health representatives are consulted, informed and trained on all aspects of H&S, including emergency arrangements associated with their work?

5.1.6 Does the employer make arrangements for workers and their safety and health representatives to have the time and resources to participate actively in the processes of organizing, planning and implementation, evaluation and action for improvement of the H&S management system?

2. Occupational health and safety management documentation

6.1 Documents and data control

6.1.1 Has the company established and maintain information, in a suitable medium such as paper or electronic form, that:

6.1.1.1 Describes the core elements of the management system and their Interaction?

6.1.1.2 Provides direction to related documentation?

6.1.2 Has the company established, and do they maintain documented procedures for the identification, maintenance and disposition of H&S records, as well as the results of audits and reviews? These procedures should include the fact that H&S must be legible, identifiable and traceable to the activities involved. The H&S records should be stored and maintained in such a way that they are readily retrievable and protected against damage, deterioration or loss. Their retention times should be established and recorded.

6.1.2 Are records maintained, as appropriate to the system and to the company, in order to demonstrate conformance to the aforementioned OHSAS specifications?

6.1.3 Are operating criteria stipulated in procedural documentation?

6.1.4 Has the company established and maintained documented procedures for controlling all safety documents and data to ensure that:

6.1.4.1 They can be located?

6.1.4.2 They are periodically reviewed, revised as necessary and approved for adequacy by authorized Personnel?

6.1.4.3 Current versions of relevant documents and data are available at all locations where operations essential to the effective functioning of the H&S system are performed?

6.1.4.4 Obsolete documents and data are promptly removed from all points of issue and points of use or otherwise assured against unintended use?

6.1.4.5 Archival documents and data retained for legal or knowledge preservation purposes or both, are suitably identified?

C. EVALUATION

1. Performance monitoring and measurement

1.1 Are procedures to monitor, measure and record H&S performance on a regular basis developed, established, documented and periodically reviewed? Is the responsibility, accountability and authority for monitoring at different levels in the management structure allocated?

1.2 Are performance indicators selected according to the size and nature of activity of the company and the health and safety objectives?

1.3 In terms of the qualitative and quantitative measures of the needs of the company, are they based on the company's identified hazards and risks; the commitments of the H&S policy

and objectives; and/or in support of the company's evaluation process, including management review?\

1.4 Do H&S measurements include the following:

- Number of incidents, accidents, and the accident frequency ratio
- Direct costs of accidents; Severity Ratio
- Number of work days per employee without lost time due to accidents
- Number and cost of citations due to incompliance with legal requirements for occupational health and safety?

1.5 Is performance monitoring and measurement used as a means of determining the extent to which Health and Safety policy and objectives are being implemented and risks controlled?

1.6 Does performance monitoring and measurement include both proactive and reactive recording and monitoring, not based upon work related injury, ill health, disease and incident statistics?

1.7 Does monitoring provide feedback on H&S performance? If so, does it provide information to determine whether the day-to-day arrangements for hazard and risk identification, prevention and control are in place and operating effectively?

1.8 Does information obtained through monitoring provide the basis for decisions about improvement in hazard identification and risk control, as well as the H&S management system?

1.9 Does proactive monitoring include specific plans, established performance criteria and objectives?

1.10 Does proactive monitoring include the systematic inspection of work systems, premises, plants and equipment?

1.11 Does proactive monitoring include surveillance of the working environment, including work company?

1.12 Does proactive monitoring include the surveillance of workers' health, where appropriate, through suitable medical monitoring or follow-up of workers for early detection of signs and symptoms of harm to health in order to establish the effectiveness of prevention and control measures?

1.13 Does proactive monitoring comply with applicable national laws and regulations, collective agreements and other commitments on H&S to which the company subscribes?

1.14 Does reactive monitoring include the identification, reporting and investigation of work-related injuries, absence records, ill health, diseases and incidents?

1.15 Does reactive monitoring include the identification, reporting and investigation of other losses, such as damage to property?

1.16 Does reactive monitoring include the identification, reporting and investigation of deficient safety and health performance, and H&S management system failures?

1.17 Does reactive monitoring include the identification, reporting and investigation of workers' rehabilitation and health-restoration programs?

1.1 Does the company include safety-related factors in the Employee-Performance Appraisal system implemented at the company? These factors should include safety awareness and compliance to safety requirement measures.

1.2 If monitoring equipment is required for performance measurement and monitoring, has the company established, and does the company maintain procedures for the calibration and maintenance of such equipment? Does the company retain records of calibration, maintenance activities and results?

2. Audit

2.1 Has the company established and do they maintain an audit program with documented procedures for periodic H&S management system audits to be carried out? In so doing, do they review the results of previous audits? Are audit results provided to management?

2.2 Are periodic H&S management system audits carried out to determine conformance with compulsory requirements; to determine whether it has been properly implemented and maintained; and to ascertain whether it is effective in meeting the company's policy and objectives?

2.3 Is the audit program, including any schedule, based on the results of risk assessments of the company's activities, and the results of previous audits?

2.4 Is the audit conducted by competent persons internal or external to the company who are independent of the activity being audited?

3. Management review

3.1 Does the company's top management review the H&S management system at suitable intervals to ensure its continuing suitability, adequacy and effectiveness? Is this review documented?

3.2 Does the management review address the possible need for changes to policy, objectives and other elements of the H&S management system, in light of H&S management system audit results, changing circumstances and the commitment to continual improvement?

Appendix 5 Draft 2 Survey protocol for mines

SIM 10-09-03
Survey protocol for Mines
Project title: ***An investigation of the system requirements for the development of an Information Management System (IMS) for proactive monitoring of Occupational Health Issues in the mining industry***

Research team member:
Mine Name:
MHSI region name:
Province:
Email:
Commodity mined:
Number of employees:
Date:

The purpose of this part of the questionnaire is to establish the level of computer access as well as to ascertain how you manage health and safety issues in your organisation. Please include any additional information you feel would assist in gaining a better understanding of how you manage health and safety issues.

- *Try to respond to all the items.*
- *For items that are not applicable, use N/A.*

Section A Computer and Environment Assessment

1. How many staff members are responsible for keeping a record of your organisation's health and safety numbers?
2. Are all of the staff members that are responsible for keeping health and safety

records up to date with computer literacy (i.e. can use Microsoft Windows or similar)?

3. If no, how many of them still require computer training?

4. Does your company have a fixed building or office for your operations?

5. Does your company have access to computer(s)? If yes, complete Section B.

Section B

1. How many computer(s) do you have access to?

2. Does your computer(s) have access to the Internet?

3. Is the computer(s) on a local organisational network?

4. Which operating system are you using? Please tick the relevant box.

Microsoft Windows,
Ubuntu (Linux), ☐
MAC, ☐
Other, please specify

5. How many employees use the computer(s) to do their work?

6. Please indicate which of the following software your organisation use:

Microsoft Word
Microsoft Excel
Open Office Spreadsheet (Calc)
Open Office Writer (Document) ☐

Section C

1. How do you currently keep a record of health and safety issues and numbers?
Please tick (√) all appropriate options.

our health and safety records are maintained via **paper-based** methods **only**, ☐ ***(complete question 2 of this section)***,

our health and safety records are stored and maintained **electronically only,** ☐ ***(complete question 3 of this section)***,

our health and safety records are maintained both **electronically** and **paper-based**, ***(complete question 2 and 3 of this section)***,

currently we do not keep a record of health and safety issues and numbers.

☐ Reason_____

Would it be possible to please attach copies of your paper-based health and safety records?
Please tick Yes (√) if the copies are attached.

2. Which computer system do you use to capture health and safety issues?

Microsoft Excel ☐
Microsoft Word ☐
Internal system ☐
Other, please specify

Section D

1. Do you think there is a need for a national database for occupational health records?
2. How do you think it should function?
3. How would a national database improve on the current method?
4. Who should the custodian of such a database be?
5. If a national database was developed would it be feasible to export your medical surveillance data to the national system? (that is if the confidentiality and access to information issues could be strictly controlled)
6. Do you report compensation cases to Rand Mutual Assurance?
7. Do you report deaths to PATHAUT? (The lung and heart autopsy database)
8. Do your report to SAMODD? (South African Mine Occupational Diseases Database)
9. Do you know about and use SAMSHA? (DMR database Safety Health and Accident database)

Section E

1	*CODES OF PRACTICE*			
TYPE OF COP		COMPILED	APPROVED	REVIEW DATE
1.1	Noise			
1.2	Airborne Pollutants			
1.3	Minimum Standards of Fitness			

1.4	Updated survey mine plan			

1.5	Does the mine have an accredited training program? Who is it accredited with?	
1.6	Are above codes of practice integrated in training of employees? In what way?	
1.7	Is the knowledge of employees checked on a regular basis? How? How are results recorded?	

2	ESTABLISHMENT OF HEALTH AND SAFETY POLICY	YES / NO
2.1	*Has the health and safety policy been developed by the employer and stakeholder?*	
2.2	*Was the health and safety committee consulted on the preparation or revision of the policy?*	
2.3	*Does the document describe organisation (flowchart) of work?*	
2.4	*Does the document establish a policy concerning protection of employee's health &safety?*	
2.5	*Does the document establish a policy concerning the protection of persons who are not employees but who may be affected by activities at the mine (contractors, the community etc.)?*	
2.6	*Does the employer display a copy of the document prominently and conspicuously at the mine?*	
2.7	*Is the document available for employees to read?*	

3	*Minimum standard of fitness Code of Practice*	YES / NO
3.1	Has the employer prepared and implemented a COP on Minimum Standard of Fitness?	
3.2	Was the health and safety committee consulted on preparation of the COP?	

3.3	Does the COP comply with the guidelines issued by the Chief Inspector of Mines?	
3.4	Is the code of practice implemented?	
3.5	Was a copy of the COP delivered to the CIOM/ Regional office?	
3.6	Was a copy of the COP supplied to the health and safety committee?	
3.7	Are employees trained in the COP?	
3.8	Is the copy of the COP available for employees to read?	
4	MEDICAL EQUIPMENT	YES / NO
4.1	*Is the facility provided with all necessary equipment to conduct medical surveillance?*	
4.2	*Is the facility staffed adequately to carry out the duties?*	
4.3	*Are all personnel suitably qualified and trained to carry out their functions? Proof*	
4.4	*Is the calibration certificate for audio booth available and valid?*	
4.5	*Do the doors of the audio booth seal properly?*	
4.6	*Is the testing environment certified as suitable for screening audiometry by a technician?*	
4.7	*Is the audiometrist registered with the Audiometry Registrar?*	
4.8	*Is the Lung Function machine calibrated daily and records kept of calibration?*	
4.9	*Is the operator trained and records kept of his certification ?*	
4.10	*Is the room well ventilated and temperatures logged?*	
4.11	*Is the Lung Function equipment suitable and functional? Check for cracks and cleanliness.*	
4.12	*Is any other equipment used to measure any other medical condition eg digital x-rays, glucometer?*	
4.13	*Is the other equipment suitable and functional? Check for cracks and cleanliness.*	

5	*OCCUPATIONAL MEDICINE REPORTS*	YES / NO
5.1	Has a system of medical surveillance of employees exposed to health hazards been established?	
5.2	Is progress of the medical surveillance reported to the manager on regular basis?	
5.3	Does the employer use the information on medical surveillance to eliminate, control and minimise the health risk and hazards to which employees are or may be exposed?	
5.4	Does the employer use the information to prevent, detect and treat occupational diseases?	
5.5	Are the occupational exposure measurements linked with the medical surveillance records?	
5.6	Have all the employees had a baseline (initial) medical examination?	
5.7	Are the medical examinations done at appropriate intervals?	
5.8	Does the employer conduct an investigation if any employee is declared unfit to perform work as a result of an occupational disease?	
5.9	Does the investigation report comply with the requirements of Section 11(5) (b) (c) (d) (i) (ii) (iii) and (e) of the Act	
5.10	Are employee's records of medical surveillance kept at the mine?	
5.11	Is the annual medical report compiled?	
5.12	Does the report give an analysis of the employee's health based on the record of medical surveillance?	
5.13	Is the report delivered to:	
5.13.1	The health and safety committee or the safety representative at the mine?	
5.13.2	The medical Inspector?	
5.14	When an employees' contract is terminated does the employer arrange for an exit medical examination?	
5.15	Is the copy of the exit certificate entered into the employee's record of medical surveillance?	
5.16	Does the mine have a TB program in place?	
5.17	Are all employees treated and monitored at the mine medical facilities?	
5.18	Does the mine have an HIV/AIDS program?	
5.19	Does the mine have a pregnancy and sexual harassment policy?	
5.20	Are all employees inducted on the above –mentioned policies?	

6	OMP /OHP APPOINTMENT	YES / NO
6.1	Is the OMP appointed in terms of Section 13 (3) (a) of the Act (as an Occupational medical practitioner or other practitioners holding a qualification in occupational medicine recognized by the Interim Medical and Dental Council of South Africa or the South African Interim Nursing Council)?	
6.2	Are the requirements of Section 13 (5) (6) and (7) met by the OMP? Section 13 (5): An occupational medical practitioner must take every measure that is reasonable practicable to – a. Ppromote the health and safety of employees at the mine; and	

	b. Aassist employees in matters related to occupational medicine. Section 13 (6): If any employee is declared unfit to perform work as a result of an occupational disease, the manager must conduct an investigation in terms of section 11 (5) Section 13 (7): If an employee is temporarily unfit to perform work as a result of any occupational disease, but there is reasonable expectation that the employee's health will improve so that the employer can return to work, the occupational medical practitioner must record that fact and notify both the employer and employee of it.	
6.3	Is the employer complying with requirements of Section 15 (1) (a) (b) (c) and 2 (a) and (b)? In other words is patient information kept confidential and are medical records kept in a safe place and not discarded of for 40 years?	
6.4	Registration of OMP with HPCSA kept in file?	
6.5	Is the OHP qualified and registered?	