

# Occupational health risk assessment: central to the management of occupational health

C.J. BADENHORST

*Group Occupational Hygiene Specialist, Anglo Platinum*

Occupational illnesses and diseases tend to be chronic and are generally characterized by temporary or permanent physical dysfunction. With the exception of some symptoms, they are not generally visible. Therefore, safety overrides health in mining because occupational ailments take years to develop and management observes less physical trauma, if they witness anything at all. Occupational health issues need to be addressed systematically, encompassing all aspects of the interaction of employees within the work environment. Risk assessment is central to the management of occupational health. This should not be seen as a complex process and may involve little more than simply considering the consequences of one's actions before starting work. Competent risk assessment provides the starting point and defines the scope of further action. The objectives and final use of an occupational health risk assessment determine the process and the method by which it is carried out.

The occupational health risk assessment is therefore a systematic procedure to identify potential health hazards, evaluate the extent of exposure subjectively and/or objectively, and to establish the need for, and effectiveness of existing control measures. Furthermore, it facilitates the drafting of occupational exposure monitoring, medical surveillance and occupational health education programmes.

Various models for conducting occupational health risk assessment provide step-by-step guidance for the identification and assessment of significant occupational health hazards and assist in producing suitable and significant occupational health risk assessments.

The paper gives an overview of an occupational health risk assessment model based on the basic principles of occupational health and the legislative requirements, which will simplify the occupational health risk assessment process and ensure a sound base for the development of all other occupational health systems.

## Introduction

From the earliest written records on human occupation, mining has been characterized as a dangerous trade with a high probability of injury, illness, or worse. This characterization developed over thousands of years during which life was fragile for those who removed and processed ore. Regrettably, mining accidents were often viewed as one of the tragic costs of extracting the materials necessary for the development of modern life.

Today, mining is among the safest industries in the world as reflected by comparable industry fatality and injury rates. These improvements are the result of a number of factors, including:

- Improved mining methods, such as increased automation and other procedures, which have limited the interaction between man, machine, and mined material
- Routine general education and specialized hazard training for workers
- Broader understanding and application of health and safety management systems and techniques
- Greater recognition of the moral imperative to protect the industry's greatest asset—its people.

Although these improvements are laudable, miners continue to be injured, develop occupational disease, and die on the job (Hethmon and Doane, 2001)

The fact that human loss continues in the industry also indicates that no single correct health and safety method has been defined and no absolute consensus has been established. However, there are obvious predominant patterns in the types of activities conducted in almost all mines to safeguard miners and those who support them, such as contractors and vendors. These include, but are not limited to, mechanisms that identify, correct and prevent hazards, educate and train personnel in hazard recognition, control work practices, and facilitate commitments and involvement.

In many mining companies, the term 'safety' implies an organizational function that may include safety and occupational health and/or occupational hygiene. The primary focus of management today is safety, or preventing negative, generally irreversible, events of acute duration. The outcomes of safety-related events are usually visible and can evoke strong emotions if the results are severe.

Occupational illnesses and diseases tend to be chronic and are generally characterized by temporary or permanent physical dysfunction. With the exception of some

symptoms, they are not generally visible. Therefore, safety overrides health in mining because occupational ailments take years to develop and management observes less physical trauma, if they witness anything at all. Despite this long-held bias, recognition is now emerging. Experts now see that occupational illness and disease do result in significant emotional and financial toll to workers, their families and communities, and their employers. Effective health and safety management must include acknowledging the importance of occupational health hazards and the proportionate application of resources to address those issues (Hethmon and Doane, 2001).

Occupational health comprises two principal elements (i) occupational hygiene and (ii) occupational medicine, and these are enshrined in the Mine Health and Safety Act.

*Occupational hygiene* is defined as the 'science and art devoted to the recognition, evaluation and control of those environmental factors and stresses arising in or from the workplace which may cause sickness, impaired health and well-being or significant discomfort and inefficiency among workers or among the citizens of the community'.

Occupational hygiene is the technical preventive measures taken at a workplace to protect the health of the workforce, i.e. the recognition, evaluation and control of micro-environmental stressors such as dust, heat, hazardous chemical substances, etc.

The occupational hygienist will stress prevention and will therefore examine and evaluate the working environment by means of scientific observation and measurement. The occupational hygienist will use the results obtained to employ engineering design techniques aimed at isolating each health hazard or reducing its concentration to acceptable levels or, alternatively, protecting the worker.

*Occupational medicine* deals with the health status of the employees potentially exposed to the micro-environmental stressors. Aspects such as pre-employment, pre-placement, periodic, special and exit medicals fall under the occupational medicine umbrella. Biological monitoring is an approach to estimating an individual's exposure in certain circumstances.

In the South African mining industry, the legislator has recognized the need to identify health and safety hazards and assess the risk associated with every activity or process, as stipulated in Section 11 of the Mine Health and Safety Act (29/1996). Cognate legislation can be found for South African Industry in the Occupational Health and Safety Act (85/1993). The Mine Health and Safety Act 29 of 1996 came into effect on 15 January 1997, replacing the Minerals Act as the legal basis for regulating occupational health and safety in South African mines.

#### **Several key occupational health issues are central to this Act:**

- Health and safety are the joint responsibility of the employer, employee and state
- Employers and employees are required to identify hazards and minimize related risks
- Equipment manufacturers, suppliers and maintainers are responsible for the supply of 'fit for purpose' equipment
- Routine measurement of hazard exposure is crucial to the management of health and safety
- Health and safety training is essential to be able to assume responsibility for the identification and minimization of risks.

The main reasons why the duty to carry out assessments is explicitly included in the Mine Health and Safety Act is:

- to ensure that the same, systematic approach is adopted for all work involving health hazards (whether in progress or to be started): identifying precautions which are correctly matched to the risk; and
- to provide a basis for the effective and consistent communication of the information collected and the decisions reached to everyone who may need to know them at any time.

#### **Occupational health risk assessment**

An occupational health risk assessment is a systematic procedure to identify potential health hazards, evaluate the extent of exposure, subjectively and/or objectively, and to establish the need for, and the effectiveness of control measures (Schoeman, 1994:7). Furthermore, the occupational health risk assessment is also intended to facilitate the drafting of occupational hygiene monitoring programmes, medical surveillance programmes (Goede, 1998; Van Der Merwe, 1998:14) and occupational health education and awareness programmes (Schoeman, 2001).

The purpose of an assessment is to enable a valid decision to be made about measures necessary to control health hazards arising from any workplace and/ or activity. It also enables the employer to demonstrate readily, both to himself and to other persons, that all the factors pertinent to the activities have been considered, and that an informed and valid judgment has been reached about the risk posed by the hazards, the steps that need to be taken to achieve and maintain adequate control, the need for monitoring exposure at the workplace, and the need for medical surveillance and biological monitoring.

#### **The occupational health risk assessment process**

There are no fixed rules about how the occupational health risk assessment process should occur. However, there are some general principles that should be followed to ensure that the risk assessment is suitable and sufficient.

An occupational health risk assessment is deemed to be suitable and sufficient if it has considered those risks that are likely to arise because of work and work activities. It should enable the development and implementation of actions, where appropriate, of systems to manage the risks. It should be appropriate to the nature of the work being conducted and should remain valid for a reasonable period of time. This will enable the risk assessment process and the significant findings to be positive, i.e. to change the working environment through changing the working procedures or through the introduction of medium- or long-term controls.

Almost all of the models referred to within the South African contexts prescribe some crucial matters that should be addressed within an occupational health risk assessment. This is, however, complicated by the subjective nature with which an occupational health risk assessment is conducted. The general complexity of these models, and the absence of specific step-by-step guidance, result in the principles of occupational health not being adhered to, or ignored by those developing their own models and approaches.

The objective was to research the principles of the occupational health risk assessment process and to create an occupational health risk assessment model based on the basic principles of occupational health and the legislative requirements, which will simplify the occupational health

risk assessment process, but, still deliver sound assessments to ensure a firm base for the development of all other occupational health systems and programmes.

## Methodology

The focus of the study was the Mine Health and Safety Act and its regulations, with specific focus on Regulation 9 of the act. The requirements set by this legislation for conducting occupational health risk assessments were studied in detail. The requirement for conducting occupational health risk assessments for South Africa industry by the Occupational Health and Safety Act (85/1993), and specified by the Hazardous Chemical Substances Regulations of the act, was also studied and compared to those requirements set by the Mine Health and Safety Act. International legislation on conducting occupational health risk assessments was researched and compared to South African legislation.

Occupational health risk assessment models were analyzed to determine shortcomings within these models. The developed and researched model facilitates occupational health risk assessments.

## Integrated occupational health risk assessment model

The objective of the model is to provide guidance for various required inputs into the occupational health risk assessment process, the principles of the occupational health risk assessment process, and the various outputs from the assessment process so that those developing their own approaches are aware of the key ingredients and some potential pitfalls. What matters most is that the model must assist the mining industry in producing suitable and sufficient occupational health risk assessments through a simplified, but scientifically sound, systematic process.

### Phase 1

#### *Planning the occupational health risk assessment*

A suitable and sufficient occupational health risk assessment cannot be carried out simply by walking through a work area. It requires a structured, planned and organized system of information gathering and recording so that assessment against the criteria provided in the Mine Health and Safety Act and the information on which it is based can be made and recorded.

#### *Consulting with the Health and Safety Committee*

Once the occupational health risk assessment is planned, the local Health and Safety Committee or Health and Safety Representative should be consulted.

### Phase 2

#### *Anticipation*

The first stage in the health risk assessment process is that of anticipation. It is considered to be the process whereby the occupational health specialist, by acquiring and studying the data related to a process, plant or activity, together with past experience, assembles theoretical tools and knowledge whereby he/she can infer the type of hazard and the degree of risk that may be present as a consequence of that process or activity.

#### *Nomination and selection of assessment team*

A wide variety of skills are required, of which the most

important is probably an intimate knowledge of the process. Any risk assessment, which does not include discussion with those who actually do the work, is unlikely to be suitable and sufficient. While those who specialize in work of this type bring specialist knowledge of particular types of hazard, which may be appropriate to certain situations, this process is by no means the sole prerogative of specialists.

### Phase 3

#### *Recognition*

The following phase in the occupational health risk assessment process is recognition. Recognition is first of all used to identify hazards. There are many techniques and tools that can be used as part of the hazard recognition phase. This phase can be sub-divided into a research phase and the walkthrough survey phase

- Research

Through comprehensive research, information is collected that provides the basis for health hazard recognition. This includes, but is not limited to, historical data from occupational hygiene reports, medical records, clinical research data, biological monitoring/epidemiological data, dose-response curves, species extrapolation research records, scientific publications, and publications by government and industry. Increasingly, the intranet or World Wide Web is a valuable means of gathering international data. All this information and data need to be assimilated, analyze and converted into a useful format so as to prepare the team who undertakes the risk assessment.

- Walk-through survey

The assessment team visits the work area of concern with the aim of evaluating the current situation within the area. This is known as the walk-through survey. During the walk-through survey, the following information must be recorded:

- Names and designation of the team members involved
- Date and time of the assessment
- Name of department, section or sub-section where risk assessment were carried out
- Number of employees working in the area and brief description of the different occupations found within the area of concern
- A flow diagram/process description
- Identified health hazards present in the area, their physical form and the nature of each hazard classified as being:
  - Chemical
  - Physical
  - Ergonomic
  - Biological or } Very often overlooked
  - Psychological }
- Description of the existing control measures and their effectiveness, including personal protective equipment.

### Phase 4

#### *Hazard identification*

On completion of the recognition phase, the occupational health specialist must study the information that was obtained from the research and walk-through survey phases. This phase requires a sound understanding of the adverse effects associated with a specific health hazard to which employees may be exposed.

## Phase 5

### *Risk evaluation*

Once the identification phase has been completed, the evaluation phase follows.

### *Exposure assessment*

The objective of this phase is to obtain predictive data on exposure of employees to the identified health hazards (i.e. the level of exposure measured or expected for a given set of circumstances). It could include subjective assessment of exposure, measuring the identified health hazard (indicative measurements or measurement results from previous sampling or monitoring) or using exposure models to predict exposure levels (Guild, Ehrlich, Johnston and Ross, 2001).

### *Dose-response assessment*

Dose-response provides a basis for estimating the response associated with a particular chemical exposure and can be expressed either in terms of 'severity of a graded response' or 'percentage of the population that could be adversely affected.' the later is widely used and is represented by a cumulative frequency distribution curve.

### *Existing controls vs. required controls*

Legislation requires that the effectiveness of existing control procedures be recorded. Recommended controls need to be recorded as well.

## Phase 6

### *Risk characterization and rating*

Risk characterization and risk rating is the processes for estimating the incident and severity of adverse health effects likely to occur due to actual or predicted exposure to workplace hazards. It is the final product of the risk assessment process that can be used by management to develop and prioritize control strategies and to communicate risks. The information obtained from the previous phase of the occupational health risk assessment process is combined to determine the level of risk and its tolerability.

## Phase 7

### *Reporting and recording*

It is vitally important that the findings of the occupational health risk assessment are recorded so that there is an effective statement and evidence about how management is taking appropriate actions to protect the safety and health of employees. Whatever format of the risk assessment report, it must be easily accessible to employees, their representatives and to inspectors. Although the recording of the risk assessment process is important, the generation of a paper system is not. The documentation system should not detract from the major purpose of the risk assessment: that is, to improve the management of risks and thereby ensure the health and safety of employees.

## Phase 8

### *Risk communication*

Communicating information on health risks to management, the employees and other stakeholders is imperative. It must always be kept in mind that employee and public opinion is a potent force that can be manipulated by the media and political interest groups. The public and

media perceive risk differently. Communication on risk should aim to bridge the gap between perceived risks and real risks. This should lead to action being taken, demonstrating transparency in the decision-making process and management commitment to maintaining a safe and healthy workplace.

## Phase 9

### *Review*

Section 11(3)(a) of the Mine Health and Safety Act requires managers to review and, if necessary, modify their risk assessments since they should not be a once-off activity. Risk assessment is a continuous process, as processes and activities change, so many hazards and risks change, and therefore the risk assessment process must change. If an accident occurs, or if more is learned about the hazards in the workplace, risk assessments need to be reviewed and modified.

## Conclusion

In conclusion, there are no fixed rules about how the occupational health risk assessment process should occur. The general complexity of risk assessment models, and the absence of specific step-by-step guidance, results in the principles of occupational health not being adhered to, or being ignored by those developing their own clumsy risk assessments. A holistic approach should be followed where one should visualize the occupational health risk assessment as the first step in a constantly reviewed occupational health management programme. In fact, occupational health risk assessment should be the cornerstone for the development of all other occupational health systems and programmes.

Occupational health cannot be managed in isolation. It must be part of an integrated occupational safety and health (OSH) or safety, health and environment (SHE) management system or any sustainable development initiative. This, in turn, must be seamlessly integrated into the general management system of the company. The primary responsibility for health and safety lies with a particular operating company's management, who should ensure that the systems and resources are adequate to meet the occupational health needs of the company. Occupational health and safety professionals provide specialist input as required. The system should be a dynamic one built around clear objectives, with a defined approach to acceptable risk, clear communication and a commitment to continuous improvement. The occupational health service provider, whether outsourced or internal, should have a direct line of communication to the chief operating officer or equivalent of the company concerned.

## References

- GUILD, R. and MARIAS, D. Hazard Identification and Risk Assessment. *SIMRAC Handbook of Occupational Health Practice in the South African Mining Industry*, R. Guild, R.I. Ehrlich, J.R. Johnston and M.H. Ross (eds.), Johannesburg, Creda Communications. 2001. pp. 63–84.
- HETHMON, T. and DOANE, C. Health and Safety Management. *Mine Health and Safety Management*, M. Karmis (ed.). Society of Mining, Metallurgy, and Exploration, Inc. (SME). 2001. pp. 17–38.

- IOHSA. Guide to Conducting an Occupational Health Risk Assessment as Required in the Occupational Health and Safety Act; Regulations for Hazardous Chemical Substances—1995. Johannesburg. 1997. 90 pp.
- SCHOEMAN, J.J. Occupational health risk assessment. *Occupational Hygiene: The Science*. [CD-ROM.] 2001.
- SCHOEMAN, J.J. Identification, Evaluation and Control Principles. *Occupational Hygiene*. Schoeman, J.J. and Schröder.H.H.E., (eds.). 2nd edn. Cape Town, Juta & Co. 1994. p. 7–15.
- SMITH, G.L. Mine Occupational Health and Safety – Towards a Holistic Solution, *Journal of the Mine Ventilation Society of South Africa*, vol. 52, June. 1999. pp. 70–75.
- SOUTH AFRICA. Department of Minerals and Energy. *Practical Guide to the Risk Assessment Process*. 1997.
- SOUTH AFRICA. 1996. Mine Health and Safety Act, No. 29 of 1996. Pretoria.
- VAN DER MERWE, H. Medical surveillance and biological monitoring: overview and guidelines for a ‘task-health-risk zone’ based approach, *Occupational Health Southern Africa*, vol. 4, no. 4. August. 1998. pp. 14–18.

