

SIMRAC Research Programme 2000-2001

- Paul van der Heever

A review of the safety performance indicates that only the gold mining sector has shown consistent improvement during the past 16 years. All mining sectors, gold, platinum, coal, diamond and *other*, have improved fatality and injury rates in the past three years. Eight main contributors to fatalities and injuries are identified and analysed for each sector. Rockfalls, transport, material handling and falling accidents, represent the most significant contributors. Explosions, fires and rockbursts represent the main causes of multiple fatality accidents, the frequency of which has decreased from an average of 10 incidents per annum to one incident in 1999. It is not possible to assess occupational health of mine workers due to uncoordinated and inconsistent recording and reporting in the mining industry and statutory institutions. SIMRAC has taken steps to rectify this situation.

Fifty-one proposals were received in response to 23 Government Gazetted topics published in Notice 2200 of 1999 on 1 October 1999. In addition 40 unsolicited proposals were received. Evaluation and prioritisation of new proposals resulted in the recommendation of 42 projects. A formal, structured adjudication approach and schedule has been instituted to facilitate proposal evaluations by expert panels, subcommittees, and an ethics committee for ratification by SIMRAC.

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4 - 5 series for Gold and Platinum operations

A total of 27 research agencies have submitted proposals to SIMPROSS. All proposal submissions and current continuation projects are currently under review for the 2000-2001 Programme. This includes the following:

* unsolicited

OCCUPATIONAL HEALTH

HEALTH 701 The provision of preventive therapy against tuberculosis for South African mine workers
HEALTH 702 Assess the incidence and work-related risk factors of musculoskeletal disorders
HEALTH 703 Hand arm vibration syndrome in South African gold mines and effects of whole-body vibration
HEALTH 704 Direct (real-time) estimation of occupational dust exposure
HEALTH 705 The use of sputum screening as active case detection method of TB
HEALTH 706 The contribution made to compensation through autopsies conducted under the ODMW Act
HEALTH 709 Identification of health hazards relating to toxic metals in silicon smelters
HEALTH 711 The nervous system effects of environmental manganese exposure of mine workers
HEALTH 712 The role of alcohol and substance use/abuse in mining accidents
HEALTH 713 Publication & printing costs of occupational health volume

GENERIC

GEN 701 Survey of best practice in respect of the design, installation, maintenance and operation of conveyor belt systems
GEN 702 Commercial personnel transportation in the underground environment
GEN 703 Methodology for the safe cleaning and making safe of various height (10-35m) highwalls
GEN 705 Ranging open path remote flammable gas detection/monitoring device
GEN 708* An involvement culture that is conducive to safety-committed employees
GEN 709* Evaluate the use of probes with flammable gas detectors
GEN 710* A pilot study for the implementation of ergonomics in the South African mining industry

COAL

COL 701 To develop best practice inertisation strategy for inbye area of underground fiery collieries
COL 702 Current practice and guidelines for the safe design of water barrier pillars.

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CALENDAR OF EVENTS

MEETINGS*:

SIMRAC: 30/05/00; 29/08/00
SIMHEALTH: 12/04/00; 17/05/00; 14/06/00
SIMGAP: 11/05/00
SIMCOM: 18/05/00
MANCOM: 5/05/00

*Subject to change

- Researchers: Please note that draft final and 4th quarterly progress reports for the 1999 Projects are due by 31 March 2000
- The Annual SIMRAC Review is due for completion in May 2000. Researchers are urgently requested to finalize their short submissions for the Annual review.
- The Annual SIMRAC Symposium will be held during June 2000. SIMRAC contracted researchers who have completed their projects or are in the process of doing so will be requested to submit a 5-page technical paper for collation in the SIMRAC Symposium 2000 Publication

SIMRAC Research Programme 2000-2001 - continued

GAP 726* Development of a vibration absorber for rockdrill vibration attenuation (**PhD Bursary application**)
GAP 727* Updating fatality and accident database
GAP 728* Updating numerical modelling handbook
GAP 729* Database for support catalogue
GAP 730* Determine the impact of SIMRAC research in GAP sector

The annual research programme will commence on 1 April 2000 after final approval by SIMRAC and ratification by the Mine Health and Safety Council early April 2000. Contracts to successful research agencies will be issued as from that date.

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COL 703 Pre-feasibility investigation of system to provide early warning of roof falls prior to support installation
COL 704 Suitable long tendon (2.5m - 15m) technologies and practices
COL 709* Development of a method to estimate coal pillar loading
COL 713* Combustion of back-filled areas on coal mines
COL 714* Quantify noise emissions from coal mining machines

GOLD AND PLATINUM

GAP 701 Risk assessment of hoisting with and without a safety-detaching hook
GAP 702 Develop tele-controls for self-thrusting percussion drilling machine and associated interface
GAP 703 Investigate coupling systems and designs currently in use in the gold and platinum sector. Recommend a specification for a coupling system for rail-bound vehicles
GAP 704 The ergonomics of locomotive design in South African mines

GAP Rock

GAP 705 Investigate the feasibility of a mine-wide continuous closure monitoring system for gold mines at a variety of depths
GAP 706 Pre-feasibility investigation of infrared thermography for the identification of loose hanging wall and impending falls of ground
GAP 707 Understanding and determining the variability of the primitive stress environment using the new stress measuring technique developed by SIMRAC to obtain additional measurements
GAP 708 The design and development of an effective support system for tabular stopes in gold and platinum mines
GAP 709 The meaningful use of peak particle velocities at excavation surfaces for the optimisation of the rockburst support criteria for tunnels and stopes
GAP 710 Underground verification of the large deflection performance of fibre reinforced shotcrete subjected to high stresses and convergence and to dynamic loading
GAP 711* Assessment of seismic risk in the Bushveld Complex platinum mines
GAP 712* Implementation of state-of-art mining knowledge and technologies [using SIMRAC and other research developments] in design and operation of a safe and efficient deep gold mine stope for the 21st Century
GAP 722* A methodology and computer program for applying improved, inelastic ERR for the design of mine layouts on planar reefs
GAP 723* Enhancements to the Support Design Analysis [SDA II] software
GAP 725* The development of a design procedure for SELDA strips (**PhD Bursary application**)

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MINE HEALTH AND SAFETY COUNCIL AWARDS SCHEME

The Mine Health and Safety Council has introduced a new safety award scheme at a function held on 22 November 1999.

The function was attended by the Deputy Minister of Minerals and Energy, Ms Susan Shabangu, the Chief Inspector, Mr. Diek Bakker, mine managers, officials and union members.

The new safety awards replace the previous Chamber of Mines and Department of Minerals' safety award system. The awards are established in terms of a unified set of national safety awards for all branches of mining.

The new awards will also include smaller mines that were previously not included in the old rewarding system.

The trophies, one for 1 million fatality free production shifts and one for 1000 fatality free production shifts (see right) were designed by Design Logo.



Occupational Health Research Results: Gold and Platinum operations - Mary Ross

The following are summaries of SIMRAC Projects in the 4 - 5 series:

GAP 440: Respiratory Effects of Exposure to Crystalline Silica

Epidemiological studies on South African gold miners have contributed significantly to knowledge on the effects of silica exposure to morbidity and mortality from lung disease. In the GAP 440 project, Dr Eva Hnidzo and collaborators reviewed the evidence from previous studies of this exposure-response relationship and also reported on two additional studies of silica exposure related to pulmonary tuberculosis and chronic obstructive lung disease. Completion of the two additional studies was partially funded by SIMRAC.

The results of the cohort study of the incidence of pulmonary tuberculosis (PTB) in white gold miners, followed for 25 years from 1970 to 1995, have important implications for medical surveillance and compensation practices for miners exposed to silica dust since:

- The risk of PTB is increased in miners with silicosis;

- The risk of PTB displays a dose-response trend with cumulative silica dust exposure in the absence of silicosis;
- PTB was diagnosed on average 7.6 years after cessation of silica dust exposure; and
- Of the PTB cases who had silicosis, 90% had x-ray evidence of silicosis before PTB was diagnosed.

Another cohort of white gold miners was restudied for a 20 year period beyond cessation of exposure to dust. It was discovered that 50% of miners who developed radiological silicosis did so after exposure to dust had ceased - a finding which should lead to renewed efforts to reduce silica exposure and a review of medical surveillance in ex-miners.

The results of a comparative study of autopsy findings and in life disability from chronic obstructive airways disease (COAD) showed a severity linked relationship between emphysema diagnosed post mortem and in life airflow impairment and difficulty in breathing (dyspnoea). Bronchitis of varying severity was associated with only mild airflow impairment. Tobacco smoking was associated with all the COAD outcomes.

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Occupational Health Research Results: Gold and Platinum operations *(continued)*

GAP 504: The occurrence, emission and ignition of combustible strata gases in Witwatersrand gold mines and Bushveld platinum mines, and means of ameliorating related ignition and explosion hazards

The three main outputs of the project were:

- a literature and technical review covering combustible gas emissions in mining operations in South Africa and other countries;
- an evaluation of geological sources and gas mixtures including review of the 1914 gas emissions reported to the DME over a 10 year period; and
- development of methods for improved gas safety.

The number of flammable gas reports and accidents is increasing for gold and platinum mines with gas accidents most commonly being caused by changes to the ventilation, lack of testing for gas and contraband while gas ignitions result from contraband and illegal tampering with caplamps. The gas emissions are usually mixtures of combustible and inert gases with methane being the predominant combustible gas present. There are geographical variations which alter the lower explosive limits for the mixtures and geological structures typically associated with gas reservoir areas and transport mechanisms.

Currently used gas detectors do not accurately identify the gas mixtures or concentrations and gas analysis cannot be conducted at the source. The recommendations based on the project results are related to increased expectation of gas emission, awareness of the type and combustible nature of the gas mixture, the limitations of the gas detectors and a knowledge of the probable gas sources.

GAP 505 A Guide to Heat Stress Management

With changes in conditions of work and new shift systems, existing guidelines had to be reviewed as long periods without heat exposure may affect acclimatisation. These new guidelines to Heat Stress Management still address the two main issues of overall fitness to work in hot environments and the application of safe work practices in a hot environment. Emphasis is placed on the assessment of personal risk and screening frequency and the work rate in different degrees of heat. The specific guidelines included are:

- Heat tolerance screening: infrastructures and procedure

- Guidelines to mines for the compilation of a code of practice required in terms of legislation
- Guidelines for the performance of emergency work in hot environments

GAP 514: Respiratory health effects in relation to crystalline silica

The project had a number of components related to establishing the feasibility of conducting a cohort study of respiratory health effects in gold miners. Routine lung function screening measurements collected over a five year period were found to be reliable for use in epidemiological studies provided that reliability and quality are ensured. Reliability can be monitored on a relatively small sample of the workforce. The routine screening data indicated that neither lung function reference values from white American or European males nor the correction factor applied for black American males were appropriate for black South African gold miners. The confounding effect of pulmonary tuberculosis (PTB) on lung function loss in silica-exposed miners was investigated. The effect of PTB on lung function loss was found to be of the same magnitude as the effect of smoking and it is therefore essential to have a detailed medical history of PTB for every miner. The results of the project highlighted priority areas for respiratory health surveillance of gold miners and further research.

For more information on the occupational health projects that SIMRAC has conducted and is in the process of currently conducting, please contact Mary Ross at mross@simpross.co.za or phone her at 27 11 358 9183.

SIMPROSS STAFF CHANGES:

Mrs Cecile Gomes has been appointed by SIMPROSS as Committee and Programme Administrator. She can be contacted at telephone 27 11 358 9190 or by email on cgommes@simpross.co.za

Mr. Paul Allen has left the services of SIMPROSS at end February 2000.

The SIMRAC Newsletter is produced by SIMPROSS during March, July and November. For further information please contact Elsie Zinsser, Private Bag X 63, Braamfontein 2017, Email: ezinsser@simpross.co.za Contributions are welcome. © No part of this newsletter may be reproduced without prior permission from the SIMPROSS Research Manager. Telephone 27 11 358 9185; Fax 27 11 403 1821