SIMRAC NEWSLETTER

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Private Bag X63, Braamfontein 2017, South Africa

Report on the promotional launch: Hearing Conservation Programme: GEN 011 - Elsie Zinsser

Hearing damage is a permanent, chronic and irreversible health risk that mineworkers are exposed to. It is also costly to the mining industry and to the nation as a whole.

At the promotional launch of the Hearing Conservation Programme (SIMRAC Project GEN 011) held on 20 August 1999, at CSIR Miningtek, it was reported that R274 million has been paid out by the Compensation Commission to SA mineworkers who suffer permanent damage to their hearing.

In a recent article published by the US National Institute for Occupational Safety and Health, (NIOSH) in their Mining Safety and Health Focus, it is estimated that by age 50 some 90% of coal miners and 49% of metal mineworkers were suffering from hearing impairment.

Dr Johan Kielblock (previously from CSIR Miningtek) reported that findings in the USA suggest that 50% of hearing awareness programmes fail within two years after being introduced.

This failure is directly attributed to a lack of managerial commitment, the lack of choice of personal protection apparatus and the inability of mine workers to conceptualise the disastrous effects of hearing loss on their family and social lives.

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Dr Kielblock pleaded for a co-ordinated plan of action between the regulator, mine management, workers, manufacturers and equipment suppliers, to combine Personal Protection Strategies (PPS) with Noise Control Engineering (NCE) mechanisms.

He stressed the importance of addressing noise hazards at source and said that noise control engineering was the most challenging obstacle to hearing conservation programmes.

Dr Kielblock also referred to the onus placed on manufacturers and suppliers to comply with the "duty of care" principle as set out in the Mine Health and Safety Act. The following aspects need to be addressed in a co-ordinated plan of action:

- The development of innovative noise control engineering equipment;
- retrofitting of current equipment such as retrofitting exhaust silencers to drills and addressing noise emissions from fans and mobile equipment;
- addressing the perceived loss of productivity during retrofitting procedures;
- ongoing education and training procedures;
- the systematic and risk-based selection of suitable Hearing Protection Devices (HPDs); and
- audiometry screening to assess competency levels of HPDs for critical occupations and revising current SABS standards if necessary.

Mr. Mike Franz, the GEN 011 Project Leader, reported that PPSs were temporary stopgaps and in the long term expensive.

He suggested that a long-term strategy be established through a Standing Committee on Hearing Conservation with representation from the industry, government and labour unions. He suggested that a Standing Committee be tasked with addressing hearing conservation at source through the establishment of three working groups, namely a NCE working group, a PPS working group and a Data Acquisition and Management Systems working group.

Nose Control Engineering is the single most important strategy for dealing with noise in the medium- to long run.

The proposed Working group dealing with Noise Control Engineering will have to look at a strategy to retrofit and modify silencers, enclosures and barriers on machines in use, and deal with design changes to new equipment and machinery.

A Hearing Conservation Training Package is available through CSIR Miningtek. The Package includes 4 Training Manuals in English and a video in Zulu or English. Please contact Mike Franz at CSIR Miningtek at 27 11 358 0000 for further information.

CALENDAR OF EVENTS

MEETINGS*

SIMRAC: 24 Feb. 2000
SIMCOM: 13 Jan. 2000; 17 Feb. 2000.
SIMGAP: 12 Jan. 2000; 10 Feb. 2000.
SIMHEALTH: 19 Jan. 2000; 16 Feb. 2000; 15 Mar. 2000
MANCOM: 14 Jan. 2000; 4 Feb. 2000; 3 Mar. 2000
* subject to change

PROGRESS REPORTS

3rd Quarterly SIMRAC progress reports are due for submission end January 2000.

PROPOSALS: 2000 PROGRAM

Research Proposals for the 2000 Research Programme are currently under consideration.
Research agencies will be notified during December 1999 of required changes to research proposals and if proposal presentations are requested for January 2000.
If you require more information please contact the Research Manager, Paul van der Heever at phone 27 11 358 9180 or by email at pvdheever@simpross.co.za

Trapped Miner Location Device: GEN 502

Dr Valerie Kononov (Miningtek) introduced a prototype two-way trapped miner location device to the mining industry on 15 October 1999.
"The device promises an integrated solution to locating and communicating with a trapped miner", Dr Kononov said.
Further testing and development of the tracking system to comply with SABS standards, Mines Codes of Practice and ergonomic standards will be undertaken before it is produced and marketed for local needs. Contact CSIR Miningtek at 27 11 358 0000 for more information.

The SIMPROSS Research Manager and staff wish you a very happy Christmas and a healthy and safe New Year.

TB: A KILLER DISEASE IN THE MINING INDUSTRY - Dr Mary Ross, SIMPROSS

Tuberculosis (TB) has become a top priority for the SIMRAC research programme in occupational health. TB has now overtaken mine accidents as the leading cause of mortality in the South African gold mining industry. More than 2% of the workforce in the gold mining sector is likely to get tuberculosis per year - an incidence similar to the reported annual injury rate - and by 1996, the mortality rate was about 0.15%.
Tuberculosis has long been recognised as an occupational disease associated with the mining industry in South Africa.
Medical historians suggest that tuberculosis was introduced to South Africa with the discovery of diamonds and later gold in the 1880s by miners who came from countries in Europe where tuberculosis was common. The close contact between these immigrants and the local miners caused tuberculosis to spread first to the local population and then to rural communities when migrant workers returned home.
In South Africa, notification of tuberculosis became compulsory after the Public Health Act was passed in 1919 and since then it has been possible to estimate and track the extent of tuberculosis occurrence and mortality. During this century, tuberculosis became and has remained a major public health problem for the population in general and the mining industry in particular.
The association between exposure to silica dust, silicosis and the development of tuberculosis is well established and hence TB has been a greater problem in the gold mining sector than in the coal mining sector in which the exposure to silica dust is less.
Under the Occupational Diseases in Mines and Works Act (Act 78 of 1973) and Amendment Act (1993), tuberculosis is a compensable disease for miners who develop tuberculosis within 12 months of last quartz exposure. In the non-mining industry, tuberculosis is also recognised as an occupational and hence compensable disease in workers who are exposed to silica and in health care workers exposed to patients suffering from tuberculosis.
Silicosis and accompanying tuberculosis have long been identified as an occupational health challenge to the mining industry. In the mid 1500s, Agricola, describing conditions in Bohemian mines, mentioned that "if the dust has corrosive qualities, it eats away the lungs and implants consumption in the body. In the Carpathian mines, women are found to have married seven husbands, all of whom this terrible consumption has carried away."
Around the beginning of this century, rock drilling and sandblasting were introduced and this resulted in widespread silicosis. On the Witwatersrand, phthisis (the term then given to silicosis with tuberculosis) caused the death of about one sixth of the rock drillers. Tuberculosis was then probably the most important cause of death in silicotic patients before dust control and chemotherapy were introduced.
Until the last decade of this century, the situation improved and the incidence of tuberculosis in miners began to decline towards the national rates. However, the emergence and

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relentless upsurge of another epidemic in the last 10 years has had an enormous impact on the incidence of tuberculosis.

The Human Immunodeficiency Virus (HIV) has become an important risk factor for tuberculosis, particularly in the mining industry.

Research by Churchyard *et al*[1] in the gold mining industry has shown that the incidence rate of tuberculosis (rate of new cases occurring per year) has more than doubled since 1990.

It is likely that much of the increase is a result of the HIV epidemic since, in the same period, the prevalence of HIV has increased almost threefold. Concurrently, Murray *et al*[2] have shown that the excess mortality in miners being treated for tuberculosis is attributable to the increase in HIV infection since more than half of the HIV infected TB patients died from non-tuberculous causes.

The HIV epidemic has thus become the most serious challenge to the health of miners both through its effect on tuberculosis and through other effects and diseases. However, there is scope for progress in the control of tuberculosis.

In their cohort study of 28 522 gold miners, Murray *et al.*[2] have shown conclusively that, even in mining communities with very high prevalence of HIV and tuberculosis, well-run TB control programmes can result in acceptable cure rates and save lives.

In the mining industry, law has required regular medical surveillance for pneumoconiosis and tuberculosis for decades.

The mining industry has recognised the importance of tuberculosis control and mines with health services usually have comprehensive TB management programmes. Management of tuberculosis includes passive case finding (patients with symptoms seeking health care); active case finding (e.g. screening of workers without symptoms by x-ray); diagnostic investigations; supervised chemotherapy with follow-up care and compliance with notification requirements.

Person-to-person infection occurs by droplet spread of the tubercle bacilli. The tubercle bacilli can infect a person and either lie dormant (not multiplying or causing disease) in the body for many years or cause disease relatively quickly. It has been shown that although the vast majority of miners have been infected with the tubercle bacillus, only about half the cases of tuberculosis are caused by reactivation of this dormant infection. The others are affected by a new infection from recent contact with infectious cases. Early detection and effective treatment of infectious workers is vital to prevent other workers from becoming infected and also to prevent the emergence of resistance to chemotherapy by the tuberculosis organisms.

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There are currently three SIMRAC research projects focussed on different aspects of tuberculosis.

One project (GEN 524) is focussed on researching the role of more frequent x-ray examination in improving active case-finding while another (HEALTH 617) is exploring the interaction of tuberculosis and silicosis on lung function.

An analysis of autopsies performed on deceased mineworkers indicated that about half the cases of tuberculosis detected at *post mortem* had not been recognised in life. These findings are the basis for a third current SIMRAC project (HEALTH 611) in which the discrepancies between in and after life diagnoses are being investigated. The objective of all these research projects is to improve tuberculosis programmes for miners and hence decrease the suffering and mortality from this disease.

The tuberculosis and HIV epidemics are public health emergencies throughout South Africa and nowhere more so than in the mining industry. It is vital for the mining industry, labour and the State to make tuberculosis, with its associated risk factors, an occupational health priority just as it has been identified as a priority for research by SIMRAC.

1. Churchyard GJ, Kleinschmidt I, Corbett EL, Mulder D, De Cock KM. Mycobacterial disease in South African gold miners in the era of HIV infection. *Int J Tuberc Lung Dis* 1999; 3(9): 791-8.
2. Murray J, Sonnenberg P, Shearer SC, Godfrey-Faussett P. Human immunodeficiency virus and the outcome of treatment for new and recurrent pulmonary tuberculosis in African patients. *Am J Resp & Critical Care Med* 1999;159(3): 733-40.

ERGONOMICS: THE KEY TO A SAFER, MORE EFFICIENT AND PRODUCTIVE MINING ENVIRONMENT - Prof. P A Scott, Ergonomics Unit, Rhodes University

Ergonomics is the scientific analysis of the work environment; the aim being not only to improve working conditions by reducing physical and mental demands often placed on workers, but also to improve productivity.

An understanding of the theoretical principles and practical applications of Ergonomics is essential in all working areas and the mines are no exception.

Although the Ergonomics Society of South Africa (ESSA) was only formally established in 1984, probably some of the earliest and best practical work done in the field was that of work physiologists Wyndam and Strydom in the sixties.

They conducted some excellent studies on the energy expenditure and heat acclimatization of mine workers.

ERGONOMICS - *continued*

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It would certainly be interesting to do some follow-up work today, with the new mining technology plus the sophisticated equipment now available for Ergonomic research.

Many working situations in Southern Africa are characterised by what has been identified as "a complex array of problems", where ill equipped workers are often required to work under extremely poor conditions.

While humans have an amazing ability to adjust to less than optimal working postures and to tolerate rather horrendous physical stressors, there are limits. The accumulative build-up of stressors will affect the worker negatively, both physically and mentally.

This leads to inefficient working practices and ultimately results in poor quality and low quantity of productivity. In such situations, the basic task of any ergonomist is to analyse the overall situation, investigate the actual demands of the work plus worker capacity to cope with the demands and, wherever necessary, to redesign the workplace to enable the worker to function efficiently and with minimal strain.

South African companies have yet to recognise the substantial impact that ergonomics can have in increasing productivity while at the same time reducing the physical and mental demands placed on the worker; in other words Ergonomics is a key factor in establishing a more cost effective organisation.

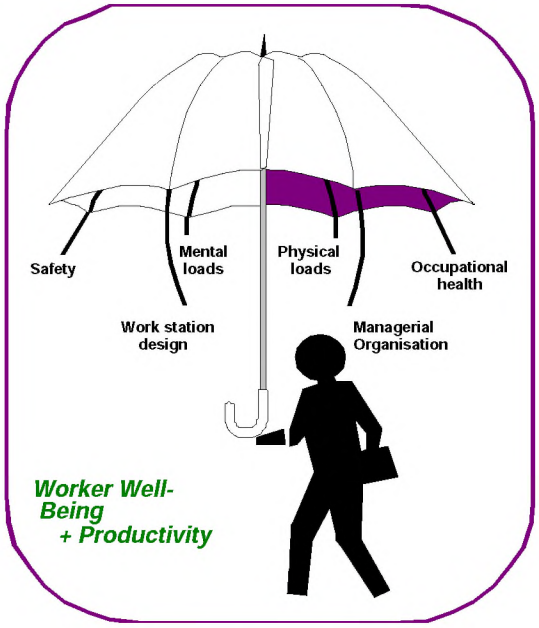
While much emphasis is often placed on safety in the work place, those involved in this important aspect tend to focus only on the immediate cause of an accident or injury and are likely to take a tunnel vision approach to an investigation of the direct and obvious cause.

Ergonomists on the other hand, acknowledge the interdependence of all components within a work site and take a more general overview of the total working ambience, together with conducting an indepth analysis of the specific problem area.

Ergonomics is therefore the umbrella discipline (See picture) which investigates both the mental and physical loads placed on workers, assesses both work station design and managerial organisation, and incorporates safety and occupational health factors.

One could briefly outline the responsibilities of an Ergonomist as to:

- evaluate the *overall* situation
- investigate *specific* work stations
- analyse the demands of the *task* (physical and/or mental)
- identify *hazardous* stations/*problem* sites
- assess the workers' *physical and mental capabilities*
- evaluate *incompatibilities* between the task and the worker
- *prioritise* areas of major concern
- initiate *intervention* strategies



The next critical step is to implement ergonomic interventions to improve the situation.

In most situations when trying to solve a problem, a 'team approach' should be taken. Everyone associated with the specific area should be encouraged to participate and be actively involved in the ongoing assessments and improvements of the various work sites within the mine.

"Participatory Ergonomics" encourages the involvement of all concerned and develops a corporate awareness of the situation; this will ultimately build a group commitment to bring about positive changes to improve the situation for all. From a supervisory/managerial position the objective would be to establish an Ergonomics ethos on the mines and to develop a "co-operative, co-responsibility" ambience within the mines.

After many years of working to establish an awareness of Ergonomics in South Africa and indeed in many Industrially Developing Countries, I firmly believe that any working environment run on sound ergonomic principles will not only improve working conditions, but should also result in an increase in productivity (with less effort). The result is that individual worker, the company and the Nation as a whole must benefit.

For more information on Ergonomics generally, or the Ergonomics Society of South Africa (ESSA) contact Professor P A Scott, Department of Human Kinetics and Ergonomics, Rhodes University, P.O. Box 94 Grahamstown 6140. Tel: 046 6038469; Fax: 046 62 23803; E-mail: p.a.scott@ru.ac.za

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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.