

Journal Comment

Mine Safety with Heritage Security

*"Tug on anything in nature and you will find
It connected to everything else"*
John Muir

In this issue there is much for the pragmatist and a great deal for the philosopher. With this Journal Comment, I start my 62nd year of association with mining and metallurgy. The quotation reflects my experience. I have rubbed shoulders with every element in the periodic table, from hydrogen, via the platinum group metals to uranium; from pragmatism to philosophies on job creation. And so it is in this issue.

On the pragmatic aspects is a set of two papers by Dr Joughin and a team of consultant co-authors including those from SRK, all of whom are long-time campaigners in assembling mathematical models expressing the probability of an accident in relation to practicality and profits of a mining operation. They have chosen the underground platinum mines of the Bushveld Complex to work on. This is undoubtedly the most difficult and complex mining challenge in South Africa.

In the second part they come to a conclusion that there is potentially a lot of practical value in this approach, but a wider pool of data is needed to quantify adequately the statistical variability of the rock strata. Collection and interpretation of more data is well justified.

There are many other papers describing new products and practices to contend with the rockfall problems, to the extent that old coal mines are being revisited and reopened to extract more coal from the pillars left behind after previous mining operations ceased.

There is a paper from China describing the development of automated machines to undertake the mining of underground coal: perhaps a portent of what might be available for our ultra-deep gold mines.

On open pit coal mining, attention is focussed on the handling of the water and the acid mine drainage problem. For example, there is a paper from Czechoslovakia, where the AMD problem brought about the closure of the mine.

In a detailed paper from the Optimum Colliery, an incredibly complex water problem is revealed. In a remarkably detailed water management protocol the mine had to resort to a reverse osmosis plant to produce saleable domestic water to achieve a complex but working environmentally acceptable system.

In a similar paper from a BHP Billiton Group coal mine, also at Middelburg, by Z. Nzimande and H. Chalke, a comprehensive commitment is made to restoration of the environment after mining is complete and to the other requirements of the Mining Charter. Of particular significance is a key statement in the paper:

'We will ensure that we take action within our own businesses and work with the governments, industry, and other stakeholders to address the challenge of climate change'.

On an extensively legal and political basis is the paper by Andrew Mitchell *et al.* entitled 'The Avatar Syndrome,' in which the sanctity of previous tribal and general hereditary rights to land and mineral resources has been enshrined in law. It is clear that the provision of future livelihoods and sustainability guarantees is rated of high importance in the Mining Charter.

On these political and philosophical aspects I should not make comment. But I feel I can point out some promising developments likely to lead to income generating opportunities after mine closure and at the same time alleviating the global warming problem.

I refer to two dramatic announcements on non-polluting energy systems that were made at the World COP17 global warming conference held in Durban, South Africa in December.

The one was a demonstration by Professor Diane Hildebrandt of Wits and Jaco van der Walt of SANEC/NEFCOR of a pilot plant that converted biomass in the form of plant and waste organic material (including domestic sewage sludge) to diesel biofuels. This process, named the 'Beau-Ti-Fuel' process, was based on pyrolysis in a high-temperature plasma arc to form 'syngas' (carbon monoxide and hydrogen), followed by a Fisher Tropsch synthesis to diesel fuel. The process and plants were claimed to be ideal for smaller applications such as in clusters of villages of small-lot farmers.

With the limited data made available it is impossible to compare this process with the conventional anaerobic digestion production of methane, also now being used commercially as a diesel fuel in office buildings. In terms of the refractory components of biomass, it seems likely to be competitive with other proposed technologies. And there is a good probability of extensive application. One can visualize mines forming cluster communities supplying their requirements of diesel fuel. This from biomass produced on rehabilitated and reconstituted land with treated effluent water ... it is certainly a concept well worth-while pursuing further because this would be self-sustaining and could create many jobs and other community benefits.

The second was a dramatic top-level presentation by Cynthia Carol, CEO of Anglo American, announcing a commitment to promote the further development of the platinum fuel cell as a dominant energy source for world use, ultimately to replace fossil fuels.

Platinum in fuel cells is like another jewel in the Anglo crown. Like diamonds, which are forever, in fuel cells, platinum is not consumed, and once guaranteed a supply of hydrogen, can last many rejuvenations and a lifetime of electric power generation.

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Two of the best and well-proven sources of hydrogen are bio-methane and syngas such as may be possible from the Beau-Ti –Fuel process and /or anaerobic digestion using plant and animal waste. These sources are neutral in terms of greenhouse gas emissions, unlike natural gas with its fossil origin and carbon footprint. The photosynthesis reaction is rated as one of the most efficient solar energy converter mechanisms.

But these are visionary concepts covering a large realm of nature, sun, sky, wind, land and water, animals, vegetables, and minerals. Pragmatically, they need quantitative and statistical assessment. Many are in progress, such as land restoration and water availability via effluent treatment, including domestic waste. But there is much still to be designated, such as what crops are best for biomass production in different localities.

A portfolio of projects has to be fitted into a strategic master plan to be tackled nationally. The Government has submitted proposals as regards employment creation, and it seems the mining and metallurgical community must respond and obviously has much to offer.

Our Journal would be honoured to publish the economic and technical details of such contributions as they are developed for professionals worldwide.

There is little doubt that coal mining will continue for many decades. Now there is green-tinged sunlight at the end of the global warming tunnel spelling out carbon credits. This must be focussed upon immediately, if only for its unique potential for creating employment around the mining and industrial areas. ♦

R.E. Robinson