

Journal Comment

*"History must be written of, by and for the survivors
Anonymous*

There is a wealth of interesting reading in this issue with papers taken from the recent PyroMetallurgy Conference. It is possibly one of the most pleasing editions we have published with items from our University departments of mining and metallurgy, and our research institutions of highly significant and scientific research stature. Also it focuses on topics representing great future wealth potential.

Geographically much of this wealth is located around the Bushveld Complex (BC), which many see as the future replica of the Witwatersrand/Free State goldfields that sponsored the centres of industrial and residential areas of affluence in the last century. Sadly, many of these are descending into ghost towns.

There are many features of similarity between BC and the goldfields. The perimeter of mineral occurrences is much the same, and both have as their main product precious metals occurring at grades of only a fraction of one ounce per ton of ore mined, and which are of today almost the same value in dollars per ounce. The main products have artificial values as monetary standards and, as in jewellery, the current level of product values are approximately the same.

However, the BC has many additional products, notably chromite for ferrochrome production and a huge potential of iron ore in the form of titaniferous magnetite, some of which contains vanadium, which is a byproduct, together with those from precious metal production such as nickel and cobalt. However the challenges in mining and recovery of the valuable constituents in the BC are much more demanding. This will become apparent when reading the papers in this issue.

The mining is complex, with many potholes and pitfalls, and in no other mineral processing activity that I am familiar with has it been necessary to achieve submicron sizes in the comminution processes, nor the sophistication of exotic modeling and automation as is necessary in the flotation processes to achieve a reasonable recovery and comply with onerous specifications for the concentrate grade. The paper by L. Andrews *et al.*, gives a good indication of the sophistication of the mineralogical techniques involved.

In all cases, the final steps are dependent on a branch of pyrometallurgy that is often referred to as electrometallurgy, largely depending on electric arc furnaces, and this is the dominant topic of the papers. If any of our readers think that these final steps are simple, I suggest that the paper by J.L. Eksteen *et al.* is the one for proper appreciation of the complexity.

As regards the electric furnace processing, the major problem of the ever-increasing power cost is being addressed with much concern and is the overriding background to the rest of the papers. There are excellent contributions from those involved in the development of the DC plasma furnaces as promising alternatives to the conventional submerged arc, three-phase systems, which are the topic of equally excellent contributions. All systems are focusing on improving efficiencies in operating procedures and reducing megawatt consumption and on co-generation of power. This work is a survival strategy to retain the competitive position of South Africa's electrometallurgical industries. Also, one would wish to avoid a situation in the platinum industry where as a result of the increased power costs only the biggest and fittest of the platinum smelters survive.

The suite of papers on furnace design and operations and improvements from international companies and from top level local designers and specialists are top quality. All deserve detailed study. They are of cardinal importance in our national strategy.

My personal interest was attracted to the paper by Steinberg and his coworkers at the Highveld Steel and Vanadium Company. This was because of my involvement fifty-two years ago as manager of the first vanadium extraction plant in South Africa, and thus with the establishment of the first Highveld Steel and Vanadium plant. I was a chemical engineer armed only with a slide rule in an unsuccessful attempt to convince the team of metallurgists that a countercurrent prereluction kiln was a better approach than a co-current option. It appears that the question is still topical today, and there is favour for my alternative option. The paper is first class and highly important. The first prereluction step is critical, and I believe it could lead to unlocking the immense potential of the production of both steel and titanium oxide or titanium metal from the BC resources of titaniferous magnetite.

Perhaps some comment on future national directions will be of interest.

The dominant, if not survival, consideration will be job creation. We are close to desperation to find, not thousands, but many millions, of 'decent' self-sustaining jobs. Our politicians and strategists are looking avidly at our unbeneficiated mineral resources to provide the main solution.

There is much wishful and muddled statistical thinking on this possibility. 'Decent' work opportunities means skills for 'adding value' to generate saleable products and services.

To make a dent in our problem we are talking of final product values many times the total turnover of the platinum and gold industries. But the trade unions continue to look at our rich gold and platinum and other unique mineral resources as our salvation.

Certainly in a build-up period we can spend a fortune in infrastructure for education training and importing intellectual property for innovative products. Of course other industries have to contribute, such as agriculture or tourism.

But at the end of the day these infrastructural educational capital expenditures have to translate into many motor car exhaust catalysts, luxury fruit exports, or air travel tickets.

We have little hope of achieving success on our own...

More positively, if we look at our international competitors in the BRICS alliance and in Europe, North America, and the Pacific Rim countries in terms of demographic statistics, our required additional export values amount to in the region of 1 per cent of their combined market potential.

International collaboration already existing in embryonic form can expand on a win/win basis. Not only do we need help in final product technology, but also the linguistics needed in marketing. Teaching mathematics and economics training for technical skills and tertiary pre- and postgraduate interaction. This can provide scope for thousands of most welcome and needed expatriates.

Our mining and metallurgy professionals should be able to proudly muster many international collaborators, and can spearhead a pattern of international interchange and interaction employment-wise and material-wise. The mineral resources could be the catalytic instigation of a wide variety of manufacturing and agricultural cluster industries. The 1 per cent would be a small price for collaborators to pay for privileged access to such materials.

What wonderful scope for many more international conferences and publications. ♦

R.E. Robinson