Innovate: 'to invent or begin to apply'- Collins Dictionary

Several papers in this issue from an international conference on industrial fluidization represent an exceptional opportunity for innovation.

It is common cause that innovation is the prerequisite for job creation, which is rated as the highest priority in Africa.

In this context the most succinct definition of 'Innovation' from Collins Dictionary includes two components; invention and application. Concepts are two a penny. Inventions, (let's call them R&D projects so as not to be confused with patents) are much more demanding in professional expertise at research institutions, and are widely reported in journals such as this one. The application component in all respects is the most comprehensively difficult.

Investors demand 'bankable economic feasibility' submissions specifying products, services, market values, and similar sources of income. They also demand comprehensive estimates of raw material, operating, and fixed costs with assurance that the technical, operating, marketing, management, and economic skills are available to create the added value that provides the profits. They also demand reasonable guarantees of the ability of the inventors of the new proposal that it has been adequately proven.

Job creation applications can be productively positive, but also parasitically negative. Creation of jobs that have to be subsidized from taxpayer funds, such as those that involve infrastructure like roads and railways, demanding levies, and increased tariffs, have negative implications in the form of non-competitive prices and retrenchment of staff in private industries.

In my sixty years of association with research I have found that, statistically, few original R&D projects lead to innovative applications, probably no better than one in 10. Generally, the time required to translate concepts to successful application is of the order of a decade, regardless of the scientific level of genius and entrepreneurship involved. Research and development expenditure must recognise such probabilities. Hence the Risk Venture Capital Portfolio with maximum national collaboration, inviting international contributions, is of such importance. This issue of the Journal is an excellent example of the benefits of such professional interaction.

The suite of papers presented at this conference on fluidized bed technology are at the forefront of the innovation requirements. They are from the Alstom Power Systems of France and from the Foster Wheeler group in the USA.

Full appreciation can come only from detailed reading. I can do little better than to point to the potential benefits in South Africa, and not the least in terms of job creation.

The papers describe the commercial successes of plants to convert waste coal to electrical power with high efficiency and great versatility in the use of lowcost coal discards and other carbonaceous material such as biomass, of which bagasse is a typical example. South Africa continues to produce large quantities of waste coal to add to its accumulated stockpile of billions of tons. An outlet for agricultural biomass would be most beneficial.

The country is desperate for additional sources of competitively priced electrical power. I use the word ‘desperate’ with good reason. Transnet has embarked on an immense road and rail transport infrastructure development programme to create millions of jobs and to handle the expanding exports of iron and manganese ores, quality coal, and other minerals and metals for overseas markets.

But there are major problems in providing the electrical power for these and other power-hungry undertakings such as low-cost housing and expansion of added value mineral products. Our waste coal is in close proximity to many electrometallurgical industries where cutbacks have occurred as the result of power cost increases and shortages. CFB technology would appear to offer extensive potential expansion in electrical power generation where it is most needed.

I am quite sure that Eskom and the mining industry are already examining these options very closely.

There are other possible benefits from CFB technology, such as the use of the waste ash to combat the acid mine drainage problem on many coal mines so as to produce useable water.

Producing cell-grade alumina to replace imports is a possible component of a portfolio of development projects. There are exciting options ahead.

There are other intriguing papers presented, and interestingly, many of these have international authors or co-authors.

A paper from Brazil for example, is particularly topical.

‘A case study application of linear programming and simulation to mine planning’, by José Adolfo de Carvalho Júnior, and Jair Carlos Koppe; João F.C.L. Costa.

This is an unusually comprehensive and versatile statistical model to optimize production planning in multiple mines with a multiplicity of different quality products, and will certainly interest our mining strategists and academics in their lectures.

Keeping to the fluidization theme, there is a paper on ‘Fluidization behavior of various titania feedstocks’, with authors from Exxaro Resources, Mintek, and the University of the Witwatersrand.

This contribution is at an early stage in the invention-to-application chain, but nevertheless refers to one of the future saleable mineral products where we are likely to have an extensive supply of low-cost starting materials. The fluidized bed is used to produce TiCl4, the commodity

starting material for pigments but also nano titanium oxide, with most interesting novel uses as indicated in a previous publication in this Journal.

On the fluidization theme there are several other papers of intriguing interest where fluid bed roasting can be considered as a pyrometallurgical alternative for low-grade base minerals rather than the hydrometallurgy route. Outotec have well- established test facilities for work on low grade cobalt and copper materials associated with iron sulphides. Cobalt is a strategic metal and the main mineral resources are in southern Africa.

I have dubbed a paper from China on hydraulicfracture as ‘Fracking in Coal Mines’, in the hope that this approach to the release of gases from underground coherent coal deposits, will have future application in the Waterberg and maybe in the Soutpansberg and far North West Limpopo coal fields in South Africa. This is inventive work with some way to go before application, but cooperation with the Chinese experts could be of value.

Last but by no means least is a paper from two South Africans and one Australian, who are members of the ‘Institute of Mine Seismology’. The paper is titled: ‘Mechanisms of large seismic events in platinum mines of the Bushveld Complex (South Africa).’

This has nothing to do with fluidization, but it has my great admiration and deserves a special place in this prestigious issue.

Rockbursts have been the evil demon in deep level mining. And their stochastic nature has made it particularly difficult to establish the cause and effect of seismic events. For the first time to my knowledge, statistical interpretations of recordings of seismic events have been able to predict the nature and locality of such events, and this is a huge advance. One only has to look at the signal recordings given in the paper to recognize the breakthrough in statistical methodology to make this discernable, albeit with a measure of uncertainty.

Hopefully this will have a positive impact on the accident level in the platinum mines of the Bushveld Complex, which I foresee has the prime potential for high-level employment in South Africa.