

Where are all the coal researchers?

Written by Q Campbell

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Coal is big. Really big. In 2011 the industry earned R 87.8 billion from coal sales, including more than R50 billion from exports. According to the Preliminary Statistical Release P2041 Mining: Production and Sales, published by Statistics SA in July 2013, the value of coal sales represented 24.5 per cent of all mineral sales for the first quarter of 2013, with gold and PGMs following at 20.5 per cent and 20.8 per cent respectively. Yet fundamental research in coal, in South Africa at least, seems to be lagging. If one can take this Journal as a benchmark, it has, since 1991, published 1168 articles of which only 167 had the word 'coal' in the title – representing 14 per cent of the published research output. So where are all the coal researchers, and why are they not publishing?

Coal research in South Africa essentially started in the 1930s around the time when the Fuel Research Institute was founded. Funding was obtained through a levy on all coal sales and government grants. This resulted, inter alia, in the famous FRI pilot plant being opened in Pretoria in 1957, where remarkable work was done on all things coal: surveying and grading, coal preparation, combustion, briquetting, chemistry. Those were the days of giants like David Horsfall and P.J. van der Walt.

After the discontinuation of the fuel levy in 1990 we entered a particularly unproductive period where very little happened. Coal-related papers in this Journal averaged between three and four per year. Individual industrial entities undoubtedly did their own research, but this was seldom published in the public domain – the information was either confidential, or it did not warrant publication because it was too applied. That valuable knowledge is lost forever. Then, in 1999, Coaltech 2020 (now known as Coaltech) was established as a cooperative research initiative jointly funded by industry, the government (through THRIP), and the CSIR. Their brief was to revitalize industry-focused research, covering the fields of underground and surface mining, geology and geophysics, coal preparation, environment, engineering, as well as human and social issues related to coal. In many cases, even some very fundamental work was supported. Two to three years later (corresponding to the typical time lag between inputs and outputs in research), the number of coal publications in this Journal more than doubled to around 10 per year, with a record of 22 coal papers in 2010. Coaltech successes included the categorization, quantification, and location of the remaining resources in the Witbank/Highveld coalfields, the successful beneficiation of fine coal using a fines DMS pilot plant, binderless briquetting, sulphate removal from process water, and the introduction of the three-product cyclone. More than 50 masters and 16 doctoral students have graduated with Coaltech support.

The question is whether this is enough to face the new challenges in coal. Worldwide, and especially in China and India, research is focused mainly on optimization of current processes (we are much too comfortable with traditionally low yields and poor efficiencies for a 'cheap' commodity such as coal!) and fines utilization and dewatering – using the many millions of tons of very good quality coal lying around the country in fines ponds. There is also a renewed interest in dry coal beneficiation, a technology that can be of particular significance in our arid country.

This special November issue of the Journal focuses on coal, and includes papers from a number of renowned research groups in the country. Three papers are dedicated to underground mining, and specifically address safety issues, two are about process accounting

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and economic optimization, and one describes an exciting new processing technology. The remaining three papers are more fundamental in nature, and this is an encouraging sign that original coal research in South Africa is alive and, at the very least, possibly slowly growing. Theoretically speaking, however, one quarter of all mining and metallurgical papers in the country should be on coal. We still have some way to go.

So where are all the coal researchers, and why are they not publishing?

It may be surprising to some that the greatest problem facing coal researchers in South Africa is not funding, but rather the availability of postgraduate students to engage in research. It is not difficult to procure project funding for specifically applied research projects, but research in coal is not popular enough to draw the necessary numbers of students to do the work. This is probably due to the negative reputation coal has from an environmental perspective, but the irony is that more research in coal will undoubtedly lead to a less negative impact, as efficiencies increase and techniques like sulphur and carbon capture become technically and financially more viable. Almost all the coal research undertaken worldwide has as an objective the mitigation of coal's environmental impact – a fact seen from the topics of international journal papers.

Apart from the lack of students, the critical mass of established researchers in coal worldwide, except in developing countries like China, is non-sustainable. In South Africa, for example, there are less than half a dozen academics specializing in coal processing. And this will not improve, owing to the shortage of potential researchers in the pipeline. What is needed is a step-change, not necessarily in funding, but rather in attitude and support from the industry as a whole. Gone are the days where coal could be viewed as cheap and easy – the technical challenges needed to make dwindling current resources and difficult new resources relevant in traditional markets are enormous. And this would involve some very fundamental and innovative ideas; crazy ideas not obviously and immediately applicable in industry. What is needed is support for blue-sky research. And it is this blue-sky fundamental research that must get published. Apart from the sterling work coordinated by Coaltech, its researchers and its contributors, we should expand the mechanism (maybe still within Coaltech?) where researchers can indulge in work that does not necessarily have a positive NPV. After all, that is happening in a country like China, and ironically, the last two potentially game-changing technologies in beneficiation (the FGX dry separator and the three product cyclone) were imported from that country. This shows once again that fundamental research breeds technological breakthroughs.

The next argument, as to who is responsible to establish the fertile breeding ground for this type of research (which means people, money, and facilities), is another debate, but it probably lies with government, industry, and academia collectively.

Let's find those future coal researchers, and let's get them published!