President: 2005–2006

The more things change, the more they stay the same... 'Plus ça change, plus c'est la même chose'

Willem Hendrik van Niekerk

The World Bank has estimated that in 2015, 10 per cent of the world's population lived on less than US$1.90 a day, down from nearly 36 percent in 1990. They also estimate that in 2015 there were still 736 million people living on less than $1.90 a day. We need significantly more progress, and soon.

Big changes, in both number and impact, have happened over the last 25 years globally, as well as in South Africa – politically, socially, economically and technologically. I don't plan to discuss all of them, but rather highlight a few and how I personally experienced them.

From an economic point of view, let me start off by contrasting how much goods and services cost then *versus* now. I commenced my metallurgical studies at the University of Pretoria in 1978. In 1979, I received an Iscor (ArcelorMittal South Africa today) bursary of about R1 300 in cash that covered everything, including residence, tuition, and textbooks. Also included as part of the bursary were medical and pension contributions from Iscor. A doctor's visit cost less than R5, but I still had to make the 'large' co-payment of R0.50 – enough to fill the tank of my 50 cc motorbike with petrol. Before you think I am a geriatric – which I probably am – and therefore assume inflation can explain all of this, let me also remind you it was still the days of the mighty rand at about R0.85 for US$ 1! Still, it remains a miniscule amount if you contrast it to what I pay today, even in real prices. I now live in the USA and work for Tronox, one of the leading global TiO_2 pigment and mineral companies. Annual tuition fees at a private university are currently about US$35 000, and for public universities (only for students living in that state) they are about US$10 000, and a visit to the doctor costs more than US$200. You can make the calculations in rand terms – the exchange rate currently fluctuates between R14 and R15 for 1 US dollar.

These two examples clearly demonstrate the huge impact of inflation, and as a consequence, exchange rates, over time.

Politically, much bigger changes have taken place. In South Africa, for example, in 1978, due to the discriminatory apartheid regime, there were no black students in my class. In fact, I think with the exception of a small number of postgraduate students, there were no black students at all at the university. Also, in those days, females were not encouraged to study engineering; the only female in our final year class photograph was the secretary of the department. Today, to the best of my knowledge, the majority of students at UP are black, and the number of female engineering students is significant.

If we look specifically at 1994, when the Institute was 100 years old (only 25 years ago), the world wide web (internet) was born, Yahoo and Amazon (market capitalization today of about $1 trillion) were founded, and we watched movies on VHS (the now-outdated DVD wasn't even invented yet). For us South Africans, a much more significant change occurred: after three centuries of white rule, Nelson Mandela became South Africa's first black president on May 10, 1994.

Socially, big changes have also occurred. Consider, for instance, the world's biggest social challenge—poverty. If we look just at extreme poverty (people living at less than US$1.90 per day on a 2011 PPP basis), the World Bank estimated that in 2015, 10 per cent of the world's population lived on less than US$1.90 a day, down from nearly 36 per cent in 1990. That is huge progress, but they also estimate that in 2015 there were still 736 million people living on less than US$1.90 a day. We need significantly more progress, and soon.

On a totally different topic, but very much part of our lives today, is the birth of social media, such as Facebook, Instagram, Twitter, during the last part of this era. I personally only use LinkedIn for professional purposes, but can fully see the benefits of social media.

Technologically, we have probably seen even bigger changes over the last 25 years, compared to those in the economic, political and social spheres. We are already talking of the 4th industrial revolution, which has brought

us concepts, such as 5G telecom networks, the Internet of Things, artificial Intelligence, big data, robotics and many more similar cyber-physical systems that are controlled through the application of computer-based algorithms. The digital revolution!

Buckminster Fuller, creator of the 'Knowledge Doubling Curve', observed that, until 1900, it took about a century for human knowledge to double, whereas today, human knowledge is doubling about every year. Furthermore, according to IBM, it will double every day in the not-too-distant future. Scary!

Strangely enough, however, given all these significant changes, to me it feels like not much has changed in our industry during my career. I am talking purely from a technological point of view as the economic, political, and social changes are clearly visible. I am not a mining expert so I will not comment on mining technology, but being a pyrometallurgist working mostly in the steel industry during the earlier part of my career, and now in the TiO_2 industry for the last 12 years, it is my view that very little has changed. Yes, we use state-of-the-art control systems, incorporating advanced process control algorithms, condition monitoring, building bigger and more efficient plants, and speeding up processes, to continuously drive down costs while improving output and quality. Simultaneously, we are developing new materials and alloys that are stronger, lighter, tougher, more heat resistant, and better equipped to work under extreme corrosive conditions, *etc.* So clearly, there are many advances in the metallurgical industry.

But, the main process route for steelmaking today is still that of the coke oven/blast furnace combined with oxygen steelmaking. The more modern scrap and DRI melting electric arc furnace route is also getting long in the tooth. The first equivalent of the blast furnace process, which was developed by the Chinese, dates back to centuries BC, and the first 'modern' blast furnaces in Europe were already operating in the 13th century. The huge breakthrough of using oxygen (LD/BOF) rather than air (Bessemer) to make steel was developed in 1948, which is relatively recent, compared to the blast furnace. To the best of my knowledge, direct steelmaking – from iron ore to steel in one vessel – remains a commercial dream.

In the TiO_2 industry, changes are also happening quite slowly. There are two main process routes by which to make pigment – the chloride and sulphate processes. Each generates about 50 per cent of the global production. The original sulphate route was commercialized in the 1920s, and the newer chloride route in the 1950s. Many have tried, but there are still no alternative commercial processes operating successfully at scale today. In fact, China is only now adapting the chloride route. The most advanced new process is the Argex process being developed in Canada, but the jury is still out on that one.

I think that you will agree with me that change happens every day, at an ever-increasing pace. So fast, in fact, that it is difficult to keep up with all the new technologies, software, applications (apps) on smartphones, or stay abreast with the political changes, such as Brexit, global trade wars, nuclear treaties, *etc.* But on the other hand, many of the challenges we face seem to be the same challenges previous generations faced. In metallurgical processing, we have the exact same targets as when I finished university 40 years ago: we strive to make processes faster, at lower costs, with higher yields and recoveries. The objective is to be as efficient as possible.

Of course, we may use all the modern tools mentioned above, and yes, we have made big strides in achieving many of our goals, but it seems to me that the more things change, the more they stay the same. Or as Alphonse Karr, editor of *Le Figaro*, the person who coined this phrase originally, stated in 1849: 'plus ça change, plus c'est la même chose' ✳

There were no black students in my class. In fact, I think with the exception of a small number of postgraduate students, there were no black students at all at the university. Also, in those days, females were not encouraged to study engineering; the only female in our final year class photograph was the secretary of the department