



Metallurgy's warning signal



The SAIMM Business Breakfast held on 3 June provided an important opportunity to test some of the assumptions underpinning our work on strengthening the minerals industry's capability ecosystem.

One of the key messages I shared at the breakfast was that the minerals industry does not fundamentally have a people problem. Rather, it has a capability development pipeline problem.

Across many disciplines, universities and training institutions continue to produce graduates. Yet industry leaders increasingly report shortages of technicians, technologists, experienced professionals, technical specialists, and future leaders across multiple levels of work. This suggests that the primary constraint is often not the number of people entering the system, but the effectiveness with which the system converts students and graduates into competent, industry-capable practitioners.

Following the breakfast, I received two important pieces of feedback.

The first was a reminder that any discussion on capability must include geology and the broader geosciences, which remain fundamental to the future of exploration and resource development.

The second piece of feedback challenged one of my assumptions and caused me to reflect on whether we are measuring the right indicators when assessing the long-term health of our professional pipeline.

Professor Kathy Sole from the University of Pretoria highlighted that while the capability pipeline argument may be valid for mining engineering, the situation in metallurgy appears more concerning.

In metallurgy, we may be facing both a capability development challenge and a numbers challenge.

Professor Sole shared data indicating that the total student numbers within one of South Africa's leading metallurgical engineering departments have declined by almost 70% over the past two decades. More concerning, the department is expected to produce fewer than ten metallurgical engineering graduates this year.

These trends should concern every organisation that is serious about beneficiation, critical minerals, and South Africa's long-term industrial competitiveness.

Mining extracts the resource.

Metallurgy converts it into value.

Without metallurgists there is no hydrometallurgical processing, no pyrometallurgical processing, no refining, and ultimately, no meaningful beneficiation.

South Africa often debates beneficiation as though it is primarily a policy, infrastructure, logistics, or energy challenge.

These are all important factors.

However, beneficiation is ultimately a capability challenge.

Mineral resources do not beneficiate themselves.

People do.

What makes the situation particularly concerning is that the challenge extends beyond student numbers alone.

Professor Sole highlighted difficulties attracting students into metallurgy, challenges securing vacation work opportunities, shortages of experienced hydrometallurgical and pyrometallurgical specialists, difficulties recruiting academic staff, and an ageing professional population approaching retirement. This places pressure on both industry capability and the academic pipeline that supports it.

Viewed together, these factors suggest a capability pipeline under increasing pressure.

Interestingly, chemical engineering graduate numbers appear to be growing, raising questions about whether alternative pathways into metallurgy should be explored as part of a broader capability development strategy.

President's Corner (continued)

I will be engaging further with other universities to better understand whether this trend is isolated or indicative of a broader challenge within the metallurgical engineering pipeline. Initial discussions suggest there may be similar concerns elsewhere, but this is something that requires further validation.

What struck me is that this is not uniquely a South African challenge. Similar concerns are emerging internationally as countries seek to expand critical minerals production and downstream processing capability. Australia, for example, is already questioning whether it can produce sufficient metallurgical capability to support its critical minerals ambitions.

Encouragingly, the ecosystem is beginning to respond.

Through the recently established Minerals Industry Education Ecosystem South Africa (MEESA) forum, universities, industry, and professional bodies are engaging more closely on issues such as workplace exposure, vacation work, graduate development, and future capability requirements. One of the first tangible outcomes has been the commitment by the Association of Mine Managers South Africa (AMMSA) to work with industry to improve vacation training opportunities for mining engineering students, with a target of placing approximately 250 students across the industry this year.

This demonstrates that when industry, universities, and professional bodies align around a shared challenge, practical solutions can emerge quickly. While the challenge remains significant, it illustrates what can be achieved when the ecosystem focuses collectively on removing barriers within the professional development pipeline.

What encouraged me most was not simply the challenge itself, but the fact that it surfaced through engagement across the ecosystem. No single university, company, professional body, or stakeholder could see the full picture in isolation. It is only when the ecosystem comes together that these signals become visible. This is exactly how an effective capability ecosystem should function.

It also made me wonder whether metallurgy is the exception, or whether similar warning signals exist elsewhere in the capability ecosystem that we have simply not yet uncovered.

The feedback reminded me that systems thinking is not about proving that we are right.

It is about learning.

At the business breakfast, I argued that the minerals industry does not have a numbers problem but rather a capability development pipeline problem.

The feedback from Professor Sole did not invalidate that hypothesis. Rather, it highlighted that different professions may be constrained at different points within the same capability development pipeline.

Mining engineering may primarily have a capability conversion challenge.

Metallurgy appears to face both an attraction challenge and a conversion challenge.

Understanding those differences may prove critical if South Africa is serious about beneficiation, critical minerals, and building the capability required to unlock future opportunities.

Metallurgy may be giving us an early warning signal.

The challenge is now visible.

The question is whether we act early enough.

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