Gold Beneficiation: Route to Sustainable Development

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Beneficiation forms one of the three legs to a resource-based technology strategy. The other legs include developing high-tech inputs into the minerals sector and the lateral migration of products initially intended for the mining sector into other sectors. The idea behind this strategy is to leverage the fact that raw materials are found in a country to grow a downstream industry capable of sustaining itself once the raw materials are used up; grow a high-tech inputs industry that can provide inputs into the mining and minerals-related industries; and develop these products to the extent that they can be sold to other sectors of the economy.

Beneficiation is considered important for countries that wish to maximise economic benefit. In South Africa’s case, many of its natural resources are exported. Since beneficiation takes place elsewhere, other countries derive the benefit of producing the higher-value product, while South Africa receives the lower economic returns associated with the lower-value product (in addition to having to cope with the trade deficits that result from it having to import higher-value downstream products as well as the capital goods necessary for its mining sector).

Beneficiation, strictly, involves any treatment of ore or industrial mineral/commodity to improve grade (or physical or chemical properties). In the case of metallic elements, the term is used especially for the processing steps in preparing the ore for smelting.

However, those involved in mining often talk about beneficiation as it relates to gold when referring to value-addition and even de-beneficiation.
Value addition is the process of adding value to a metal, mineral or commodity. This value addition may occur at any point from the removal of the material from the earth to the finished product.

Meanwhile, debeneficiation involves a fabrication step in which value is added to metals by alloying them with other metals to produce alloys with specific properties (such as 9-ct gold, austenitic steel).

This talk will use beneficiation in a less strict sense and include value addition and debeneficiation, and include discussion on jewellery and the industrial uses of gold.

Many believe that the supply of high-tech inputs into the natural resources sector offers one of the greatest opportunities for economic growth. These can be supplied to various stages of the mining cycle, including exploration, mining, mineral processing and beyond.

In particular, high-tech inputs should be promoted where they represent a particular world-acknowledged strength of the South African economy. Such would be the case in mining explosives, shifting and hoisting technology, drilling equipment and abrasives, cooling of deep mines, rock-mechanics design, metallurgical processes and plants, general underground mining technology and intellectually-based services (including environmental services and consulting).

Lateral migration occurs when skills and technologies built up in a particular area are transferred to another. This type of technology migration is particularly evident in the Nordic countries, where generic technologies have sometimes been used in alternative industries. This type of movement has led to countries becoming less dependent on their natural resources, and even on supply to the natural-resources sector. Their diversified client base has assisted these companies, and the countries in which they reside, to grow economically.

Getting back to beneficiation, which may be seen as a starting point to the development of a country that is not dependent on its resources exports, many in the South African gold mining industry complain that there are more sticks than carrots in the government’s proposed beneficiation legislation. They complain that there are too many obstacles in the way for beneficiation to take place. In addition, they insist that gold beneficiation is not their core strength.

However, what they do agree with is that a gold beneficiating enabling environment should be created, even though many insist that they are not the ones to benefit from this environment. Some of the key obstacles to beneficiating gold include an absence of skills in this sector, a limited location advantage, the absence of a metal-loan scheme, and a marketing and branding strategy that does not promote South African-produced gold products.

Some would argue that there is insufficient that is being done to increase the level of skills in the jewellery sector in South Africa and that this acts as an impediment to growth. Institutions that provide training for the jewellery sector include Cape Technikon, Stellenbosch University, Wits Technikon, Tswane Technikon, KZN Technikon, Vukani Ubuntu and Kgabane, Mintek’s own initiative to train predominantly rural women in jewellery manufacture. Those who argue that skills are important in promoting gold beneficiation would argue that these institutions provide less of the training at the bench than many other institutions in other countries provide.

However, there is also the argument that the gold jewellery sector is unusual in that, although a successful industry does have the highly-skilled mastercrafters who tend to make the models for
jewellery, it also needs those with lower levels of skills to finish off pieces. The jewellery sector is also changing to the extent that the more profitable jewellery businesses have often switched to Cad/Cam alterations of designs to keep the designs fresh.

Another interesting point is that the number of people employed in the jewellery industry may increase as a result of the Beneficiation and Diamond Bills. The first will try to promote beneficiation in general, while the second is likely to further promote the gold jewellery industry since a cut stone set in a ring quickly increases the value of the products. Some 12-million carats of diamonds were produced in 2003, of which 352,978 ct were beneficiated by 3,500 people in an area of between 40,000 m² and 60,000 m². Since the Bill intends for 10% of the diamonds mined in the country, or 1.2-million carats, to be beneficiated, this requires a considerable increase in the amount of space and people to be involved in the beneficiation of diamonds alone. If the spin-off of this legislation is that it stimulates the gold-jewellery industry, skills in this sector will also be required.

The jewellery industry says that the provision of gold loans is the most important aspect of a gold-beneficiating enabling environment. At present, jewellers need to have 120% collateral for the gold that they borrow, in addition to paying interest on the loan. Most jewellers cannot afford this, and end up producing fewer products than they would have had gold loans been available.

This is set to change, with the proposal that collateral for a new gold-loan scheme be provided by the jeweller, AngloGold Ashanti, Gold Fields and by BAE/Saab. The jeweller would put up 33.3% of the collateral, the mining companies would put up 33.3% and the defence industrial participation partner would put up 33.3%.

However, it now appears that the scheme will only benefit large jewellery producers. This is because discussions on the table suggest that 50 kg will be the minimum amount of gold that is borrowed. In addition, small-scale jewellers are expected to provide three years of financial information – which will act as another obstacle to gaining access to these loans.

Other gold-loan schemes in South Africa, including one that involved Stanbic, have failed in the past, since it was felt that the risk profile of the jewellers was too high. The current proposal may also fail, since it does not boost the SMME sector, which was the priority of the initiative.

Creating a beneficiation-enabling environment from an insurance perspective could involve the reduction of the amount of collateral needed by jewellers for borrowing gold. At present, while discussions on gold loans have centred around other parties assisting jewellers with the 120% collateral required for a gold loan, a reduction in the amount of collateral required is not being considered.

At a physical level, more secure jewellery-making zones would also help to reduce the costs of doing business for jewellers. This is because areas such as the Gold Zone, at Rand Refinery, Jewel City, in Johannesburg’s CBD, or the airport jewellery zone, which is currently being promoted, reduce the cost of insurance for gold producers.

Since the jewellery produced in South Africa would eventually have to be sold, marketing and branding of the products is important. Several South African gold companies, including AngloGold and Gold Fields, are investing in the promotion of gold through their own internal initiatives as well as through contributing to the World Gold Council. However, other gold producers do not see marketing as part of their business and do not contribute to the World Gold Council, which often promotes gold jewellery as a generic product.

Some have suggested that the right way to approach marketing is by creating a product with a distinct South African feel. For instance, Mintek’s Kgabane has created the Interwoven brand, using traditional basket-weaving skills to weave with gold and silver. It has also created a range of bead jewellery with a uniquely African feel. The latter range has been quite successful and has reaffirmed that tourism-based retail is an important jewellery niche.

Many argue that South African-produced goods will only have an advantage if they have a South African feel, yet South African or African brands of jewellery have a low price point. Many suggest that clients will only pay more than R2,500 for an item if the price is accompanied with status and an extremely professional finish – which South African products are unlikely to achieve initially. In addition, a South African brand would have to appeal to the trendsetters who would buy unusual items; production of this type of brand would lead to South African producers missing out on the generic market,
which is the market that is the driver behind the jewellery industry.

These are perhaps some of the reasons why a South African brand might not be the most successful way of entering the international market. However, all this points to the fact that any strategy to create an enabling environment should address the issue of whether a marketing and branding strategy that promotes gold should be generic or whether it should promote a South African or African product.

Some countries have a strong location advantage in the form of a developed domestic demand for gold jewellery, an experienced goldsmith industry, and have vertically-integrated industries that encompass some aspects of the jewellery-manufacturing chain, including mining, beneficiation, financing and marketing.

South Africa does not have these advantages. Its only potential advantage is a tiny cost saving in sourcing gold in South Africa for further beneficiation (~15c US/oz = 0.0003%).

While jewellery mark-ups to the retail phase can be as high as around 290%, there can be considerable value added through the use of gold in non-traditional ways. There can be an approximately 650% increase in value if gold is made into electronics, and an 820% increase if gold is used in chemicals.

Mintek is involved in the development of non-traditional uses for gold and has 50:50 joint ventures with Gold Fields, AngloGold Ashanti and Harmony for the production of materials, catalysts and biomedical applications using gold.

Catalysis is one of the research areas that is expected to result in a considerable offtake of gold.

Some of the highlights in Mintek’s work on catalysts include that:

- Mintek intends to have a gold-catalysis respirator, developed in conjunction with an overseas company, on the shelves by 2007, if it successful in its submission of the product to the National Institute of Occupational Safety and Health next year.

- An agreement has been signed between a large catalyst manufacturer and Mintek and AngloGold Ashanti to produce catalysts on their behalf should this be warranted. This project may come on stream within the next year or two and, should it become a reality, it is likely that the plant will be established in Gauteng.

Mintek projects in this area of research are broadly grouped as air-quality, pollution control, chemical processing, fuel cell and catalyst scale-up projects. All of these are partially funded by AngloGold Ashanti.

The World Gold Council states that there are possible emerging or current biomedical applications in dental alloys, anti-bacterial applications, prosthesises and implants, stents, sensors and labelling, cancer treatment, drug delivery and arthritis treatment.

Mintek is involved in cancer-treatment projects, drug-delivery systems, anti-malaria programmes and anti-HIV projects that use gold. These projects are partially funded by Harmony Gold.

About R4-million of Autek’s total expenditure of R30-million has been spent on the biomedical programme, which involves about 35 people.

Gold’s unique properties are also being looked at to see which new materials can be developed. Mintek, in a joint venture with Gold Fields, uses gold’s properties in the development of new gold-containing alloys, electrochemical applications, shape-memory alloys and nanotechnology.

So while about 80% of the gold that is being consumed in the world is consumed in the form of jewellery, it is possible that gold’s other uses may start gaining in prominence. In industrial research and development, South Africa has a strong advantage over others who choose to continue to see gold as a store of value. With Project Autek being launched abroad this year, the industrial uses of gold should also be further promoted through funding by the Canadian government and Canadian companies.