SA scrap reservoir protected

SA scrap metal supply enhanced by controls

Edison themes

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As part of the South African government's efforts to support the domestic steel industry, it has recently renewed steel scrap export and pricing controls. It seems that these are having the intended impact of limiting exports and securing lower-priced raw material to the benefit of domestic scrap consumers. At this point, these controls do not extend to other minerals such as coal and iron ore and the larger South African (SA) steel producers are currently lobbying the government to implement comparable controls on iron ore and coal.

Regulations support the SA scrap market

In July, the SA government extended its price preference system (PPS) by another two years, as it feels that, although effective, it has not yet fully achieved its target of creating an adequate supply of quality scrap to domestic consumers, at a cost benefit. The government also added an ad valorem duty of 20% plus additional physical controls to tighten the net. Since the implementation of PPS in 2013, scrap export volumes have drastically declined from around 1.7mtpa in 2014 to a pre-pandemic level of 0.5mt.

New capacity favours scrap users as feedstock

Much lower scrap metal prices have provided local consumers with some leeway in terms of costs. The majority of scrap is consumed by steel producers (around 60% of SA steel production is made from scrap). While newer technology in the form of induction furnaces (6% of SA steel capacity) and electric arc furnaces (another 22% of SA steel capacity) is 100% reliant on scrap (making them clear beneficiaries of the controls), the majority of SA steel production is still from blast furnaces. While induction furnaces and electric arc furnaces use a lower percentage of scrap in production, they still account for around 30% of SA steel industry scrap demand.

Industry asking for focus on total iron reservoir

The SA steel industry argues that the scrap reservoir should be seen as part of a national steel-making resource including iron ore and coal. It suggests that the government should consider universally discouraging the outflow of iron ore and coal from the country and implementing equivalent controls on ore and coal exports to those currently applied to scrap metals. The industry also believes that a more optimum way of protecting the local steel industry is for the government to focus on unfairly priced imports rather than export duties.

From the street

South African (SA) exports of scrap are being successfully restricted, in tandem with the PPS, which secures a discounted local price for the benefit of domestic steel producers. Larger SA steel producers are now proposing that the SA government extends similar controls to other minerals such as coal and iron ore.

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Analyst

Hennie Vermeulen +971 (054) 449 1728
mining@edisongroup.com

Scrap controls extended to benefit steel reservoir

South African steel industry

In South Africa, the primary steel producers have a combined installed production capacity of 9.0mtpa (including stainless steel and idled capacity). Blast furnace production of 4.4mtpa (49%), mainly uses iron ore as feedstock. The balance, 4.6mtpa (51%), comprising basic oxygen, electric arc and induction furnace production, is electric (although some electric arc furnaces can also use ore). All processes consume mostly ferrous metal scrap. In South Africa, electric arc producers account for more than half of the steel industry's ferrous metal scrap demand, and rely mainly on scrap. Globally, the ratio of blast furnaces (mainly iron ore as source of iron) and electric arc furnaces (mainly scrap as source of iron) is 70% and 30% respectively in favour of iron ore. The main players in the production of primary carbon steel and leading generators (and consumers) of scrap are shown in Exhibit 1.

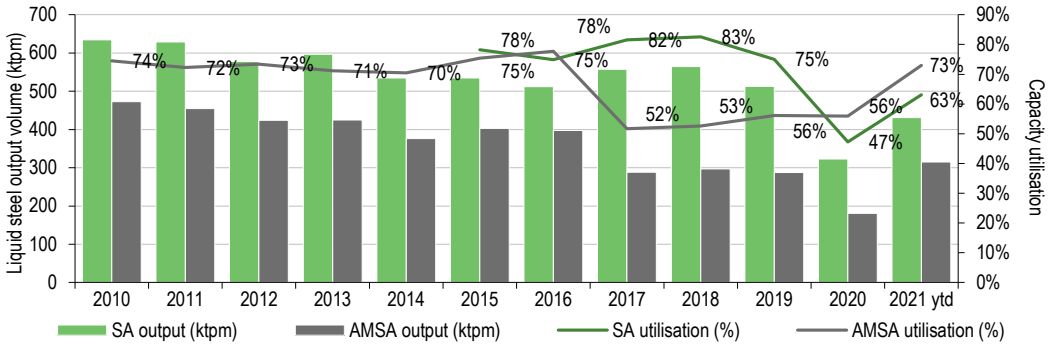
Exhibit 1: South African primary installed steel production capacity

Producer	Process	Installed capacity (ktpa)
ArcelorMittal South Africa	Basic oxygen furnace	2,000
ArcelorMittal South Africa	Blast furnace	4,400
SCAW Metals	Electric arc furnace	580
DAV Steel	Electric arc furnace	425
Cisco Steel	Electric arc furnace	245
Unica	Induction furnace	175
Agni	Induction furnace	115
SA Metal Group	Induction furnace	95
Fortune Steel	Induction furnace	95
Veer	Induction furnace	55
ProRoof	Induction furnace	25
Columbus Stainless Steel	Electric arc furnace	750
Total	Energy source (49% coal, 51% electricity)	8,960

Source: South African Steel and Metal Fabrication Master Plan 1.0, Edison Investment Research

Turning to steel production, national capacity utilisation in 2019 was 75%, after being above 80% in 2017 and 2018. In 2020, the pandemic drove the rate down to below 50% and it is only now recovering, reaching above 60% utilisation. The graph below shows the trend in domestic steel production since 2010. It is worth noting how ArcelorMittal South Africa (AMSA), by far the largest steel producer in South Africa, has seen its market share eroded since 2017 as new capacity, mainly induction furnaces started to be added from around 2015. The ease in availability of scrap, the benefit of controlled scrap prices and government funding prompted a number of small players to enter the steel-making industry.

Exhibit 2: South African steel production and capacity utilisation rates



Source: South African Iron and Steel Institute (SAISI), Edison Investment Research

Government interventions

The SA government imposes a range of controls on the scrap metal industry. These were first introduced in 2013, through the PPS, aimed at ensuring an adequate supply of affordable ferrous scrap into the domestic market.

The PPS was structured to improve the availability of quality scrap at affordable prices to local consumers, with the intention of making it more cost competitive against imports, and to increase investments and employment. As a matter of interest, many other countries such as some EU countries, India, Pakistan and the UAE, have either banned scrap exports or limited the export trade.

Under the PPS, scrap exports are not allowed unless they have first been offered for sale domestically for 30 days at a 30% price discount to imported material (using the Metal Bulletin Rotterdam scrap price). Previously, the domestic price was determined by using landed import prices. Since 2013, the PPS controls have visibly reduced scrap exports, improved availability and gone a long way to achieving lower scrap input costs. However, these structures remain crucial to the economic provision of scrap to the SA steel industry and in July 2021 the PPS was extended by two years (along with other physical measures to enhance control). In addition, from August 2021, an ad valorem duty of 20% was imposed on exports of scrap.

Scrap market

Sources

Scrap generators are divided into production scrap and obsolete material. Production scrap is a result of metals generated during the primary production process (the so-called yield losses during the whole process) and, secondly, during manufacturing activities. This includes offcuts, shavings, trimmings, stampings, returns, etc, which is called internal scrap as it is reused during future production processes.

The consumption parameters listed by the World Steel Association to produce 1,000kg of steel are 1,370kg iron ore, 780kg metallurgical coal, 270kg fluxes and 125kg scrap via the blast furnace route, while the electric route consumes 586kg iron ore, 150kg metallurgical coal, 88kg fluxes and 710kg scrap. Although electric furnaces can also utilise iron ore and other iron-containing resources, scrap is the preferred main source in almost all cases.

The second source of scrap is recovered scrap stemming from daily life, and accumulated by recyclers and collectors. It comprises waste from products that have completed their life cycle or have been discarded for other reasons. Scrap recovery rates are variable and depend on the economic viability of recovery process, ie if the value of the recovered scrap is low, the incentive to collect is reduced and hence more material is sent to landfill through government cleaning services, which are outside the recycling net. If the source is far away, the price has to justify the extra distance that collectors have to travel to extend their search.

Consumption

Before the pandemic, AMSA typically consumed about 11.5mt iron units annually, of which iron ore made up 85% (9.5mt) and scrap 15% (2.0mt). Almost 85% of scrap is sourced internally and the remaining 0.3mt is procured on the open market. However, given the poor state of apparent steel demand in South Africa over the past 10 years, AMSA's steel output has been trending down from 6.0mtpa in 2010 to below 4.0mtpa in 2018. This was followed by a further contraction in 2019, after which the pandemic squeezed output to only 2.2mt in 2020. This implies that the consumption of scrap has declined over time and only a resurgence in the cost of iron ore over the past five years has prompted AMSA to review utilising more scrap in its feedstock.

Domestic demand for scrap is about 4.0mt, with 1.5mt sourced internally by steel producers and 2.4mt purchased on the open market. Supply into the open market was 3.0mt, allowing 0.5mt to be exported and leaving a small amount in excess. On balance, there is an adequate supply of scrap in South Africa, although there could be marginal pressure on availability in the future based on known additional steel-making capacity currently in progress, estimated at about 200ktpa. Retaining and potentially further increasing the controls on scrap exports will ensure the availability of scrap annually. Assuming that scrap generated by primary steel producers will be consumed in the year created, estimated demand for scrap in 2019 is shown in Exhibit 3 below.

Exhibit 3: South African demand for scrap – 2019

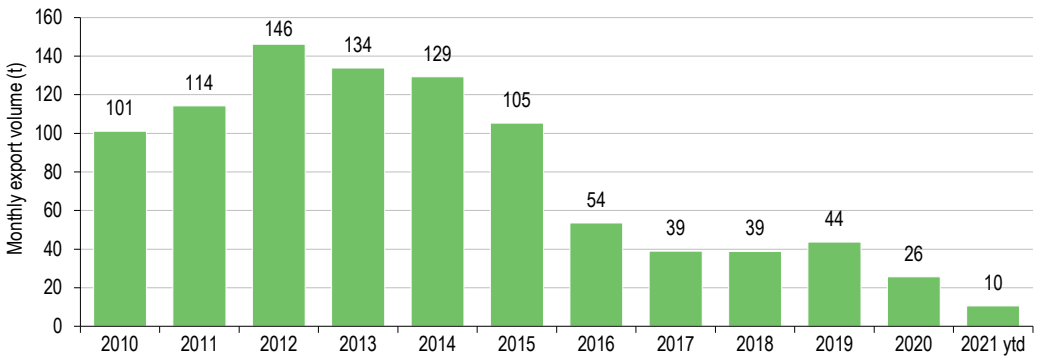
Producer	Process	2019			Sourced	
		Available capacity (ktpa)	Output at 75% (ktpa)	Implied scrap demand (ktpa)	Internal (ktpa)	External (ktpa)
ArcelorMittal South Africa	BOF	2,000	1,500	608	456	152
ArcelorMittal South Africa	BF	2,900*	2,180	471	354	118
SCAW Metals	EAF	580	435	522	26	496
DAV Steel	EAF	425	319	510	26	485
Cisco Steel	EAF	245	184	294	15	279
Unica	IF	175	131	193	4	189
Agni	IF	115	86	127	3	124
SA Metal Group	IF	95	71	105	2	102
Fortune Steel	IF	95	71	105	2	102
Veer	IF	55	41	61	1	59
ProRoof	IF	25	19	28	1	27
Columbus Stainless Steel	EAF	750	563	825	549	276
Total		7,460	5,600	3,846	1,438	2,409
Exports						523
Imports						60
Total scrap available						2,992
Domestic consumption						3,906

Source: International Trade Administration Commission of South Africa (ITAC), Edison Investment Research. Note: *Saldanha Steel (1.5mtpa) under care and maintenance. BOF = basic oxygen furnace; BF = blast furnace; EAF = electric arc furnace; IF = induction furnace.

Exports

Immediately before the implementation of PPS in 2013, 2012 exports of ferrous scrap had peaked at.1.8mt (146ktpm) and were still high in 2013 and 2014. However, since then, exports have drastically declined to a pre-pandemic level of 0.5mt (44ktpm), as shown in Exhibit 4 below, indicating that PPS-related regulatory controls are having the intended impact. We note that in the face of declining primary steel output during 2020 and 2021, it seems logical to assume that there may be an oversupply of scrap locally. Nonetheless, there appears to be little evidence that any excess volumes are finding their way into the export market.

Exhibit 4: Average monthly ferrous export volume

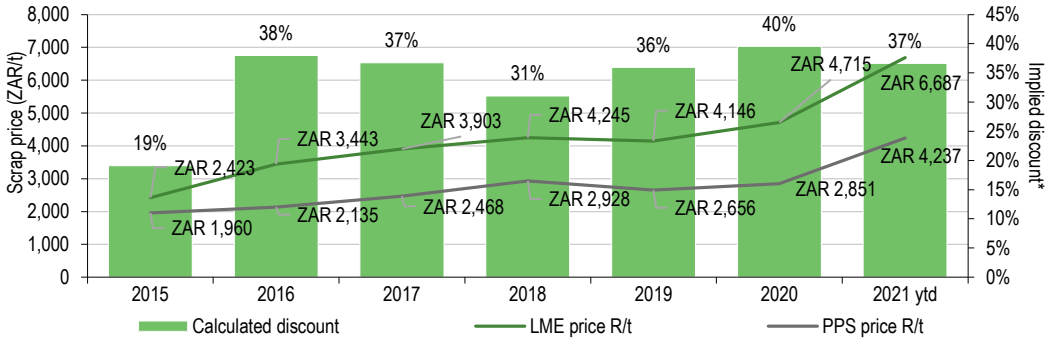


Source: South African Iron and Steel Institute (SAISI), International Trade Administration Commission of South Africa (ITAC), Edison Investment Research

Pricing

Prices of scrap for local consumers have been lower than international equivalent values, reflecting the SA government policy to ensure competitive (scrap) input prices for SA steel producers. Exhibit 5 below shows LME international scrap prices relative to PPS values (both in ZAR/t). Although data for 2014 are not available, from an average discount of 19% in 2015, the impact of PPS expanded the discount to an average of 36% over the following six years. Note that LME data are used here as a proxy for the actual PPS reference price of Metal Bulletin Rotterdam, as the latter data were not available. We observe that the recent weakness in industrial and infrastructure demand, and consequently steel demand, is flowing through into depressed scrap metal demand, which may be pushing prices down, even beyond the PPS value.

Exhibit 5: LME scrap prices relative to actual PPS values



Source: International Trade Administration Commission of South Africa (ITAC), Refinitiv, Edison Investment Research

Recycling

Steel is a key component in the industrialisation of the SA economy and an important consideration is that steel is ideal for recycling. It can be readily and cost-effectively recovered from the domestic waste stream. Other interesting facts about the recycling of steel are:

- Unlike many other materials, steel's properties do not deteriorate when it is re-melted.
- Across the world about 650mt of steel products, including used steel cans, appliances, automobiles and construction materials, are recycled every year. This equates to a worldwide carbon steel supply ratio of 35% sourced from recycling and 65% from other iron-bearing resources such as iron ore. China consumes only 20% of its iron demand for steel making from scrap, while Turkey consumes 86%, the United States 70% and the EU around 56%. In South Africa, some 4.0mt are recycled annually, which is a ratio of 44% relative to steel production.
- The fact that such a large proportion (51% of SA crude steel production is (scrap-consuming) electricity based, creates an incentive for collectors to continue their efforts as the demand for scrap from domestic steel producers remains relatively high (albeit subject to economic fluctuations). The mainly manual collection process is also well entrenched and South Africa has a long history of collectors making a living from scrap, albeit at a subsistence level.
- Recycling scrap plays a vital role in reducing environmental costs and cleaning up society as a whole. It creates landfill space, ensures materials do not become litter and conserves valuable resources/raw materials.
- Scrap plays a key role in supressing industry emissions and resource consumption, as every ton of scrap used for steel production circumvents the emission of 1.5t of CO_2 and the consumption of 784kg of iron ore, 630kg of coal and 182 kg of limestone (source: World Steel Association, May 2021). Put another way, to make steel using scrap consumes only a quarter of the energy otherwise needed by using iron ore.
- Scrap also acts as a cooling agent, absorbing excess heat from the exothermic decarbonisation process, and as indicated on page 2, is a source of iron units.

- Once a product is manufactured, it enters a period of use during which time it is considered to be in the scrap reservoir, even though the actual metal will only become available at the end of that specific product's useful life. The average lifespan of refrigerators is 11 years, yet millions of units are discarded annually because of compressor failure, which has nothing to do with metal fatigue. With compressor replacement cost equivalent to that of a new refrigerator, consumers typically choose to replace rather than repair. The refrigerator is just one example of how the potential lifespan of the components in a product is poorly exploited. Many other factors influence a product's typical residence time in the scrap reservoir; a report by Resources, Conservation and Recycling in 2013 estimated the average lifespan of steel at 35 years.

Technology and differing scrap use

The government's implementation of PPS in 2013 was aimed at providing the SA steel industry with a controlled cost and secure domestic supply of scrap. This had the intended effect of supressing scrap exports and prioritising SA steel producers as the primary scrap users:

- PPS has led to a 30% drop in the value of scrap in the local market, with an immediate lowering of input costs to those steel-making units that represent the demand for scrap (ie mainly the electricity based).
- It may equate to overall improved competitiveness of the SA steel industry, although we note that it may be seen to benefit some parts of the steel industry more than others (ie blast furnace processes, based on iron ore, for which scrap is a lesser proportion of overall inputs).
- Although some might suggest that these latter players should push up their input content of scrap to also participate in the benefit, one should keep in mind the following:
  - Blast furnaces can take a maximum of about 150kg scrap per ton of hot metal. As an example, AMSA consumes about 100kg scrap per ton of hot metal. However, that does not mean that scrap as feedstock can automatically be increased by 50%. By increasing the rate of scrap relative to iron ore into the furnaces, the cost benefit of using cheaper pulverised coal as an energy source is reversed as more expensive metallurgical coal is needed for the melting process.
  - The cost of running an electric arc furnace is higher than running an induction furnace, whose output yields are higher, implying that less input material is needed for the same volume of output. Electric arc furnace technology may also need an additional process called secondary metallurgy, further adding to costs and capital outlays. As a rule of thumb, EAFs are up to 10% more expensive to operate than IFs.
  - Physically, scrap may be unsuited to blast furnaces, due to its size and shape. The material can create blockages in bunkers and top hoppers, while elongated pieces can tear conveyers and zinc contamination in the scrap can make it unusable.
  - Finding scrap in suitable physical dimensions and uniformity for blast furnaces can be a challenge, while the lack of scrap processing and storage facilities could hamper the potential increase in utilisation of scrap further.
  - Other capital-intensive factors such as desulphurisation stations and granulation equipment could be needed.

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Frankfurt +49 (0)69 78 8076 960
Schumannstrasse 34b
60325 Frankfurt
Germany

London +44 (0)20 3077 5700
280 High Holborn
London, WC1V 7EE
United Kingdom

New York +1 646 653 7026
1185 Avenue of the Americas
3rd Floor, New York, NY 10036
United States of America

Sydney +61 (0)2 8249 8342
Level 4, Office 1205
95 Pitt Street, Sydney
NSW 2000, Australia