

THE FUTURE ROLE OF THE CATALYTIC CONVERTERS INDUSTRY IN THE DOWNSTREAM VALUE ADDITION TO SOUTH AFRICA'S PLATINUM GROUP METALS

DIRECTORATE: MINERAL ECONOMICS



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

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ABSTRACT

South Africa's Platinum Group Metals (PGMs) industry is export orientated, with just under 90 percent of mine output exported. For unbeneficiated metals, this is too large a figure to export and it means that a very small proportion of the country's PGMs are beneficiated locally. On the local front, catalytic converters industry is the biggest beneficiary of the country's PGMs. With the catalytic converters industry largely export orientated, the introduction of the Automotive Production Development Programme (APDP) to replace the Motor Industry Development Programme (MIDP) will likely result in decreased levels of benefits to producers, an anticipation that has already resulted in some discomfort and instability in the industry. However, both the government and the industry have acknowledged this drastic change and in order to smooth the transition, additional support measures outside of the APDP will be developed. As more than 90 percent of PGMs sold locally are used in the manufacture of catalytic converters, it follows that increased levels of beneficiated PGMs output lie in the growth of the local catalytic converters manufacturing industry, the success of which could lead to socio-economic development. Given the continued substitution of platinum for palladium in catalytic converters, it is equally important to further develop other markets for PGMs, particularly the fuel cells industry, in order to ensure sustainability of future PGMs mining and downstream value addition.

1. INTRODUCTION

Despite close to a century of modern PGMs mining, South Africa (SA) remains a relatively small player when it comes to downstream value addition to these precious metals. The country's PGMs industry is export orientated, with just over 11 percent of mine output sold locally, largely to the catalytic converters industry. Catalytic converters are South Africa's biggest automotive component export segment and the industry is the biggest local beneficiator of the country's PGMs. However, the future of the local industry is under threat due to the anticipated transition in incentives from the MIDP to the APDP. This is according to the Catalytic Converter Interest Group (CCIG), which has been engaging with the Department of Trade and Industry (DTI) on this matter for a number of years and with the Department of Mineral Resources (DMR) more recently. According to the CCIG, the APDP signals a significant redistribution of benefits away from the automotive component sector and would therefore result in a substantial reduction in the local beneficiation of a number of key minerals, contrary to one of the stated objectives of the government's revamped Industrial Policy Action Plan (IPAP2). The main objective of this report is therefore to determine future role of SA's catalytic converter industry in downstream value-addition to SA's PGMs.

2. PGMs IN CATALYTIC CONVERTERS

Catalytic converters are devices used to convert toxic exhaust emissions from an internal combustion engine into non-toxic substances. They convert over 90 percent of hydrocarbons, carbon monoxide and oxides of nitrogen from gasoline engines into less harmful carbon dioxide, nitrogen and water vapour. The catalytic converter consists of several components. For automotive catalytic converters, the auto-catalyst core is often a ceramic monolith with a honeycomb structure, but metallic foil monoliths were introduced in the 1990's and are used by some automotive manufacturers. A washcoat is a carrier for the catalytic materials and is used to disperse the materials over a high surface area. The catalyst itself is most often a combination of different PGMs.

Significant changes over time in both the proportions of platinum, palladium and rhodium used and PGMs loading have occurred since the introduction of catalytic converters in the mid-1970's, largely due to the introduction and evolution of emissions regulations. The first auto-catalysts were oxidation catalysts, which primarily used a combination of platinum and palladium. Because these catalysts had little effect on oxides of nitrogen, new standards in

the 1980's resulted in the introduction of three-way catalyts, which contained platinum and rhodium in a 5:1 ratio, with rhodium playing an important role in the reduction of nitrogen oxides. Palladium came to the fore from 1989 onwards as automakers began using more durable palladium-based three-way catalyts to take advantage of the metal's price discount to platinum. Technological advances made by auto-catalyts manufacturers enable more response to changing PGMs price differentials. The choice of precious metals and ratio of PGMs used can vary between auto-catalyts. It is the use of PGMs across the system as a whole that is important. It is roughly estimated that between 5 g and 10 g of platinum was used in an auto-catalyst in 1980, declining to between 3 g and 4 g today as a result of the continued replacement of this pricey metal with the relatively cheaper palladium.

3. THE LOCAL PGMs AND CATALYTIC CONVERTERS INDUSTRY

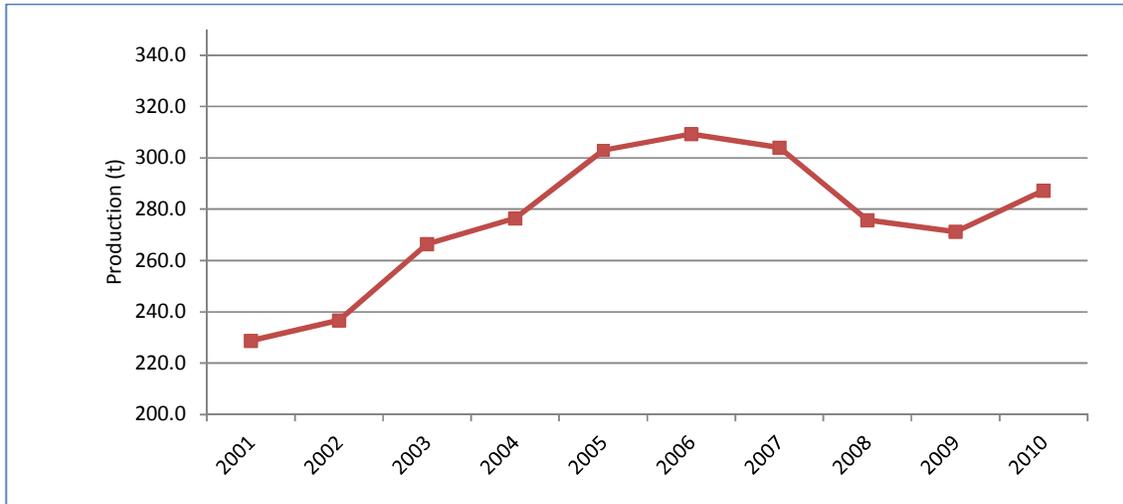
3.1 Production and Sales of PGMs

In 2010, South Africa's known reserves of PGMs represented 87.7 percent (70 000t) of the world total. The country's PGM output is derived almost exclusively from the Bushveld Complex, with only minor amounts coming from the Evander Gold Field, the Uitkomst Complex and the Phalaborwa Igneous Complex. In 2010, there were 23 platinum producing mines operating in the Bushveld Complex, 22 of which exploited the Merensky Reef and UG2 Chromitite Layer, with one, the Mogalakwena Section – an opencast operation – exploiting the Platreef, on the northern limb of the Complex. Both the western and eastern limbs hosted ten mines each, while three of the mines were located on the northern limb of the Bushveld Complex.

At the current production rate and known reserves, exploitation of South Africa's PGM reserves is expected to continue for at least the next 250 years. Between 2001 and 2010, South Africa's PGM production increased by 25.6 percent from 228.7t to 287.3t (Figure 1). In 2010, production increased by 5.9 percent year-on-year to 287.3t, with local sales increasing by 35.8 percent to 31.1t, and export sales decreasing by 2.6 percent to 244.4t. However, local sales amounted to only 11.5 percent (31.7 t) of total sales, or 11.0 percent of total production, with 95 percent (30.1 t) of these being consumed in the manufacture of catalytic converters and the remainder in jewellery manufacture. Still, considering the vast amount of resources available in the country, the level of local beneficiation of these commodities is too low. This presents an opportunity to expand the country's beneficiated PGMs output in order to contribute to significant job creation through maximum value derivation from the

exploitation of the resources, as advocated by the Precious Metals Act and the Beneficiation Strategy.

FIGURE 1: SOUTH AFRICA'S PGM PRODUCTION, 2001 - 2010.



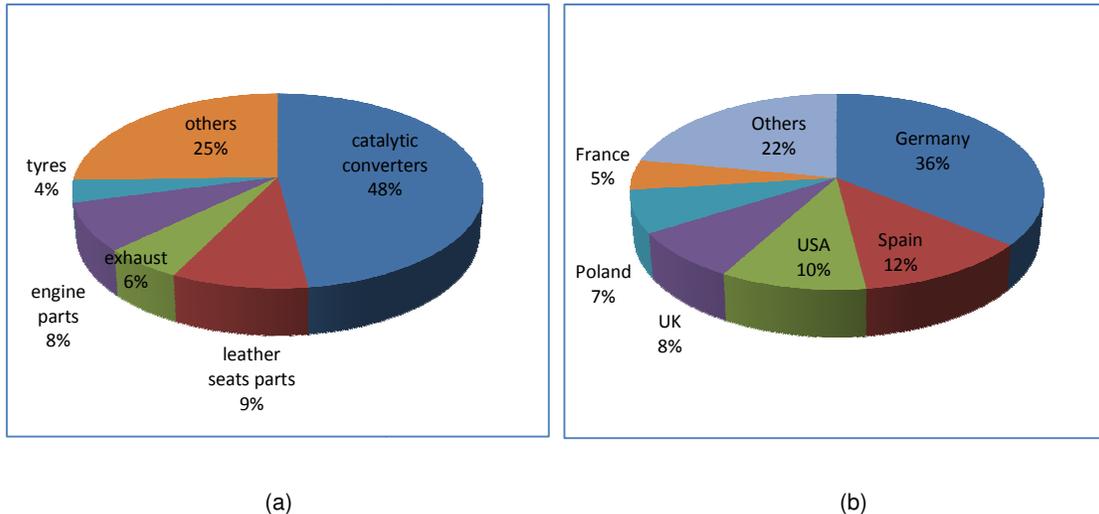
Source: Directorate Mineral Economics.

3.2 Production and Sales of Catalytic Converters

With a production of 525 227 vehicles in 2010, South Africa can be regarded as a minor contributor to global vehicle production, which reached 78 million units in 2010 alone. However, the automotive sector is a local giant, having contributed about 6.2 percent to the country's gross domestic product (GDP) and employing around 28 000 people in 2010. The government has therefore identified the automotive industry as one of the key growth sectors, with the aim of increasing vehicle production to 1.2 million units by 2020, while significantly increasing local content thereof.

South Africa exported R30.8 billion worth of automotive components in 2010, a 10.6 percent increase over 2009. At 48 percent of all components exported in 2010 by value, catalytic converters continued to be the country's most exported vehicle parts (Figure 2a). Germany, Spain, the USA and the UK were destinations for more than half of all catalytic converters exported in 2010 (Figure 2b). Other key exports include engines, silencers, exhausts, radiators, wheels and tyres, stitched leather car seat covers, sound systems and axles, especially for heavy trucks.

FIGURE 2: AUTOMOTIVE COMPONENT EXPORT CATEGORIES AND MAIN EXPORT DESTINATIONS FOR CATALYTIC CONVERTERS, 2010.



Source: SA Automotive Industry Yearbook, 2010.

All of the major vehicle makers are represented in South Africa, as well as eight of the world's top ten auto component manufacturers and three of the four largest tyre manufacturers. Many of the major multinational companies use South Africa to source components and assemble vehicles for both the local and overseas markets. Between 2000 and 2006, the industry's investment in production and export infrastructure quadrupled, from R1.5 billion to R6.2 billion, before slowing to R3-billion in 2007. Capital investment was a low R2.5 billion 2009, probably due to the global financial crisis, but increased to around R4.0 billion in 2010. The value stood at R4.5 billion in 2011 at the time of writing. By contrast, investment in the production of catalytic converters has progressively decreased from R654.6 million in 2008 to R180.4 million in 2010, while the value stood at R149.6 million in 2011. According to the CCIG, this was mainly attributed to the anticipated change in government support programmes.

3.3 Government Support Programmes

Administered by the DTI, the MIDP is a government support program for the local automotive industry, introduced in September 1995 in an effort to rationalize the SA motor industry, reduce production costs by encouraging longer production runs of fewer models, stimulate new employment and create a positive balance of trade in motor vehicle and motor vehicle components. Under the MIDP, the industry has become a major beneficiary of some of SA's raw materials, benefiting around R10 billion worth of the country's mined PGMs,

with direct employment peaking at 5 162 in 2008. Despite these successes, the programme is to come to an end in 2012 and be replaced by the APDP. This comes after a review of the MIDP noted that the industry faced a number of challenges, including the fact that the industry remained relatively small in global terms, as well as challenges of major domestic infrastructure, logistical inefficiencies and skills shortages.

The new APDP aims to stimulate growth in the automotive vehicle production industry to 1.2 million vehicles per annum by 2020 with associated deepening of the components industry. This would provide an opportunity to increase the local content of domestically assembled vehicles. The APDP is structured in four key elements namely, tariffs, local assembly allowance, production incentives and automotive investment allowance. The programme will include a local assembly allowance (LAA), which will allow vehicle manufacturers with a plant volume of at least 50 000 units per annum to import a percentage of their components duty-free. The LAA would come in the form of duty credits issued to vehicle assemblers based on 18 percent to 20 percent of the value of light motor vehicles produced domestically from 2013. Manufacturers would also receive value-add support to help encourage increased levels of local value addition along the automotive value chain, with positive spin-offs for employment creation.

Essentially, the main difference between the MIDP and the APDP is that the former rewards value-added exports, while the latter will reward local value addition. With the catalytic converters industry largely export orientated, the introduction of the APDP will likely result in decreased levels of benefits, an anticipation that has already resulted in some discomfort and instability in the industry. This has even led to speculations that the future of the local catalytic converters industry is under considerable threat and could be lost entirely within the next 2 – 3 years, according to the CCIG, which has been engaging with the DTI on this matter for a number of years and with the DMR more recently. According to the CCIG, the net benefit available under the MIDP for a typical catalytic converter reduces from 8.9 percent currently to 8.1 percent in 2012, the last year of the program, while under the APDP the benefit available reduces to 4.2 percent in 2013, the first year of the programme. Both the government and the industry have acknowledged the drastic change from the MIDP to the APDP and in order to smooth the transition, additional support measures outside of the APDP will be developed.

4. GLOBAL DEMAND FOR PGMs FROM AUTOCATALYSTS

Gross platinum demand increased by 16.0 percent to 223.4t in 2010, largely due to an increase in automotive and industrial purchasing (Table 2). Total worldwide vehicle production improved by 25 percent as a result of stronger consumer and fleet sales, which in turn were driven by improved economic conditions. Overall, gross purchases of platinum for autocatalysts improved by 43 percent to 88.6t in 2010.

TABLE 1: PGMs DEMAND BY APPLICATION, 2010.

Tonnes (t)	Platinum	Palladium	Rhodium
Total Supplies	171.8	206.7	21.3
Gross Demand			
Autocatalysts	88.6	154.5	20.5
Chemical	12.6	11.2	1.9
Electrical	6.2	40.0	0.1
Investment	18.4	30.8	-
Jewellery	68.5	17.6	-
Other	29.1	18.9	2.2
Total Gross Demand	223.4	272.9	24.7

Source: Johnson Matthey's Platinum 2010.

Gross automotive sector demand for palladium also rose by 34.6 percent to 154.5t, the highest since 1999 as economic recovery drove vehicle production higher in all regions. Supplies from total recycling of the metal improved by 29.1 percent to 52.3t, but these were outweighed by demand from the automotive sector and physical investment, resulting in a palladium market deficit of 13.9t. Despite strong recovery in purchasing of rhodium by the metal's largest sector, the automotive market, the rhodium market remained oversupplied by 3.2t of the metal. Demand from the automotive sector increased by 17.1 percent to 20.5t.

5. FUTURE IMPLICATIONS FOR LOCAL BENEFICIATION

5.1 Opportunities

The global automotive sector has shown signs of recovery from the economic crisis and this has resulted in a surge in demand for autocatalysts and ultimately PGMs. As the number of vehicles on the road increases, further cuts in pollution per vehicle are needed to keep improving air quality. Some developed countries continue to apply increasingly stricter

emissions standards, providing SA with an opportunity of even greater use of its PGM reserves by producing even more catalytic converters. Furthermore, recent developments emanating from engagements between the South African government and the CCIG on the promulgation of the APDP are very encouraging as far as the future of industry is concerned. As more than 90 percent of PGMs sold locally are used in the manufacture of catalytic converters, it follows that increased levels of beneficiated PGMs output lie in the growth of the local catalytic converters manufacturing industry, the success of which could lead to jobs, new infrastructure and to increased government revenues that, in turn, can be invested in social priorities such as job creation, education, health care, and poverty alleviation. In the meantime, it is vital that the industry continues to engage with the government to quantify the level of additional support required to sustain the industry.

5.2 Threats

The continued trend of substituting platinum for palladium in catalytic converters is worrying and should be viewed in serious light. Palladium is already a full-on substitute for platinum in petrol auto catalysts, but, thankfully, still only a partial substitute in diesel auto catalysts. Should this trend continue, it might spell disaster for the country's platinum, which accounts for more than 50 percent of all PGMs produced in the country, while palladium and rhodium account for just under 30 percent and less than 10 percent, respectively. The automotive industry currently accounts for more than 50 percent of all platinum demand and the current trend might see the price of the metal plunging much further down in future, which might affect the importance of the metal as one of the major forex earners. For the benefit of the country, there are hopes that the long-term outlook for platinum demand in the automotive industry remains one of strong growth, seeing that the PGMs industry has already survived a 50 percent cut in the use of this metal in catalytic converters. But this is not guaranteed, particularly with manufacturers worldwide working towards cutting the use of all types of PGMs in catalytic converters and finding a less expensive substitute. It is therefore vitally important to further develop other markets for PGMs, particularly platinum as the major group metal produced in the country, in order to ensure sustainability of future PGMs mining in the country.

6. CONCLUSIONS

For unbeneficiated metals, 89.0 percent of mine output is too large a figure to export. As the largest market and beneficiator of South African PGMs, the local catalytic converters industry must be sustained and grown beyond the current levels of output, particularly when

the demand for autocatalysts from the global automotive sector is not showing any signs of slowing down. Both the government and industry must be commended for moving swiftly and diffusing a potentially disastrous situation by engaging with each other and coming up with added support measures. However, sustainability and development of the local catalytic industry must not be done at the expense of other potential PGMs markets, such as the fuel cells industry. Should the current trend of diminishing use of PGMs in auto catalysts continue, other industries will still be there to ensure sustainability of future PGMs mining. This will also go a long way in helping to derive maximum value from the country's PGMs resources, thereby contributing to social upliftment in the form of job creation and poverty alleviation.

7. RECOMMENDATIONS

The following recommendations are made:

- Having a vast amount of PGMs resources makes SA a potential long term strategic major supplier of catalytic converters and therefore a potential major beneficiary of PGMs. However, downstream value addition will be impossible without production and therefore the government needs to intensify efforts to attract more investment into exploration in the industry.
- Increased levels of beneficiated PGMs output partly lies in the growth of the local catalytic converters manufacturing industry. It is therefore vital that the industry continues to engage with the government to quantify the level of additional support required to sustain the industry.
- With the continued substitution of platinum for palladium in catalytic converters, it is vitally important to further develop other markets for PGMs, particularly the fuel cells industry, in order to ensure sustainability of future PGMs mining and downstream value addition.

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