

PLATINUM GROUP METALS

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It was another stellar year for platinum. Having breached both the key US\$500 and US\$600/oz levels in 2002, platinum soared through the US\$700 and US\$800 barriers in 2003 culminating in a 23-year high of US\$842/oz just prior to year-end. It was a case of *déjà-vu* for sister metals palladium and rhodium, as ample metal availability kept prices for both metals under constant pressure throughout the year. The average annual prices for platinum, palladium and rhodium were US\$692, US\$200 and US\$507/oz respectively. In the case of palladium and rhodium, this was their lowest level since 1997.

The platinum market registered its fifth consecutive year of deficit in 2003. However, the gap narrowed as another year of growing demand by the automotive industry was outweighed by a decline in jewellery demand due to the rising and fluctuating price coupled with increasing supply. In the case of palladium, the market surplus almost doubled to close on 1 Moz as supply and demand continued their divergent paths. With demand remaining static, the rhodium market moved into surplus as a result of increases in South African production and Russian sales.

Automotive

Platinum demand for use in autocatalysts rose by 6% to 2.8 Moz due to further strong growth in European diesel car sales and the adoption of stricter emission standards.

Light-duty vehicle sales form the backbone of PGM demand by the automotive industry. Despite the uncertain economic conditions that clouded the outlook at the start of 2003, catalysed vehicle sales were virtually unchanged at an estimated 54.5 million units for the year. Low interest rates and cash-back incentives on new vehicle purchases underpinned US light-vehicle sales which totalled 16.7 million units, a mere 1% down on the previous year, but still the fifth-best year in the industry's 100-year plus history. Light trucks once again took market share from cars and now account for 53.2% of the total light-vehicle market. Because of their larger engine size, light trucks require larger catalysts with higher catalyst loadings to meet emission standards than their passenger car counterparts.

In Western Europe, passenger car sales also performed better than expected and, at 14.2 million units, were only 1.3% below the year before. One of the main reasons for the better performance was a further surge in demand for diesels, whose market share rose by 3.2% to 43.6%.

In Japan, car sales remained stagnant at 4.5 million units as the mood of cautious optimism in the country failed to filter through to consumer spending. The decline in vehicle sales in the established regions such as North America

and Europe was balanced by strong growth in the rest of the world. China was the fastest-growing country in this region, and also in the world, with sales of new cars increasing by 72% to 2.18 million units.

Platinum demand benefits from the growth in diesel vehicle sales due to the fact that diesel autocatalysts use predominantly platinum. Economic factors, namely fuel efficiency, tax incentives and lower maintenance, are behind the growth in their popularity. Diesel engines are around 25% more fuel efficient than their gasoline counterparts, engine life is ten times that of a gasoline unit, maintenance requirements are lower and the cost of the fuel is around 20% cheaper. The above, coupled with competitive, and in some cases superior performance, durability and reliability, are the main reasons behind the growth in their popularity. Compared to gasoline engines, diesels operate with an excess of air. These conditions result in cooler combustion and consequently lower exhaust temperatures. This environment requires a platinum oxidation catalyst, often with higher loadings than their gasoline counterparts, to enable the required oxidation performance.

Although no new emission standards were implemented in the established sales regions in 2003, many automakers pre-empted the pending legislation in both the US and Europe due to the fact that credits and/or incentives were offered for early compliance.

In the US, credits were obtainable for early compliance to the Federal Tier 2 and California LEV 2 standards, both of which take effect from the start of January 2004. The Tier 2 regulations are based on averaging the emissions for a fleet of vehicles. The standards have eight permanent levels of stringency, termed certification bins. Automakers can certify vehicles to any one of the bins, but must meet the fleet average NO_x requirement of 0.07 grams per mile. Since Tier 2 standards are based on a fleet average NO_x standard, this measure is used to calculate credits for each manufacturer. Because the legislation demands constant fleet average NO_x emissions, the credits can be held indefinitely so as to offset unexpected vehicle sales distributions in a particular year. The credits may also be sold to other manufacturers to help them meet the Tier 2 NO_x standard.

California's persistent smog problem has caused its emission standards to be consistently lower than the Federal Standards. In addition to having manufacturers meet three increasingly more stringent emission categories, LEV 2 also requires manufacturers to meet a fleet average NMOG (non-methane organic gas) emission limit. If a manufacturer's fleet average NMOG level is better than that required in a particular year he receives credits towards future NMOG emissions. That credit can either be offset against future emissions or be sold to other manufacturers. The credits earned in the phase-in period to 2006 can be applied to emissions in any year until 2007. Credits earned post-2006 carry their full value in the year following their obtainment, 50% of their value in the second year after they were earned, 25% in the third year and are of no value in subsequent years.

Although the next set of regulations in Europe, Euro IV, will only become mandatory in 2005, government tax incentives and pressure from environmental groups have resulted in some manufacturers already offering vehicles compliant with the new standards. One of the main thrusts of the impending legislation has been aimed at particulate and NO_x emissions for diesel vehicles. Since their adoption, engine combustion improvements have allowed manufacturers to avoid the use of filters to capture particulate emissions. However, pressure from environmental groups concerned about the harmful effects of particulate emissions have forced manufacturers to offer diesel particulate filters as options on their vehicles. Tax incentives for particulate filter purchases in countries such as Germany, Sweden, Belgium and the UK have encouraged their early usage. Where manufacturers have used engine calibration to meet the particulate standards without filters, they have had to increase the platinum loadings to meet the required carbon monoxide and hydrocarbon reductions. The strategy to lower particulates by higher combustion temperature is accompanied by higher NO_x emissions. Conversely, when the combustion temperature is lowered to meet the required NO_x emissions, a particulate filter with a higher loaded oxidation catalyst is needed to meet the particulate, hydrocarbon and CO requirements.

Despite palladium's favourable economics, which have resulted in auto manufacturers substituting it for platinum, demand fell by 4.5% to 4.32 Moz. The size of the converters on some large-volume models has been reduced, which results in less palladium use for those vehicles. In addition, precious metal loadings are being optimised by taking advantage of the latest coating technology and formulations, and also by the fact that automakers do not want to completely eliminate the platinum option, given the price volatility of PGMs. The growth in diesel car sales was also a contributory factor. Rhodium demand remained firm in 2003, at 630,000 oz.

Jewellery

The rising and volatile platinum price finally took its toll on jewellery consumption, with demand falling by 12% to 2.5 Moz.

In China, the major market demand fell by almost 17% to 1.25 Moz. The decline resulted from manufacturers withdrawing from the market as margins came under pressure. This is due to the fact that platinum jewellery in China is priced to the metal price plus a fabrication margin, unlike other metal jewellery which is priced on a piece basis. This situation was further exacerbated by reluctance by the retailers to increase their price in line with that of the free market. In addition to this, the market had also to contend with the outbreak of SARS during the first half of the year, which curtailed sales. However, at the consumer level, platinum still remains the metal of choice in the fashion jewellery category. Platinum, in addition to continuing to extend into the secondary and tertiary cities, has begun to make inroads into the bridal sector, which has proven to be the cornerstone of other major markets. The commencement of platinum trading on the Shanghai Gold Exchange in August 2003 helped the manufacturing industry by eliminating the 17% VAT and reducing the consumption tax on platinum jewellery from 10% to 5%, the onus of which was switched to the retailer.

Low margins and inventory recycling, coupled with a sluggish economy, resulted in Japanese demand dropping by 13% to 675,000 oz. Total sales on a piece and value basis declined by 11% and 1% respectively compared with the previous year. The decrease in sales was almost entirely due to a 20% decline in sales in the lower price brackets of up to 50,000 yen. Sales in the higher price segments in most cases recovered. The strong in-roads made by white gold at the expense of platinum since the start of the decade stopped in 2003. Platinum's market share on a piece basis was unchanged at 26%, with white gold's 5% increase to 37% coming at the expense of its sister metal yellow gold.

In the US, sales of platinum jewellery were virtually unchanged at around 300,000 oz. Sales in the bridal sector were up year-on-year despite the introduction of new lines in white metal such as titanium for male wedding bands. As was the case in 2002, it was fashion jewellery and in particular the lower price brackets, that bore the brunt of the rising and fluctuating metal price as manufacturers moved into white gold. On the other hand, sales at the top end of this segment remained resilient. The high price has also meant that retailers continued the practice of only replenishing inventory.

In Europe, demand was yet again unchanged at 170,000 oz. The UK is increasingly becoming the cornerstone of this market, with further strong growth in the bridal sector. Figures from the UK Assay office showed that the number of platinum pieces hallmarked increased from 243,759 to 314,077, which represents a 31% increase in terms of ounces to 83,000 oz. The German market remained under pressure throughout 2003, with exports to the US and UK providing the only relief for manufacturers. In the local market, only the bridal sector maintained its position, and fashion jewellery continued to lose ground to white metal look-alikes such as steel and silver. Although similar conditions prevailed in Italy, the situation was exacerbated by a fall in exports due to weakness in the demand for chain. Demand in Switzerland was virtually unchanged, with an increase in jewellery sales being balanced by a fall in watch sales.

Elsewhere in the world, demand for platinum jewellery remained firm at around 100,000 oz. In India, demand continues to grow as both consumer awareness and knowledge improve. Platinum jewellery has begun to make in-roads in Taiwan with the three major chains all offering platinum jewellery. In Korea, there is potential in the bridal sector but there is still a need to establish a hallmarking system and a greater awareness. The potential of both markets is being evaluated by the Platinum Guild International, the promotional arm of the platinum industry, with the view to assisting in their development.

Other demand

Other usage for platinum declined by 2.5% to 1.6 Moz in 2003 primarily because of a fall in investment. Investment demand declined owing to the strong price, which resulted in reduced purchases of bullion coins by US investors, coupled with Japanese investors using the opportunity to sell large bars back onto the market. Of the industrial applications, the electronics

industry continued to benefit from the use of platinum where it is used as an alloy to enhance storage capacity in devices such as computer hard disks, cell phones, digital cameras and MP3 players. In the glass industry, the strong growth in the production of high-quality glass for flat-panel display screens, particularly in southeast Asia, continued to underpin demand. Demand in the chemical and petroleum industries remained stable.

Demand for palladium in other industrial applications was virtually unchanged at 2.15 Moz. Consumption of palladium by the electronics industry stabilized at 750,000 oz despite an almost 20% increase in the growth of multi-layer ceramic capacitors, its major end use in this sector. This was due to a combination of ongoing miniaturisation, thriftiness and displacement by base metal electrodes. The lower price stimulated dental demand, which increased by 6% to 835,000 oz. The bulk of the increase came from Japan where usage increased by 27% to 515,000 oz. Industrial demand for rhodium supported by strong usage by the glass industry was maintained at 90,000 oz.

Supply

Platinum supply increased by 3% in 2003 to 6.76 Moz, the bulk of the increase, once again, coming from South Africa.

South Africa's platinum production rose by 4.5% to 4.66 Moz. Refined output at Anglo Platinum grew by 2.5% to 2.31 Moz. The fall in output from steady-state operations of 6%, to 1.80 Moz, was more than offset by an increase in ramp-up mine production to 510,000 oz. Implats' primary operating unit, the Impala lease area, maintained production at 1.05 Moz. In November 2003, Implats announced the suspension of mining operations at Crocodile River due to the difficult geological conditions encountered as mining changed from an open pit to an underground operation. Lonmin's production of refined platinum grew by around 15% to 900,000 oz. The majority of the additional output was sourced from its new open-pit operation. Northam Platinum's production rose by 10% to 205,000 oz, a record level for the company, and Aquarius Platinum's output grew by 19% to 155,000 oz, primarily due to the bringing on stream of its new Marikana mine.

In North America, platinum production fell by 25% to 295,000 oz. The decline was due to lower production at Inco as a result of a three-month strike at its Ontario operations, and a slower-than-anticipated ramp-up of those operations following the strike. At Stillwater Mining Co, platinum production totalled 134,000 oz compared with 141,000 oz for the prior year. The small decline at the Stillwater mine to 100,000 oz, was more than compensated for by a 25% increase in production at East Boulder. In June 2003, the company concluded the Norilsk Nickel transaction whereby Norilsk acquired a 50.8% shareholding in Stillwater Mining for US\$100 million in cash and 877,169 oz of palladium. At North America Palladium, PGM production increased by 32% to 313,000 oz, of which platinum accounted for 24,000 oz.

In Zimbabwe, refined platinum production increased by 60% in 2003 to 120,000 oz. At Zimplats' Makwiro mine the ramp-up to full production was achieved, with full year output of 80,000 oz of platinum being close to

nameplate capacity. During the year, Implats took effective control of Zimplats by increasing its holding in the company to just over 82%. The balance of the country's production came from Mimosa, a 50:50 joint venture between Implats and Aquarius Platinum.

Russian sales are estimated to have been in the region of 1 Moz in 2003, 5% up on the previous year. At this level, sales are believed to have been once again augmented by metal from stock. Spurred by the higher platinum price, the recovery of metal from spent autocatalysts is estimated to have increased by 7% to 620,000 oz.

The appreciation of the rand and operational difficulties in the relatively unmined Eastern Bushveld, have resulted in some of the South African expansion plans falling behind schedule.

In December 2003, Anglo Platinum announced that, following a revision of its expansion programme, it was slowing down the rate of implementation. The group is now targeting 2.9 Moz of refined platinum in 2006, compared with the original plan of 3.5 Moz over the same period. In terms of the revised plan, the ramp-up of Bafokeng Rasimone and Modikwe are unaffected, nor is the Kroondal venture with Aquarius. The Twickenham, Der Brochen, Pandora and the second phase of the Rustenburg tailings retreatment project are to be slowed by between one and three years.

Implats' growth strategy, which comprises a combination of mining, concentrate purchases and tolling, remained on track to deliver 2 Moz of platinum by 2006. Construction at Marula continued throughout the year, with plant commissioning commencing in early 2004, processing the stockpiled material that has built up. At Two Rivers, a small-scale trial mine was started better to understand the geology and mineralogy, and to evaluate mechanised equipment. A feasibility study on the 120,000 oz/y project is in the final stages of completion. Both Aquarius' Marikana project and Southern Era's Messina Mine were preparing to raise output.

In Zimbabwe, both Makwiro and Mimosa had reached steady-state production of 90,000 oz and 70,000 oz of platinum respectively. Further expansions at both operations are under consideration.

Lonmin's target of producing 1 Moz/y of refined platinum by 2008 remained on schedule. The additional output comes from the expansion of existing operations, coupled with the Pandora joint venture with Anglo Platinum.

Palladium supply rose by just over 3% to 7.39 Moz. Russian sales surged by almost 80% to 3.4 Moz and more than made up for the decline in inventory usage, which characterised the previous year. Supplies of palladium from both South Africa and Zimbabwe grew in line with mine expansions. Combined output from the region grew by 5% to 2.35 Moz. Despite a 32% increase in palladium output to 289,000 oz at the Lac des Iles mine, North American production fell by 7% to 910,000 oz, primarily as a result of the decline in Inco's production.

Supply from spent autocatalysts continued to grow strongly as more of the heavily loaded palladium converters used in the 1990s were recycled. DLA sales for 2003, were 140,000 oz, which leaves 60,000 oz for disposal. Rhodium supplies, of which South Africa contributes 75%, grew by 5% to 760,000 oz.

Prices

The rally in the platinum price witnessed in 2002 continued, for the most part, unabated throughout 2003. Having opened the year at US\$600/oz, platinum climbed rapidly and broke through the psychological US\$700/oz barrier in both February and March, in both cases succumbing to the inevitable profit taking. Having eased back towards US\$600/oz in April as sentiment turned bearish due to a worsening economic outlook exacerbated by the SARS virus, platinum resumed its upward spiral in May.

Throughout the second half of the year the price maintained its upward momentum, posting a succession of 23-year highs and culminating in the year's high of US\$842/oz on December 18. Positive fundamentals and speculative buying (aided by a weakening dollar), low interest rates and political instability, were behind platinum's fortunes. The year's final fixing of US\$814/oz represented a 40% increase over the year's opening price.

Palladium made a positive start to 2003. Having opened the year at US\$234/oz, the metal staged a modest revival on the back of short covering of platinum to post the year's high of US\$271/oz on January 22. Once again, however, palladium's weak fundamentals re-asserted themselves and the price eased over the following months, fixing at the year's low of US\$144/oz on April 17. Through mid-year, a traditionally quiet period, palladium traded for the most part in a narrow US\$160-US\$190/oz band. In late August, palladium benefited from the resurgence in speculative interest in commodities and the price broke above US\$200/oz for the first time in five months. Having held above US\$200 for the most of September, the price gradually drifted down in the lead-up to year-end due to a combination of weak demand and more than adequate supplies. The year's final fixing of US\$193/oz represented an 18% decrease over the year's opening fix. The average discount for the year to platinum was US\$491 compared to US\$213/oz in the previous year.

The rhodium price rebounded strongly in January following the steady decline witnessed during the second half of 2002, which took the metal below US\$500/oz. The price surged to a high of US\$650/oz in early January as consumers returned strongly to the market before easing to US\$600/oz at month-end. The price began to slide in early March as consumer demand dried up, reaching a low of US\$400/oz in late April. At these levels, buying recommenced and rhodium rallied to almost US\$600/oz in May before falling to US\$500/oz as sellers returned to the market. The floor that developed at this level was largely maintained for the balance of the year, as supply remained adequate to meet demand.

Market outlook

Platinum's fundamentals remain sound, a feature of the market since the start of the decade. The automotive and jewellery sectors continue to form the backbone of demand and are coupled with robust usage from other industrial applications. Automotive usage will continue to drive demand due to a combination of the implementation of stricter emission-control technologies for light and heavy-duty diesel vehicles, as well as further growth in European diesel car sales. Although jewellery demand eventually succumbed in 2003 to the rising and volatile price, the longer-term outlook of a lower and stable price will underpin future demand.

Palladium demand is expected to be boosted by its substitution of platinum in gasoline formulations in the automotive industry. However, growing supply, coupled with significant above ground stocks, should stabilise prices at around current levels, which should stimulate longer-term market development. Rhodium usage, which is dominated by the automotive industry, will grow in line with tighter legislation and rising vehicle sales.

Platinum supply and demand ('000 oz)

Demand	2001	2002	2003
Automobile	2,180	2,620	2,750
Jewellery	2,550	2,840	2,500
Other	1,635	1,620	1,590
Total Demand	6,365	7,080	6,840
Supply			
South Africa	4,120	4,460	4,650
Rest of Western World	495	505	505
Russian Sales	1,100	950	1,000
Secondary Metal	550	570	620
Total Supply	6,265	6,485	6,775
Implied change in stock	(100)	(595)	(65)

Palladium supply and demand ('000 oz)

Demand	2001	2002	2003
Automobile	5,435	4,530	4,325
Industrial	2,545	2,100	2,155
Total Demand	7,980	6,630	6,480
Supply			
South Africa	1,985	2,175	2,250
Rest of Western World*	2,140	2,680	1,300
Russian Sales	4,500	1,900	3,400
Secondary Metal	340	390	450
Total Supply	8,965	7,145	7,400
Implied change in stock	985	515	920

* = includes stocking / destocking

Price movements

	Platinum	Palladium	Rhodium
2003	US\$/oz	US\$/oz	US\$/oz
January	630	255	557
February	682	253	581
March	676	225	555
April	625	163	478
May	651	167	516
June	662	179	489
July	682	173	476
August	693	182	495
September	705	211	485
October	732	201	486
November	760	197	487
December	808	198	478
Average	692	200	507

Monthly average price for platinum and palladium is the London pm fix.