

## PLATINUM GROUP METALS

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**P**latinum enhanced its position as a metal for the future with demand in 2001 reaching a new record high of 6.5 Moz amidst an environment of global economic slowdown. The automotive industry was the main driver of growth due to a combination of stricter emission standards, substitution of palladium and growing diesel sales. Although supplies exceeded 6.0 Moz for the first time the market remained in deficit for the third successive year. This was reflected in the price which averaged US\$530/oz for the year.

A decade of uninterrupted growth came to an end for palladium in 2001 as demand slumped 14% to 7.56 Moz. The main reason behind the drop was a halving of electronics demand due to a severe downturn in the market exacerbated by inventory de-stocking. Despite a reduction in supplies, primarily due to lower Russian sales, the market registered a surplus of 410,000 oz. This was reflected in the price, which slumped from a high of US\$1,094/oz in January to a low of US\$315/oz in early October.

Although rhodium usage by the automotive industry continued to grow, more than adequate supplies of metal in the market resulted in a halving of the price over the year.

### **Automotive**

Despite a weakening economic environment worldwide and the tragic events of September 11, vehicle sales in the three major markets of the US, Western Europe and Japan confounded virtually all earlier bearish predictions. In the US, a record fourth quarter buying spree resulted in light vehicles sales for the year of 17.2 million units, the second highest total on record. The late surge in sales was due to the introduction of zero interest financing and steep discounts to revitalise the market following the morale -sapping effects

of early September. In Western Europe, car sales were also the second highest on record at 14.8 million vehicles. As was the case in the US, it was a heavy autumn incentive programme that reversed the steady downward trend of the preceding months. An important feature of the European market for platinum is the meteoric rise in the demand for diesel cars. In 2001, oil-burners accounted for 36% of the market. In Japan, new car sales were marginally up on the previous year despite the worsening economic climate. Underpinned by buoyant vehicle sales, platinum demand increased by 15% to 2.25 Moz owing to a combination of more stringent emission standards, substitution of highly-loaded palladium catalysts and the strong growth in European diesel sales.

The imposition of stricter standards generally requires higher PGM autocatalyst loadings. In the US, this was as a result of an increasing number of vehicles meeting the LEV and ULEV standards. In addition, some manufacturers have fitted autocatalyst systems that meet the more stringent Federal Tier 2 and California LEV II standards, both of which take effect from 2004. In Europe, Euro Stage III legislation, first introduced at the start of 2000 for new models, was extended to encompass all new vehicles from January 2001. These standards required a significant increase in the use of platinum for diesel engines. The use of platinum-based particulate traps, though not required till 2005, have already been adopted by some manufacturers and further boosted platinum demand in this sector. In Japan, loadings benefited from the new Low Emission Standards which will take full effect from 2002. Other countries adopting tighter emission controls included Korea, China and India.

The soaring palladium price of recent years has reversed the metal's role as a cost saving component. This, coupled with the uncertainty

regarding Russian supplies, has resulted in many manufacturers switching their current and future catalyst formulations from palladium to platinum. The move to platinum is mainly at the expense of the palladium only or palladium/rhodium system in the underfloor position.

As mentioned above, the growth in diesel vehicle sales has greatly benefited platinum. This is due to the fact that diesel engines use a platinum-based oxidation catalyst. Palladium is more sensitive to the sulphur in the diesel fuel. Since diesel engine exhausts are significantly cooler than the temperature of their gasoline engine counterparts, higher precious metals loadings are often needed for the required oxidation performance.

Consumption of palladium by the automobile industry was virtually unchanged last year at 5.3 Moz, thus bringing to an end a decade of stellar growth. This was due to a combination of a shift back to platinum, as discussed above, and thrifting. The thrifting programmes have been primarily directed at the highly loaded close-coupled and under-floor catalyst. This has been achieved by improvements in all areas of emission control technology. These include the use of high cell density substrates, the incorporation of metal oxides in the washcoats and better engine control and management systems. Although thrifting is set to continue, palladium will remain the metal of choice in the close-coupled converter due to its better thermal stability and superior hydrocarbon control.

Rhodium demand grew by 2.5% to 590,000 oz. This was due to a combination of tighter emission regulations and the use by some automotive manufacturers of additional rhodium in their catalyst formulations in order to thrift palladium.

### **Jewellery**

Despite another surge in Chinese platinum jewellery demand, the weak global economic conditions, coupled with the higher price, took its toll elsewhere and demand declined by 6% to 2.65 Moz.

China firmly entrenched its position as the world's largest consumer of platinum jewellery with sales up 18% to 1.3 Moz. Demand would have been higher had it not been for the high price and tax investigations at the beginning of the year. The higher price had little impact at the consumer level, rather it was felt at the manufacturing level where fabricators cut back production as their margins were eroded. The lack of product was further compounded by tax investigations which caused periodic interruptions in production. The sharp decline in price at mid-year restored margins and with retailers once again fully stocked consumers satisfied their almost insatiable desire for platinum jewellery.

In Japan, the high price had its greatest impact due to the worsening economic conditions. Demand declined by 25% to 800,000 oz due to a contraction in consumer spending, particularly for luxury goods, and the recycling of old stocks and returned consumer pieces. Recycling is estimated to have reduced demand for new metal by 160,000 oz. As was the case in 2000, sales in the lower price brackets were worst affected, with manufacturers and retailers increasing their white gold product range to satisfy retail price points and the younger buyers desire for more affordable jewellery fashion items.

The slowdown in the US economy took its toll on jewellery demand with sales down 20% to 300,000 oz. Having started the year with excess stocks, retailers saw margins come under increasing pressure due to slowing sales and the high price. Their response was to resort to replacing only turnover items which, in turn, reduced fabrication demand. Contrary to most expectations, sales in the final quarter were marginally ahead of the corresponding period a year ago as many Americans altered their values following the horrific events of September 11.

In Europe, demand declined by 20% to 160,000 oz despite a small increase in the UK. The weak economic conditions took their toll in both the German and Italian markets. In

Germany, the impact was in the local market where consumers turned to cheaper white gold pieces, whereas in the case of Italy it was the export markets that suffered most.

The development of the Indian market is proceeding well. Launched in Mumbai and Delhi in September 2000, the campaign was extended to Bangalore, Chennai, Hyderabad and Calcutta last year. The campaign has already succeeded in creating considerable consumer awareness which bodes well for the long-term growth of platinum jewellery.

### Other Demand

Despite weakening economic conditions, industrial demand for platinum increased by 3% to 1.5 Moz. This is due to the fact that many applications do not reflect current economic activity but rather investment decisions in new plants taken in prior years. This was reflected by the glass industry which continued to benefit from the growing market for liquid crystal displays which are used in a whole host of electronic equipment such as personal computers, televisions and cameras. By contrast, the electronics industry bore the brunt of the global slowdown due to a downturn in computer sales, where platinum is primarily used in hard disks to enhance storage capacity. Chemical demand was virtually unchanged from the previous year. The balance of demand is taken up by a myriad of minor applications in the aerospace, automotive, dental and medical industries. Investment demand turned positive last year as the decline in the platinum price in mid-year encouraged buyers of bars and coins back into the market.

It was a dismal year for palladium demand in non-automotive applications, with consumption falling 36% to 2.26 Moz. The electronics industry was by far the worst affected, with demand down by 50% to 1.05 Moz, a level not seen since the early 1980s. This was due to the decline in multi-layer ceramic capacitor production owing to the weak market conditions and the high palladium price. The situation was further

exacerbated by the fact that many manufacturers started the year with large inventories of both products and components. In the major market Japan, the move from palladium to nickel-based capacitors slowed because of companies' reticence for new investment in a recessionary environment. In the dental industry, the high price encouraged further moves away from palladium alloys to gold and silver alloys in both Europe and the US. The effect was more muted in Japan because palladium alloys there are covered by the Ministry of Welfare.

### Supply

The supply of platinum grew by 7% in 2001 to 6.25 Moz, with the bulk of the increase coming from the South African producers.

In South Africa, platinum production increased by 340,000 oz to 4.12 Moz. Refined output at Anglo Platinum increased by 13% to 2.11 Moz. The majority of the increase was due to a reversal of the production lost in the previous year owing to strike action and extensive flooding. At Impala, production from the lease area was maintained at 1.0 Moz, while output at the new Crocodile River Mine which was brought into production in February 2001 was 30,000 oz. Lonmin increased throughput by around 10% to 725,000 oz. A five-week strike at Northam resulted in production declining by 10% to around 170,000 oz. Kroondal continued its build-up to full production with output for the year being in the region of 100,000 oz of refined platinum.

In North America, platinum output rose by 17% to 340,000 oz. At Stillwater, production at Stillwater Mine increased by 17% to 121,000 oz which included an additional 5,000 oz from construction and development activities at the new East Boulder Mine. During the year the company announced revised operating plans for both mines. At Stillwater, the expansion to the previously planned 3,000 t/d has been deferred and the mine will maintain the current mining rate of 2,500 t/d. At East Boulder, the planned production has been halved to 1,000 t/d, with commercial production scheduled for

the first half of 2002. North American Palladium's Lac des Îles mined failed to achieve its anticipated 15,000 t/d throughput at its newly constructed concentrator because of problems with the crusher. Platinum output for the year was in the region of 10,000 oz. The balance of North American output is a by-product of nickel mining by Inco and Falconbridge.

In Zimbabwe, Mimosa continued to operate at an annual level of around 15,000 oz of platinum. Zimplat's, Ngezi open-pit project commenced operations, with first concentrate delivered to Impala for processing late in the year. Russian sales of platinum are estimated to have been in the region of 1.1 Moz which once again implies a significant de-stocking. Sales by the US Defense Logistic Agency (DLA) were 40,000 oz compared with 5,000 oz in the previous year. This brings total inventory sales since their commencement in 1997 to 285,000 oz, equivalent to almost two-thirds of their initial inventory. Platinum recovered from the recycling of spent autocatalysts, the vast majority of which continues to be sourced from North America, rose by 30,000 oz to 530,000 oz.

During the year the South African producers announced the next round of their expansion plans in order to ensure adequate supplies of platinum to meet the strongly growing demand needs of the metal.

Anglo Platinum announced an additional three new mining projects as part of its expansion plans to increase production to 3.5 Moz/y of refined platinum. Two joint ventures were announced during the year. The first joint venture, the Pandora project with Lonmin, is scheduled to build-up to full production of 230,000 oz/y of platinum from 2007, of which Anglo Platinum's share will be 50%. The second joint venture, the Styldrift project with the Royal Bafokeng Nation, is expected to produce 250,000 oz/y of platinum by 2006. A new mine, Twickenham, is to be established in the Eastern Bushveld and full production of 160,000 oz/y of platinum is expected to be achieved by 2005. These projects, together

with those previously announced, amount to 1.35 Moz of platinum.

Implats' growth strategy of raising production to an annual 2.0 Moz of platinum by 2006 remained on track with the announcement of a number of new projects. In March, Implats announced the acquisition of an effective 40% stake in the Ngezi-Hartley assets of Zimplats on the Great Dyke. Full production of 100,000 oz/y of platinum is expected to be attained in late 2002. Also on the Great Dyke, the company negotiated a 35% stake in Mimosa, which is currently proceeding with expansion plans to boost platinum production to 70,000 oz/y by 2003. Implats and Anglovaal Mining announced the development of a new mine, Two Rivers, on the Eastern limb of the Bushveld. The mine, expected to come into production in 2004, will produce in the region of 100,000 oz/y of platinum. Impala will smelt, refine and market all the metal from the above projects.

Lonmin revised its growth profile plan. Its previous target of 870,000 oz/y of platinum production by 2008, has been brought forward by five years to 2003. The additional ounces for this phase of its expansion will come from existing operations. In addition, the Pandora joint venture with Anglo Platinum mentioned above will take the company to 1.0 Moz/y by 2008.

#### Platinum Supply and Demand ('000 oz)

| DEMAND                  | 1999         | 2000         | 2001 <sup>e</sup> |
|-------------------------|--------------|--------------|-------------------|
| Automobile              | 1,880        | 1,950        | 2,250             |
| Jewellery               | 2,880        | 2,830        | 2,650             |
| Other                   | 1,520        | 1,400        | 1,570             |
| <b>Total Demand</b>     | <b>6,280</b> | <b>6,190</b> | <b>6,470</b>      |
| <b>SUPPLY</b>           |              |              |                   |
| South Africa            | 3,905        | 3,780        | 4,120             |
| Rest of Western World   | 700          | 400          | 495               |
| Russian Sales           | 500          | 1,150        | 1,100             |
| Secondary Metal         | 460          | 500          | 530               |
| <b>Total Supply</b>     | <b>5,565</b> | <b>5,850</b> | <b>6,245</b>      |
| Implied change in stock | -715         | -340         | -225              |

<sup>e</sup> estimate



Palladium supplies declined by around 3% to 7.97 Moz in 2001. Russian sales of 4.5 Moz, while down on previous years, were still heavily reliant on sales from stock. South African and North American production increased by 11% and 26% to 2.035 Moz and 825,000 oz respectively. While supply from spent autocatalysts continued to grow, up 18% to 300,000 oz, it will still be a number of years before the heavily loaded vehicles of the mid 1990s are scrapped. DLA sales increased by 10,000 oz to 195,000 oz, which leaves an estimated 500,000 oz still available for sale.

#### Palladium Supply and Demand ('000 oz)

| DEMAND *            | 1999         | 2000         | 2001 e       |
|---------------------|--------------|--------------|--------------|
| Automobile          | 4,845        | 5,275        | 5,300        |
| Industrial          | 3,700        | 3,550        | 2,260        |
| <b>Total Demand</b> | <b>8,545</b> | <b>8,825</b> | <b>7,560</b> |

#### SUPPLY

|                         |              |              |              |
|-------------------------|--------------|--------------|--------------|
| South Africa            | 1,910        | 1,835        | 2,035        |
| Rest of Western World   | 1,130        | 945          | 1,135        |
| Russian Sales           | 5,500        | 5,200        | 4,500        |
| Secondary Metal         | 210          | 255          | 300          |
| <b>Total Supply</b>     | <b>8,750</b> | <b>8,235</b> | <b>7,970</b> |
| Implied change in stock | 230          | -590         | 410          |

e estimate

\* excludes consumer stocking / destocking

#### Terminal Markets

Platinum trading volumes rose 18.9% on TOCOM in 2001 to 16.15 million contracts. August was the most active month on the exchange with both daily and monthly records of 0.25 million and 2.9 million contracts traded respectively, as investors, worried about the poor economic outlook, finalised the liquidation of their long positions. Having seen the year's high of 303,744 lots traded in January, open interest declined for most of the year on the back of negative sentiment closing the year at 257,280 lots. Warehouse stocks were virtually unchanged at year end, at 19,676 oz.

The failure of the palladium contract to recover from the collapse in confidence of the previous year was reflected in trading volumes which were down 88.4% to 116,958 contracts. The lack of interest was likewise reflected in the open interest contract which traded around 3,000 lots/mth, a level not seen since the launching of the contract in the early 1990s. Warehouse stocks closed the year at 1,350 oz.

It was another dismal year for both metals on the New York Mercantile Exchange (NYMEX). Volumes for platinum and palladium declined by 36.7% and 49.1% to 201,222 and 25,825 contracts respectively. It was a similar picture for open interests with lots traded down 24.5% and 31.1% to 6,363 and 1,273 for platinum and palladium respectively, at year-end. Warehouse stocks reflected the metals' differing fundamentals with those for platinum down 63.3% at 12,300 oz, whilst those for palladium rose by 278.6% to 60,200 oz.

#### Prices

Platinum began 2001 with a flourish, soaring to US\$645/oz on January 11, its highest fixing of the year. Underpinned by strong physical demand, platinum traded for the most part in a narrow US\$580 - \$620/oz range, ebbing and flowing in response to the market's interpretation of events such as global economic weakness, Russian supplies, speculative activity and price movements in other precious metals. In mid-July, the price began to weaken as growing negative market sentiment resulted in a series of long liquidations on TOCOM over the following three months. Having fixed below US\$500/oz in late July, a brief rally following the tragic events of September 11 was short-lived and platinum fixed at the year's low of US\$406/oz on October 2. Platinum began a modest recovery in mid-November as improving market sentiment, coupled with the usual concerns regarding Russian supplies for 2002. The year's final fixing of US\$477/oz represented a 22% decline over the year's opening fix.

**Price Movements**

|           | Platinum | Palladium | Rhodium |
|-----------|----------|-----------|---------|
| 2001      | US\$/oz  | US\$/oz   | US\$/oz |
| January   | 622      | 1 041     | 2 043   |
| February  | 601      | 973       | 2 183   |
| March     | 585      | 781       | 2 006   |
| April     | 595      | 697       | 1 860   |
| May       | 610      | 655       | 1 797   |
| June      | 579      | 614       | 1 681   |
| July      | 531      | 525       | 1 671   |
| August    | 451      | 455       | 1 514   |
| September | 458      | 444       | 1 267   |
| October   | 432      | 335       | 945     |
| November  | 430      | 329       | 688     |
| December  | 461      | 399       | 938     |
| Average   | 530      | 604       | 1 549   |

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

Having opened the year at US\$965/oz, palladium quickly broke through the US\$1,000 barrier to fix at the year's high of US\$1,094/oz on January 26 as the absence of Russian supplies fuelled concerns in an illiquid market. In early February, the market went into steep decline due to a combination of physical selling, falling consumer demand and substitution in its main industrial applications, namely automotive and electronics. The price crossed below platinum on July 13 for the first time in over a year. The spiral reached its bottom on October 2, with spot fixing at US\$315/oz, a 26-month low. Palladium consolidated in November trading in a narrow US\$315 - US\$340/oz range before staging a modest recovery to close December at

US\$440/oz as the annual concerns regarding the following year's Russian supplies surfaced. The difference between the year's high and low fixes was an astonishing 71%.

Rhodium started the year at around US\$2,000/oz and strengthened to US\$2,300/oz in late February on the absence of Russian metal and steady consumer demand. The return of the Russians to the market in March signalled a steady decline. Persistent selling, coupled with weak consumer demand, saw the price drop to a three-year low of US\$675/oz on November 12, before recovering to US\$950/oz at year-end on the same concerns that impacted its sister metals, platinum and palladium.

**Market Outlook**

The fundamentals for platinum continue to be enhanced by both the automotive and jewellery industries. Automotive usage is set to continue to expand due to the implementation of stricter emission standards worldwide and the ongoing growth in the diesel engine segment. Jewellery demand underpinned by a robust Chinese market will further benefit from a return to economic growth in its other major consuming regions and the development of new markets such as India. Current indications are that all the South African expansions announced will be required to keep the market balanced going forward. Palladium usage will continue to be thrifted and substituted, where possible, in the automotive and electronics industries, respectively. This should be viewed as a positive development as it will return the market to a fundamental balance and remove its unnatural dependence on inventory sales. Rhodium, like platinum, will benefit from the tighter emission legislation.