

Summary and Outlook

Platinum

Demand for platinum grew by 5 per cent to 6.54 million oz in 2002, driven by another strong year of sales to the Chinese jewellery market and by greater use of platinum in autocatalysts. Supplies of platinum failed to keep pace with demand, rising by less than 2 per cent to 5.97 million oz. As a result, the deficit in the platinum market widened to 570,000 oz.

The consumption of platinum in **autocatalysts** grew by 17 per cent last year. Further growth in sales of diesel cars, rising light vehicle output, tighter emissions regulations, and greater use of platinum-based catalysts at the expense of palladium, all contributed to the higher use. Purchase of platinum by auto manufacturers, however, increased by less than 4 per cent to 2.61 million oz as some satisfied a significant proportion of their platinum needs from stocks.

Jewellery demand for platinum in 2002 expanded by 9 per cent to 2.83 million oz. Fabrication of platinum jewellery in China again climbed impressively, platinum demand rising by 14 per cent to 1.48 million oz. A recovery in Japanese purchases was due to less platinum being available from inventories following significant depletion of stocks in 2001, rather than a rise in retail sales. In the USA, a degree of restocking by jewellery retailers at the start of the year lifted demand for platinum, but purchases of metal by European manufacturers softened.

Industrial demand for platinum increased by 2 per cent to 1.59 million oz, led by demand for platinum-based catalysts from the chemical industry. Reduced investment in new manufacturing capacity caused a fall in purchases of platinum by the glass industry, while demand from electrical applications, such as computer hard disks, weakened slightly.

Net demand for platinum coins and bars from the **investment** sector edged lower in 2002 – higher prices in the second half of the year depressed sales of new products and led to greater disinvestment in Japan.

Supplies of platinum increased by 2 per cent in 2002, rising to 5.97 million oz. South African output expanded substantially but this was largely offset by a sharp fall in Russian sales. As a result, the deficit in the platinum market widened to 570,000 oz. Market stocks in Switzerland were heavily drawn down to help satisfy the shortfall, while the US Defense National Stockpile Center (DNSC) sold close to 90,000 oz of platinum during the year, exhausting its available inventory. Short-term lease rates responded to the increased

- Demand for platinum grew by 5 per cent in 2002 to a new high of 6.54 million oz.
- Buoyant retail sales of platinum jewellery in China, despite higher prices, lifted total jewellery purchases by 9 per cent.
- Auto industry purchases of platinum were limited by the use of stockpiled metal by some companies, but consumption of the metal in **autocatalysts** grew strongly.
- Industrial demand for platinum increased by 2 per cent; the main contribution to the growth came from higher demand for catalysts from the chemical industry.
- Supplies of platinum increased by just 2 per cent as sharply higher output in South Africa was balanced by a drop in sales from Russia.
- The widening deficit between supply and demand was reflected in the platinum price, which rose by 24 per cent to finish the year at \$598.

market tightness, rising above 10 per cent several times and touching 20 per cent in October.

The platinum **price** rallied in response to the high lease rates and the widening supply deficit. Sporadic weakness due to long liquidation on TOCOM and NYMEX tended to be brief, and dips in the price swiftly attracted good bids for metal on the spot market. Market sentiment grew increasingly bullish on the back of the fundamental strength of demand, as well as a degree of concern about the potential for delays to planned mine expansions. In addition, a strong flow of speculative funds into hard commodities increased buying of platinum futures. As a result, the price rose from \$481 in January to a peak of \$607 in December.

Supply

Supplies of platinum from **South Africa** reached a record high of 4.45 million oz in 2002, an increase of 8.5 per cent. Both the expansion of existing operations and growing production from developing mines contributed to the rise.

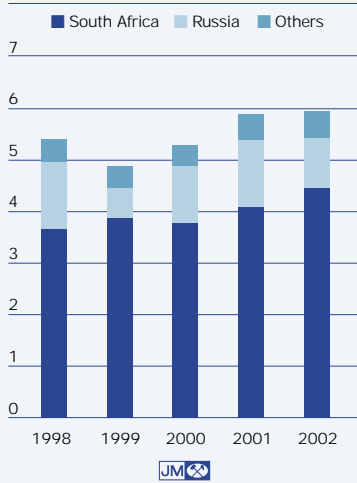
Anglo Platinum delivered a 6.7 per cent increase in platinum output in 2002, producing 2.25 million oz of refined metal. This, however, was 100,000 oz less than the group had initially forecast due to a slower than expected build up of output at the Bafokeng Rasimone Platinum Mine (BRPM) and a temporary decline in grades at PPRust.

These set backs, coupled with delays in granting new mining authorisations by the government, caused Anglo Platinum to revise its long-term expansion

Platinum Supply and Demand '000 oz		
	2001	2002
Supply		
South Africa	4,100	4,450
Russia	1,300	980
North America	360	395
Others	100	145
Total Supply	5,860	5,970
Demand		
Autocatalyst: gross	2,520	2,610
recovery	(530)	(570)
Jewellery	2,590	2,830
Industrial	1,560	1,590
Investment	90	80
Total Demand	6,230	6,540
Movements in Stocks	(370)	(570)
		



Supply of Platinum
1998-2002
Million oz



strategy. The group still plans to reach an annualised production rate of 3.5 million oz of refined platinum by the end of 2006 but a greater proportion of the increased metal output is now scheduled for 2005 and 2006. This will include contributions from a project to re-treat tailings dams around the Rustenburg area that was announced last year.

Platinum production from Impala's mining operations increased by 7 per cent, with output at its core lease area reaching a little over 1 million oz. At Crocodile River, however, geological difficulties caused a sharp fall in the volume of ore mined. Mine development began at the Marula project on the eastern Bushveld and Impala completed a first phase of expansion at its pgm refinery during the year. Throughput will rise as increased volumes of concentrate are delivered from smaller South African producers and from the Zimplats and ZCE Platinum mines in Zimbabwe. Output from the latter two companies rose as expansion gathered pace at the Mimosa and Ngezi mines.

The tonnage of ore milled at Lonmin rose in 2002, substantial expansions to concentrator capacity were brought on stream, and the Pandora joint venture with Anglo Platinum to mine reserves to the east of Lonmin's existing operations was approved by the South African government. Lonmin also commissioned its new smelter at Western Platinum during the year but this was damaged by an explosion in December. The repaired smelter is due to be recommissioned during the fourth quarter of 2003; in the meantime Lonmin has brought several of its older furnaces back into service, and a proportion of concentrate is being toll refined by Impala.

The volume of ore milled at Northam increased by 11 per cent in 2002, in part reflecting the loss of 32 days' production to a strike the previous year but also due to an improvement in face availability. Production at Aquarius Platinum's Kroondal mine continued to ramp up towards planned capacity and the company's Marikana operation began producing concentrate by the end of the year. Ore production at SouthernEra's Messina mine also began to build.

In 2002, **Russian** sales of platinum fell back from the previous year's high of 1.3 million oz, dropping to 980,000 oz. This level of shipments more closely reflected actual output of platinum at Norilsk Nickel and from the two alluvial operations in the Far East of

Russia. Norilsk continued to invest in modernisation and efficiency programmes at its mining and processing facilities in Siberia and the Kola Peninsula but these had no impact on output in 2002.

Norilsk's sales in 2001 were boosted by the release of metal previously held as loan collateral by a Russian bank, and sales of metal were also made from central government stocks. During 2002, however, no further significant disposals from this source were evident.

Moves to declassify information on geological reserves and production of pgm in Russia gathered pace during 2002 but an act of parliament is required to rescind the existing legislation. This is not expected before the end of 2003. The level of government pgm stocks is almost certain to remain confidential.

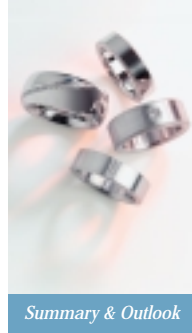
Supplies of platinum from **North America** increased substantially in 2002, rising by almost 10 per cent to 395,000 oz. Output at Inco climbed as the company exploited a small but pgm-rich ore body at one of its Sudbury mines in Canada. In the USA, production at Stillwater climbed in line with expanded palladium output at its East Boulder mine in Montana.

Demand

Despite substantial use of platinum inventories by some US auto manufacturers in 2002, purchases of the metal by the **autocatalyst** industry increased by 3.6 per cent to 2.61 million oz. Including stock draw downs, the underlying use of platinum in autocatalysts jumped by an impressive 17 per cent. In Europe, the growth in sales of diesel cars was instrumental in leading higher demand for platinum. In North America and Asia, firm growth in light vehicle production increased autocatalyst consumption of platinum. Demand was also stimulated by some auto manufacturers' programmes to minimise their palladium requirements through greater use of platinum-based autocatalysts, and the global trend towards tighter control of vehicle emissions.

Sales of diesel cars in Western Europe rose by 7 per cent in 2002 and the market share taken by them reached 40 per cent. With diesel vehicles utilising only platinum-based autocatalysts, this growth was responsible for a significant proportion of the sharp rise in demand for platinum to 1.24 million oz.

In both Europe and North America, some manufacturers made greater use of platinum-based catalysts on a number of their gasoline car models at



the expense of palladium-rich systems. This switching reflected programmes introduced in 2000 and 2001 by several auto companies to reduce their reliance on palladium, following the sharp rise in the metal's price. Given the long lead-time for the development and certification of new catalyst systems, the effect of these programmes was only fully felt in 2002.

A strong rise in light vehicle production in the USA also boosted consumption of platinum in autocatalysts. Although light vehicle sales fell, manufacturing rates were high throughout the first half of the year as auto companies sought to rebuild inventories at dealerships. As a result, light vehicle production increased by almost 7 per cent.

However, despite the greater use of platinum in autocatalysts in North America, purchases by auto companies dropped by 28 per cent to 570,000 oz. Several US auto makers had stockpiled significant volumes of platinum over the previous few years – these inventories were diminished during 2002, reducing demand for the metal.

The limits on automobile emissions continue to tighten worldwide and had an impact on platinum autocatalyst demand last year, particularly in Japan. Although tighter emissions standards are not due to enter legislation until 2005, a significant proportion of Japanese cars already meet proposed lower limits. This improvement in emissions control in advance of legislation had the effect of raising average platinum loadings in 2002. Coupled with a 6.2 per cent increase in car production, this boosted Japanese autocatalyst demand for platinum by 25 per cent to 425,000 oz.

China experienced a 35 per cent jump in light vehicle production in 2002 to 2.65 million vehicles and the regulation of car emissions in the country is tightening. These two factors drove a 15 per cent increase in autocatalyst demand for platinum in the Rest of the World.

Demand for platinum in **jewellery** rebounded by 9 per cent in 2002, reaching 2.83 million oz. The Chinese jewellery sector again led the growth: purchases by Chinese fabricators jumped by 14 per cent to 1.48 million oz. In Japan, retail sales weakened further but purchases of metal increased as less jewellery stock was recycled. In North America, restocking by retailers early in the year boosted demand for platinum.

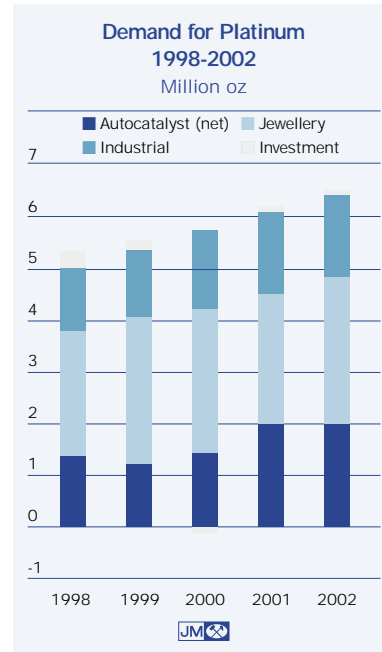
Chinese sales of platinum jewellery were strong throughout 2002. Platinum jewellery has established a

firm position in both the fashion and bridal sectors of the market, and consumers identify with the metal's attributes such as purity and its distinctiveness from traditional Chinese jewellery. With the Chinese economy continuing to grow rapidly and disposable incomes rising, retail sales of platinum jewellery continued to increase.

However, Chinese fabricators of platinum jewellery began to face difficulties in making sufficient profit margins during the second half of the year when the spot price of platinum climbed from under \$550 per oz to \$600 per oz. Chinese retailers of platinum jewellery have been reluctant to raise their prices, fearing a loss of market share, and so movements in retail prices lag well behind the price of platinum bullion. As the spot price increased, manufacturers were unable to pass on their higher raw material costs to retailers and their profit margins were eroded as a result.

The Japanese economy remained weak in 2002, GDP expanding by just 0.3 per cent year-on-year. Total sales of precious metal jewellery fell by 10 per cent on a piece basis and platinum jewellery sales slid by 15 per cent as retailers marketed white gold fashion jewellery to cost-conscious consumers. In the core bridal segment of the market, however, platinum retained its strong position.

Despite the fall in retail sales of platinum jewellery, purchases of metal by fabricators increased by 30,000 oz to 780,000 oz. The Japanese jewellery industry made strenuous efforts to reduce stock levels



Sales of diesel cars climbed again in Europe last year, spurring autocatalyst demand for platinum.





Demand for platinum in high-quality glass production fell in 2002 but remained firm by recent historical standards.

throughout 2001; consequently less metal was available to be recycled during 2002.

In North America, restocking by platinum retailers and fabricators during the first quarter of 2002 led to a rise in purchases of metal over the year of 30,000 oz to 310,000 oz. The uncertain economic outlook in the USA, however, meant that consumers were cautious in their spending on luxury goods and retail sales of platinum jewellery improved only marginally.

The European market for platinum jewellery was mixed – sales in the UK continued to rise but the German and Italian markets were depressed. Fabricators in these countries had some success in increasing export sales but this was not sufficient to prevent platinum demand in Europe as a whole from edging slightly lower in 2002.

Industrial demand for platinum increased moderately to 1.59 million oz. Demand for platinum-based catalysts from the chemical and petroleum refining industries increased, purchases of platinum for use in electrical applications were marginally down, while demand from the glass industry was affected by less investment in new manufacturing capacity.

Chemical industry demand for platinum in the form of process catalysts was boosted by 12 per cent, largely due to the construction of additional production facilities in the Middle East and Asia. Investment in new paraxylene plants and rising demand for silicones in China, in particular, supported higher demand for platinum-based catalysts.

In the electrical sector, purchases of platinum for use in computer hard disks softened slightly in 2002 – the growing use of hard disks in non-computing applications did not fully offset weak personal computer sales and the continued reduction in the average number of disks per hard drive. Demand for platinum in thermocouples also edged lower, reflecting overcapacity and a lack of investment in the steel, glass and semiconductor industries.

There was substantial expansion of LCD glass and fibreglass manufacturing capacity in Asia in 2001, which boosted demand for platinum equipment significantly. The rate of expansion slowed in 2002 and this, coupled with several glass furnace closures in North America and Europe, led to a fall in glass industry purchases of platinum. That said, at 255,000 oz demand was still firm by historical standards.

Demand for platinum from other market sectors

was generally positive last year, and use of the metal in applications such as spark plugs, sensors and biomedical equipment increased. The use of platinum as a component of high-gold dental alloys, which increased in 2001 following the palladium price spike, flattened out in 2002 as palladium alloys began to regain market share.

Demand for platinum **investment** products remained relatively weak. Sales of platinum coins and investment bars are price-sensitive and demand dropped during the second half of the year as the price increased. The higher price also triggered greater sales of bars back to the market in Japan. In total, net investment demand for platinum softened to 80,000 oz.

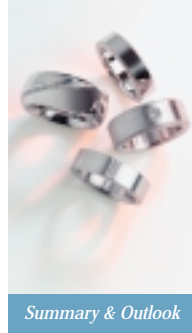
Outlook

The deficit between platinum supply and demand widened in 2002 as growth in the jewellery and autocatalyst markets outstripped increased supplies of metal from South Africa. The impact of tight physical availability was magnified during the first quarter of 2003 by strong fund buying of platinum futures on NYMEX and TOCOM, and the London fixing price surged to \$705 on the 11th March – a 23-year high.

Purchasing from the Chinese jewellery sector fell away at this level as, with retail prices static, manufacturers' profit margins disappeared. Some fabricators switched a proportion of their output to white gold as a source of greater profits. The subsequently rapid fall in the platinum price back below \$650 on concerted long liquidation of futures allowed platinum jewellery fabricators to regain a degree of profitability. However, unless retail prices increase significantly, margins are likely to remain tight.

In addition, the outbreak of the SARS virus has already had a noticeable impact on consumer spending in China. In late April the government announced that the week-long Labour Day holiday would be shortened to help to discourage widespread travel. This holiday has developed into one of the major shopping periods in the Chinese calendar in recent years. Its abbreviation, coupled with the wider effect of SARS on consumer behaviour, is expected to be detrimental to platinum jewellery sales.

The effect of poor manufacturer profit margins and weaker retail sales may well result in a fall in the level of platinum demand from the Chinese jewellery sector this year compared to the high level seen in 2002.



In Japan, inventories throughout the jewellery industry are now low. With little further opportunity to recycle stock, purchases of platinum by fabricators are likely to increase and will better reflect the level of consumption. The economy, however, remains weak and little growth is expected in retail sales.

Purchases of platinum by the auto industry are likely to increase for the fourth successive year in 2003. Despite indications that car production in the USA may decline, the use of platinum inventories by US-based manufacturers will have less impact than in 2002 as stocks are run down. In Europe the penetration of diesel cars is expected to continue to grow and an increasing number of vehicles will meet the tighter Euro IV standards that will enter effect from 2005. All these factors will result in a further increase in autocatalyst demand for platinum.

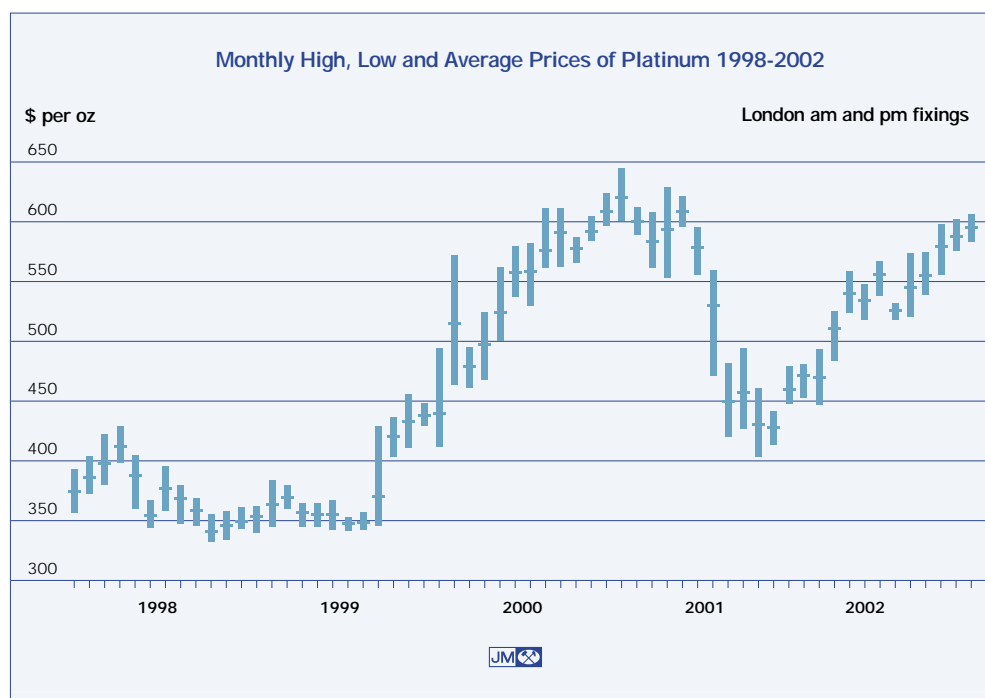
In all regions, auto manufacturers are re-examining the ratio in which they use pgm in light of the current large discount in the price of palladium to platinum. Although many manufacturers remain wary of the past price volatility, a degree of movement back in favour of palladium is expected. There will be little impact on platinum or palladium demand in 2003, however, as the process of emission systems development, calibration and certification takes many months.

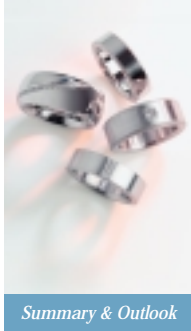
We forecast another moderate increase in industrial

purchases of platinum this year as demand for platinum in electrical applications such as computer hard disks and thermocouples is expected to improve. Demand in other sectors will largely depend on the rate of economic growth. The prognosis is mixed as both business investment and consumer confidence are still weak in Japan, the USA and much of Europe.

Platinum supplies from South Africa will increase further as the expansion of mining continues. Production should also rise again at the Zimbabwean mines but this will be offset by lower output in North America as Inco's production subsides from recent highs. Russian platinum shipments are forecast to continue at or close to the rate of production. In March 2003, Norilsk released an outline of its intended production plans through to 2015, noting that pgm production is expected to remain fairly constant, the emphasis of development being on increasing efficiencies and reducing costs.

In summary, we expect to see demand for platinum flatten out or soften moderately in 2003. Supplies from South Africa will continue to rise, while shipments from Russia are forecast to be stable. The overall increase in supply, however, is unlikely to close the gap with demand and physical availability of metal will remain tight. Consequently, we expect platinum to trade between \$590 and \$690 for the next six months.





Palladium

- Palladium demand slumped by almost 30 per cent in 2002 to 4.78 million oz, the lowest level for nine years.
- Heavy use of inventories and the effects of thrifting reduced palladium purchases by the auto industry by 39 per cent to 3.08 million oz.
- Purchases of palladium for electronics increased by 6 per cent but remained substantially below consumption due to a further reduction of inventories.
- Demand for palladium used in dental alloys recovered by 3 per cent – the metal's weaker price enabled palladium alloys to gain market share in the USA and Japan.
- Palladium demand in the remaining other applications grew by 12 per cent, led by higher jewellery alloy production in China and Japan.
- Supplies of palladium dropped steeply to 5.25 million oz as Russia continued to restrict sales. Despite this, the market remained in surplus and the price dropped by more than \$200 to a low of \$222.

loadings successfully reduced, and profit margins in the US auto industry under pressure, auto companies made substantial inroads into their palladium inventories in 2002. In addition, some metal was sold back to the market by car manufacturers during the year.

In the electronics sector, the excess inventories of both palladium and manufactured components that accumulated towards the end of 2000 continued to be depleted last year. The use of stocks, however, was lower than in 2001 and purchases of palladium increased by 40,000 oz to 710,000 oz. Production of multi-layer ceramic capacitors (MLCC), the largest electronic application for palladium, increased year-on-year but nickel-based MLCC took further market share from palladium products.

The fall in the price of palladium during 2002 encouraged a moderate move back to greater use of palladium dental alloys in North America and Japan. In Europe, however, the substantial investment that has been made in base metal and porcelain-based dental materials, at the expense of palladium, precluded any significant revival of demand.

Demand for palladium in other applications advanced by 12 per cent to 610,000 oz. Production of jewellery alloys containing palladium increased, while demand for palladium-based chemical catalysts was broadly flat. Purchases of palladium for use in petroleum refining catalysts were positive following net sales of the metal back to the market the previous year.

Supplies of palladium slid by 28 per cent in 2002 to 5.25 million oz as Russian shipments were cut back to levels not seen since 1990. In the face of weak demand, and in an effort to support the palladium price, Russian sales were restricted to just 1.93 million oz – less than half the previous year's total and some distance below the level of production. A significant proportion of Norilsk's palladium output was used to repay a long-standing government loan. Gokhran has stated that it made no sales from the state stockpile during the year.

Shipments of palladium from South Africa, however, climbed to 2.16 million oz, rising in line with growing platinum output. Palladium production in North America also increased substantially in 2002, nearing 1 million oz as expansions at Stillwater Mining and North American Palladium took effect.

Consequently, despite Russian efforts to bring supply more in line with weak demand, the palladium market

Overview

In 2002, purchases of palladium by the auto industry dropped dramatically due to the very substantial use of stocks by some auto makers. Consumption of palladium on autocatalysts also declined as thrifting programmes and greater use of platinum-based autocatalysts took effect. In contrast, demand from the electronics sector improved somewhat as the use of inventories subsided but substitution of palladium by nickel in the capacitor industry continued. In total, palladium demand slumped by almost 30 per cent to 4.78 million oz.

Russian shipments of palladium fell sharply in response to the weak market but production of the metal in all other regions expanded. As a result, the market remained oversupplied and the price weakened from \$440 at the start of the year to less than \$230 in December.

Autocatalyst demand for palladium slumped to 3.08 million oz in 2002, a drop of almost 40 per cent. Leading US car companies built up substantial volumes of palladium in the late 1990s, anticipating continued strong growth in the metal's use in autocatalysts and further disruptions to Russian. The sharp rise in the palladium price towards the end of that period, however, led auto makers to begin thrifting their use of the metal. With concerns about the security of palladium supply easing, palladium

Palladium Supply and Demand '000 oz		
	2001	2002
Supply		
South Africa	2,010	2,160
Russia	4,340	1,930
North America	850	990
Others	120	170
Total Supply	7,320	5,250
Demand		
Autocatalyst: gross	5,090	3,080
recovery	(280)	(370)
Dental	725	750
Electronics	670	710
Other	545	610
Total Demand	6,750	4,780
Movements in Stocks	570	470



remained substantially in surplus in 2002. Liquidity was further increased as the US Defense National Stockpile Center (DNSC) sold more than 324,000 oz of palladium during the year. The combination of slack demand and oversupply resulted in the **price** falling for much of the year. Brief spikes caused by short-covering on the thinly-traded futures markets punctuated the decline, but over the course of 2002 the spot price dropped from \$440 in January to under \$230 in December.

Supply

Norilsk Nickel suspended spot sales of palladium in August 2001 and continued to sell metal only under contract throughout 2002. In addition, the **Russian** state treasury, Gokhran, has also said that no sales of palladium were made from government inventories during the year in support of Norilsk's position. The net result was a 56 per cent slump in sales of palladium from Russia to 1.93 million oz.

With Norilsk's sales running well below the level of production since August 2001, a substantial build up of palladium inventories would have occurred at the company but for two factors. Norilsk repaid a long-standing loan from the Ministry of Finance with a large volume of palladium – believed to be equivalent to as much as six months of production. In addition, the proposed deal under which Norilsk would acquire a majority stake in Stillwater Mining required the former to deposit 877,000 oz of palladium in a London vault by March 2003, the metal to be used as part payment of the share purchase. These two transactions will have accounted for much of Norilsk's production that would otherwise have accumulated.

Sales of palladium by **South African** pgm producers increased by 7.5 per cent to 2.16 million oz in 2002, reflecting the rise in platinum output from both established and developing mines. Anglo Platinum led the increase, with palladium output growing by 6 per cent to 1.11 million oz. Production in Zimbabwe also rose as mining rates increased at the Mimosa and Negezi operations.

Output in **North America** jumped by 16 per cent to 990,000 oz – expansions of mining and processing capacity at both Stillwater Mining and North American Palladium delivered higher volumes of concentrate, while Inco's output reached a new high thanks to mining of small but pgm-rich ore zones.

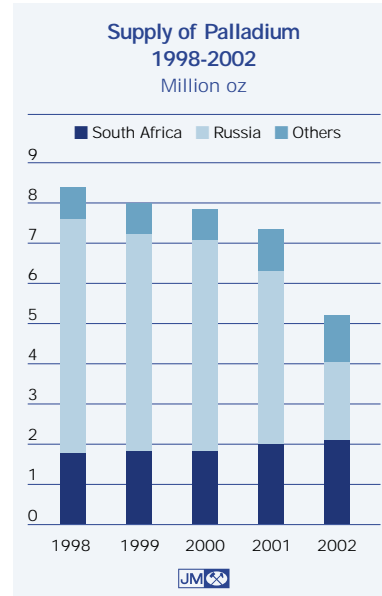
Demand

Purchases of palladium for use in **autocatalysts** plunged to just 3.08 million oz in 2002, a drop of a little over 2 million oz from the previous year. By far the largest component of this fall was the heavy use of inventories of metal by some US-based auto companies, which meant that purchases of metal were substantially lower than consumption.

The US auto industry's view of the desirability of holding large stocks of palladium has changed over the last two years due to a combination of factors. A key aspect of this change has been the reduction in auto companies' own projections of their future metal requirements. Advances in both engine and emissions control technology, coupled with thrift of palladium, have enabled many auto manufacturers to reduce their forecast palladium demand going forward.

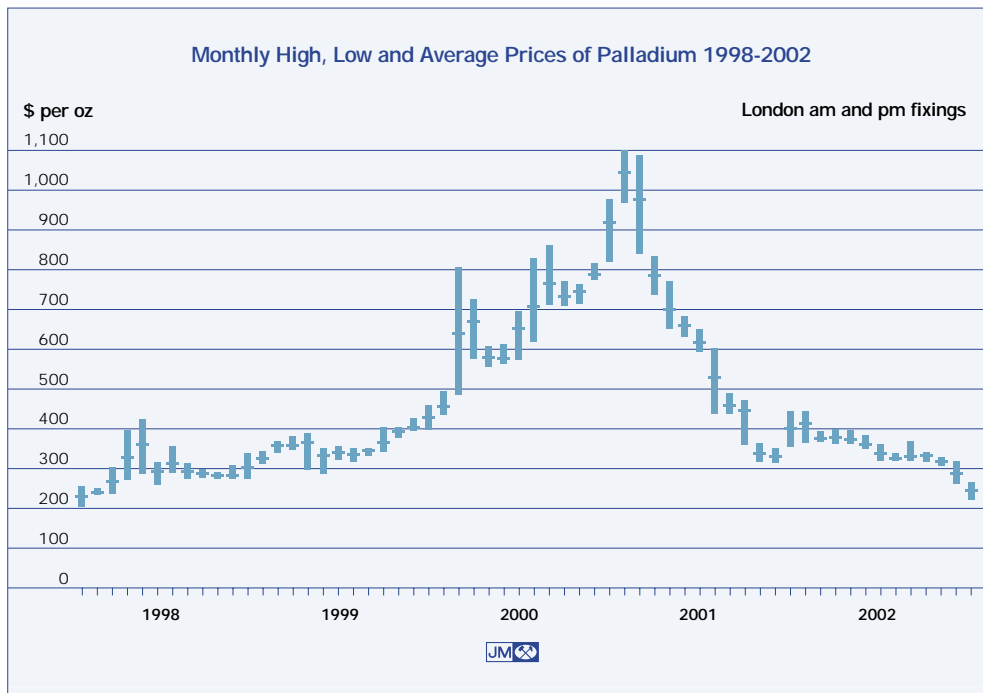
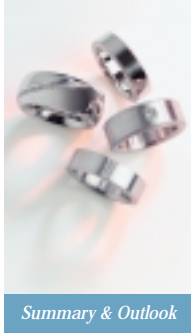
A second issue has been the balance sheet implications of holding large palladium inventories, which were reassessed following Ford's write-down of its pgm stocks last year, at a time when pressure to reduce costs within the industry was intensifying. In addition, confidence in the stability of supplies has risen, with output in South Africa and North America growing and Norilsk Nickel continuing to pursue long-term supply contracts.

Efforts to thrift palladium use on autocatalysts were spurred by the rise in the metal's price to over \$1,000 in early 2001. Auto makers were successful in reducing their intensity of palladium use in a number of ways, including development of improved emission control



Banks of flotation cells at Norilsk Nickel's Talnakh operation on the Taimyr Peninsula in Siberia.





systems, increasing the proportion of rhodium used on some catalysts, and by moving towards greater use of platinum-based catalysts on certain vehicle models. These initiatives reduced the use of palladium on autocatalysts by 15 per cent last year, with the impact most noticeable in the USA. In Europe, a fall in gasoline vehicle production and a further loss of market share to diesels contributed to lower palladium demand.

infrastructure remained subdued. As a result, overall demand for palladium in applications such as hybrid integrated circuits (HIC) and resistors was flat.

Demand for palladium for use in **dental** alloys improved in 2002, the fall in the price of the metal enabling palladium-based alloys to regain a degree of market share in some markets. Total dental demand increased by 25,000 oz to 750,000 oz.

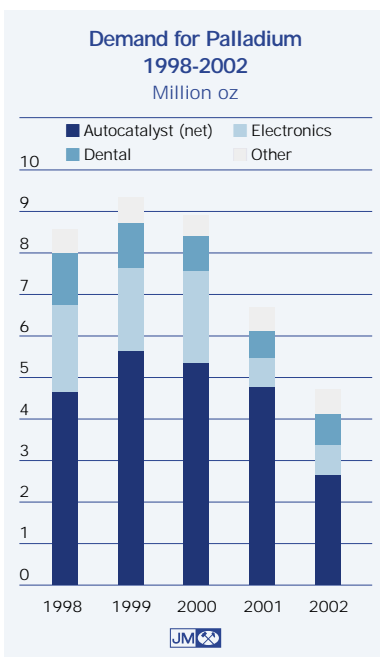
The Japanese dental market experienced moderate growth as the lower palladium price encouraged greater use of a 20 per cent palladium alloy. In North America, palladium-based alloys claimed some market share back from high-gold products, metal demand rising by 8 per cent. In most European markets, however, the substitution of palladium with cheaper base metal alloys or porcelain products appears to have become permanent. The exception was Italy, where precious metal products still dominate and where sales of palladium alloys increased. Across Europe as a whole, however, demand was flat.

Purchases of palladium for **industrial** and other markets grew in 2002, rising by 12 per cent to 610,000 oz. Most of the increased demand came from palladium used in jewellery alloys. In Japan in particular production of white gold climbed resulting in higher palladium demand (palladium is commonly

Purchases of palladium by the **electronics** industry recovered somewhat in 2002, increasing by 6 per cent to 710,000 oz. Excess inventories of palladium and components within the industry as a whole were largely depleted during the year – the lower rate of stock utilisation compared with 2001 led to higher demand for palladium.

Shipments of MLCC rebounded by approximately 16 per cent in 2002, as sales of capacitor-intensive products such as mobile phones improved and demand from the automotive electronics sector grew. However, the substitution of palladium by nickel MLCC continued, the market share of palladium components falling to just 37 per cent.

The fall in the price of palladium slowed efforts to substitute the metal in plating applications but demand remained static. With the exception of China, sales of personal computers and IT equipment were disappointing in 2002, and spending on telecoms



used as a whitening agent in white gold alloys in Japan). Demand for palladium-based catalysts from the chemical industry improved moderately, rising by 2 per cent, but soft economic growth in many regions restrained investment in new manufacturing capacity.

In 2001 the high price of palladium caused some petroleum companies to replace palladium-based refining catalysts with base metal products and sell palladium back to the market. The much lower price of the metal in 2002 reduced the financial benefits of substitution and demand for palladium used in hydrocracking catalysts was positive.

Outlook

Demand for palladium is expected to improve in 2003 as less use of inventories by both the auto and electronics industries will result in an increase in metal purchases. Although US auto companies will continue to consume stockpiled palladium this year, the rate of inventory use will be substantially lower compared with 2002. As a result, global purchases of metal will grow significantly but will remain a long way short of the 6.75 million oz bought in 2001.

Despite the increase in purchases, consumption of palladium in autocatalysts will fall further. The effect of continuing projects to thrift palladium by auto companies will be felt this year and average loadings are expected to decrease. Programmes to replace palladium-based autocatalysts with platinum-based alternatives on some vehicle models, however, have largely run their course and will have little further impact on palladium demand. Indeed, given the substantial discount in the price of palladium to platinum, some auto manufacturers are preparing to migrate a proportion of their autocatalyst systems back towards greater use of palladium.

North American car production in 2003 is set to fall from last year's high. Gasoline vehicle output in Western Europe is also likely to soften, with diesels taking further market share, and growth in auto manufacturing in Asia is expected to moderate. These factors will dampen consumption of palladium.

Inventories of palladium and components in the electronics sector have largely been run down to normal working levels and stock use is not expected to affect palladium purchasing in 2003. Demand for the metal will therefore increase and will be more closely aligned with consumption. However, nickel-based MLCC will take additional market share from



Tightening controls on vehicle emissions and rising car production in China are positive factors for palladium demand.

palladium components and overall demand for palladium is likely to remain below 1 million oz.

Continuing price weakness should enable palladium-based dental alloys to make further small gains in market share in North America and Japan, but the combined increase in demand will be small in context of the overall palladium market.

Output of palladium from South Africa will grow substantially in 2003 as the expansion of platinum mining continues. Many of the developments at existing mines and the new projects on the eastern limb of the Bushveld Igneous Complex exploit reserves of UG2 ore, rather than the Merensky Reef. The UG2 typically contains a higher proportion of palladium than the Merensky Reef and this will provide an additional boost to palladium output going forward.

Sales of Russian metal are likely to exceed last year's low. Norilsk Nickel has reported some success in signing new supply contracts with consumers, while comments from the Ministry of Finance suggest that sales of metal from government stocks may resume this year. Disposals of palladium are also continuing from the US DNSC, although as of the end of April 2003 there were less than 160,000 oz left in the stockpile.

In summary, even though demand for palladium is forecast to improve in 2003, it is likely to be once again outstripped by supply and the market will remain in surplus. As a result, we expect the recent price weakness to persist, with palladium trading between \$120 and \$180 during the next six months.