

Palladium



Autocatalyst

Purchases of palladium by the autocatalyst industry are forecast to rise by 5.5 per cent to 3.65 million oz in 2004. Much of the increase will be due to increased purchases of metal by North American auto manufacturers as their use of palladium from inventories continues to decline. Demand is also expected to grow in Japan and the Rest of the World, driven by higher light vehicle production and tighter emissions standards. In Europe, however, palladium demand will fall as gasoline powered cars lose further market share to diesels.

Europe

European production of gasoline cars is expected to fall by 6 per cent in 2004 to around 8.76 million vehicles, which will result in palladium demand falling by a similar percentage to 1.125 million oz. The drop in gasoline vehicle output will be a consequence of the continuing rise in market share of diesels – as a majority of gasoline vehicles are fitted with palladium-based catalysts, this will have a proportionate impact on demand for the metal.

Japan

Purchases of palladium by the Japanese auto industry are forecast to climb by 8 per cent to 595,000 oz in 2004. Higher demand will result from strong light vehicle production, a degree of switching away from platinum into palladium, plus the rising popularity of larger, heavier vehicles.

Japanese light vehicle production is on course to expand by more than 3 per cent in 2004, primarily due to higher exports, and this will contribute to the expected rise in palladium demand. In addition, although sales in the domestic market are likely to be only marginally higher than in 2003, larger cars and SUVs are accounting for an increased proportion of sales. These generally require a greater volume of catalyst (containing a higher overall pgm content) than smaller-engined vehicles.

Japanese car companies have tended to be conservative about changing catalyst formulations on gasoline vehicles in response to pgm prices. However, given the substantial and sustained price difference between platinum and palladium, some auto makers are moving to reduce their use of catalyst systems based on the former in favour of palladium.

North America

Purchases of palladium by the North American auto industry are forecast to climb by 15 per cent to 1.39 million oz this year. The reason for the increase lies with falling inventory use – although some palladium has been used from stock or sold back to the market this year, the volumes concerned are significantly less than in 2003, and so overall purchases by car companies have risen. We expect palladium inventories to be run down to target working levels by the end of this year.

In contrast to purchases of metal, actual use of palladium on catalysts will fall for the fourth year in succession, although the drop in consumption this year will be modest. Thrifting continues to outweigh the effects of switching from platinum to palladium on gasoline vehicles. In the four years from 2000 to 2004, the volume of palladium used on catalysts in North America will have slumped by 1.5 million oz to less than 1.6 million oz.

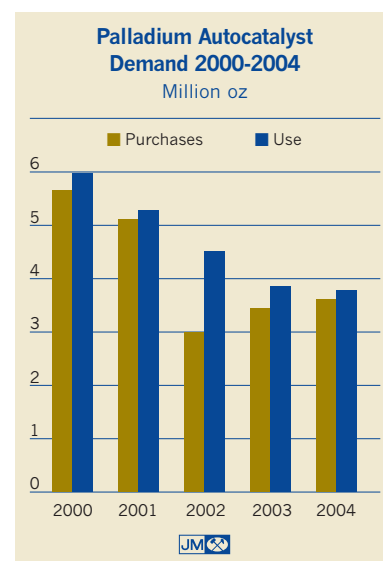
Rest of the World

Autocatalyst demand for palladium in the Rest of the World will increase by a projected 7 per cent to 540,000 oz in 2004. Greater vehicle production in South Korea, India, much of South East Asia, and in Brazil, together with tightening emissions standards, will be key to the increase. Although Chinese light vehicle demand is also projected to climb strongly, the poor fuel quality in China (sulphur levels, in particular, are high) is tending to slow the growth in use of palladium, which is more susceptible than platinum to deactivation by sulphur compounds.

Autocatalyst Recovery

The volume of palladium recovered from scrapped autocatalysts is forecast to surge by 28 per cent to 525,000 oz in 2004. The biggest increase in volume terms will be seen in North America (up by 28 per cent to 345,000 oz), reflecting changes in the mix of catalysts reclaimed. An increasing proportion of cars being scrapped dates from the mid-1980s onwards, and many of these vehicles are fitted with relatively heavily-loaded palladium-based catalysts. This factor, together with higher catalyst recovery rates, will also result in palladium recovery in Europe jumping by an estimated 50 per cent to 105,000 oz. In Japan the volume of palladium recovered is forecast to be stable at 40,000 oz this year.

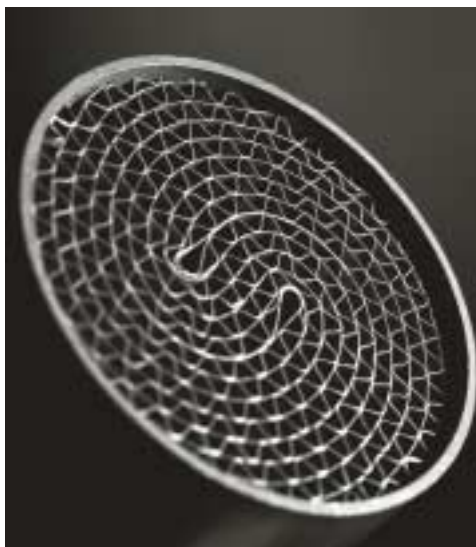
	2003	2004
Europe	1,200	1,125
Japan	550	595
North America	1,205	1,390
Rest of the World	505	540
Total	3,460	3,650
Autocatalyst recovery	(410)	(525)





Palladium

Auto company purchases of palladium are forecast to climb by 5.5 per cent in 2004, although much of the increase will be due to lower use of metal from stocks in the USA.



Electronics

Purchases of palladium by the global electronics industry are projected to increase by 2 per cent to 915,000 oz in 2004. Demand for palladium in hybrid integrated circuits (HIC) will increase on the back of strong demand for the components in a range of electronic applications. Use of the metal in multi-layer ceramic capacitors (MLCC), however, will fall again, hit by the ongoing trends of miniaturisation and thrifting.

Demand for hybrid integrated circuits was strong during the first nine months of 2004, propelled by increasing use of these components in automotive and telecommunications applications. With HIC not subject to the same degree of miniaturisation as MLCC, and thrifting having slowed, purchases of palladium are expected to increase by 10 per cent this year. Use of the metal in plating applications is also forecast to rise in 2004 on the back of firm growth in demand for connectors and lead frames for both consumer and industrial electronics applications.

Growth in demand for multi-layer ceramic capacitors has lagged behind the growth in sales of mobile phones, personal computers and related electronic goods during 2004 because product inventories were generally high at the start of the year. Nevertheless, shipments of MLCC will grow by an estimated 6 per cent to around 630 billion. Purchases of palladium by MLCC manufacturers, on the other hand, are forecast to fall by 3 per cent in 2004. The decline in palladium demand will result from the continuing reduction in average component size, plus further thrifting of the palladium content of the conductive pastes used in MLCC.

On a more positive note, the substitution of palladium by nickel-based MLCC has slowed, with nickel components now accounting for approximately two thirds of the market. The conversion of MLCC manufacturing capacity from palladium to nickel requires a significant amount of capital investment. Capacitor producers have already switched those products with a high number of conductive layers, and therefore a significant metal content, to nickel; there is less financial incentive to invest in converting products with lower layer counts (smaller metal contents), particularly given the current weakness in the price of palladium. In addition, because of the intrinsic characteristics of palladium MLCC, such as high thermal durability, they are preferred to nickel

Dental

Demand for palladium in dental alloys is forecast to rise by just 2 per cent to 840,000 oz in 2004. Use of the metal in Japan is growing slowly, helped by the relatively low metal price, whilst demand in North America is projected to be marginally higher. Use of palladium-based alloys in Europe is not expected to change.

Japan remains the largest market for palladium used in dental alloys by a considerable margin due to the state-backed subsidy of treatment with 'kinpala' alloys which contain 20 per cent palladium. In 2003 the proportion of the cost of treatment covered by the state was cut from 80 per cent to 70 per cent. Inital reports that this would result in a sharp fall in kinpala production were not born out by official statistics, the low price of palladium apparently compensating for the reduction in the subsidy. The market is expected to grow slowly in 2004, resulting in a small rise in palladium demand to 525,000 oz.

Demand for palladium in dental alloys in North America is projected to edge up by 5,000 oz to 230,000 oz in 2004 – the relatively low price of the metal has made palladium-based alloys more competitive compared with high gold alloys. However, there are many other alternative materials available, with white porcelain bridges and caps growing in popularity.

In Europe, palladium-based dental alloys were widely substituted by alternatives following the spike in the price of the metal in 2000 and early 2001. Much of the substitution was permanent and demand for palladium in 2004 is forecast to be flat at 70,000 oz.

Palladium Demand: Dental '000 oz		
	2003	2004
Europe	70	70
Japan	515	525
North America	225	230
Rest of the World	15	15
Total	825	840



Palladium Demand: Electronics '000 oz		
	2003	2004
Europe	85	65
Japan	220	250
North America	215	180
Rest of the World	375	420
Total	895	915





components in certain more demanding applications (automotive engine management systems, for example).

On a regional basis, demand for palladium in the electronics sector continues to shift towards China and South East Asia, in line with the geographical transfer of component manufacturing capacity.

Other

Palladium demand from other applications is forecast to leap to 1.26 million oz in 2004, almost double the previous year's total. A rapid move by some Chinese jewellery manufacturers into the fabrication of palladium jewellery between January and April will be responsible for much of the increase. Total Chinese jewellery demand for palladium is projected to reach 510,000 oz this year.

Demand for palladium in the manufacture of catalysts for the bulk chemicals industry is also expected to rise, whilst significant volumes of small investment bars have been bought by private investors in North America.

Demand for palladium from the jewellery sector is projected to jump from 250,000 oz in 2003 (most of which was used in white gold alloys) to 740,000 oz in 2004. Chinese purchases of palladium are forecast to expand from just 25,000 oz last year to 510,000 oz, the result of a number of manufacturers rapidly switching a portion of their output to the fabrication of palladium jewellery.

The move into palladium jewellery manufacture was a direct result of the rapid rise in the price of platinum from \$815 at the start of the year to over \$900 by mid-March. Profit margins on the manufacture of platinum jewellery consequently fell to less than Rmb3 per gram, and with palladium jewellery offering a margin of up to Rmb25 per gram, an increasing number of jewellers began fabricating palladium products. Purchases of the metal surged in March and April as wholesalers and retailers built up stocks, contributing to the rise in the palladium price from less than \$200 at the start of the year to a peak of \$333 in April. Unfamiliarity with the metal amongst consumers and sales staff in stores, however, meant that retail sales of palladium jewellery developed far more slowly.

The rapid fall in the palladium price from over \$330 in mid-April to under \$240 in May subsequently discouraged some manufacturers who, having bought

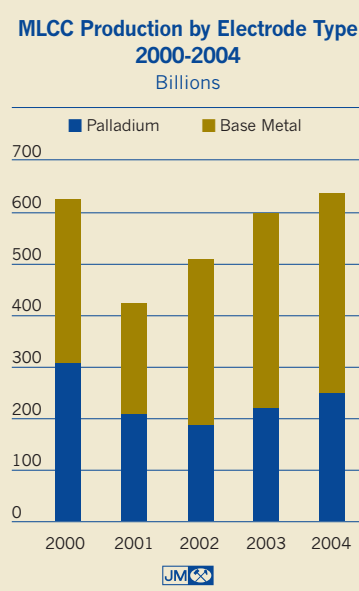
metal as the price climbed, were left holding losses. In addition, profit margins on palladium jewellery declined as competition amongst manufacturers, wholesalers and retailers increased. At the same time, the fall in the price of platinum back to around \$800 resulted in improved margins for platinum jewellery. Consequently, the number of companies fabricating palladium products declined. Those that have continued have scaled back their output of palladium items to more closely reflect the level of orders from retailers, rather than supplying stock on consignment.

The majority of retailers selling palladium jewellery have, to date, been located in secondary and tertiary cities. Palladium offers a more affordable alternative to platinum for consumers seeking white precious metal jewellery, and has also been successfully competing against white gold on the basis of its purity.

In major cities, including Beijing and Shanghai, fewer stores have chosen to sell palladium products. There has not been any co-ordinated marketing of palladium jewellery, and platinum remains the jewellery metal to which consumers aspire. In addition, some retailers have been reluctant to confuse customers and risk cannibalising sales of platinum. Another deterrent to stocking palladium is the fact that it is currently subject to VAT, in contrast to platinum which can be purchased free of VAT via the Shanghai Gold Exchange.

A second area of substantially increased demand for palladium in 2004 has emerged in the form of retail sales of coins and small investment bars (typically 1 oz in weight) in North America. Increased marketing and promotion of palladium investment products, coupled with greater investor and media interest in commodities in general, resulted in a rush of sales during the first quarter of the year when the price was rising. Total investment demand this year is forecast to reach 150,000 oz.

Demand for palladium in chemical catalyst applications is forecast to increase by 10 per cent in 2004 to 280,000 oz. The majority of the growth will be seen in Asia and the Middle East, where there has been significant investment in new production capacity for the bulk chemicals purified terephthalic acid, vinyl acetate monomer, and hydrogen peroxide. Palladium demand from most other industrial applications, including petroleum hydrocracking catalysts, gas sensors and stationary emissions control, is expected to be largely unchanged this year.



Palladium Demand: Jewellery & Other
'000 oz

	2003	2004
Europe	120	125
Japan	195	195
North America	150	265
Rest of the World	175	675
Total	640	1,260