

PALLADIUM

- Gross demand for palladium is forecast to soften by 9% this year to 8.89 million ounces. We forecast that autocatalyst and industrial demand will remain strong, however jewellery demand will decline and net investment demand is forecast to be negative.
- Purchasing of palladium by the global autocatalyst sector is set to grow by 6% to a new record level of 5.92 million ounces this year.
- Industrial demand for palladium is anticipated to grow by 180,000 oz to 2.65 million ounces, the highest level since 2005.
- Gross palladium jewellery demand is set to decline by 8% to 545,000 oz in 2011.
- Due to redemptions in ETFs in 2011, palladium investment demand is forecast to be negative by 215,000 oz.

AUTOCATALYST

Gross palladium demand from the global automotive sector is forecast to increase by 6% to 5.92 million ounces in 2011 as light duty vehicle production is set to rise in all regions apart from Japan. Vehicle production was strongly up in Europe and North America in the first half, although Japanese production was sharply down due to disruption from the earthquake and tsunami. Generally higher levels of vehicle production in gasoline markets as well as greater palladium use in diesels is expected to drive palladium purchasing up to new record levels this year.

Europe

Growth in vehicle production together with continuing substitution of platinum in diesel aftertreatment systems is expected to result in gross palladium demand in European autocatalysts rising by 12% to 1.49 million ounces in 2011, the highest level for ten years. Substitution is anticipated to raise the proportion of palladium used in a typical European light duty diesel autocatalyst to 30%. Light duty diesel vehicle production, which is set to rise by almost 700,000 units to 9.4 million vehicles, is thus also expected to lift palladium demand. Despite an expected fall in light duty gasoline production in Europe this year of just under 200,000 units to 8.9 million vehicles, palladium demand is forecast to grow due to the full introduction of Euro 5 meaning higher palladium loadings on average per catalyst. Almost all European manufacturers now use palladium-rhodium three-way catalysts (TWCs) having substituted platinum with palladium over a number of years, with only a very small proportion of European gasoline vehicles now using any platinum at all.

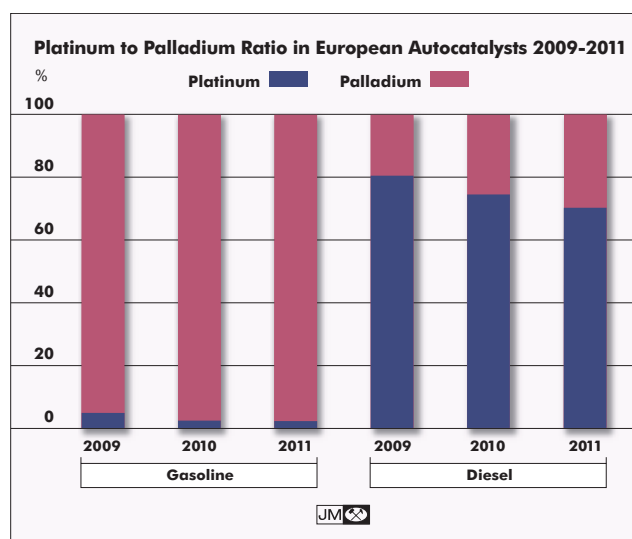
With poor sales of passenger vehicles in European countries affected by high levels of public debt, national austerity measures and an uncertain outlook across the eurozone, total

sales this year are expected to be flat or slightly down in the European region as a whole, despite some brighter spots such as Germany. However, vehicle production is anticipated to remain some way ahead of sales as exports continue to grow. Sales of premium European-made vehicles continue to be strong in China and the USA, driving up use of palladium for light duty gasoline autocatalysts.

Japan

Vehicle output in Japan was already looking set for a difficult 2011 due to declining domestic and export sales before the March earthquake and tsunami. As a result of the disaster, light duty vehicle production is anticipated to fall by at least 1.3 million units to just under 8 million vehicles in 2011, due to stoppages, parts shortages and electricity restrictions. Gross demand for palladium from the Japanese automotive sector is forecast to fall by 145,000 oz to 675,000 oz this year.

Since the Japanese vehicle market is mainly gasoline and most vehicles manufactured in Japan for export are also



Platinum has been mostly substituted out of European gasoline autocatalysts. Palladium use is growing in diesel vehicles.

Palladium Demand: Autocatalyst '000 oz						
	Gross		Recycling		Net	
	2010	2011	2010	2011	2010	2011
Europe	1,330	1,485	(335)	(385)	995	1,100
Japan	820	675	(80)	(70)	740	605
North America	1,355	1,480	(790)	(925)	565	555
China	1,005	1,100	(30)	(35)	975	1,065
Rest of the World	1,070	1,175	(75)	(90)	995	1,085
Total	5,580	5,915	(1,310)	(1,505)	4,270	4,410

gasoline, reduced production has impacted palladium demand more than platinum demand in relative and absolute terms. Overseas transplants operated by Japanese manufacturers have been affected by parts shortages and have cut production, which has impacted pgm demand in those regions as well.

North America

Gross demand for palladium in autocatalysts in North America is forecast to rise by 125,000 oz to 1.48 million ounces, the highest level since 2007 – before the onset of the financial crisis.

The first half of this year saw higher levels of vehicle production in a slowly improving economic climate. For the full year of 2011, we expect that North American light duty vehicle production will be around 10.6 million units, an increase of almost a million units compared with 2010. Although consumer confidence in general remained low in the USA, sales of vehicles were impressive in the first nine months due to rising dealer inventories and favourable pricing for consumers. As a result of growth in light duty production, palladium use is set to increase in light duty gasoline systems. One key factor in this is that domestic manufacturers, which tend to use only palladium–rhodium in gasoline aftertreatment, have performed strongly this year.

China

After rising at over 30% between 2009 and 2010, this year growth in vehicle production is expected to slow to single figures. The phasing out of purchase tax subsidies and vehicle scrappage incentives, which had particularly favoured sales of cheaper domestic-brand vehicles, has impacted on production levels this year. Furthermore, attempts to curb the growth of car use in cities experiencing major congestion – such as Beijing's limits on new car registrations to 20,000 per month, which became effective in January 2011 – have all had the

desired effect of slowing the growth in the car market to more sustainable rates. Other contributory factors have been the impact of supply shortages on Japanese joint ventures, rising fuel prices, and tighter consumer credit.

However, despite a slower rate of growth in automotive production, more stringent China 4 gasoline emissions standards which came into force across the country in July 2011 will bolster palladium demand by requiring higher catalyst loadings. Overall, palladium demand is forecast to reach 1.1 million ounces this year, an increase of 95,000 oz.

Rest of the World

Palladium demand from the autocatalyst industry in the Rest of the World region is expected to increase by around 10% this year to 1.18 million ounces. Manufacturers in Brazil, India, Korea, Mexico and Russia have all experienced a strong year.

JEWELLERY

Gross demand for palladium in the jewellery sector is expected to contract by 50,000 oz in 2011 to 545,000 oz.

The Chinese market is sure to remain the world's largest for palladium jewellery, although demand is set to decline relative to 2010. Higher metal prices are expected to contribute to lower weights of pieces manufactured in Europe and lower sales to consumers in North America.

China

Once again, palladium jewellery demand in China is expected to decline in 2011. We forecast a fall of 30,000 oz to 330,000 oz.

Palladium retains a following in certain parts of the country but even there, lack of differentiation with other white metals and elevated prices this year have contributed to a further slowing of demand. Dollar prices in the first nine months of 2011

Palladium Demand: Jewellery '000 oz						
	Gross		Recycling		Net	
	2010	2011	2010	2011	2010	2011
Europe	65	65	0	0	65	65
Japan	75	75	(20)	(20)	55	55
North America	65	45	0	0	65	45
China	360	330	(80)	(190)	280	140
Rest of the World	30	30	0	0	30	30
Total	595	545	(100)	(210)	495	335

were on average 46% higher than the already elevated levels of 2010, and 41% higher in RMB terms. This has simultaneously lowered consumer demand for what was previously seen as an affordable precious metal while also helping to stimulate recycling. Some manufacturers have ceased producing palladium jewellery due to lack of consumer interest, thus lowering our net demand figure to 140,000 oz. Price rises have also damaged palladium by reducing retailer margins. In addition, the lack of effective marketing of palladium jewellery in China is expected to contribute to the fall in demand.

Other Regions

Gross palladium jewellery demand in Europe is expected to remain flat at 65,000 oz this year.

In the first nine months of 2011 around 85,000 UK-made pieces were hallmarked, 5% up on the same period in 2010. However, the weight of stamped metal declined by 21% in the first three quarters relative to 2010. One of the key reasons for this has been the higher price of palladium in 2011, which has narrowed the price differential with platinum and gold and led retailers to stock lighter weight pieces. Higher prices have also led to some rings being manufactured in lower-fineness alloys such as Pd500.

Although a new trade and consumer marketing campaign for palladium has just started, gross demand for palladium in the jewellery sector in North America in 2011 is expected to fall by 20,000 oz to 45,000 oz. Over recent years, palladium has gained ground in the male wedding band sector. As the price has increased, palladium's positioning as a men's jewellery metal has been increasingly challenged by cheaper alternatives including base metals. Palladium is also used to enhance the colour of white gold jewellery in some higher-end pieces, for which demand has been resilient. Demand for palladium in Japan, where it is used as an alloying agent, will remain robust.

ELECTRICAL

Gross demand for palladium in the electrical sector is forecast to rise by 5% this year to 1.49 million ounces.

Production of electronics items continues to grow, driven by consumer demand and the need for businesses to upgrade computer hardware. In multi-layer ceramic capacitors (MLCCs), palladium demand has been stable, particularly in applications where cost is less important than performance. The increasing complexity of electrical devices means that more MLCCs as well as more palladium-containing resistors

Palladium Demand: Electrical '000 oz						
	Gross		Recycling		Net	
	2010	2011	2010	2011	2010	2011
Europe	195	200	(175)	(195)	20	5
Japan	295	340	(55)	(55)	240	285
North America	160	150	(80)	(85)	80	65
China	360	375	(35)	(40)	325	335
Rest of the World	400	420	(95)	(105)	305	315
Total	1,410	1,485	(440)	(480)	970	1,005

and other passive components are required per device, helping drive up demand. Use of palladium connectors, which are required to be both conductive and highly durable, is expected to show a similar trend this year as the number of components per device grows. The use of gold, traditionally the metal preferred for connector applications, has suffered recently due to the high gold price compared with palladium and the fact that palladium has a much lower density so less of it is needed to coat the same thickness.

DENTAL

Demand for palladium in the dental sector is set to remain flat this year at 595,000 oz.

Production of palladium-containing Kinpala alloy in Japan is expected to soften once again in 2011, reducing palladium demand to 245,000 oz. This is in line with long-term trends in improved dental health as well as competition from resin and ceramic based cosmetic dental treatments. In North America, although porcelain-fused-to-metal (PFM) dental treatments are generally in decline due to the rising market share of metal-free restorations, the elevated price of gold is expected to result in use of PFM alloys with higher palladium contents. Similarly, palladium demand in the European dental industry is anticipated to hold up well as there is a move away from high gold alloys to palladium based systems on cost grounds.

Palladium Demand: Dental '000 oz			
	2009	2010	2011
Europe	65	80	80
Japan	295	250	245
North America	260	250	255
China	0	0	0
Rest of the World	15	15	15
Total	635	595	595

CHEMICAL

Demand for palladium in the chemical industry is set to increase by 23% this year to 455,000 oz as a result of capacity expansions driven by downstream consumer demand. Purchasing in Asia is anticipated to stimulate demand in the chemical sector again this year, whereas capacity overhangs in developed markets are expected to leave demand largely flat.

Palladium catalysts are utilised in the manufacture of purified terephthalic acid (PTA), a chemical feedstock used to produce polyester and polyethylene terephthalate (PET). Demand for PET in consumer products such as textiles and packaging is growing rapidly in the developing world and remains high in developed markets. Expansion of capacity for PET manufacture has put pressure on upstream manufacturers of PTA. As a result, there has been expansion of PTA manufacturing capacity this year, particularly in China, India and Pakistan. Construction and expansion of plant in China is expected to contribute to a doubling of demand for palladium in process catalysts in 2011.

INVESTMENT

This year has seen a major shift of investor sentiment away from palladium. This contrasts with the situation in 2010 when the rise in gross demand for palladium from ETFs was second only to growth in the automotive sector. As of early October 2011, palladium ETF holdings stood starkly in negative territory with net redemptions in the year to date. In comparison, in terms of ounces, liquidation in palladium ETFs was almost exactly matched by new investment in platinum ETFs.

In the aftermath of the Japanese earthquake in March, at a time of political turmoil in the Middle East and North Africa and uncertainty about the world economy, there were sizable redemptions in palladium ETF holdings across various investment vehicles. Physical palladium investment holdings were more severely affected than those for platinum, perhaps reflecting palladium's greater use in automotive and industrial applications. At other times during the year when investors feared that industrial recovery would stall, such as in May as eurozone debt concerns once again emerged, and in August following the US credit rating downgrade, there were bouts of liquidation in palladium ETFs.

Holdings of palladium in the US fund were on a generally downwards trend between May and September. Following the

Palladium Demand: Chemical
'000 oz

	2009	2010	2011
Europe	85	105	80
Japan	20	20	20
North America	50	65	80
China	75	65	150
Rest of the World	95	115	125
Total	325	370	455

heavy investment inflows into the US ETF just after its launch in January 2010, and the subsequent doubling in palladium's price last year, many investors would have been in a position to take profit during 2011. Palladium has traded on average 61% higher in the first nine months of 2011 than the same period last year, with periods of rising price generating further opportunities for profit-taking. Despite positive underlying fundamentals, a perception that palladium may not repeat its previous price performance may have led some holders to redeem ETF investments. There may also have been some distressed selling during wider commodity market sell-offs this year. The US fund remains by far the largest palladium ETF vehicle and the fact that so much palladium remains in the fund, almost 800,000 oz at the time of writing, may indicate that there is a body of core, long-term investors who hold their positions during temporary market uncertainty.

Palladium demand in European ETFs fared somewhat better this year, with net investment in some of the newer funds offsetting redemptions in the more established vehicles. We anticipate that net palladium demand in the investment sector in Europe will be positive for the full year.

Weak economic conditions and negative market sentiment imply further volatility in the ETF market before the end of 2011. For the year as a whole, we forecast that redemptions in palladium ETFs will keep overall investment demand in negative territory. Liquidation is also expected in the coin and small bar investment market in North America again this year.

Palladium Demand: Investment
'000 oz

	2009	2010	2011
Europe	525	(5)	60
Japan	0	10	10
North America	95	1,090	(285)
China	0	0	0
Rest of the World	5	0	0
Total	625	1,095	(215)