

PALLADIUM

- **Gross demand for palladium will soften in 2013, dropping 3% to 9.63 million ounces, but the market will remain in significant deficit.**
- **Growth in auto demand will slow, with the only significant rise in consumption coming from China, where gasoline vehicle output is set to expand at double digit rates.**
- **Industrial demand will retreat to 2.20 million ounces, its lowest level since 2004, as palladium use in MLCC and dental alloys continues to erode.**
- **Investors have shown a much reduced appetite for palladium this year, while jewellery demand will drop to a ten year low.**

AUTOCATALYST

In the autocatalyst sector, we anticipate further growth in the use of palladium in all regions except Japan, although at a modest pace compared with the dramatic gains of recent years. Only China will record a double digit increase in palladium consumption in 2013, reflecting another year of rapid expansion in domestic vehicle output.

Europe

Against a backdrop of sustained weakness in European vehicle sales, palladium use by the region's auto makers has held up well this year, with modest growth expected in all sectors. Total demand for palladium in light and heavy duty emissions control, including non-road catalysts, is expected to rise by 3% to just under 1.50 million ounces.

Light duty vehicle production in Europe is forecast to fall by over 2% in 2013, but with the diesel sector bearing the brunt of the decline, output of gasoline vehicles should decrease only marginally on last year. Palladium consumption will be boosted by strong growth in shipments of predominantly premium-brand gasoline cars to North America. These exports include growing numbers of vehicles meeting stringent Ultra Low Emission Vehicle (ULEV) and Partial Zero Emission Vehicle (PZEV) standards, which typically contain higher loadings of palladium and rhodium than vehicles certified to European Euro 5 emissions regulations.

Palladium's use in light duty diesel aftertreatment is also set to rise modestly, as it makes further gains at the expense of platinum. European auto makers continue to seek cost savings in their catalyst systems, and where possible they are substituting platinum with palladium.

Like platinum, the use of palladium in heavy duty diesel catalysis will benefit this year from pre-buying of Euro VI trucks ahead of the introduction of the new regulations in January 2014. This will result in much higher pgm loadings on vehicles

meeting the stricter emissions limits. However, palladium takes a much smaller share of the pgm mix on heavy duty diesel catalysts than it does on light duty systems, and the absolute amount of palladium used in this sector remains modest.

Japan

With output of light duty gasoline vehicles expected to drop by over 2%, and no new legislation to drive changes in loadings, demand for palladium from Japanese auto makers is predicted to fall to 765,000 oz in 2013. In this region, the gasoline sector accounts for over 95% of automotive palladium demand; there is some minor use of palladium in heavy duty diesel trucks and non-road engines, both of which segments will see marginal increases in offtake this year.

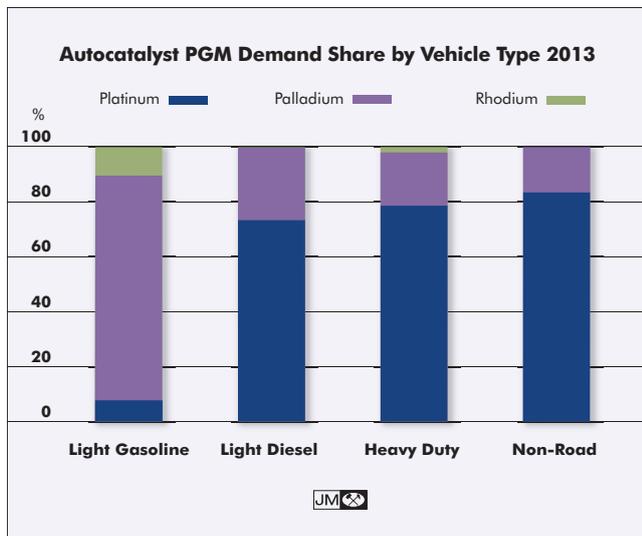
North America

A combination of factors – improving economic outlook, pent up consumer demand for vehicles and the availability of cheap credit – has stimulated vehicle sales in North America in 2013. Output of light trucks and cars is forecast to reach 13 million in 2013, a 4% increase on last year, and above the pre-crisis 2007 level. Changes in market share in favour of smaller vehicles will restrict the growth in palladium demand, but offtake will nevertheless reach 1.82 million ounces – the

Palladium Demand: Autocatalyst
'000 oz

	Gross		Recycling		Net	
	2012	2013	2012	2013	2012	2013
Europe	1,450	1,495	(305)	(390)	1,145	1,105
Japan	790	765	(105)	(110)	685	655
North America	1,815	1,820	(1,080)	(1,145)	735	675
China	1,330	1,505	(45)	(60)	1,285	1,445
Rest of the World	1,320	1,385	(135)	(155)	1,185	1,230
Total	6,705	6,970	(1,670)	(1,860)	5,035	5,110

Palladium accounts for 82% of pgm demand in gasoline vehicles, but only 25% of total usage on diesel engines (including non-road).



highest level since 2001.

Downsizing has been a feature of the US market this year, with sales of small cars and crossover utility vehicles (CUVs) outpacing growth in the market as a whole. CUVs combine features of a sports utility vehicle (SUV) with those of a passenger car, and tend to be somewhat smaller than a typical American light duty truck. Sales of CUVs are forecast to rise by more than 18% this year, accounting for more than a quarter of total light duty sales. This has caused a slight decline in average engine size across the US market, and has tended to limit growth in palladium demand, since loadings are typically correlated with engine displacement.

China

After two years of slower growth in gasoline car output, China is expected to see a return to double digit growth in the light duty sector in 2013. Palladium consumption will rise accordingly, up 13% to 1.51 million ounces, overtaking European auto demand for the first time. Although there are no changes in emissions limits for gasoline cars this year, some auto makers have started to anticipate the next round of legislation, replacing current engine platforms with China V variants. This has resulted in larger catalyst volumes on some vehicles.

Rest of the World

The rest of the world region will see continued growth in automotive demand for palladium, up 5% to 1.39 million ounces this year on the back of higher output of gasoline vehicles in parts of Asia and South America, and tighter emissions limits

in some markets.

The largest increase will occur in Thailand, where Euro 4 equivalent legislation has applied since January 2013. At the same time, output of light duty gasoline vehicles in this country is expected to surge by a quarter, resulting in palladium consumption more than doubling. Russia will also see a jump in demand, as Euro 4 legislation is applied to all new models, although the impact of higher loadings will be softened by general weakness in the car market.

Elsewhere, trends in light duty output will be the main influence on demand. There will be gains in South America, where gasoline vehicle production is expected to rise by nearly 7% to exceed four million vehicles for the first time, and in Mexico, where output has been boosted by strong sales in the country's major export market, the USA. However, this growth will be partly offset by a dip in purchases of palladium by auto makers in the large South Korean market. The weakness of the Japanese yen has damaged the price competitiveness of Korean models, hitting sales to this major export market.

JEWELLERY

Palladium jewellery continues to lose market share in China, and has yet to establish a substantial foothold in any other market. As a result, the slide in jewellery offtake will continue in 2013, with demand dropping to a ten year low of 390,000 oz.

Gross demand from the Chinese jewellery trade is set to fall to just 185,000 oz in 2013, hit by a continued absence of effective marketing, combined with consumer perceptions that palladium jewellery is of mediocre quality and represents poor value for money. Dwindling consumer demand for the end product has resulted in a steady decline in the number of manufacturers willing to produce and of retailers prepared to stock palladium items.

In other regions, purchases by the jewellery trade will be

	Gross ¹		Recycling ²		Net ³	
	2012	2013	2012	2013	2012	2013
Europe	65	65	0	0	65	65
Japan	70	70	(15)	(15)	55	55
North America	45	45	0	0	45	45
China	240	185	(175)	(165)	65	20
Rest of the World	25	25	0	0	25	25
Total	445	390	(190)	(180)	255	210

unchanged. In Japan, palladium is mainly used as an alloying element in platinum and white gold jewellery; both these markets are in decline, while there has been a shift towards alloys with a lower palladium content. This has been offset by some growth in demand for palladium jewellery, albeit from a low level. North America has a more substantial palladium jewellery market, but palladium is positioned against much less costly base metal products, and expanding its share is proving to be a difficult challenge. However, US jewellers are expected to use slightly more palladium in white gold alloys this year. Sales of gold jewellery grew by 5% in the first half of 2013, as a result of a strengthening economy and greater availability of inexpensive gold jewellery in lower purity alloys.

INDUSTRIAL

Consumption of palladium in industrial applications is predicted to decline by nearly 7% to 2.20 million ounces in 2013, reflecting continued substitution with base metals in the electronics sector, and a move away from precious metal alloys in reconstructive dentistry.

By far the largest industrial application for palladium is in electronics, where demand will total 1.06 million ounces this year, down 11%. Over the last two decades, manufacturers of multi-layer ceramic capacitors have progressively replaced palladium with lower cost metals such as nickel and copper. This substitution has affected all but the most conservative end-use markets, where reliability is most critical; as a result, palladium-based MLCC are increasingly restricted to military and medical applications.

In contrast, the use of palladium to plate electronic components such as leadframes and connectors is expected to remain robust in 2013, supported by its technical qualities – notably its oxidation resistance, even at high temperatures – and its cheaper cost relative to gold.

In the chemical sector, Chinese investment in new capacity for the manufacture of PTA (purified terephthalic acid, a precursor of polyester) appears to have passed its peak, but

the baton has been handed to India, which is still seeing strong growth in the polyester clothing market. Sales of palladium to the chemical industry will remain unusually strong by historical standards, at 530,000 oz.

Demand for palladium in dental applications will see further erosion in 2013, reflecting improved dental care and the increasing use of non-precious materials, including ceramic treatments, in all markets.

INVESTMENT

With no equivalent to the new Absa platinum fund, investment in palladium ETFs has been muted during the first nine months of 2013. Net palladium investment demand is forecast to fall to 75,000 oz in 2013, down from 470,000 oz last year.

The first two months of this year saw significant investment in ETFs, as the price recovered strongly, rising from a low of \$669 in early January to a high of \$775 in mid February. Funds in Europe and North America reported 195,000 oz of net inflows during that period, with February recording the fifth largest monthly total since palladium ETFs were first launched in 2007. However, the majority of these gains were relinquished during the three months to August, in the heaviest prolonged period of disinvestment since 2011, leaving total net investment for the first nine months at just under 50,000 oz.

In September 2013 it was announced that Absa Capital had received regulatory approval for a new Johannesburg-listed palladium ETF. Like its platinum counterpart, this new fund will be backed exclusively by metal of South African origin and it will therefore qualify as a domestic investment vehicle. This will allow local institutional investors greater access to a palladium ETF for the first time, and is likely to generate additional investment inflows. However, the launch date for this new product has not yet been confirmed, and we have not made any allowance for it in our forecast of palladium investment this year.

Palladium Demand: Industrial '000 oz			
	2011	2012	2013
Chemical	440	530	530
Dental	540	530	510
Electrical	1,375	1,190	1,055
Other	110	100	100
Total	2,465	2,350	2,195

Palladium Demand: Investment '000 oz			
	2011	2012	2013
Europe	(35)	165	30
Japan	5	0	(5)
North America	(535)	305	50
China	0	0	0
Rest of the World	0	0	0
Total	(565)	470	75