

PLATINUM QUARTERLY

Q3 2019

21st November 2019

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FOREWORD

This edition of *Platinum Quarterly* considers platinum supply and demand developments for the third quarter of 2019, provides an updated outlook for 2019 and presents a forecast for 2020. We also provide our views on issues and trends relevant to investors considering exposure to platinum as an investment asset and an update on how our product partnerships continue to meet investors' needs.

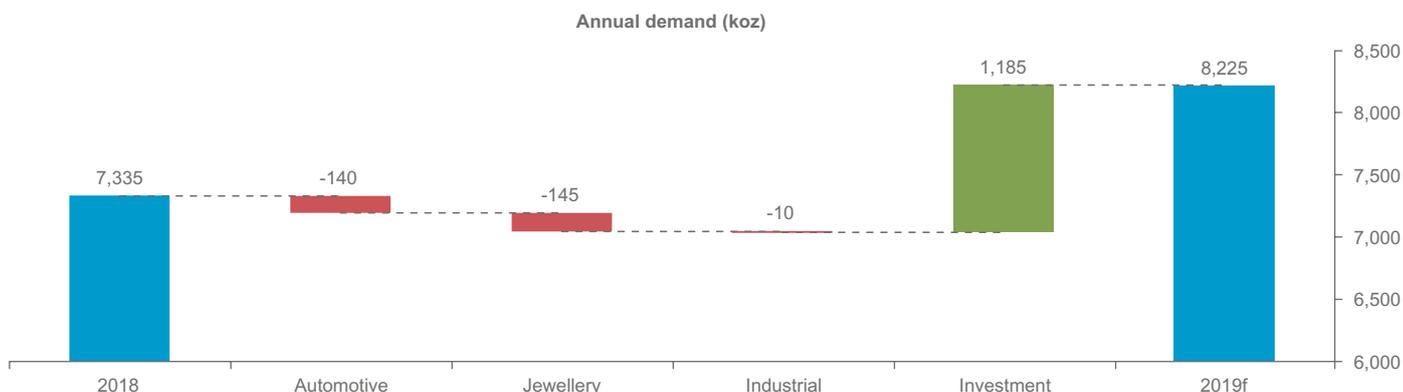
Platinum supply and demand – updating 2019 and introducing 2020 forecasts

The platinum market is forecast to be in balance this year as the updated 2019 forecast now reflects a deficit of 30 koz compared to the prior estimate of a surplus of 345 koz. A significant increase in investment demand more than offsets lower automotive, jewellery and industrial demand compared to 2018.

This initial 2020 forecast reflects a market surplus of 670 koz, reflecting a 1% decrease in supply and a 10% decrease in demand, predominantly due to lower investment demand that, although forecast to be well above the five year average, is not expected to include a repeat of this year's record ETF buying.

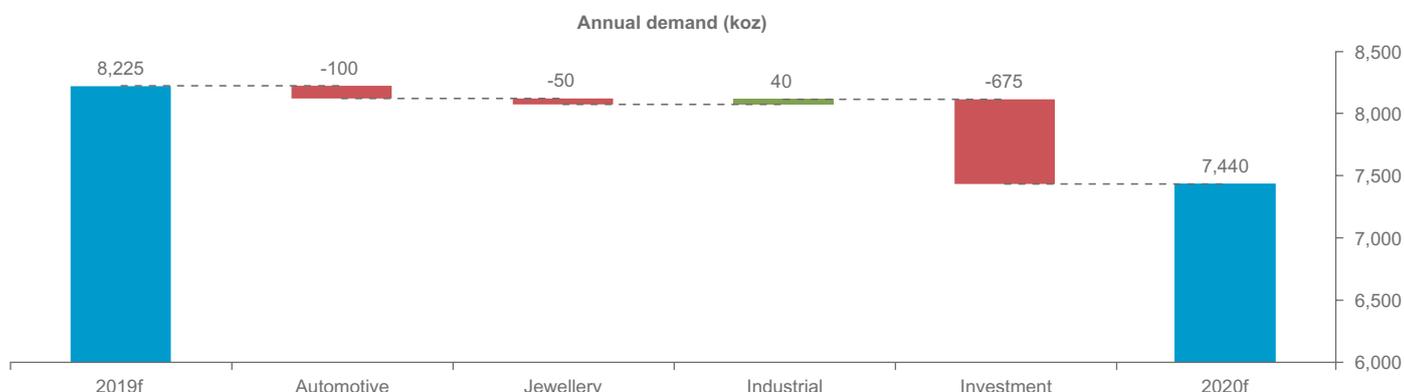
Total demand in 2019 is forecast to be 12% higher than in 2018. Robust investment demand of 1,095 koz (925 koz from increased ETF holdings and 170 koz from bar and coin purchases) in the first nine months of this year informs a forecast of 1.2 moz for 2019. This more than offsets expected demand decreases in the automotive and jewellery segments of 5% and 6% respectively.

Total 2019 supply is forecast to increase by 2% over 2018 with increases in both mining supply and recycling. Refined production is forecast to grow by 1% as some mining projects ramp up, but mostly due to the refining of metal built up in the processing pipeline in 2018. Recycling supply is forecast to grow by 3% in 2019 as an increase in platinum recovered from autocatalysts more than offsets a decrease in jewellery recycling due to the low platinum price.



Source: SFA (Oxford)

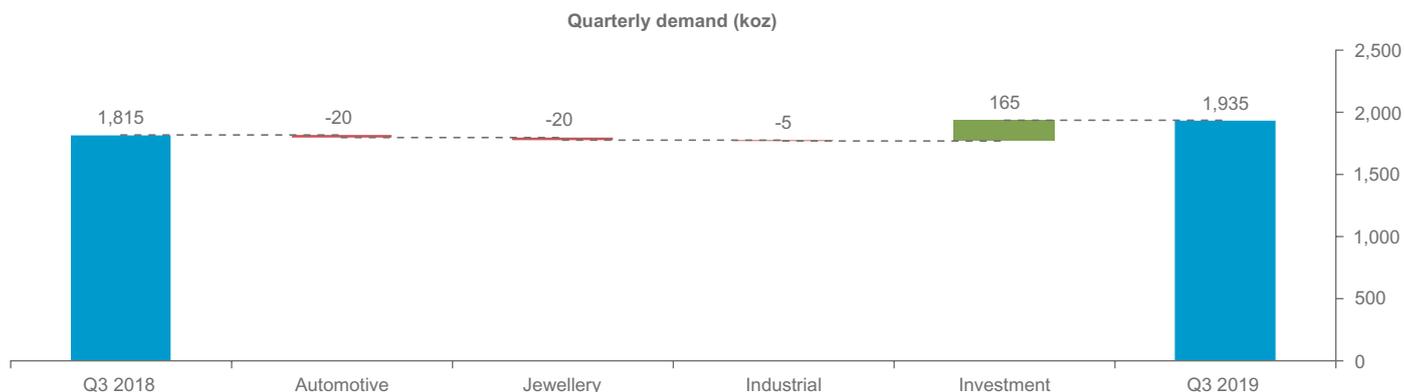
Forecast 2020 supply is 1% lower with a 2% decline in refined production and a 1% increase in recycling. Demand in 2020 is forecast to fall in the automotive (-3%) and jewellery (-2%) categories but increase by 2% in the industrial category. Lower forecast investment demand of 675 koz is the primary reason for the 670 koz forecast market surplus next year.



Source: SFA (Oxford)

Q3 2019 was near balance with total supply down 8% and total demand up 7%

The seasonal large surplus seen in the third quarter of 2017 and 2018 fell to a small surplus of 25 koz in Q3'19. This was due to the year-on-year fall in mining supply of 11% that more than offset the 2% rise in recycle supply, and a 7% rise in total demand. The supply fall was primarily due to smelter maintenance in South Africa and demand was up due to strong investment demand.



Source: SFA (Oxford)

The *Platinum Quarterly* data and report (starting on page 5) are prepared independently for WPIC by SFA (Oxford).

The platinum investment case – strong investment demand and demand growth potential in autocatalysts and fuel cells

The particularly strong investment demand in the first half of 2019 continued in Q3 and into Q4 with the increase in ETF holdings of c.1 moz the highest seen since physically backed platinum ETFs were launched in 2007. This ETF buying by large institutional investors, who typically take 2 to 3 year views and positions, reflects the value opportunity they see; from demand growth potential and constrained supply. It also reflects that they believe evidence and wider recognition of this demand growth, now within their investment horizon, will play out in the short term.

Looking forward, we see the following platinum demand growth drivers:

- **Sustained investment demand:** We expect platinum to benefit further from the growing number of investors considering precious metals. Since 2014 the WPIC has taken platinum's investment case to a wider pool of investors making platinum's consideration as a precious metal asset more likely. In 2019 we have observed a growing number of large macro funds, already using gold as an alternative to the c. US\$13 trillion of negative yielding debt globally, also including exposure to platinum. Our product partnerships continue to increase the availability of retail platinum investment products with new products and partners enhancing the likelihood of higher retail investment demand. The unprecedented institutional ETF buying was 925 koz to end-September with an additional 55 koz in October extending this positive trend.

- **Increased automotive demand as platinum replaces palladium in gasoline and diesel car emissions control:** Over 80% of palladium is produced as a by-product, to nickel in Russia and platinum in South Africa, and consequently material short-term palladium supply growth is not possible. In May 2019, Johnson Matthey (JM) forecast palladium's eighth consecutive deficit in 2019 of over 800 koz as significant palladium demand growth is expected as China implements China 6, which is more stringent than US and EU (RDE) regulations. JM estimated the China 6 implementation palladium demand growth in 2019 alone at 500 koz. This growth would only be softened by the reduced car sales in China rather than see palladium consumption decline as some commentators have suggested.

The palladium price rose above that of platinum in September 2017 and in 2019 to date has traded, on average, \$637/oz higher than platinum. This remains well above the level autocatalyst manufacturers suggested as the point of substitution in gasoline engines on cost grounds alone.

The high price, sustained demand growth and limited supply growth of palladium now makes material platinum demand growth due to substitution of some palladium in gasoline cars extremely likely. Resolving divergent views on when this substitution will occur is being helped by several detailed examples of how it will occur. Initial concerns focused on reduced washcoat stability in high temperature gasoline engines. This is said to cause platinum particles to agglomerate more than palladium ones (losing surface area and catalytic efficiency through sintering). This is now shown to be less relevant as substitution can occur first in large, low temperature gasoline V6 and V8 engines in the US, in lower temperature underfloor catalyst bricks in gasoline cars and in palladium-containing diesel autocatalysts. This substitution, even if gradual and if only 10% of palladium in these uses is replaced, is sufficient for meaningful – several hundred thousand ounces – annual platinum demand growth.

Many investors may have been unaware of palladium use in diesel catalysts when considering substitution by platinum. The amount of palladium used in diesel autocatalyst applications in key markets (Western Europe, North America and China) is c. 700 koz of palladium per annum. Platinum substituting palladium in diesel catalysis – the natural and long-standing home of platinum – has much lower emissions control risk than substitution in gasoline catalysis. This should significantly shorten implementation lead time. In May 2019 Johnson Matthey said it expected that platinum use in diesel autocatalysts to replace palladium could grow by tens of thousands of ounces in the short to medium term. At that stage the palladium price was \$470/oz above platinum but in Q3 this rose to an average of \$653/oz and since the start of Q4, palladium has averaged \$839/oz above platinum. This rapid rise in the palladium premium, despite the rising platinum price, will have increased the urgency with which automakers and fabricators implement this substitution in diesel emissions control systems.

- **Increased diesel automotive demand due to increased sales:** We expect further stabilisation in the diesel share of Western European car sales. From 1st September 2019, all cars sold must comply with Euro 6d Temp emissions requirements (RDE) which includes on-road emissions testing. Independent on-road testing has shown that these new diesel car NO_x levels are significantly below the 168 mg/km required; some as low as 21 mg/km. To avoid massive fleet CO₂ fines, automakers are expected to promote diesel cars, something they have avoided since 2015, which is likely to increase diesel sales and platinum demand. The diesel portion of car sales in the EU continues to decline at a slower rate but while diesel car sales in the EU were down by 14% year-on-year to the end of September, diesel car sales in Germany over the same period were up by 8%. Slow growth in the total number of battery electric and hybrid vehicles sold in the EU further increases the need for higher diesel sales to help avoid fleet CO₂ fines.
- **Growing demand for fuel cell electric vehicles:** There is increasing acceptance that fuel cell electric vehicles will sit alongside battery electric vehicles as part of a multi-drivetrain solution to achieve zero on-road emissions. News flow related to heavy duty and non-road fuel cell vehicle applications, including trains, has increased significantly during 2019. Platinum's demand growth from fuel cells will be driven initially by heavy duty applications.

WPIC initiatives highlights

We continue to focus on increasing the number and impact of product partnerships in two of our key target markets, China and North America.

In China, initiatives launched through our Shanghai office continue to increase significantly the awareness and ownership of platinum as an investment asset. Our collaboration and partnerships with large and prestigious Chinese organisations such as Bank of China, Agricultural Bank of China and China Gold Association is raising public and institutional awareness of how to invest

in platinum despite some infrastructure challenges. Four of our partners are now producing and selling platinum bars, enhancing retail availability and choice. We have a strong pipeline of new partners and products that will assist in enhanced awareness and distribution of platinum in 2020 and beyond.

In the US we are pleased to note continued good progress with two new partnerships with A-Mark Precious Metals and Sunshine Minting Inc.

WPIC product partnerships typically increase the number, quality and awareness of platinum investment products available to investors worldwide. In addition, the established links between our partners and their clients, customers and partners are invaluable in increasing awareness of platinum as an investment asset and amplifying the distribution of WPIC research and insights. We are pleased to have partnered with the CME Group who now provide WPIC insights to their global audiences. This will further enhance the impact and effectiveness of the WPIC Research and Investor Development programme that contributes directly to meeting the research and insight needs of the growing pool of investors actively considering an investment in platinum.

The heightened global prominence of addressing climate change has elevated the importance of reducing CO₂ emissions from vehicles; making clean diesel and fuel cell electric vehicles more likely to provide short- and medium-term solutions in this regard. The sustained elevated level of global debt with negative yields maintains the increased attractiveness of precious metals, including platinum. This provides a helpful platform to enhance the demand growth potential that has already bolstered platinum's investment case.

Paul Wilson, CEO

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PLATINUM QUARTERLY Q3 2019

Table 1: Supply, demand and above ground stocks summary

	2018	2019f	2020f	2019f/2018 Growth %	2020f/2019f Growth %	Q2 2019	Q3 2019
Platinum Supply-demand Balance (koz)							
SUPPLY							
Refined Production	6,120	6,225	6,110	2%	-2%	1,630	1,500
South Africa	4,470	4,520	4,365	1%	-3%	1,180	1,090
Zimbabwe	465	460	460	-1%	0%	120	115
North America	350	370	410	6%	11%	100	80
Russia	665	690	695	4%	1%	185	170
Other	170	185	180	9%	-3%	45	45
Increase (-)/Decrease (+) in Producer Inventory	+10	-20	+0	N/M	-100%	+20	-40
Total Mining Supply	6,130	6,205	6,110	1%	-2%	1,650	1,460
Recycling	1,935	1,990	2,000	3%	1%	495	500
Autocatalyst	1,420	1,495	1,530	5%	2%	365	385
Jewellery	510	485	460	-5%	-5%	130	115
Industrial	5	10	10	100%	0%	0	0
Total Supply	8,065	8,195	8,110	2%	-1%	2,145	1,960
DEMAND							
Automotive	3,100	2,960	2,860	-5%	-3%	760	695
Autocatalyst	2,955	2,805	2,705	-5%	-4%	720	665
Non-road	145	150	155	3%	3%	40	35
Jewellery	2,305	2,160	2,110	-6%	-2%	545	545
Industrial	1,915	1,905	1,945	-1%	2%	475	465
Chemical	570	625	635	10%	2%	150	175
Petroleum	240	235	245	-2%	4%	55	55
Electrical	205	210	215	2%	2%	50	50
Glass	245	215	205	-12%	-5%	60	50
Medical and Biomedical	240	240	245	0%	2%	70	45
Other	415	380	400	-8%	5%	90	90
Investment	15	1,200	525	N/M	-56%	90	230
Change in Bars, Coins	280					60	35
Change in ETF Holdings	-245					30	205
Change in Stocks Held by Exchanges	-20					0	-10
Total Demand	7,335	8,225	7,440	12%	-10%	1,870	1,935
Balance	730	-30	670	N/M	N/M	275	25
Above Ground Stocks	4,140*	3,055	3,695	-1%	22%		

Source: SFA (Oxford). *As of 31st December 2012. NB: Numbers have been independently rounded. N/M means not meaningful.

Notes:

- All estimates are based on the latest available information. They are subject to revision in our subsequent quarterly reports in the event that additional information is identified.
- The WPIC did not publish quarterly estimates for 2013 or the first two quarters of 2014. However, quarterly estimates from Q3 2014, to Q3 2017 are contained in previously published PQs which are freely available on the WPIC website. Quarterly estimates from Q4 2017 and half-yearly estimates from H2 2017 are included in Tables 3 and 4 respectively, on pages 17-18 (supply, demand and above ground stocks).
- The 2019 and 2020 forecasts are based on historical data and trends as well as modelling, with varying degrees of accuracy depending upon the supply or demand category. Investment demand is expected to be the least predictable segment. Some historical views are based on data and modelling that pre-date WPIC publication of PQ.

2019 THIRD QUARTER PLATINUM MARKET REVIEW

Global platinum supply declined by 8% year-on-year to 1,960 koz in Q3'19, following an 11% drop in mine supply to 1,460 koz which dwarfed a 2% rise in recycling to 500 koz. Total platinum demand increased by 7% to 1,935 koz, largely owing to another strong quarter for investment demand, particularly ETFs. Elsewhere, however, jewellery consumption fell by 4% year-on-year to 545 koz, automotive demand decreased by 3% to 695 koz, and industrial end-use requirements were down by 1% to 465 koz. As a result of lower supply and higher demand, the market tightened to a 25 koz surplus in Q3'19 (see Chart 1 below).

Chart 1: Supply-demand balance, koz, Q3 2019

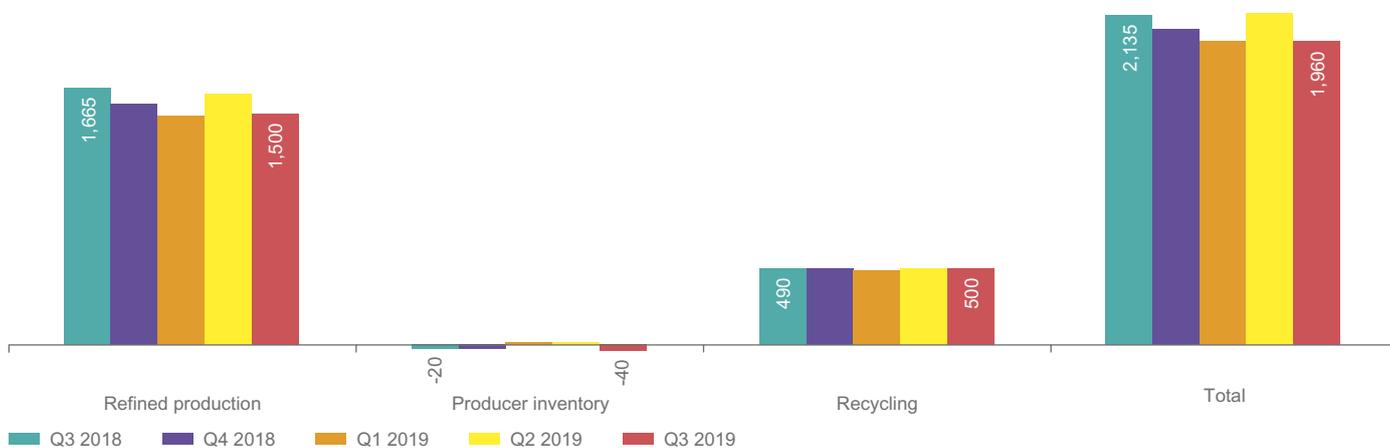


Source: SFA (Oxford)

Supply

Global refined production fell by 10% (-165 koz) year-on-year to 1,500 koz (Chart 2) in the third quarter of 2019 owing to reduced output from South Africa. Planned maintenance at smelting operations on the Western Limb constrained processing capacity and, as a result, refined output from South Africa declined by 11% (-140 koz) year-on-year to 1,090 koz in Q3'19. Supply fell marginally in Zimbabwe by 4% (-5 koz) year-on-year due to repair work at concentrating facilities. In North America, growth in production from the US was offset by a drop in production from Canada, resulting in a decline from the region of 11% (-10 koz) year-on-year to 80 koz. Output from Russia was also down by 6% (-10 koz) year-on-year to 170 koz because of the commissioning of a new precious metals concentrate production line at metallurgical facilities. Supply was stable at 45 koz in other regions in Q3'19. Total mining supply dropped 11% year-on-year to 1,460 koz owing to a 40 koz increase in producer inventory.

Chart 2: Platinum supply, koz

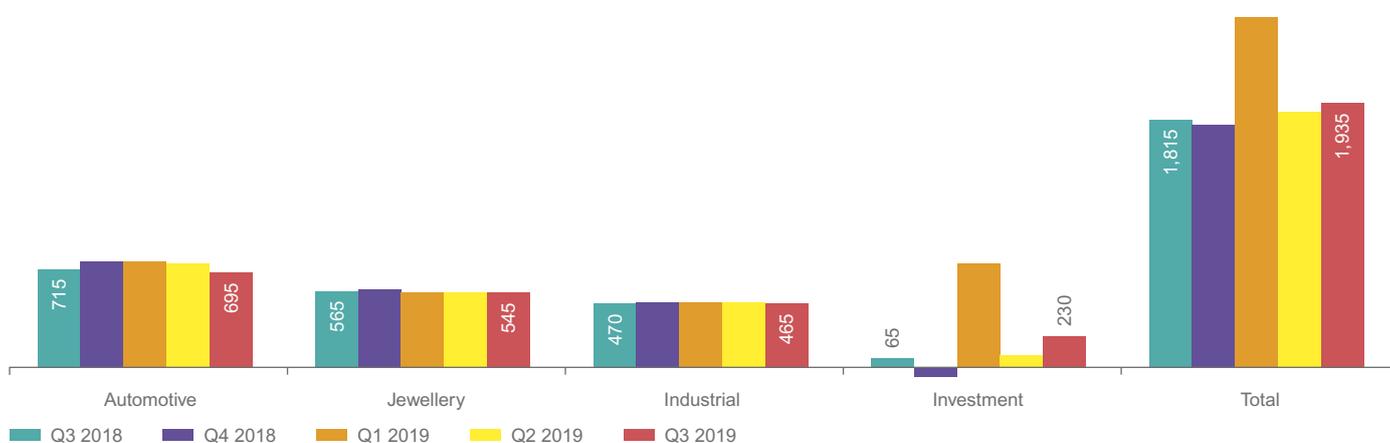


Source: SFA (Oxford)

Platinum recovered from recycled autocatalysts and jewellery totalled 500 koz in the third quarter, up 2% (+10 koz) year-on-year. Growth in autocatalyst recycling was partially offset by a decline in jewellery recycling. Autocatalyst recycling expanded by 5% (+20 koz) year-on-year to 385 koz. Scrappage rates remained high and record palladium prices encouraged the flows of catalysts to recyclers. Jewellery recycling was 115 koz in Q3'19, down 8% year-on-year, as the modest improvement in the platinum price towards the end of the quarter did not have an appreciable impact on the amount of jewellery recycled.

Demand

Chart 3: Platinum demand, koz



Source: SFA (Oxford)

Automotive demand

Third quarter automotive demand for platinum fell by 3% year-on-year to 695 koz, but by 9% from 760 koz compared to the previous quarter.

Western Europe still accounts for about 40% of global platinum automotive demand, despite peaking in 2016, and remains the largest market by far, with North America and Japan less than half the size, while China and India are less than a fifth the size of Europe.

Diesel shares in Western Europe continue to decline, but the rate of decline has stabilised through 2019. By the end of the third quarter of 2019 (year to date), diesel's share had fallen to 32.2% of new car sales in Western Europe, down from 36.9% for the same period of 2018. Among Europe's 'Big 5' automotive markets, Italy leads with 41.7% diesel, while the UK brings up the rear on 26.3%, with France and Germany each on around 34% (source: LMC Automotive). Diesel mild hybrid powertrains are slowly displacing conventional diesel powertrains as they offer further improvements in already competitive fuel economy for relatively modest additional cost. Mild hybrids' autocatalysts, and hence platinum content, are essentially the same as those of a conventional diesel car.

Sales in India, the second-largest market for light-duty diesel vehicles, remain stubbornly weak, affected by both automotive-specific and wider issues. Tighter credit conditions and more rigorous lending criteria make it harder for many people to finance a car, while vehicle prices have been rising to reflect the higher safety and emissions standards which must be built into all cars, along with higher acquisition costs (registration and insurance fees). Weak consumer sentiment continues to affect most purchases.

Jewellery demand

Jewellery demand for platinum was down 4% at 545 koz in Q3'19 compared to the same quarter last year, but remained flat quarter-on-quarter. Demand in China continued to shrink, but was offset by an uptick in consumption from Japan and a seasonal increase in India.

China's platinum jewellery demand slipped further during the quarter. Platinum purchases from the Shanghai Gold Exchange (SGE) by jewellery end-users endured another double-digit drop year-on-year for the quarter. Fabricators and vertically integrated retailers were winding down their inventory as companies continued to report higher fabrication numbers than both their purchase and sales numbers. Unsurprisingly, the performance of the major Hong Kong brands was impacted by protests: Chow Tai Fook reported a 7% decline in its same-store sales in mainland China and a 42% drop in Hong Kong & Macau, while Luk Fook reported a 25% decline for mainland China and a 39% drop for Hong Kong & Macau. Official statistics for jewellery retail sales were down 5% year-on-year in Q3'19, as higher metal prices and shifting consumer preferences dampened demand.

Reduced GDP growth and higher gold prices have impacted footfall in jewellery stores in India, thereby limiting platinum jewellery demand growth to 10% year-on-year in the third quarter. In Japan, jewellery demand has fluctuated throughout the year, but was up in Q3'19 as consumers rushed to purchase ahead of the increase in consumption tax to 10% on 1 October. North American demand is down 6% year-on-year owing to a difficult jewellery retail environment which is undergoing major restructuring whereby traditional stores are closing in favour of online retail.

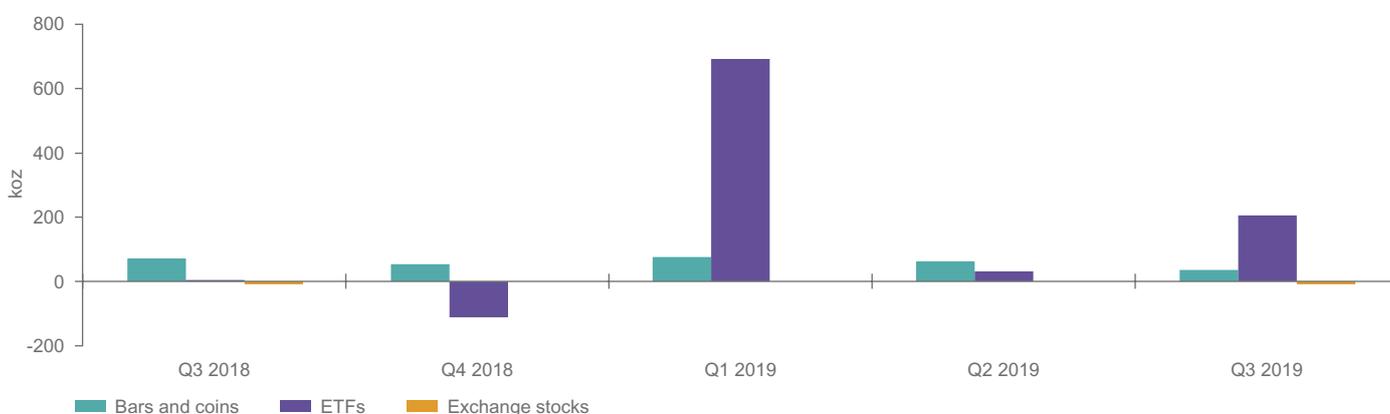
Industrial demand

Third quarter industrial demand for platinum decreased by 1% year-on-year (-5 koz) to 465 koz, which was also down 2% (-10 koz) from Q2'19. Greater requirements for chemical catalysis were offset by lower demand for use in glass fabrication and other industrial applications. Fewer new glass fabrication facilities and expansions are expected to be completed in the RoW region during the second half of this year compared to the same period in 2018, particularly in Southeast and West Asia, reducing new metal demand for fabrication equipment during Q3'19. Conversely, in China the construction of major new paraxylene plants boosted new chemical catalyst requirements last quarter, along with new propane dehydrogenation (PDH) capacity in the country.

Investment demand

Platinum investment demand was 230 koz in Q3'19 (Chart 4), as ETF investment and bar and coin demand increased while exchange stocks fell slightly. Bar and coin investment was a relatively modest 35 koz. Net bar purchases in Japan, the largest market, dropped almost 50% from the second quarter. Bar purchases were strong while the price held fairly steady through July and August, but investors took some profits and sold bars as the price climbed in September, reaching its highest level of the year. Coin sales were also lower than earlier in the year when the US Mint released the platinum American Eagle coin.

Chart 4: Platinum investment



Source: SFA (Oxford)

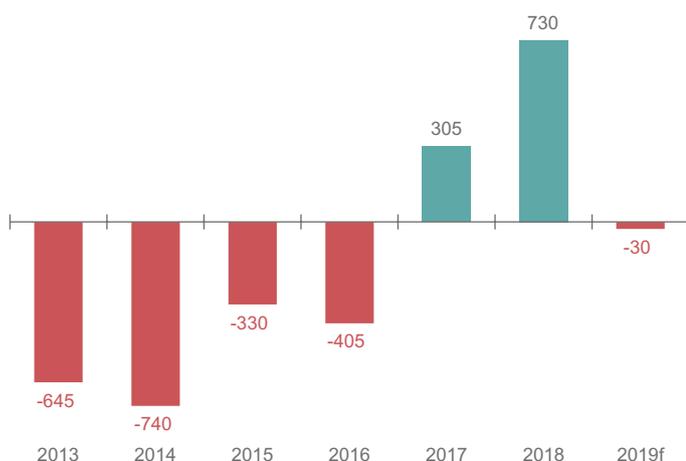
ETFs saw another quarter of positive flows. After a relatively quiet second quarter, ETF investors' net purchases came to 205 koz in Q3'19. The majority of those gains were in the UK, where ETF holdings grew by 182 koz, while US and Swiss investors increased their holdings by 83 koz and 21 koz respectively. However, South African and Japanese investors reduced their ETF holdings by 62 koz and 21 koz respectively. As was the case with bars in Japan, these net sales from ETFs appear to be profit-taking. In South Africa, the platinum price exceeded ZAR14,000/oz for the first time since 2016.

2019 FORECAST

Global platinum supply is predicted to increase by 2% year-on-year to 8,195 koz this year, supported by greater primary (+2%) and secondary (+3%) supply. Total mining supply is forecast to be up by 1% (+75 koz) to 6,205 koz in 2019. South Africa (+50 koz), Russia (+25 koz), North America (+20 koz) and other regions (+15 koz) are all expected to increase year-on-year, while output from Zimbabwe is forecast to decline marginally (-5 koz). In addition, producer inventory levels are anticipated to build by 20 koz. Platinum supply from recycling is set to rise by 3% to 1,990 koz, as growth in autocatalyst recycling (+5% to 1,495 koz) should outweigh a drop in recycled jewellery volumes (-5% to 485 koz).

Total platinum demand is projected to grow by 12% to 8,225 koz in 2019, predominately owing to strong investment demand eclipsing reductions in automotive (-5%), jewellery (-6%) and industrial (-1%) end-uses. ETF investors have significantly increased their platinum holdings this year, with the full-year total looking likely to beat the 2013 record of 906 koz. Conversely, lower requirements in Western Europe and India are expected to reduce automotive consumption to 2,960 koz, while a decline in China sees jewellery demand decrease to 2,160 koz. Meanwhile, industrial usage is estimated to fall to 1,905 koz, despite growth in the chemical sector. Following the substantial increase in investment demand, the market now looks set to shift to a slight deficit of 30 koz this year (Chart 5).

Chart 5: Supply-demand balance, koz, 2013-2019f



Source: SFA (Oxford)

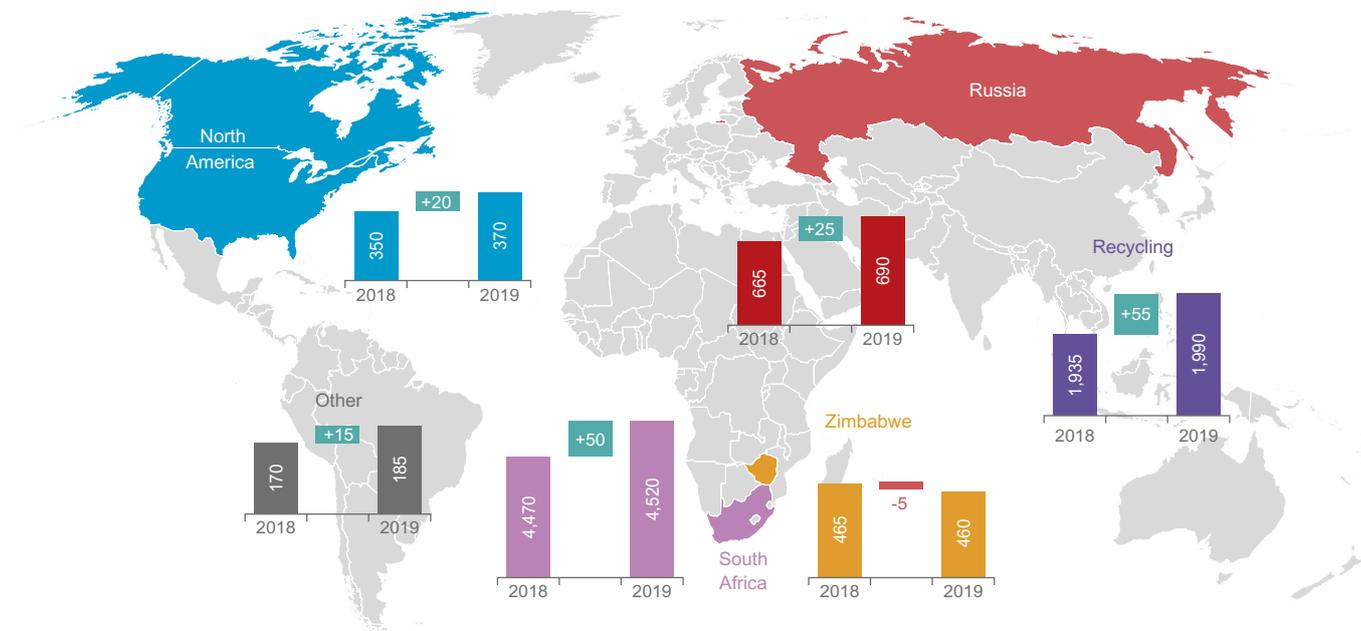
Mine supply

Global refined production is estimated to rise by 2% (+100 koz) year-on-year in 2019 to 6,225 koz. South African output is predicted to increase by 1% (+50 koz) to 4,520 koz as the ramp-up of new production and the addition of work-in-progress stock offset the decline in production resulting from shaft closures and mine depletion. Supply from Russia is expected to grow by 4% (+25 koz) year-on-year following the release of accumulated work-in-progress inventory in the first half of the year. Zimbabwean output is forecast to fall marginally by 1% (-5 koz) to 460 koz owing to extended repair work at concentrating operations. The ramp-up of new production in North America is likely to result in a 6% increase (+20 koz) in 2019, while growth of 15 koz is also anticipated from the RoW. In the first nine months of 2019, producer inventories were up by 20 koz, meaning that total mining supply is expected to equate to 6,205 koz for 2019, an increase of 1% (+75 koz) on 2018 mining supply.

Recycling

Platinum recycling is projected to reach 1,990 koz this year, an increase of 3% (+55 koz) year-on-year, as automotive recycling continues to grow while jewellery recycling shrinks. Secondary supply from spent autocatalysts is forecast to rise by 5% to 1,495 koz this year. The number of vehicles reaching end-of-life is growing and rising numbers of diesel cars are being scrapped in Europe, which is boosting the amount of platinum being recovered. Jewellery recycling is projected to decline by 5% this year to 485 koz, as the low platinum price restricts the value and hence the amount of jewellery being traded in.

Chart 6: Changes in supply, koz, 2019f vs. 2018



Source: SFA (Oxford)

Automotive demand

Global automotive demand is forecast to reach 2,960 koz in 2019, down 5% (-140 koz) from 3,100 koz in 2018.

In Europe, the platinum content of light-duty diesel aftertreatment is being thrifted somewhat, even as the final stage of Euro 6d legislation is implemented in January 2020. Catalyst functionality is increasingly being combined; in particular, the roles of the previously separate platinum-rich diesel particulate filter (DPF) and no-platinum selective catalytic reduction (SCR) are being merged onto one 'brick'. Platinum retains a role on the diesel oxidation catalyst (DOC).

In September, the Indian government offered some support to automakers by cutting the corporate tax for domestic manufacturing companies from 30% to 22%, with the aim of further stimulating the economy. By reducing the burden of corporate tax on automakers, it has enabled some modest price reductions (Rs5,000, up to 2%) on new vehicles for sale; this includes some diesel models including the Swift, Baleno, Dzire and Tour S from Maruti Suzuki, India's top automaker. The platinum content of some diesel cars is likely to be starting to increase as automakers get ahead of the introduction of tighter light- and heavy-duty emissions standards (Bharat VI) in 2020.

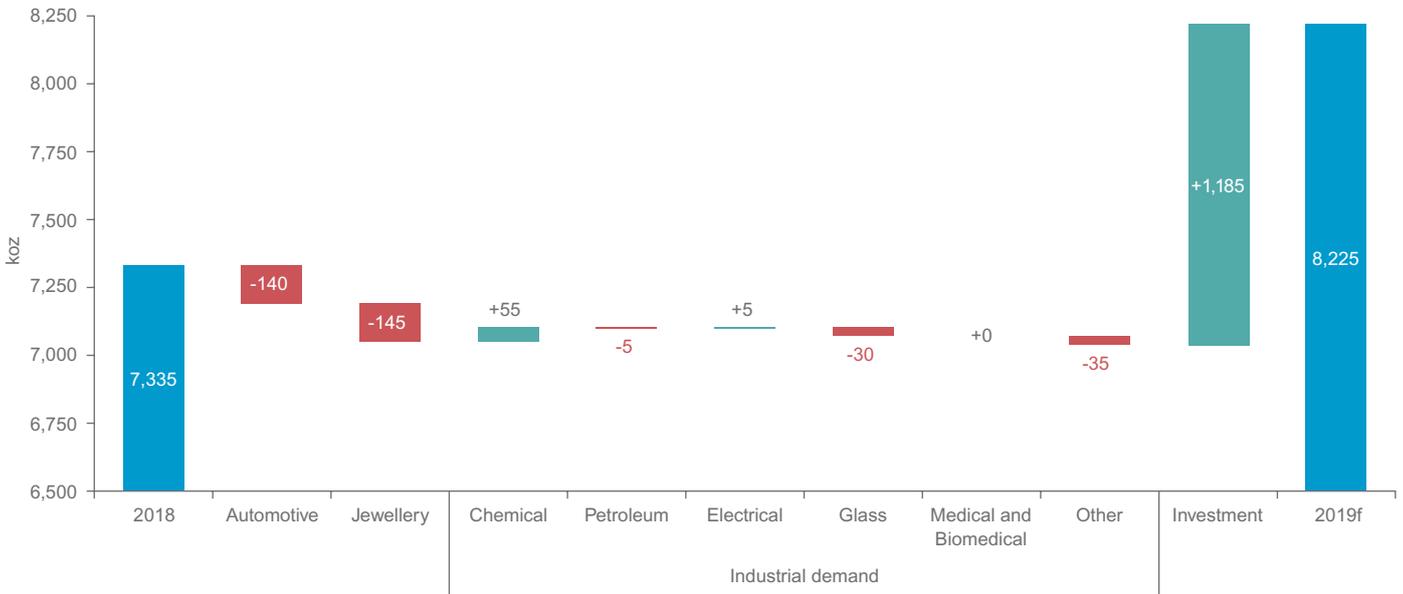
Jewellery demand

Global platinum jewellery demand is forecast to drop by 6% to 2,160 koz compared to 2018 levels. The ongoing pullback in Chinese jewellery demand is the primary reason, as the country still accounts for around half of the world's platinum jewellery consumption.

China is set to see another double-digit decline in platinum jewellery demand in 2019 from 1,155 koz in 2018, as the industry adapts to changing consumer habits towards lower price points, leading to lightweight pieces. This works against platinum's inherent density properties, although new lightweight designs are steadily coming to market. Activity on exchange and imports are expected to remain tepid as major players are likely to continue to draw down inventory.

Elsewhere, platinum jewellery demand is set to remain flat year-on-year, with steady growth from India helping to offset slight contractions in North America and Western Europe.

Chart 7: Changes in demand by category, 2019f vs. 2018

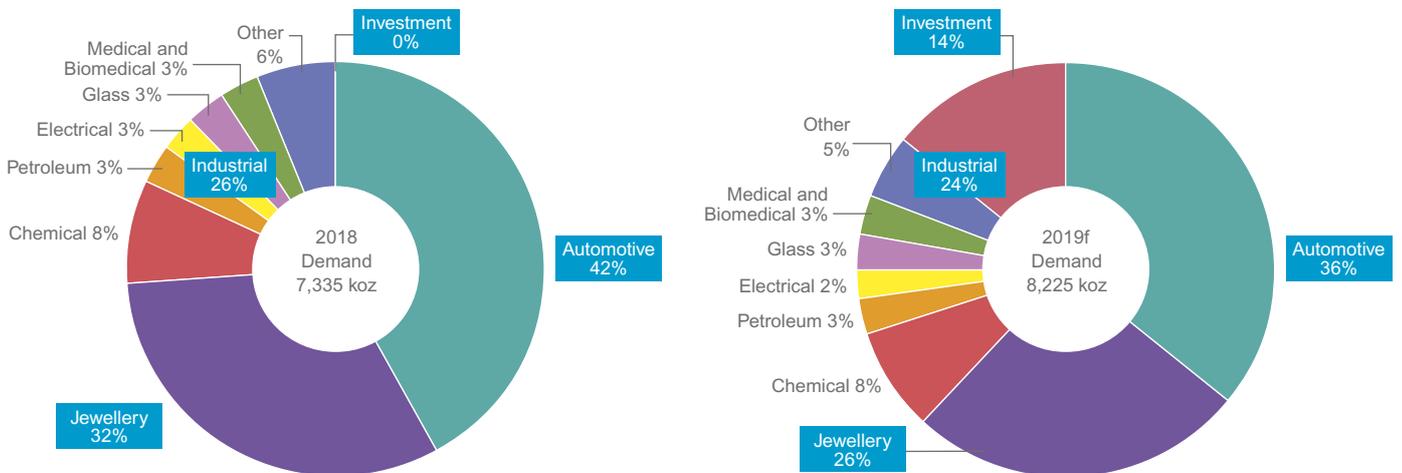


Source: SFA (Oxford)

Industrial demand

Industrial demand for platinum is estimated to fall by 1% year-on-year (-10 koz) to 1,905 koz in 2019, primarily owing to lower requirements for glass fabrication (-30 koz) and other end-uses (-35 koz), which together should more than offset growth in the chemical sector (+55 koz). Elsewhere, changes in platinum use are predicted to be relatively minor, with electrical demand set to increase by 5 koz and petroleum requirements decreasing by the same amount, while usage in medical applications remains stable year-on-year.

Chart 8: Demand end-use shares, 2019f vs. 2018



Source: SFA (Oxford)

Chemical

Platinum use in the chemical industry is forecast to grow by 10% to 625 koz (+50 koz) this year, following substantial capacity expansion in China. Major new paraxylene plants in Zhejiang and Liaoning, linked to the construction of large integrated refining and petrochemical complexes, should boost new catalyst requirements in the country during 2019, as should new platinum-based PDH capacity in Fujian and growing silicone production nationally. Similarly, in the US a new isobutane dehydrogenation (iBDH) plant in Texas is likely to lift new metal demand marginally this year, while minor growth in the silicone and nitric acid segments is also set to increase usage in Western Europe slightly.

Petroleum

Net petroleum requirements are predicted to drop by 2% to 235 koz in 2019, as growth in China is eclipsed by declining demand in the RoW. Catalytic reforming and isomerisation capacity is set to expand in China this year, driven by tighter automotive emissions standards and the need to produce compliant fuels, with upgrades planned by major domestic refiners. Conversely, however, the rate of capacity expansion is forecast to decelerate in the RoW, especially in India, where several refineries were upgraded last year ahead of the implementation of stricter emissions standards. As a result, new catalyst purchases are likely to weaken somewhat in the region this year following the spike in India's demand in 2018.

Electrical

Electrical demand is expected to be up by 2% to 210 koz this year, owing to minor growth in China and the RoW. The total number of platters (disks) required for hard disk drives (HDDs) is forecast to rise by 1% in 2019, lifting platinum consumption, as an increase in the average number of disks per HDD outweighs a decline in overall HDD shipments. Strong growth in the high-capacity, multi-disk enterprise segment should account for this increase in the average and overall number of disks required for HDDs, and thus growth in HDD platinum requirements.

Glass

Platinum use in glass fabrication is projected to decline by 12% to 215 koz in 2019, largely owing to weaker demand in the RoW region. The timing of some of the new fabrication facilities and expansions due to be completed in the region this year, with many commissioned in Q1'19, meant that the new metal required was likely to have been purchased late in 2018 rather than in 2019, thereby lifting platinum requirements last year at the expense of demand this year. Demand is also set to decrease slightly in Western Europe (fewer new plants and expansions), whilst remaining stable in China year-on-year.

Other

Platinum consumption in other industrial end-uses is forecast to shrink by 8% to 380 koz this year, with lower usage in most regions, particularly Japan, North America and China. Softer demand for automotive sensors and spark plugs is expected to reduce platinum use in China during 2019, as domestic ICE-based vehicle production declines by 8%, while in Japan and the US, thrifting by some fuel cell manufacturers is predicted to temporarily decrease requirements for both transport and stationary fuel cell applications, trumping growth in unit volumes.

Investment demand

Investment demand is predicted to be 1,200 koz in 2019. ETF investors have, in aggregate, continued to increase their holdings and the total for the year looks set to comfortably beat the previous record of 906 koz that was seen in 2013 when the first platinum ETF was launched in South Africa. Bar and coin demand is projected to be somewhat lower than in 2018, mainly owing to a lower level of bar purchases in Japan.

2020 OUTLOOK

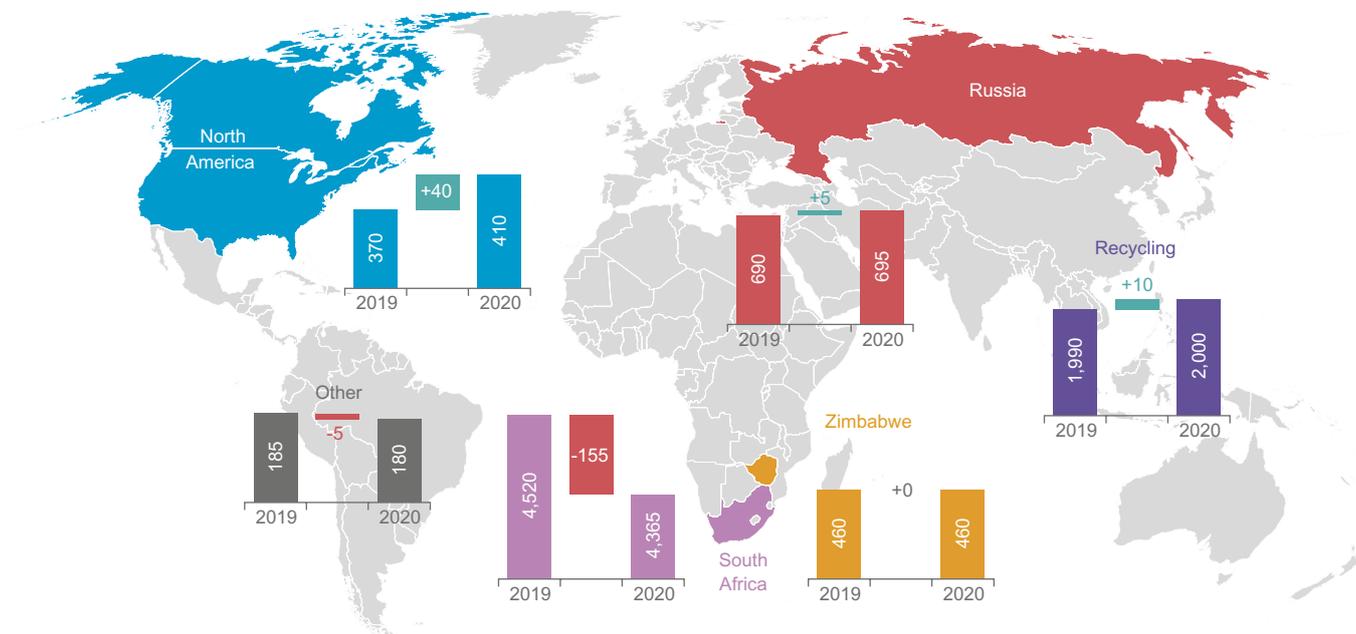
In 2020, global refined production is forecast to contract by 2% (-115 koz) year-on-year to 6,110 koz, largely as a result of shaft closures in South Africa which are expected to be implemented during the year. Consequently, refined production from South Africa is projected to fall by 3% (-155 koz) year-on-year to 4,365 koz in 2020. Output from North America is estimated to grow by 11% (+40 koz) to 410 koz next year owing to the ramp-up in new production, and Russian supply is also likely to rise by 1% (+5 koz) to 695 koz. Production for the rest of the world is forecast to decline by 3% (-5 koz) to 180 koz while output from Zimbabwe should remain stable at 460 koz.

Global secondary platinum supply is forecast to grow marginally to 2,000 koz (+10 koz), while autocatalyst recycling is expected to increase by 35 koz that is being mostly offset by a decline in jewellery recycling (-25 koz).

There are some issues that could hinder the flow of recycled material but, taking these into consideration, platinum autocatalyst recycling is still estimated to grow by 2% year-on-year to 1,530 koz as the number of vehicles being scrapped rises. The high lease rates and backwardation in palladium futures are making the management of working capital more difficult for scrap collectors and processors. There are growing numbers of diesel particulate filters (DPFs) which have a silicon carbide substrate that is more difficult to process than cordierite, limiting the number of facilities that can process them. The closure of a refinery means that autocatalyst recycling capacity in the northern hemisphere will be operating near capacity.

Jewellery recycling is predicted to decline by 5% to 460 koz next year. The downturn in the Chinese jewellery market is set to continue and the relatively low platinum price is expected to negatively impact the amount of jewellery that is being traded in and recycled in both China and Japan.

Chart 9: Changes in supply, koz, 2020f vs. 2019f



Source: SFA (Oxford)

Automotive demand of 2,860 koz is forecast for 2020, down 3% (-100 koz) from 2019. The forecast reduction is largely due to the ongoing, but slowing, decline in the market share of diesel passenger cars in Western Europe combined with reduced autocatalyst loadings owing to a reconfiguration and consolidation of after-treatment systems.

In Europe, the final stage of Euro 6d legislation will be implemented in January 2020. However, the reduction in autocatalyst loadings as a result of the combination of the previously separate platinum containing diesel particulate filter with the no-platinum selective catalytic reduction (SCR) brick exceeds the increase in loading of the diesel oxidation catalyst.

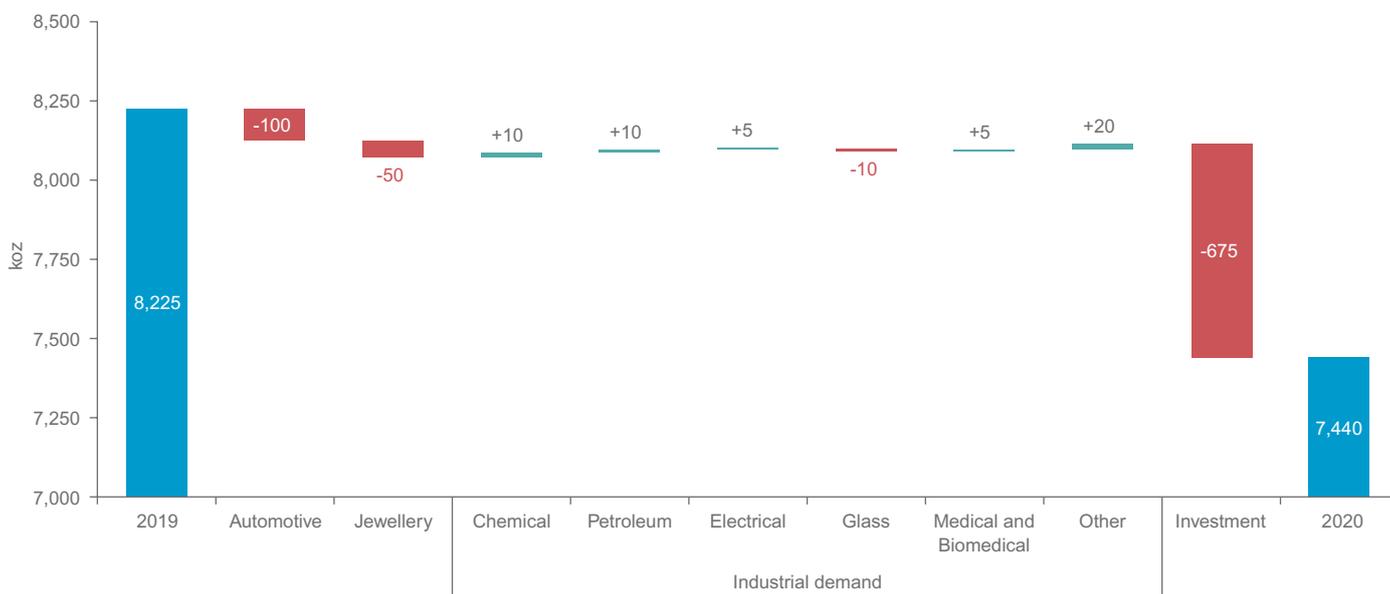
Substitution of platinum, to replace some of the palladium in gasoline three-way catalysts (TWC) and in diesel oxidation catalysts is being investigated, reflecting the favourable pricing and market balance of platinum compared to palladium. To implement such substitution extensive development and testing work is required to ensure that such reformulated catalysts will comply with increasingly stringent emission legislation. The developments and testing work are not at an advanced enough stage to result in any additional platinum demand from substitution in 2020.

Tightening emissions legislation will support diesel aftertreatment and hence increase platinum content in India for light vehicles and in China and India for heavy-duty vehicles. This increase is insufficient to offset the decline forecast in Europe.

In India, there is upside for platinum demand as BS VI emissions legislation will be introduced from April 2020 for all new light- and heavy-duty vehicles, a significant step up from BS IV. Compliance with these standards will require a considerable increase in PGM loadings, principally platinum, in the aftertreatment, up from, in some cases, minimal PGM content in BS IV vehicles. The additional cost of BS VI aftertreatment carries a high risk of some demand destruction (automakers offer fewer models, higher prices deter customers) in the diesel light-vehicle segment, where alternative gasoline powertrains have similar performance but lower aftertreatment costs. Heavy-duty powertrains have little alternative to diesel, so the upside for platinum demand is more certain than for cars.

China VI heavy-duty emissions standards are set for implementation from July 2021, essentially mandating diesel particulate filters (DPFs) with significant platinum content for heavy-duty vehicles. Implementation has already been brought forward in some areas to July 2019 under the government's Blue Skies initiative, so a steady ramp-up of platinum use is likely through 2020 as catalyst fabricators and automakers produce an increasing share of their output to meet China VI.

Chart 10: Changes in demand by category, 2020f vs. 2019f



Source: SFA (Oxford)

This year has been a particularly difficult one for the jewellery industry. US-China trade wars impacting tourism spending, a softer economic environment, restructuring of retail towards online channels, the high price of gold and the shift to lighter-weight jewellery pieces have all had a negative impact on platinum demand. In 2020, demand is forecast to fall at a slower rate, mainly as excess stocks are wound down in China and new lightweight jewellery designs help to offset declining sales of heavier pieces. Nonetheless, it will remain a difficult task to recover platinum jewellery sales growth in China. On this basis, demand in China is projected to drop below 1 moz for the year and global jewellery demand forecasts indicate a 2% contraction.

Industrial platinum demand is projected to rise by 2% year-on-year (+40 koz) to 1,945 koz in 2020, supported by steadily growing requirements in most sectors, including chemical (+10 koz), petroleum (+10 koz), electrical (+5 koz), medical (+5 koz) and other end-uses (+20 koz). In the chemical industry, expanding PDH capacity plus rising silicone and nitric acid production across Asia are expected to lift platinum demand in the RoW region, while greater fuel cell adoption in Japan and the US should boost consumption in other industrial applications. Similarly, a major new gas-to-liquids (GTL) plant and stronger expansion of oil refining capacity in the RoW are forecast to increase net requirements for petroleum processes next year, dwarfing small declines in North America, Western Europe and Japan (refinery closure). However, demand growth is likely to be tempered by lower usage in the glass industry (-10 koz), as fabrication capacity growth is set to slow throughout the RoW.

Platinum investment in 2020 is forecast to be 525 koz. ETFs are expected to have another positive year, but not to come close to the 2019 total. Bar and coin demand is predicted to remain at a similar level to 2019. The yen is forecast to strengthen modestly next year and that should push down the yen price which will encourage investors to continue to purchase bars in Japan.

ABOVE GROUND STOCKS

The market is predicted to have a deficit of 30 koz this year before shifting back to a 670 koz surplus in 2020, which would result in above ground stocks ending 2019 at 3,025 koz and increasing to 3,695 koz at the end of next year.

The WPIC definition of above ground stocks is: the year-end estimate of the cumulative platinum holdings not associated with exchange-traded funds, metal held by exchanges or working inventories of mining producers, refiners, fabricators or end-users.

PLATINUM QUARTERLY Q3 2019

Table 2: Supply, demand and above ground stocks summary – annual comparison

	2013	2014	2015	2016	2017	2018	2019f	2020f	2019f/2018 Growth %	2020f/2019f Growth %
Platinum Supply-demand Balance (koz)										
SUPPLY										
Refined Production	6,070	4,855	6,160	6,035	6,125	6,120	6,225	6,110	2%	-2%
South Africa	4,355	3,115	4,480	4,255	4,380	4,470	4,520	4,365	1%	-3%
Zimbabwe	405	405	405	490	480	465	460	460	-1%	0%
North America	355	400	385	395	365	350	370	410	6%	11%
Russia	740	740	710	715	720	665	690	695	4%	1%
Other	215	195	180	180	180	170	185	180	9%	-3%
Increase (-)/Decrease (+) in Producer Inventory	-215	+350	+30	+30	+30	+10	-20	+0	N/M	-100%
Total Mining Supply	5,855	5,205	6,190	6,065	6,155	6,130	6,205	6,110	1%	-2%
Recycling	1,980	2,035	1,705	1,840	1,890	1,935	1,990	2,000	3%	1%
Autocatalyst	1,120	1,255	1,185	1,210	1,325	1,420	1,495	1,530	5%	2%
Jewellery	855	775	515	625	560	510	485	460	-5%	-5%
Industrial	5	5	5	5	5	5	10	10	100%	0%
Total Supply	7,835	7,240	7,895	7,905	8,045	8,065	8,195	8,110	2%	-1%
DEMAND										
Automotive	3,115	3,255	3,370	3,460	3,325	3,100	2,960	2,860	-5%	-3%
Autocatalyst	2,975	3,110	3,235	3,320	3,185	2,955	2,805	2,705	-5%	-4%
Non-road	140	150	140	135	140	145	150	155	3%	3%
Jewellery	2,945	3,000	2,840	2,505	2,460	2,305	2,160	2,110	-6%	-2%
Industrial	1,485	1,575	1,710	1,810	1,680	1,915	1,905	1,945	-1%	2%
Chemical	535	540	530	580	560	570	625	635	10%	2%
Petroleum	50	65	205	215	100	240	235	245	-2%	4%
Electrical	195	215	205	195	210	205	210	215	2%	2%
Glass	145	175	200	205	180	245	215	205	-12%	-5%
Medical and Biomedical	220	220	225	230	235	240	240	245	0%	2%
Other	340	360	345	385	395	415	380	400	-8%	5%
Investment	935	150	305	535	275	15	1,200	525	N/M	-56%
Change in Bars, Coins	-5	50	525	460	215	280				
Change in ETF Holdings	905	215	-240	-10	105	-245				
Change in Stocks Held by Exchanges	35	-115	20	85	-45	-20				
Total Demand	8,480	7,980	8,225	8,310	7,740	7,335	8,225	7,440	12%	-10%
Balance	-645	-740	-330	-405	305	730	-30	670	N/M	N/M
Above Ground Stocks	4,140*	3,495	2,755	2,425	2,020	2,325	3,055	3,695	-1%	22%

Source: SFA (Oxford). *As of 31st December 2012. NB: Numbers have been independently rounded. N/M means not meaningful.

PLATINUM QUARTERLY Q3 2019

Table 3: Supply and demand summary – quarterly comparison

	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q3'19/Q3'18 Growth %	Q3'19/Q2'19 Growth %
Platinum Supply-demand Balance (koz)										
SUPPLY										
Refined Production	1,580	1,300	1,605	1,665	1,565	1,480	1,630	1,500	-10%	-8%
South Africa	1,110	915	1,160	1,230	1,170	1,030	1,180	1,090	-11%	-8%
Zimbabwe	140	115	115	120	120	115	120	115	-4%	-4%
North America	95	90	85	90	90	85	100	80	-11%	-20%
Russia	190	140	200	180	145	205	185	170	-6%	-8%
Other	45	40	45	45	40	45	45	45	0%	0%
Increase (-)/Decrease (+) in Producer Inventory	+25	-5	+55	-20	-20	+5	+20	-40	100%	N/M
Total Mining Supply	1,605	1,295	1,660	1,645	1,545	1,485	1,650	1,460	-11%	-12%
Recycling	505	460	485	490	495	480	495	500	2%	1%
Autocatalyst	365	330	345	365	380	355	365	385	5%	5%
Jewellery	140	130	140	125	115	125	130	115	-8%	-12%
Industrial	0	0	0	0	0	0	0	0	N/M	N/M
Total Supply	2,110	1,755	2,145	2,135	2,040	1,965	2,145	1,960	-8%	-9%
DEMAND										
Automotive	850	800	810	715	770	770	760	695	-3%	-9%
Autocatalyst	810	765	775	680	735	735	720	665	-2%	-8%
Non-road	35	35	40	35	40	40	40	35	0%	-13%
Jewellery	680	595	585	565	575	550	545	545	-4%	0%
Industrial	435	470	475	470	485	475	475	465	-1%	-2%
Chemical	135	145	135	155	135	155	150	175	13%	17%
Petroleum	25	55	55	55	55	55	55	55	0%	0%
Electrical	65	55	50	50	55	55	50	50	0%	0%
Glass	35	55	60	70	60	65	60	50	-29%	-17%
Medical and Biomedical	70	55	70	45	70	55	70	45	0%	-36%
Other	105	105	105	95	110	90	90	90	-5%	0%
Investment	100	60	-55	65	-65	765	90	230	254%	156%
Change in Bars, Coins	65	85	70	70	50	75	60	35	-50%	-42%
Change in ETF Holdings	55	-15	-125	5	-115	690	30	205	N/M	N/M
Change in Stocks Held by Exchanges	-20	-10	0	-10	0	0	0	-10	0%	N/M
Total Demand	2,065	1,925	1,815	1,815	1,765	2,560	1,870	1,935	7%	3%
Balance	45	-170	330	320	275	-595	275	25		

Source: SFA (Oxford). NB: Numbers have been independently rounded. N/M means not meaningful.

PLATINUM QUARTERLY Q3 2019

Table 4: Supply and demand summary – half-yearly comparison

	H2 2017	H1 2018	H2 2018	H1 2019	H1'19/H1'18 Growth %	H1'19/H2'18 Growth %
Platinum Supply-demand Balance (koz)						
SUPPLY						
Refined Production	3,145	2,905	3,230	3,110	7%	-4%
South Africa	2,250	2,075	2,400	2,210	7%	-8%
Zimbabwe	240	230	240	235	2%	-2%
North America	190	175	180	185	6%	3%
Russia	375	340	325	390	15%	20%
Other	90	85	85	90	6%	6%
Increase (-)/Decrease (+) in Producer Inventory	+15	+50	-40	+25	N/M	N/M
Total Mining Supply	3,160	2,955	3,190	3,135	6%	-2%
Recycling	985	945	985	975	3%	-1%
Autocatalyst	695	675	745	720	7%	-3%
Jewellery	290	270	240	255	-6%	6%
Industrial	0	0	0	0	N/M	N/M
Total Supply	4,145	3,900	4,175	4,110	5%	-2%
DEMAND						
Automotive	1,635	1,610	1,485	1,530	-5%	3%
Autocatalyst	1,560	1,540	1,415	1,455	-6%	3%
Non-road	70	75	75	80	7%	7%
Jewellery	1,260	1,180	1,140	1,095	-7%	-4%
Industrial	855	945	955	950	1%	-1%
Chemical	295	280	290	305	9%	5%
Petroleum	50	110	110	110	0%	0%
Electrical	115	105	105	105	0%	0%
Glass	80	115	130	125	9%	-4%
Medical and Biomedical	115	125	115	125	0%	9%
Other	200	210	205	180	-14%	-12%
Investment	90	5	0	855	N/M	N/M
Change in Bars, Coins	110	155	120	135	-13%	13%
Change in ETF Holdings	15	-140	-110	720	N/M	N/M
Change in Stocks Held by Exchanges	-35	-10	-10	0	-100%	-100%
Total Demand	3,840	3,740	3,580	4,430	18%	24%
Balance	305	160	595	-320		

Source: SFA (Oxford). NB: Numbers have been independently rounded. N/M means not meaningful.

PLATINUM QUARTERLY Q3 2019

Table 5: Regional demand – annual and quarterly comparison

	2013	2014	2015	2016	2017	2018	2019f	2020f	2019f/2018 Growth %	2020f/2019f Growth %	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019
Platinum gross demand (koz)															
Automotive	3,115	3,255	3,370	3,460	3,325	3,100	2,960	2,860	-5%	-3%	715	770	770	760	695
North America	425	465	500	460	425	450									
Western Europe	1,345	1,420	1,550	1,705	1,555	1,295									
Japan	580	590	510	455	440	410									
China	130	120	125	160	190	185									
India	160	160	175	170	170	190									
Rest of the World	475	500	510	510	545	570									
Jewellery	2,945	3,000	2,840	2,505	2,460	2,305	2,160	2,110	-6%	-2%	565	575	550	545	545
North America	200	230	250	265	280	280									
Western Europe	220	220	235	240	250	255									
Japan	335	335	340	335	340	345									
China	1,990	1,975	1,765	1,450	1,340	1,155									
India	140	175	180	145	175	195									
Rest of the World	60	65	70	70	75	75									
Chemical	535	540	530	580	560	570	625	635	10%	2%	155	135	155	150	175
North America	55	55	55	55	50	50									
Western Europe	110	105	80	115	110	110									
Japan	10	10	10	15	15	15									
China	195	215	235	230	215	215									
Rest of the World	165	155	150	165	170	180									
Petroleum	50	65	205	215	100	240	235	245	-2%	4%	55	55	55	55	55
North America	40	25	-25	90	55	55									
Western Europe	-45	-15	70	10	5	25									
Japan	10	-35	5	0	-40	5									
China	80	-5	45	80	45	10									
Rest of the World	-35	95	110	35	35	145									
Electrical	195	215	205	195	210	205	210	215	2%	2%	50	55	55	50	50
North America	10	15	15	10	15	15									
Western Europe	5	10	10	10	10	10									
Japan	15	15	15	15	15	15									
China	75	70	70	80	90	85									
Rest of the World	90	105	95	80	80	80									
Glass	145	175	200	205	180	245	215	205	-12%	-5%	70	60	65	60	50
North America	5	10	0	20	5	5									
Western Europe	-10	15	10	5	5	35									
Japan	0	-25	-5	-10	-10	0									
China	90	85	95	100	85	75									
Rest of the World	60	90	100	90	95	130									
Medical	220	220	225	230	235	240	240	245	0%	2%	45	70	55	70	45
North America	90	90	90	90	95	95									
Western Europe	75	75	75	80	80	80									
Japan	20	20	20	20	20	20									
China	15	15	20	20	20	20									
Rest of the World	20	20	20	20	20	25									
Other industrial	340	360	345	385	395	415	380	400	-8%	5%	95	110	90	90	90
Investment	935	150	305	535	275	15	1,200	525	N/M	-56%	65	-65	765	90	230
Total Demand	8,480	7,980	8,225	8,310	7,740	7,335	8,225	7,440	12%	-10%	1,815	1,765	2,560	1,870	1,935

Source: SFA (Oxford). NB: Numbers have been independently rounded.

GLOSSARY OF TERMS

Above ground stocks

The year-end estimate of the cumulative platinum holdings not associated with: exchange-traded funds, metal held by exchanges or working inventories of: mining producers, refiners, fabricators or end-users. Typically, unpublished vaulted metal holdings from which a supply-demand shortfall can be readily supplied or to which a supply-demand surplus can readily flow.

ADH

Alkane dehydrogenation: catalytic conversion of alkanes to alkenes. Broad term encompassing BDH and PDH.

BDH

Butane dehydrogenation; catalytic conversion of isobutane to isobutylene.

Bharat Stage V/VI standards (BS-V, BS-VI)

Early in 2016 the Indian government announced the intention to 'leapfrog' Bharat Stage V and move directly to Bharat Stage VI, equivalent to Euro 6, in 2020.

Conformity factor (CF)

The EU is to allow automakers to exceed current Euro 6 NO_x limits, giving time to adapt to new real-world driving emissions rules. From September 2017 for new models and from September 2019 for new vehicles, a CF of up to 2.1 (110%) will be allowed over the 80 mg/km NO_x limit. This CF will be phased out at the latest in 2021, then from January 2020 (new models) and January 2021 (new vehicles) a lower CF of 1.5 will be allowed, reflecting statistical and technical uncertainty of the tests.

Diesel oxidation catalyst (DOC)

A DOC oxidises harmful carbon monoxide and unburnt hydrocarbons, produced by incomplete combustion of diesel fuel, to harmless carbon dioxide and water.

Diesel particulate filter (DPF) and catalysed diesel particulate filter (CDPF)

A DPF physically filters particulates (soot) from diesel exhaust. A CDPF adds a PGM catalyst coating to facilitate oxidation and removal of the soot. The terms are often used interchangeably.

Emissions legislation

Tailpipe regulations covering emissions of particulate matter, hydrocarbons and oxides of nitrogen.

ETF

Exchange-traded fund. A security that tracks an index, commodity or basket of assets. Platinum ETFs included in demand are backed by physical metal.

Euro V/VI emission standards

EU emission standards for heavy-duty vehicles. Euro V legislation was introduced in 2009 and Euro VI in 2013/2014; will be widely adopted later in other regions.

Euro 5/6 emission standards

EU emission standards for light-duty vehicles. Euro 5 legislation was introduced in 2009 and Euro 6 in 2014/2015; will be widely adopted later in other regions.

Form factor

The size of a hard disk drive (e.g. 2.5-inch or 3.5-inch) which varies depending on the device the drive is used in.

GTL

Gas-to-liquids is a refinery process that converts natural gas to liquid hydrocarbons such as gasoline or diesel fuel.

HDD

Hard disk drive.

HDV

Heavy-duty vehicle.

ICE

Internal combustion engine.

koz

Thousand ounces.

LCD

Liquid-crystal display used for video display.

LCV

Light commercial vehicle.

Lean NO_x traps (LNT)

Rhodium-based, catalyses the chemical reduction of NO_x in diesel engine exhaust to harmless nitrogen.

Metal-in-concentrate

PGMs contained in the concentrate produced after the crushing, milling and froth flotation processes in the concentrator. It is a measure of a mine's output before the smelting and refining stages.

moz

Million ounces.

NEDC

New European Driving Cycle vehicle emissions test.

Net demand

A measure of the theoretical requirement for new metal, i.e. net of recycling.

Non-road engines

Non-road engines are diesel engines used, for example, in construction, agricultural and mining equipment, using engine and emissions technology similar to on-road heavy-duty diesel vehicles.

NO_x storage catalyst (NSC)

Used in light duty diesel aftertreatment to convert harmful oxides of nitrogen to harmless nitrogen and carbon dioxide. The PGM content is mainly platinum, with some rhodium. NSCs may be used in conjunction with SCR technology to minimise NO_x emissions.

OECD

Organisation for Economic Co-operation and Development, consisting of 34 developed countries.

oz

A unit of weight commonly used for precious metals.
1 troy ounce = 1.1 ounces.

Paraxylene

A chemical produced from petroleum naphtha extracted from crude oil using a platinum catalyst. This is used in the production of terephthalic acid which is used to manufacture polyester.

PDH

Propane dehydrogenation, where propane is converted to propylene.

PGMs

Platinum-group metals.

PMR

Precious metals refinery.

Producer inventory

As used in the supply-demand balance, the change in producer inventory is the difference between reported refined production and metal sales.

RDE

Real Driving Emissions – the term used by the EU to define the testing protocol that will measure pollutants emitted from cars, including NO_x, while driven on the road. It is in addition to laboratory tests. RDE testing was implemented in September 2017 for new types of cars and will apply to all registrations from September 2019.

Refined production

Processed platinum output from refineries.

Secondary supply

Recycling output.

Selective catalytic reduction (SCR)

PGM-free, converts harmful NO_x in diesel exhaust to harmless nitrogen, via a tank of urea solution. Used in heavy-duty diesel vehicles, increasingly competes with LNT in light-duty diesel vehicles. Contained within an aftertreatment system which normally requires a platinum-containing oxidation catalyst ahead of the SCR unit.

SGE

Shanghai Gold Exchange.

SSD

Solid-state drive.

Stage 4 regulations

European emission standards implemented in 2014 for non-road diesel engines.

Three-way catalyst

Used in gasoline cars to remove hydrocarbons, carbon monoxide and NO_x. Largely palladium-based now, some rhodium.

Tier 4 stage

Emissions standards phased in between 2008 and 2015 in the US for non-road vehicles.

WIP

Work in progress.

WLTP

Worldwide Harmonised Light Vehicle Test Procedure is a laboratory test to measure pollutant emissions and fuel consumption. WLTP replaces the New European Driving Cycle (NEDC).

WPIC

The World Platinum Investment Council.

Ounce conversion

1 million troy ounces = 31.1 tonnes.

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