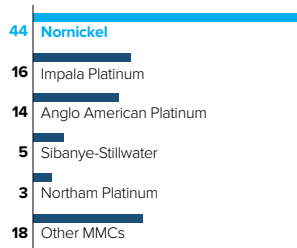


PALLADIUM (Pd)

THE COMPANY'S INDUSTRY POSITION

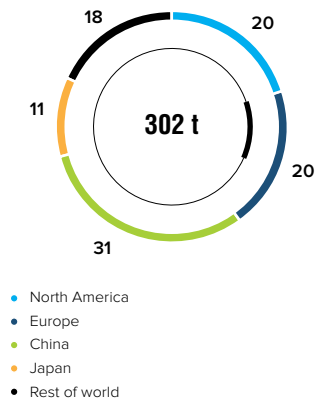
No 1

NO. 1 IN PALLADIUM PRODUCTION¹ (%)



Source: Company data

INDUSTRIAL CONSUMPTION OF PALLADIUM BY REGION (%)



Source: Company data

KEY TRENDS IN THE PALLADIUM MARKET

Despite price volatility in the first half of 2020, palladium chalked up further gains over the year. Early in 2020, palladium maintained its price momentum from the second half of 2019 amid high demand and metal shortages on the spot market, hitting an all-time high of USD 2,795/oz on 28 February. After reaching this level, palladium plummeted by almost 45% in March amid a global pandemic and the automotive industry virtually grinding to a halt. However, the plunge was followed by an equally fast recovery, supported by a faster-than-expected

pick-up in the automotive industry and suspended processing operations at South Africa's mines. Palladium price was further bolstered by a weaker US dollar and negative real yields of treasury bills in key countries stemming from extraordinary monetary and fiscal measures taken by central banks and governments across the world. By year end, palladium price consolidated between USD 2,315/oz and USD 2,350/oz. Average annual net speculative positions dropped 71% to 10 tonnes on the New York Mercantile Exchange (NYMEX).

AVERAGE ANNUAL PALLADIUM PRICES (USD/OZ)

2015	2016	2017	2018	2019	2020
691	613	869	1,029	1,538	2,197

Source: LPPM

MARKET BALANCE

Since 2010, there has been a sustained undersupply in the physical palladium market covered by the inventories accumulated in previous years. In 2020, palladium supply deficit was fully offset by drawdown of consumers' strategic stocks on lower demand and uncertainty caused by the pandemic and lower ETF inventories.

2020 palladium prices averaged at

2,197
USD/oz,

up 43% from the 2019 average of USD 1,538/oz.

¹ Refined metal including production from own feedstock by third parties under tolling agreements

PALLADIUM MARKET BALANCE IN 2020 (T)²

Palladium production and consumption balance	-6
Outflows from ETFs	4
Destocking by consumers	2
Supply and demand balance	0

CONSUMPTION

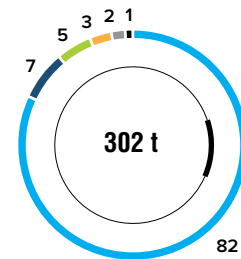
In 2020, industrial consumption of palladium decreased by 43 t (-14%) y-o-y to 302 t.

AUTOMOTIVE INDUSTRY

Exhaust treatment systems account for the bulk of total palladium consumption. In this sector, palladium is used in catalytic converters to detoxify exhaust fumes. In most countries, such converters are legally required to be installed on all motor vehicles.

Due to its unique catalytic properties ensuring effective chemical reactions throughout the entire vehicle life cycle, there are almost no alternatives to palladium in this sector except for platinum, which is used mostly in diesel vehicles, and rhodium. Given the already significant share of the automotive industry in rhodium consumption and small market size (annual global production stands at 23 t), rhodium is subject to high price volatility and risk of physical metal shortage.

PALLADIUM CONSUMPTION IN 2020 BY INDUSTRY (%)



- Exhaust aftertreatment systems
- Electronics
- Chemical catalysts
- Dental alloys
- Jewellery
- Other

Source: Company data

INDUSTRIAL CONSUMPTION OF PALLADIUM IN 2019-2020 (t)



Source: Company data

² Excluding reallocated other reserves

In 2020, palladium consumption in the automotive industry decreased by 40 t. The plunge was driven primarily by the spread of the coronavirus infection and the subsequent halts in business activity across the globe. In early spring, most automakers had to suspend operations, while dealers stopped selling. However, new safety rules were implemented at production sites and sales outlets in a relatively short time, and automakers and their dealerships in various countries were able to resume operations by early summer. China, which was the first market to be hit by the pandemic and subsequent restrictions, led the global automotive market recovery in the second half of the year: while sales fell 79% y-o-y in February, they were up y-o-y as early as April. In the reporting period, car sales in China slipped 4%. European and North American automotive markets were slower to recover as they were affected by the pandemic later than China and were under restrictions for a longer period of time. In September, European and North American market recovery slowed down on fears of a second wave of COVID-19 and tougher restrictions. 2020 automobile sales in Europe and North America were down 20% and 15%, respectively. Notably, fiscal incentives and low interest rates have mitigated the negative impact of the pandemic on the global automobile industry. Fiscal incentives helped towards restoring consumers' purchasing power, while lower interest rates made car loans more affordable.

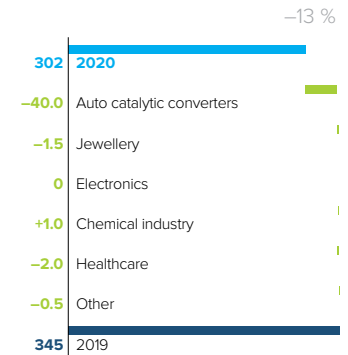
Despite declining car production and sales, higher usage of platinum group metals (PGMs) per autocatalyst partially offset the negative trend. The higher PGM loadings per vehicle were mostly driven by tougher regulations on pollutant emissions, including the Worldwide Harmonised Light Vehicle Test Procedure (WLTP) – a new procedure for testing cars' emissions that took

effect in the EU and Japan in September and October 2019, respectively. WLTP is designed to make tests more rigorous by extending their distance and duration, increasing the car weight, requiring faster acceleration, and stipulating that testing should be performed at different altitudes and temperatures. The Real Driving Emissions (RDE) test in the EU is another recently introduced regulation, in effect as of September 2019. These developments forced automakers to implement more sophisticated exhaust treatment systems and use more PGMs per catalytic converter. In China, the marked increase of palladium usage in autocatalysts came in the wake of tougher environmental requirements as part of the China 6b rollout across the country starting from 2019. The China 6b standard is based on best practices in emission control as developed in the USA and the EU, and sets out certain additional requirements.

Changes in the fleet mix also boosted palladium consumption among automakers as light diesel vehicles were further replaced with petrol cars and hybrids, which make greater use of palladium-based catalytic converters for exhaust fumes. The market share of diesel cars in Europe (the 27 EU countries + the UK + EFTA countries) dropped over the year from 30% to 26%.

Vehicle hybridisation is another trend driving palladium consumption. In 2020, production of hybrid-electric vehicles, so called mild, full and plug-in hybrids (PHEVs), increased by 69%, 8% and 51%, respectively. Since hybrids include petrol engines, they mostly use palladium-based catalytic converters. With the same engine displacement as the regular petrol vehicle, the hybrid uses more of the metal due to more frequent cold starts. The growing use of PGMs in the automotive industry is also driven by consumers migrating from sedans to larger-engine crossovers. In the USA, the SUV/pickup share grew by 5% to 69% in 2020.

CHANGE IN PALLADIUM CONSUMPTION IN 2019–2020 BY APPLICATION AREA (t)



Source: Company data

ELECTRONICS

In 2020, palladium consumption in the electronics industry remained unchanged at 23 t. In recent years, the use of palladium in multi-layer ceramic capacitors has been in decline, becoming limited to the most sophisticated products with a focus on reliability and performance in harsh environments, such as those in the defence and aerospace industries. Given the metal price inelasticity of demand, consumption in these sectors is expected to remain flat. Transition to 5G telecoms networks should also somewhat offset lower demand elsewhere. Moreover, despite disruptions at electronics assembly lines during the first half of the year, the work-from-home trend driven by the pandemic bolstered demand for laptops and TV sets.

CHEMICAL INDUSTRY

In 2020, the use of palladium in chemical catalysts increased by 1 t y-o-y. In the medium term, growing consumption of palladium in the chemical industry will be driven by newly launched terephthalic acid projects in China.

CHEMICAL INDUSTRY

The consumption of palladium in the healthcare sector continued a downward trend and declined by 23%, or 2 t, y-o-y due to the substitution of palladium with composite material alternatives and gold, which is currently priced lower. In Japan, the largest consumer of dental palladium, demand for palladium has been declining in recent years by an average of 5% to 10% per year.

JEWELLERY

Palladium is used in white gold alloys or in its pure form to make wedding rings among other items. In 2020, jewellery-related consumption of palladium decreased by another 1.5 t. A drop in Chinese demand for jewellery amidst a general slowdown in consumer spending and a consumer shift to other luxury goods were the primary cause of the continued sales decline. Sales of men's palladium wedding jewellery were also affected by growing prices for the metal.

INVESTMENTS

Investor demand for palladium kept shrinking in 2020 mostly due to outflows from exchange-traded funds (ETFs), which had their inventories reduced by 4 t to 18 t – an all-time low since 2008. The outflows amid growing palladium prices were driven by a wave of profit taking and by investors reallocating their capital to other palladium investment options.

PRODUCTION

In 2020, primary refined palladium production decreased by 10% y-o-y to 200 t.

In Russia, the leading palladium producing country, palladium output decreased by 3 t due to a high base effect from 2019, when the Krasnoyarsk Precious Metals Refinery (Krasstsvetmet) processed Nornickel's work-in-progress inventories that had been built up previously.

South Africa, the world's second largest producer, also demonstrated a decrease (– 19 t) in refined palladium output due to the COVID-19 nationwide lockdown and operational issues at Anglo American Platinum's pyrometallurgical facilities. In Zimbabwe, palladium output increased by 1 t.

Primary palladium production in Canada and the USA remained largely flat.

The main sources of recycled palladium supply are scrapped auto catalytic converters, as well as jewellery and electronic scrap. In 2020, recycled output declined by 15 t to 96 t due to COVID-19 restrictions and a drop in new car sales which, in turn, impacted the supply of vehicles for recycling.

The sources of previously accumulated palladium stockpiles include trading companies, financial institutions, government reserves, and consumers' surplus inventories.

ANNUAL PRIMARY PALLADIUM OUTPUT IN 2019–2020 (t)

2019:— 221 t

Countries	2020
South Africa	– 19
Zimbabwe	+1
Russia	– 3
Canada	0
USA	0
Rest of world	0
Total	200

Source: Company data