

Real Mining. Real People. Real Difference.

ANGLO AMERICAN PLATINUM Precious Metals Supply

Mr. J Ndlovu Executive: Processing Anglo American Platinum

Date: November 2015







Key Messages

- PGM production comprises 6 primary metals: Platinum (c. 52%), Palladium (c. 29%), Rhodium (c. 10%), Ruthenium (c. 6%), Iridium (c. 1%) and Osmium
- The PGM industry has always supplied the required PGM quantities to meet market demand
- Global PGM reserves at +200 years are adequate to meet future demand but current prices to low to incentivise new production
- The top 4 PGM miners are integrated from mining to refining and account for c. 80% of the market, whilst the top 5 fabricators account for c. 85% of fabricated products
- The processing technology is world class, with class leading efficiencies
- Significant innovation will be required to remain competitive and Anglo is looking for step changes in water and energy use and alternative forms of processing



Executive Summary

- Platinum Group Metals (PGMs) are recovered through both underground and open pit mining from polymetallic sulphide ores containing PGMs, Nickel, Copper and other metals:
 - Platinum (Pt), Palladium (Pd), Rhodium (Rh) and Ruthenium (Ru) are the most prevalent of the six PGMs, with Iridium (Ir), and Osmium (Os) found in much smaller quantities but mined concurrently
 - Gold is often associated with PGM deposits and treated as part of a family with Platinum, Palladium and Rhodium collectively known as "4E"
 - Nickel and Copper are the most prevalent base metals
 - Chromite (used to derive Chrome) is another significant byproduct
 - Silver and Cobalt are also found in trace quantities
 - Selenium, Tellurrium and Bismuth can and are sometimes recovered in trace quantities
- World PGM reserves total about 2,120⁽¹⁾ M oz (c.200 years at the current rate of production), most of which are found in relatively few areas of the world; South Africa (95%), Russia (2%), North America (1%) and Zimbabwe (1%)
- South Africa (SA) is the source of over 50% of newly mined PGMs and over 70% for Platinum⁽²⁾. PGM mining in South Africa is located in the Bushveld Complex in three regions commonly referred to as the Western, Eastern, and Northern Limbs
- The Bushveld Complex includes three **distinct mineral-bearing strata** known as **reefs**:
 - The Merensky Reef, the source of most current SA production, contains relatively higher PGM grades and ratios of Platinum (vs Palladium)
 - The **UG2 Reef**, a **chromite-rich** reef, is **more consistent**, but lacks Merensky's high yield of Gold, Copper and Nickel byproducts. UG2 ore may contain as much as twice the PGM reserves as Merensky and Platreef
 - Platreef is a wider reef with lower PGM values, but higher base metal content
- Its getting harder to remain profitable the "running hard to stand still" effect
 - Mines getting deeper with trickier geology
 - Society is demanding a fair share of the profit pool in a industry suffering from poor economics
 - No incentive for new production
- The future of technology in PGM mining is focused on creating a step change in mining extraction processes and effective use of critical resources such as water, energy



Overview of PGM Mining – Anglo American Production 20123

PGMs are exclusively found within composite sulphide ores, and therefore always linked with the mining and processing of multiple by-products

		Indicative Profile		Key Markets
		Production	% of Sales	
PGM	Platinum	c. 2.38 M oz	63%	Autocatalysts, Jewellery, Electrical, Fuel Cells
Orebodies ⁽¹⁾	Palladium	c. 1.38 M oz	19%	Autocatalysts, Electrical, Jewellery, Dental
	Ruthenium	0.7 M oz	1%	Data Storage, Electronics, Chemicals
Copper-Nickel Sulphide Ore	Rhodium	0.29 M oz	6%	Autocatalysts, Chemicals, Glass
	Iridium	0.07M oz	1%	Chemicals, Spark Plugs, Electronics, PGM Alloys
Chrome	Osmium	0 M oz	0%	No developed market
	Gold	0.1 M oz	3%	Jewellery, Investment, Electronics, Dental
	Silver	0.13 M oz	0.05%	Industrial, Jewellery, Photography, Investment
	Nickel	16.8kt	6%	Stainless Steel, Alloys, Plating, Batteries
PGMs	Copper	8.3 kt	2%	Wires & Cables, Brass, Copper Tube
Other Precious Metals	Cobalt	0.7 kt	0.1%	Alloys, Magnets, Dyeing, Li-ion Battery Electrodes
Base and Other Metals	Chrome	230 kt	1%	Stainless Steel, Chemicals

Source: Anglo Platinum. Notes: Production and sales figures are based on Anglo American Platinum 2013 sample. Sodium sulphate and sulphuric acid are also sold, but only total 0.12% of revenue. (1) "PGM orebodies" is a layman term used for descriptive purposes in this presentation. (2) Osmium is currently not refined.



Global PGM Production

Almost 52% of newly mined PGMs (and 72% of Platinum) are produced in Southern Africa, which also holds 96% of the world's total PGM reserves, over 200 years of demand





Industry Structure Overview

From mining through fabrication and end-use, the PGM value chain is highly concentrated





PGM Industry Structure Overview

Comments

Anglo Platinum leads the majors players in the PGM production market with c. 31% share



Refined PGM Production (2013)



Simplified PGM Activity Chain

Major PGM miners are integrated from mining to refining and therefore maintain considerable processing assets that produce both refined PGMs and by-products





Agenda





PGM Industry Fragmentation

SA PGM mining has become more fragmented since 2000, driven by empowerment legislation. However, refined metal sales have remained with the major players

South African Mine Production (2000 to 2013)



Comments

- SA government's "Use it or lose it" policies requires rights holders to timely develop resources
- New mining players, have come onto the market largely as a result of laws intended to address our discriminatory past
- In a over supplied market 'one mine' new entrants don't have the ability to curtail production due to capital already sunk

Source: Anglo Platinum, Johnson Matthey. Notes: Aquarius and Northam sales considered to be to the refiners as they do not have any refining capability in-house.



Industry Supply & Demand

Comments



Platinum Supply & Demand

Comments

- PGM demand has always been met
- During strike disruptions in 2014, industry was able to keep supplied
- Future supply is secure



Running hard to stand still – an industry in financial crisis

PGM prices are down c.25% this year with cost inflation of c.10%



Current PGM metal prices are as low as they were in 2005, **whilst input costs up circa 85%**

AngloAmerican

Our current reality – how long can industry burn so much cash?

If current PGM prices are sustained companies will not have the financial means to keep mines open or even open new ones



Crises - 80% of PGM industry can't cover its cash costs and SIB at current spot prices



Agenda





Current technology

Some of the most modern and efficient processing facilities



Comments

- Anglo operates underground and open pit mines
- The concentrating facilities are industry best practice
- Smelting and refining facilities considered best practice facilities
 - Unique converting process
 - World first automated nickel electro-winning



FUNDAMENTALLY Change Mining

Deliver step change value in mining performance by working together with partners to transform our operational practices using novel technologies

- Across the **full value chain**
- Technologies that will make a difference across multiple commodities
- Enhance performance of our **Tier 1 & 2 assets**
- Using **Open Forums** as a key tool

FutureSmart[™]



The future of Processing: Our Journey So far





Our aspiration for Sustainability and Processing

Water Open Forum

Could we:



Could we:



Redesign our processes and technology to be waterfree and/or only use recycled water



Redesign our processes and technology to adapt to any size and grade of ore deposit



Consume only minimal clean water for our own needs and the potential to be a user of others' waste water; help develop new sources of clean, potable water



Transform mineral processing into a **fully flexible** and highly **integrated manufacturing system**



Through water, create sustainable development opportunities not only for Anglo American, but for all stakeholders



Dramatically **reduce the energy**, **water** and **physical footprint** required for extracting minerals from ore



We are working on six key priority areas.....





Key Messages

- PGM production comprises 6 primary metals: Platinum (c. 52%), Palladium (c. 29%), Rhodium (c. 10%), Ruthenium (c. 6%), Iridium (c. 1%) and Osmium
- The PGM industry has always supplied the required PGM quantities to meet market demand
- Global PGM reserves at +200 years are adequate to meet future demand but current prices to low to incentivise new production
- The top 4 PGM miners are integrated from mining to refining and account for c. 80% of the market, whilst the top 5 fabricators account for c. 85% of fabricated products
- The processing technology is world class, with class leading efficiencies
- Significant innovation will be required to remain competitive and Anglo is looking for step changes in water and energy use and alternative forms of processing