Materials Processing Institute

1944 - 2019 75 YEARS OF INNOVATION

Ontong Java Development Company Ltd

# PGMs from Pig Iron

Materials and Process Innovation for a Sustainable Future

# Non-Standard Job

**Profit share from processed material.**

**Partners**

- Reginald Aipia Owner/Founder – Providing the metal ingots to Port in Solomon Islands.
- Ethos Eco – Technical Experts on processing PGMs, Logistics and Sales.
- MPI – Providing Facilities to process and also assess the finished material to equate potential value on sale.

Iron is from circa 18th century shipwreck(s)

- Solomon Island location

Material analysis shows PGM levels above those found in ‘good’ PGM ores

- Good PGM ore is 5 to 15 ppm
- These > 1000 ppm,
- Highest levels detected > 4000 ppm


https://www.thermofisher.com/blog/mining/why-mining-platinum-group-metals-can-be-fraught-with-difficulty/

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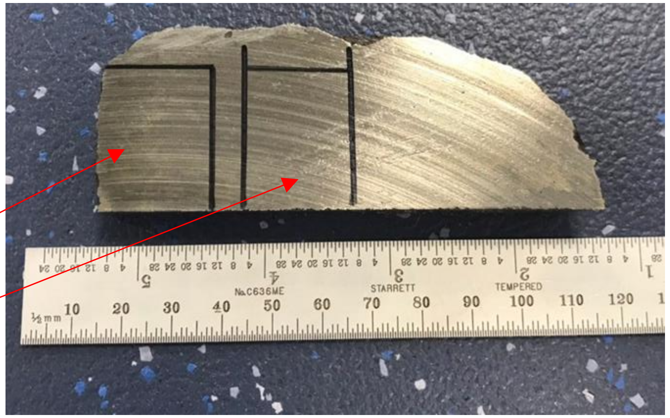
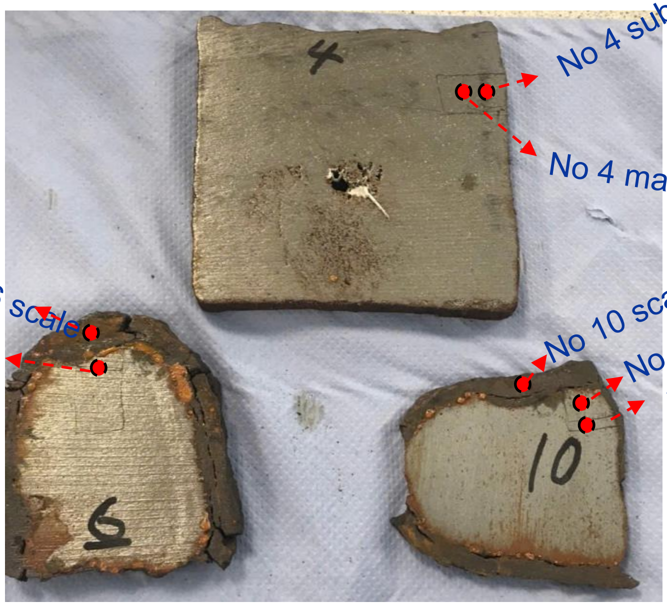
# PGM levels



Surface

centre




| | C | Al | Si | P | S | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | As | Nb | Ru | Rh | Pd | Os | Ir | Pt | Ag | Au |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| surface | 5.2 | 0.007 | 1.183 | 1.672 | 0.057 | 0.216 | 0.179 | 0.086 | 0.65 | 90.36 | 0.074 | 0.058 | 0.011 | 0.055 | 0 | 0.127 | 0 | 0.019 | 0 | 0.009 | 0.011 | 0.019 | 0.007 |
| centre | 5.2 | | 1.132 | 1.655 | 0.062 | 0.247 | 0.185 | 0.088 | 0.67 | 90.48 | | 0.057 | 0.01 | 0.041 | 0 | 0.126 | 0.003 | 0.018 | 0.008 | 0.005 | 0.009 | 0 | 0.002 |

| | C | Al | Si | P | S | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | As | Nb | Ru | Rh | Pd | Os | Ir | Pt | Total PGM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | mass% | ppm |
| No4 Sub surface | 5.2 | 0.01 | 5.578 | 0.899 | 0.064 | 0.229 | 0.014 | 0.024 | 1.325 | 86.37 | 0.074 | 0.038 | 0.012 | | | 0.125 | 0 | 0.021 | 0 | 0.005 | 0.015 | 1654 |
| No4 Matrix | 5.2 | 0.009 | 5.563 | 0.909 | 0.065 | 0.233 | 0.019 | 0.022 | 1.327 | 86.45 | | 0.034 | 0.012 | | | 0.125 | 0 | 0.018 | 0 | 0.007 | 0.005 | 1555 |
| No6 Scale | 5.2 | 0.116 | 3.549 | 3.03 | 0.46 | 0.524 | 0.542 | 0.306 | 1.278 | 83.86 | 0.085 | 0.283 | 0.057 | 0.255 | 0.014 | 0.341 | 0 | 0.04 | 0 | 0.013 | 0.02 | 4130 |
| No6 Sub surface | 5.2 | 0.012 | 1.129 | 1.616 | 0.045 | 0.2 | 0.169 | 0.084 | 0.618 | 90.63 | | 0.06 | 0.01 | 0.051 | | 0.125 | 0 | 0.019 | 0 | 0.015 | 0.019 | 1778 |
| No10 Scale | 5.2 | 0.277 | 9.905 | 1.464 | 0.342 | 0.221 | 0.243 | 0.144 | 0.658 | 80.2 | 0.069 | 0.122 | 0.025 | 0.091 | | 0.309 | 6E-04 | 0.07 | 0 | 0.009 | 0.02 | 4077 |
| No10 Sub surface | 5.2 | 0.01 | 1.012 | 1.555 | 0.097 | 0.177 | 0.166 | 0.083 | 0.623 | 90.75 | 0.055 | 0.059 | 0.01 | 0.042 | | 0.128 | 0 | 0.017 | 0 | 0.008 | 0.01 | 1630 |
| No10 Matrix | 5.2 | 0.01 | 1.018 | 1.592 | 0.077 | 0.177 | 0.165 | 0.083 | 0.622 | 90.72 | 0.061 | 0.058 | 0.011 | 0.046 | | 0.128 | 0.0006 | 0.02 | 0 | 0.005 | 0.008 | 1613 |

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# Risks

- XRF analysis shows circa 1600 to 4100 ppm
  - However, peak overlaps make it unclear
    - Cl may overlap with Ru, Rh, Pd
    - P overlaps Ir and Pt
  - However, analysis fits broadly with Ethos Eco’s other data access
- Non-standard job – profit share
  - However, variation on payment upon completion method
  - No agreement yet on profit share
  - No agreement if costs are removed first and then the remainder shared
  - May open up other opportunities
    - Indonesian contacts
      - Mine tailings
        - Need more detail from Ethos Eco
    - Rapid Ion Recovery cell
- Time – 2025/2026 processing.
- Tonnage – multiple 20,000 kg shipments minimum 140,000kg
- Ethos Eco will need to show provenance on material providing all export / antiquities licenses.

# PGM values

- Circa 140 tonnes of this iron available.
  - Taking max Ruthenium and min Ruthenium values (average everything else)
  - Estimated £8M to 12M of PGM in iron at full market price
    - (todays Johnson Matthey prices - https://matthey.com/products-and-markets/pgms-and-circularity/pgm-management )
  - Look to beneficiate to above 50% before selling on so will not get full value
    - Assuming 40% value
      - Will need to recover costs and a share of remaining from this 40%

| | $/troyoz | $/kg | £/kg |
|---|---|---|---|
| ruthenium | $ 485.00 | $ 15,593.09 | £ 12,318.54 |
| | | | |
| rhodium | $ 4,650.00 | $ 149,500.76 | £ 118,105.60 |
| palladium | $ 946.00 | $ 30,414.56 | £ 24,027.50 |
| osmium | | | |
| platinum | $ 946.00 | $ 30,414.56 | £ 24,027.50 |
| Irdium | $ 4,600.00 | $ 147,893.22 | £ 116,835.64 |

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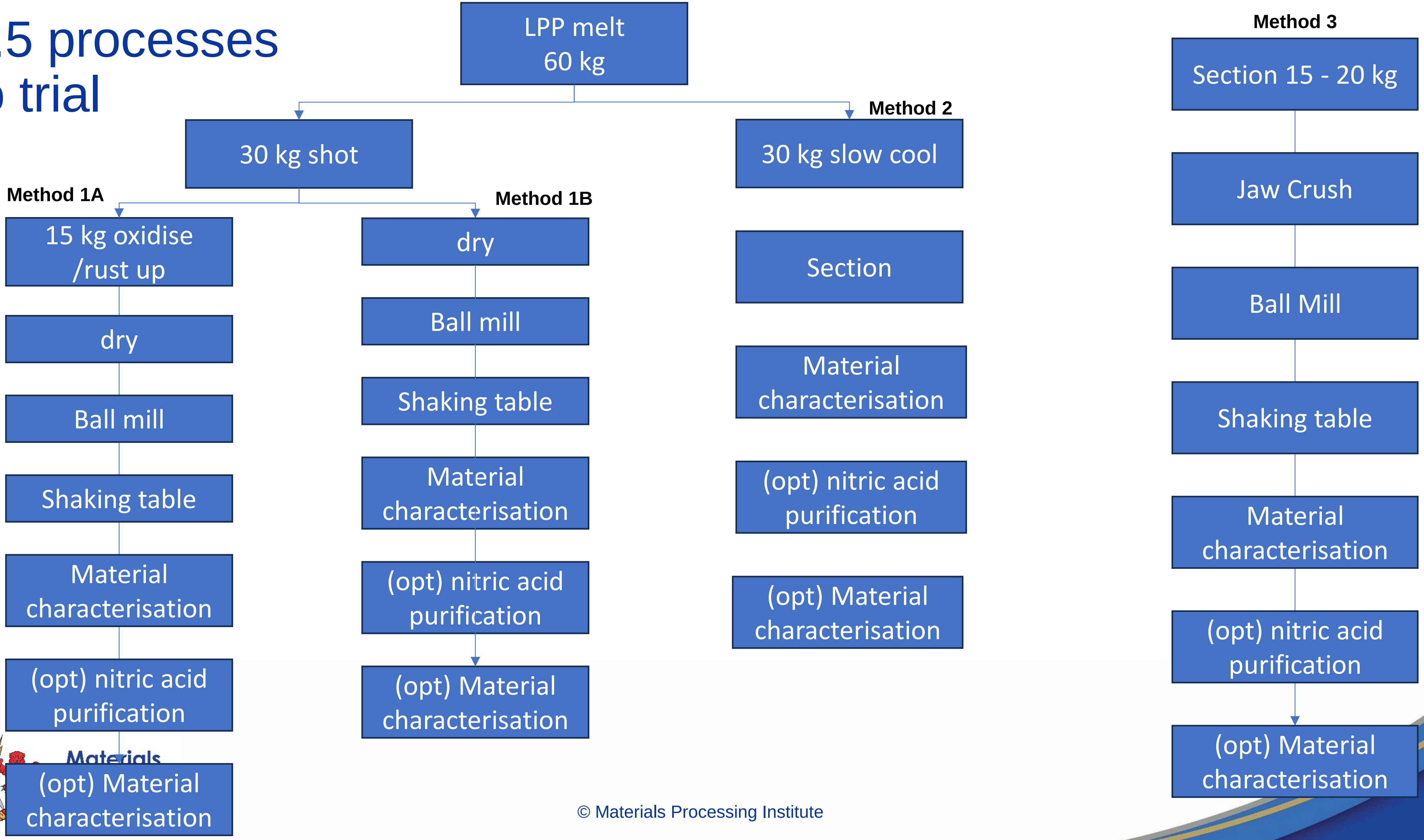
# 3.5 processes to trial



# Summary

- 140 tonnes of iron available
- Circa £8M to £12M in PGM value
  - Full market price
  - Full recovery
- Beneficiate to > 50% PGM
  - Assume 40% full market price to cover costs and split up?
- Requesting financial support from Ethos to aid in processing method.
  - Initial Process 500 kg of ingots due.
  - 20,000 kg phase 2 then x 6 over c.2025/26

- Risks involved
  - Prove out method to unlock revenue from process(es)
  - XRF peak overlap
  - Non-standard job
    - Paid on sale of materials
    - Profit share
    - Will need meeting with Ethos Eco?
    - Some sort of upfront agreement signed?

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# Thank You

Materials Processing Institute
Eston Road
Middlesbrough
TS6 6US
United Kingdom

+44 (0)1642 382000
enquiries@mpiuk.com

www.mpiuk.com

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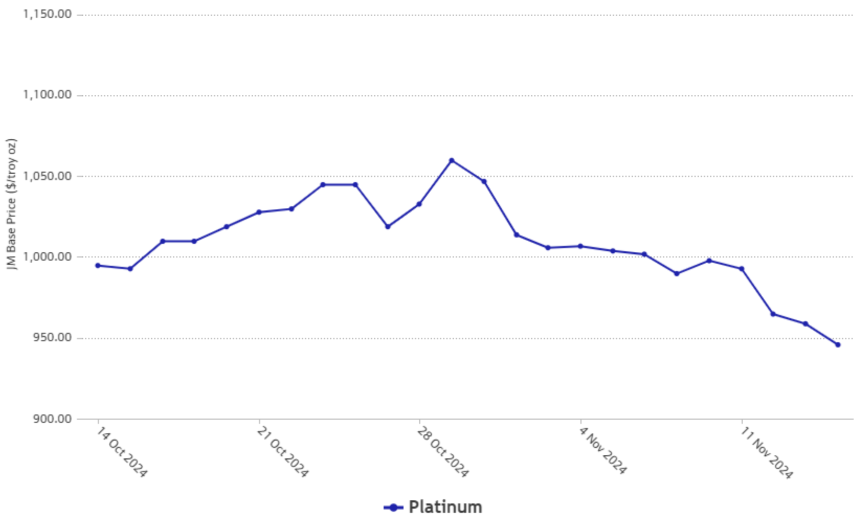
CHART | TABLE

Date from: Oct 14, 2024 To Date to: Nov 14, 2024 OR Custom date selection

SAVE AS

| Metal | Current price ($/troy oz) |
|---|---|
| Platinum | 946.00 |
| Palladium | 946.00 |
| Rhodium | 4,650.00 |
| Iridium | 4,600.00 |
| Ruthenium | 485.00 |

Last update : 14 Nov 2024/London




Platinum average: $1,009.08

Johnson Matthey's Base Price Disclaimer

## Categories