

# Global PGM Refining and Recycling

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# Changing Times

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Johnson Matthey last presented at the  
31<sup>st</sup> IPMI, Miami in 2007

## Three Key Areas of Change

1. Risk Management
2. Maximising Profits
3. Lower Metal Prices



# Risk Management

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- JM PGM refining established in 1817 - 200 years of experience
- Profit '08/09 - £267.9M (+1%), strong cash growth
- Underpinned by income in diverse areas including pharmaceutical and petrochemical Industries less affected by the global downturn
- Publicly traded company - FTSE 100
- Security of supply
  - Three PGM refineries, (US, UK, India)
  - Two Au+Ag refineries (US, Can)
  - Closed loop supply and refine service for most PGM products
  - Trading offices with 24hr market coverage (US, UK, HK)
  - Close relationship with South African Mines

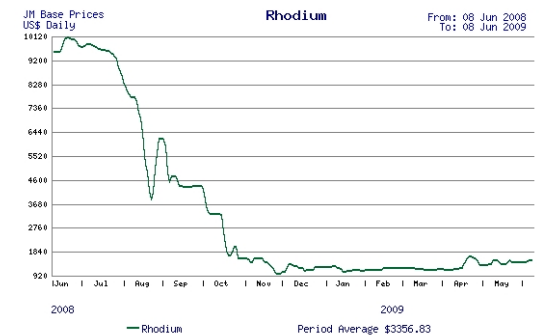
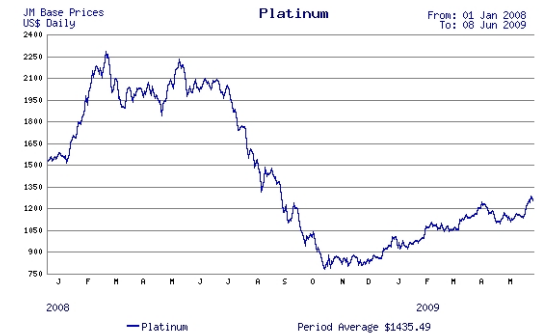
# Key Areas of Change

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1. Risk Management
2. Maximising Profits
3. Lower Metal Prices

# Maximising Profits

- Lower prices for Pt, Ru and Rh, Au and Ir buoyant
- All PM's continue to be high value commodities and a large contribution to assets
- Real need to squeeze assets and mobilise cash
  - External Risks
    - Accuracy of Evaluation for refinables & stocks
    - Security of metal
  - Internal Risks
    - Metal cannot be tied up in the plant
    - Metal cannot be lost from the plant



# Metal Recovery

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- PM accumulation in the plant items ties up cash
- Areas such as reaction vessels, pipe-work and heat transfer surfaces key areas
- Some cases this can only be recovered at the end of equipment life
- JM used its experience in recovering metal from chemical plants allied with its PM chemistry knowledge
- Can offer a global service to identify and remove all precious metals from all industries



# Smopex<sup>®</sup>

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- Polymer fibre based metal scavenger
- Irreversibly binds selectively to precious metals over base metals
- Can recover metals at very low levels
- As polymer based, after recovery can be ashed to produce high grade concentrate
- New manufacturing techniques and fibre types available
- JM total recycle option to scavenge, refine, supply metal or products back



# Key Areas of Change

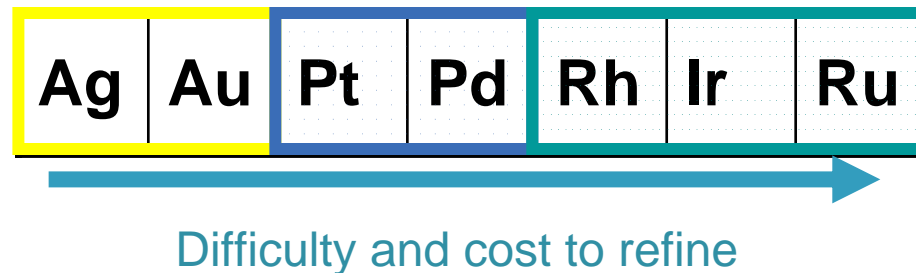
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1. Risk Management
2. Maximising Profits
- 3. Lower Metal Prices**

# Lower Metal Prices

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- Pt, Rh and Ru fallen dramatically
- Economics of refining much tougher, especially for mixed metal, complex materials



- When prices high, technical capabilities easier to extend
- In a shrinking market, need to focus on core values and volume efficiency
- JM core strength efficient and economic refining of these complex residues

# Materials Refined by JM

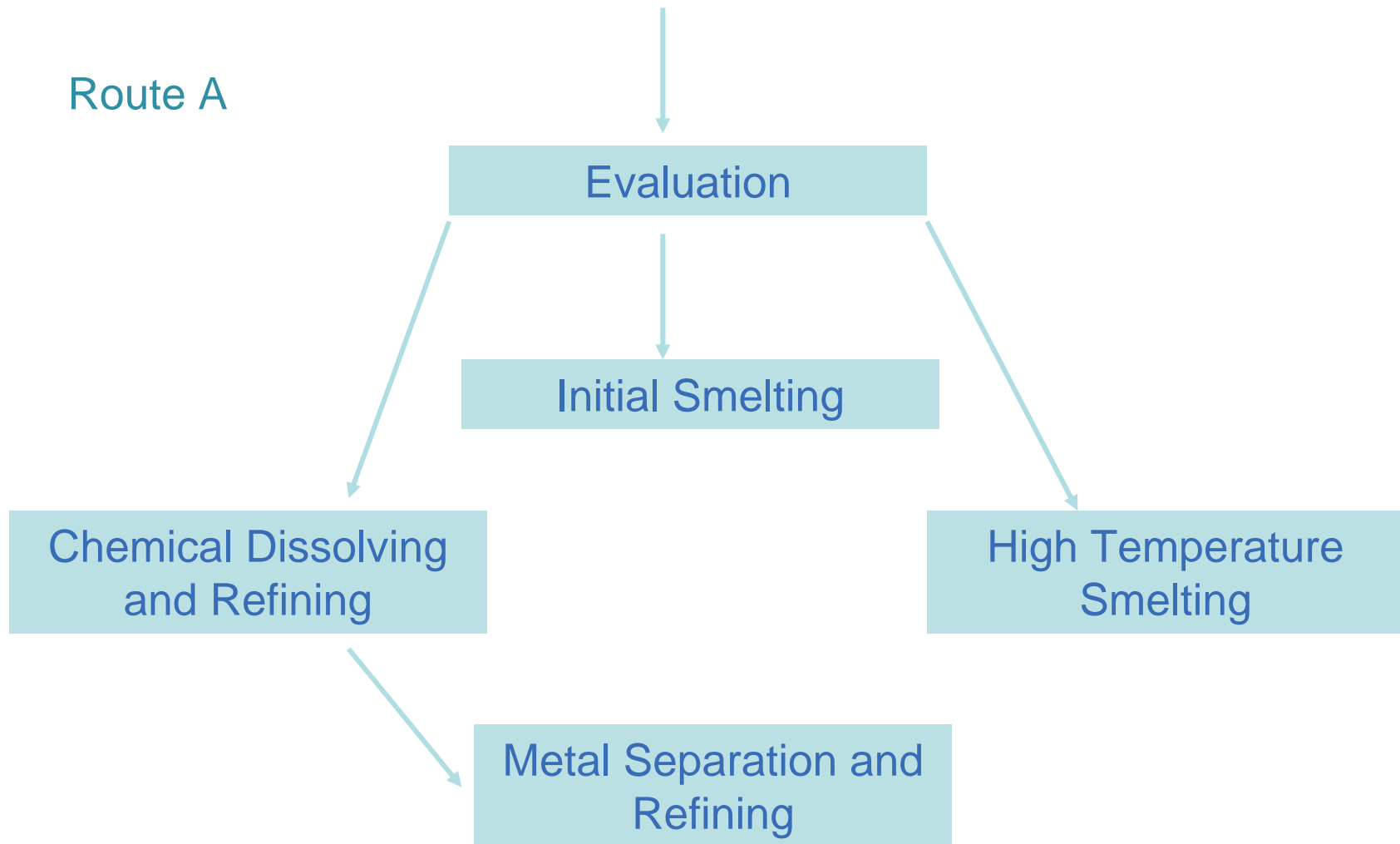
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- **Refiners of Au, Ag, Cu, Ni, PGM** - By product PGM residues, solutions, bullion
- **Automotive** - Pre processed autocatalyst scrap, washcoats, solutions, Fuel Cells and membrane electrodes
- **Electronics** - Targets, MLCC, manufacturing residues
- **Glass / Nitric Acid**- Alloys, refractories, clean-down residues
- **Jewellery** - PGM alloys, scraps, sweeps
- **Industrial / Chemicals** - Spent catalysts, solutions, residues
- **Pharmaceuticals** - Carbon, alumina, silica catalysts
- **Petroleum** - Alumina, silica catalysts
- **Dental** - PGM Alloys, sweepings

# Au, Ag, Pt, Pd, Rh, Ir, Ru mixed residues or bullions >0.5%PGM

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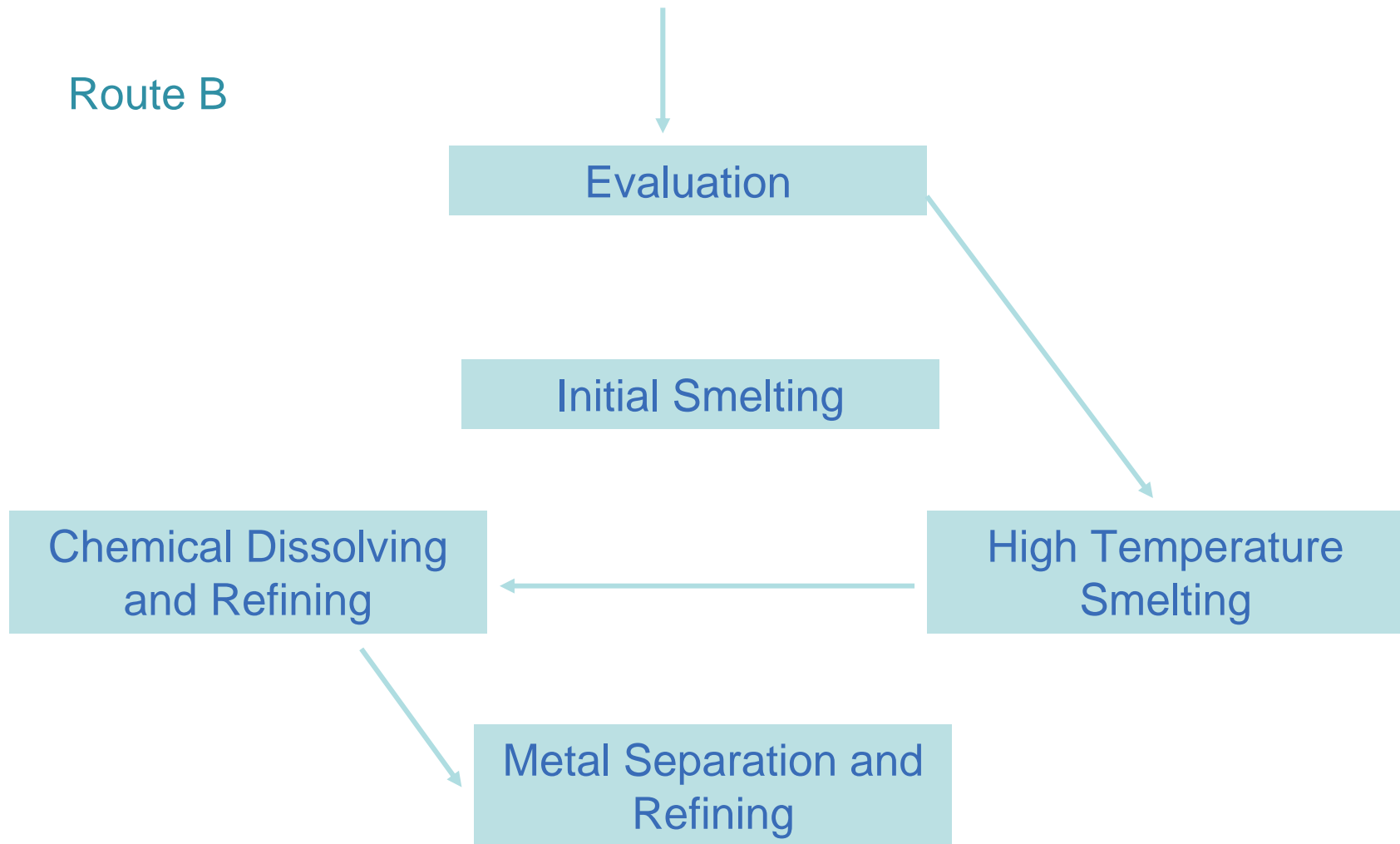
Route A



# Spent Catalysts, refractories and slurries

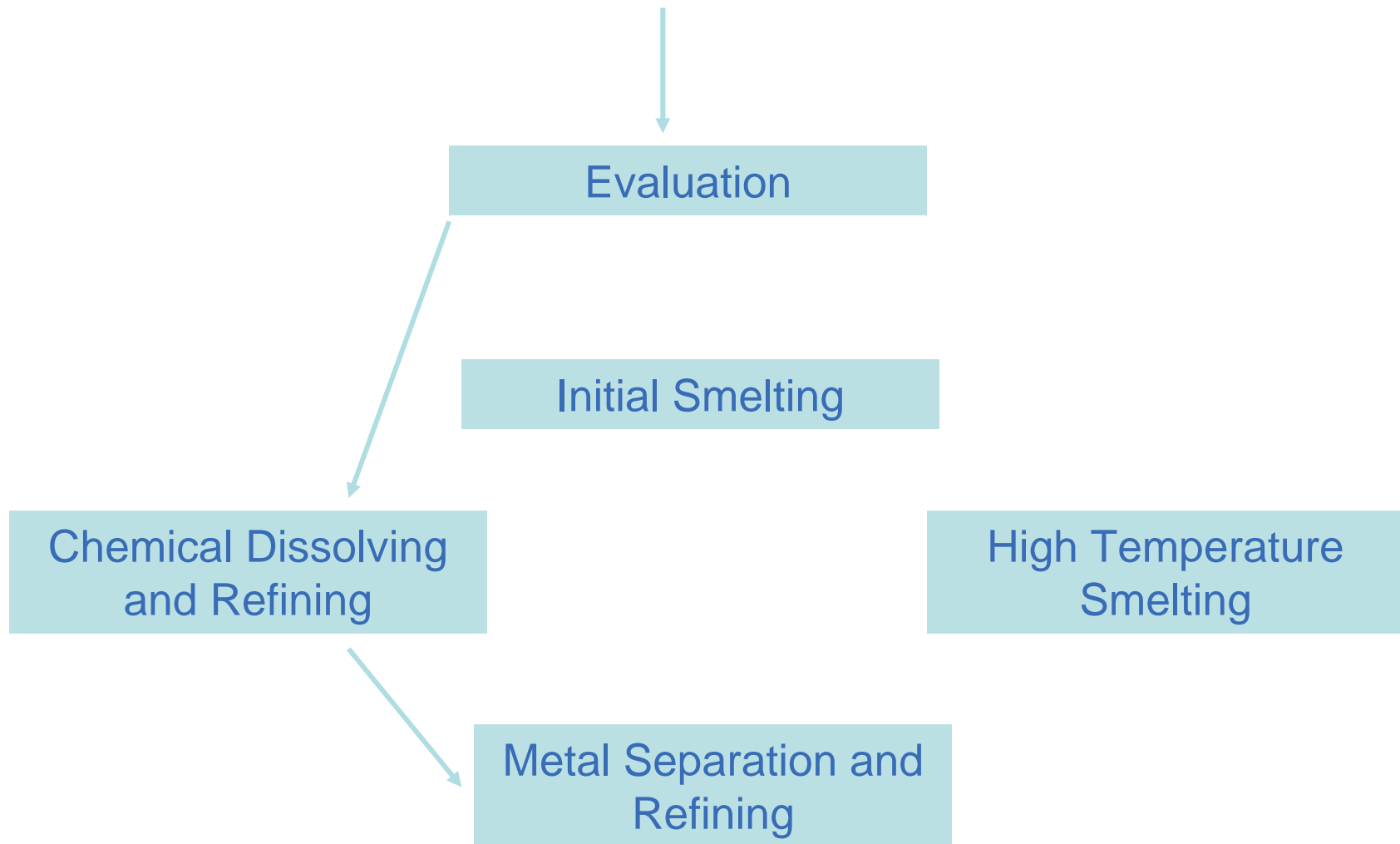
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Route B



# Electronic grade Ru

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# Case Studies

1. High Grade PGM Alloys
2. Smopex<sup>®</sup>
3. Metal Recovery

# Case Study 1– High Grade PGM Alloys

- Industries: Jewellery, Glass, watch making, fibreglass
- Traditionally two evaluation methods
  - Pure metals – Assay by difference
  - Mixed Alloys – Assay major elements
- Material can arrive in different forms eg plate, swarf, rings, chains, fabrications, ingots
- Difficult alloys to melt, sample, assay and refine



# Case Study 1– High Grade PGM Alloys

- JM developed Total Evaluation
- Utilised evaluation techniques at our refineries and alloy fabrication facilities
- Dramatically reduced evaluation lead-times for all elements in these alloys
- Enables more attractive metal management / trade finance facilities, lowers risk
- Can efficiently melt, sample, assay and refine exotic alloys
- Pt/Rh – 80:20, 90:10 – Glass / Industrial
- Au/Pt/Ir, Pt/Ir, Pd/Ru, Pt/Ru – Jewellery & Watch making



# Case Study 2 - Smopex<sup>®</sup>

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Metal Recovery from  
PGM refining Effluent  
streams

Effluent (PM+BM)  
10m<sup>3</sup> per day  
5ppm Pt  
\$100,000 per year

Footing/ Lime treatment  
80% Overall Recovery  
Low Grade cake for refining  
\$20,000 per year loss

Smopex Treatment  
98% Overall Recovery  
High grade ash for recycling  
50,000 x concentration ratio  
\$2,000 per year loss

# Case Study 2 - Smopex<sup>®</sup>

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- Smopex can replace or enhance traditional values recovery processes
- New manufacturing techniques have enabled more competitive pricing
- JM can offer process design, fibre selection and screening plus recovery and sale of metal – full recycling route
- New range of fibres being developed to complement metal separation chemistry and offer new refining routes
- Global technical support with specialists in US, Europe, India, Japan and China

# Case Study 3 – Metal Recovery

Tanks used in JM PGM  
chemical manufacturing process

1000 gallon polymer tank  
Pt surface deposition  
Cleaned monthly by  
production operators  
End of life  
Tank split into two  
sections for trial work

**Traditional Incineration**  
385 Oz recovered  
100% Recovery

**New Surface Recovery**  
377 Oz recovered  
98% Recovery

# Case Study 3 – Metal Recovery

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- Destroying the tank recovers the most value
- This leaves >\$300,000 asset tied up until tanks are scrapped
- Pt deposition is progressive, regular removal is a nett reduction in assets
- The new surface method is non destructive and does not affect the tank surface
- All six tanks can be cleaned routinely to recover metal build up
- Other materials which cannot be incinerated (steel, glass lined, etc) show similar levels of metal recovery

# Summary

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- **Risk Management**
  - **JM is a safe home for your metal**
- **Maximising Profits**
  - **JM can reduce metal losses and lockup**
- **Lower Metal Prices**
  - **JM can refine complex materials efficiently**

Any Questions?

[www.jmrefining.com](http://www.jmrefining.com)