Is the Primary Zinc Smelting Industry Ready to Face a More Competitive Marketplace Once Again?

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Introduction

- How have concentrate flows changed with the reopening of smelters such as La Oroya?
- Adapting to an increasingly complex concentrate mix: what process innovations are available to the primary producer?
- The benefits of multi-facility, multi-stream smelting
- How are price trends in co- and by-products affecting smelter dynamics?
- Can secondaries help fill the gap arising from lower concentrate supplies?

- Is your zinc smelter ready?
How have concentrate flows changed with the reopening of smelters such as La Oroya?

The concentrate market is quite flexible with the increase in traders

La Oroya only takes a small amount of the concentrates produced in Peru:

- Zinc 45 kt/a ~ 10%
- Lead 120 kt/a ~ 20%

More impact on concentrate flows from:

- Concentrate production and refined zinc demand in China
- Concentrate quality import restrictions
Adapting to an increasingly complex concentrate mix: what process innovations are available to the primary producer?

Large mines being replaced by smaller ones

- **Upcoming closures:**
  - Century (500 kt/a)
  - Skorpion (110 kt/a)

- **Coming on-stream:**
  - Opening of Ozernoye (350 kt/a) and Gamsberg (??? kt/a)
  - Others opening at less than 100 kt/a
  - Dugald River on hold (200 kt/a)

Increased complexity of new concentrates

- Dugald River and Gamsberg - Manganese
Adapting to an increasingly complex concentrate mix: what process innovations are available to the primary producer?

- Existing plant capability
  - Residue processing limits
  - Impurity tolerance limits
- Concentrate leaching for bulk concentrates
- Residue smelting
- Manganese removal
- Halide control
- Magnesium removal
- By-product recovery
The benefits of multi-facility, multi-stream smelting

- Economies of scale
  - Resourcing
  - Maintenance
  - Environmental controls
  - Infrastructure and services
- Increased zinc recovery
- Fewer residue streams
  - Disposable iron residue
- Treat a broader range of raw materials
- Increased by-product opportunities
  - Realise full value in feed streams

Examples
- Hindustan Zinc
- Kazzinc
- Korea Zinc
- La Oroya
- Nyrstar
- Penoles
- Porto Vesme
- Trail
How are price trends in co- and by-products affecting smelter dynamics?

Traditional by-products are at the bottom of the price cycle
• Nickel
• Cobalt

Some may be at the end of their life cycle
• Cadmium
• Mercury

Are there other by-products that are attractive?
How are price trends in co- and by-products affecting smelter dynamics?

Are there other by-products that are attractive?
- Copper
- Indium, germanium and gallium
  - Smart phones, tablets, etc.
  - Electronics
  - Semiconductors

Implementation of recovery processes

What interesting impurities do you have in your feed?
Can secondaries help fill the gap arising from lower concentrate supplies?

Increase in facilities processing EAF dust through to refined zinc

Increase in the use of oxides sourced from EAF dust
• Substitute for concentrate feed
• Plants exclusively for oxide processing

Increase in re-treatment:
• Primary leach residue stockpiles
• Iron residue ponds
• Concentrator tailings dams
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- What does your future feed blend look like?
- Is it secured?
- Does it suit your existing plant?
- Are you competitive?
- Could you integrate to become a multi-facility, multi-stream operation?

- What future feed materials are out there?
- Do you understand the limits of your existing plant?
- What opportunities are out there?
- Which ones can you take advantage of?
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The traditional way to approach this:
• Consider that it is a problem, not an opportunity
• Use your existing technical resources and methods
  – Individual groups looking inwardly at their individual area of focus

This has been done before
• And you will get the same result if you do it again

Something different is needed
• But zinc plants are complicated
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Zinc plants are complicated:

- **The zinc business**
  - Competition
  - Overall profitability
  - Cost of production
  - Stakeholders

- **Enabling technologies**
  - Flowsheet
  - Equipment

- **Corporate systems**
  - Toll-gating
  - Approvals
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Zinc plants are complicated:

- The owners / operators know the plant best
- Hatch can provide a proven holistic plant optimisation methodology
  - Synergistic integrated teams
  - Fundamental understanding of zinc processing and the zinc business
  - Identify and pursue the high value ideas
  - Do the homework – prove the benefits
  - Focus on value
- The new way
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Hatch Operational Performance

- Operational Readiness prepares capital projects for safe and stable transition to operations
- Asset Management and Performance Enhancement impact availability and capacity
- Sustaining Projects & Engineering support the effective use of funds in the execution of sustaining capital portfolios
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Operational Readiness

Working as an integrated team, using a proven framework, helping the client be prepare for the transition of a new project to operations.
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Asset Management

- Asset management assessments
- Developing asset strategy and plan
- Reliability engineering services
- Critical spares assessment
- Specialised inspection services
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Performance Enhancement

- Life extension
- Capacity increases
- Debottlenecking
- Recovery improvement
- Operational efficiencies
- Cost and energy reduction
- Energy recovery
- By-product realisation
- Operational stability
- Alternative feed materials
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Sustaining Projects & Engineering

Targeted capital program delivered by specialist teams with expertise in project delivery in operating environments.

Understanding the business and its operation, enables development and delivery of the optimal sustaining capital program to meet the business objectives.
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Delivering a Step Change

Hatch Differentiation

- Unique blend of zinc process expertise, zinc operations understanding and project delivery excellence
- Organisation wide approach that draws from business and financial management and also technical, engineering, operations and maintenance disciplines
Challenges:
- Determine utilization of equipment at 130 ktpd
- Determine if the proposed system is capable of achieving 145 ktpd
- Determine the options for alleviating the bottlenecks to achieve 145 ktpd. Size and cost the various options.

Results:
- Changes in the operations strategy for: stockpiles, buffers, batching strategy Cu/Zn
- The Concentrator is sustainably processing 149 ktpd
- Minimal capital spend
Nickel Refinery
BHP Billiton Yabulu Nickel Refinery

Challenges:
- Improve process efficiencies, overall process recoveries, energy savings and waste elimination
- Identify, risk filter and prioritise savings opportunities
- Develop a plan to carry out engineering modifications to achieve the best return on investment capital

Results:
- 6% increase in nickel production
- 20% decrease in operating costs over a 3 year program
- AUD 20 million capital expenditure with an IRR of 77%
- Site internationally competitive
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There are a number of challenges, or opportunities that we have discussed

Step change operational performance improvements are needed:

• The new way (Hatch way)
• The traditional way
• No way (do nothing)

Any questions?