Life Cycle Inventories for Minerals Processing in South Africa and Australia

Uses in Decision Making for Technology Choice

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Presentation Outline

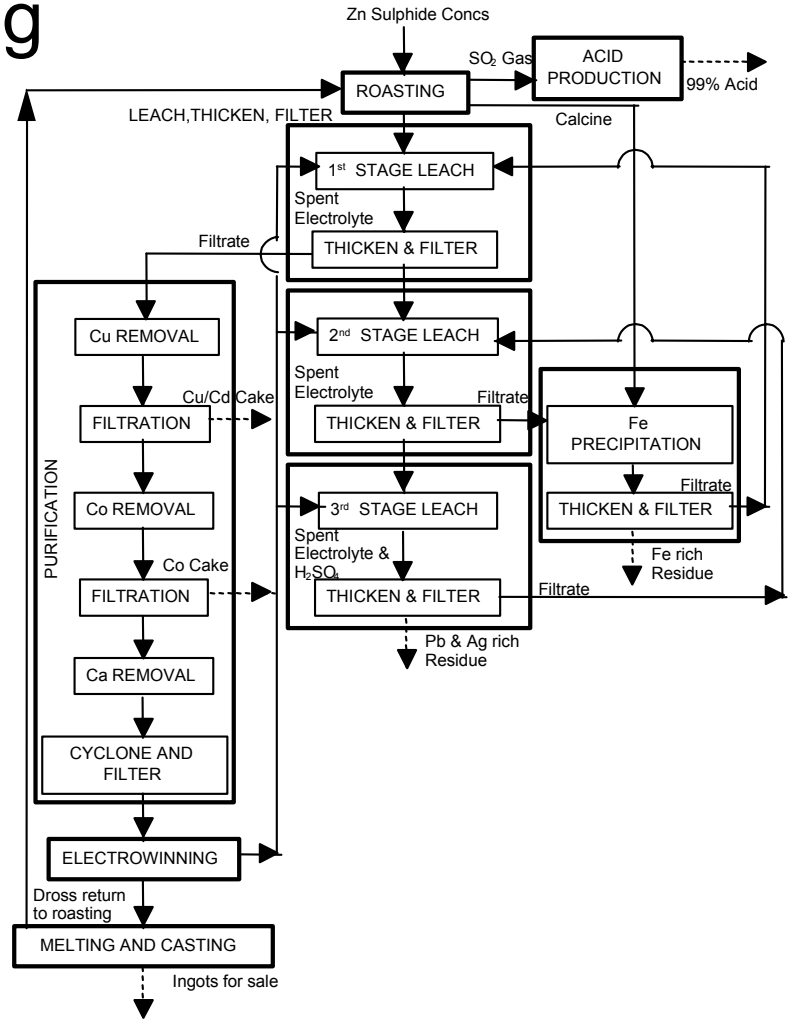
- Rules for Flowsheet development
  - Considerations specific to Inventory development
- Presentation of Generalised Flowsheets
  - South Africa and Australia
- Decision Making for Technology Choice using Inventories
  - Case Studies

Flowsheet Development

- Boundary
  - Cradle to Gate
- Rules for definition of unit process boundaries
  - Common Function
  - Mass Flow Rate
  - Hazardous Materials
  - Energy Intensity
  - Common Waste Generation
- Modelling Approach
  - Average Process Plant Performance
- Levels of Aggregation
  - Commodity Specific
  - Sub-sector
  - Industry-wide

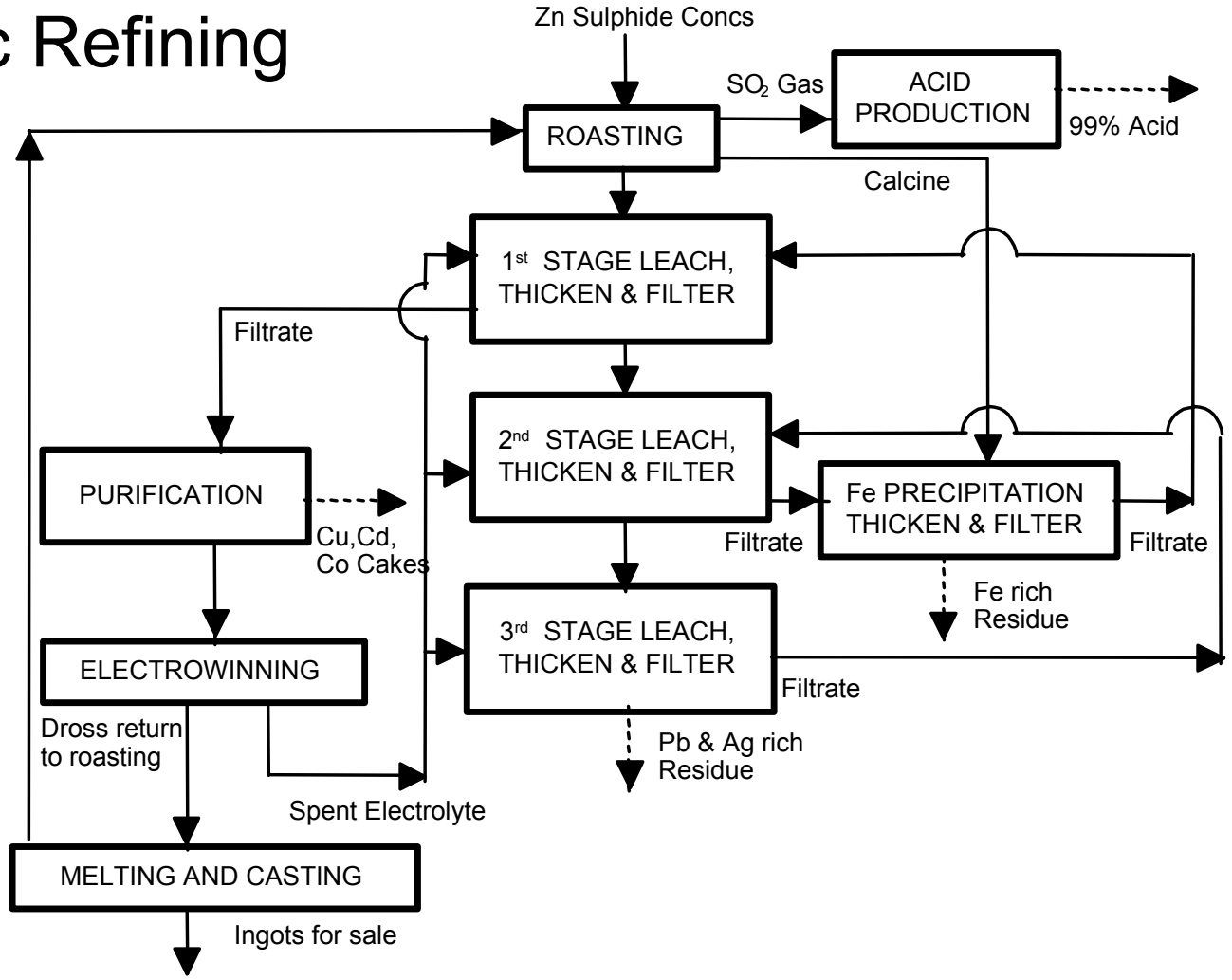
Example

- Zinc Refining



Example

- Zinc Refining

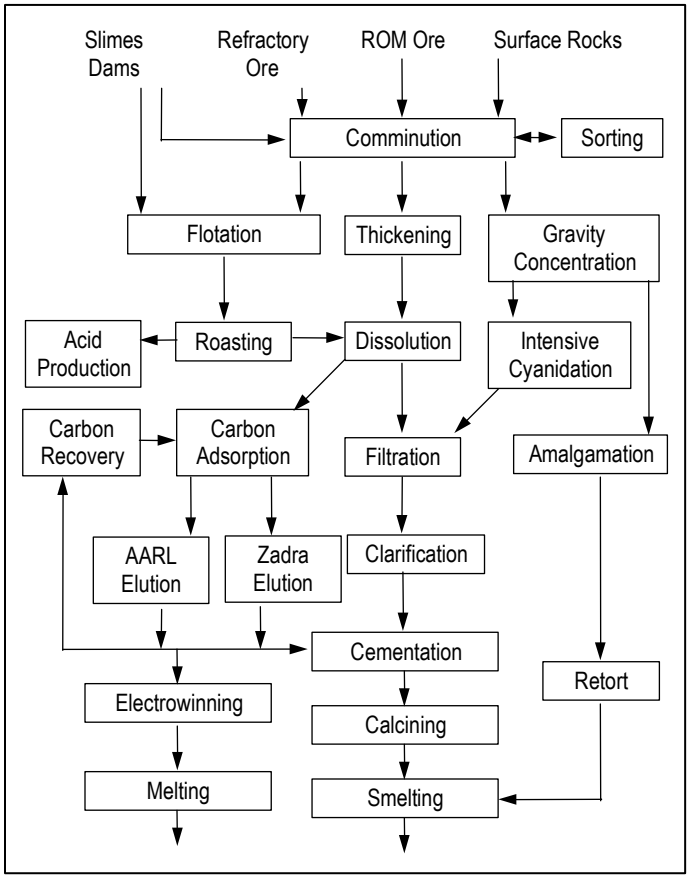


Sub-sectors Included

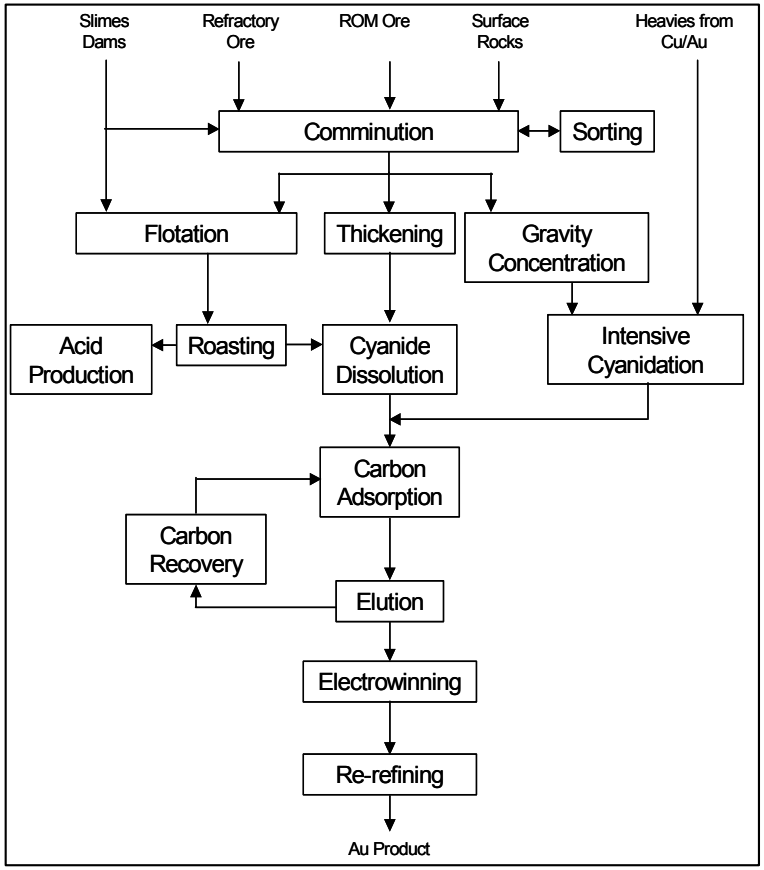
- Coal
- Gold
- Non-Ferrous Metals
- Ferrous Metals
- Platinum Group Metals
- Mineral Sands

Sub-Sectoral Flowsheets

- Gold Industry South Africa

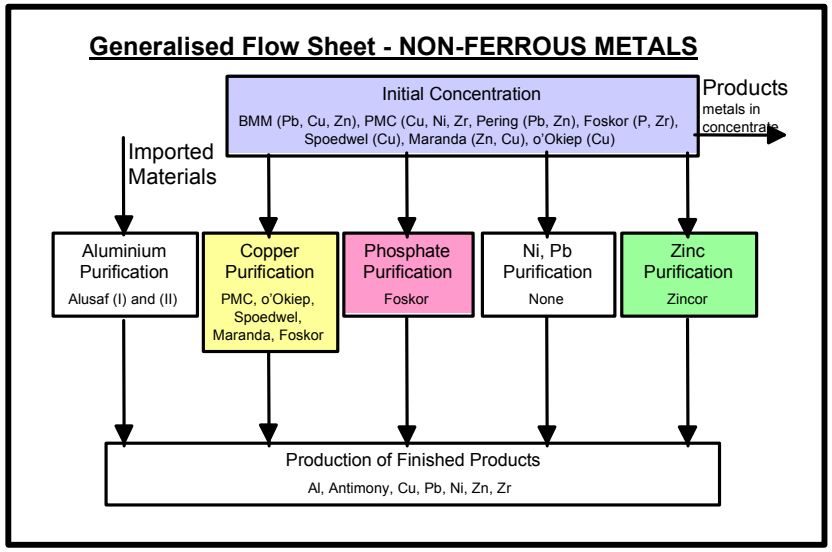


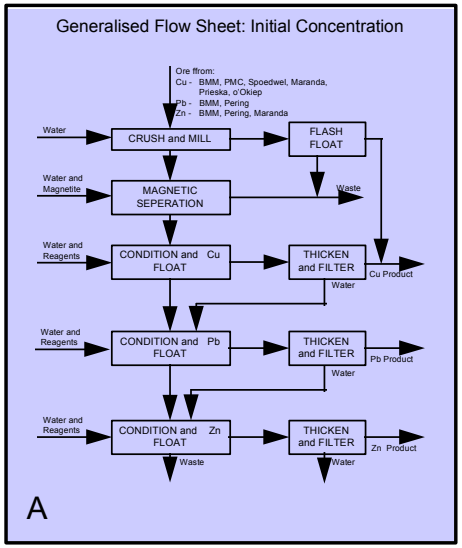
- Gold Industry Australia

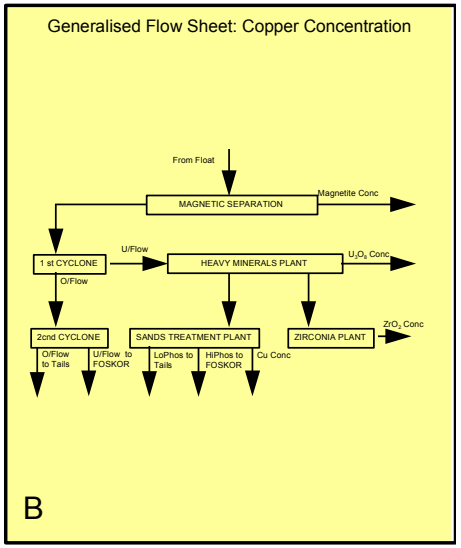


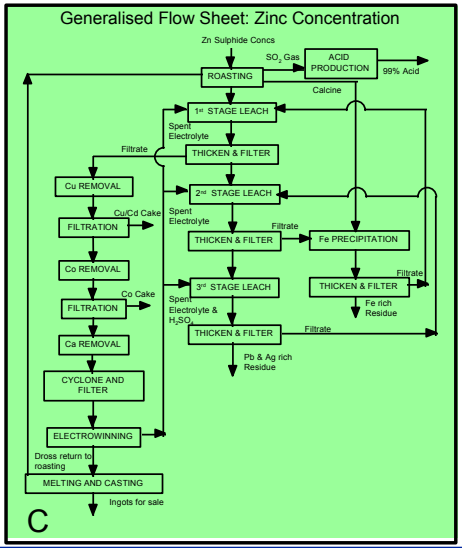
Disaggregation of Sub-Sectors

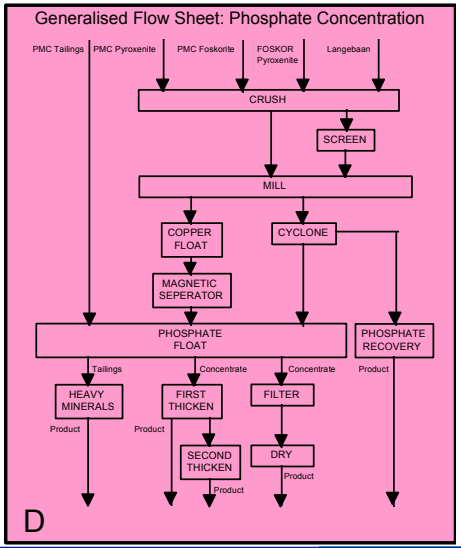
- Non-ferrous Metals in South Africa

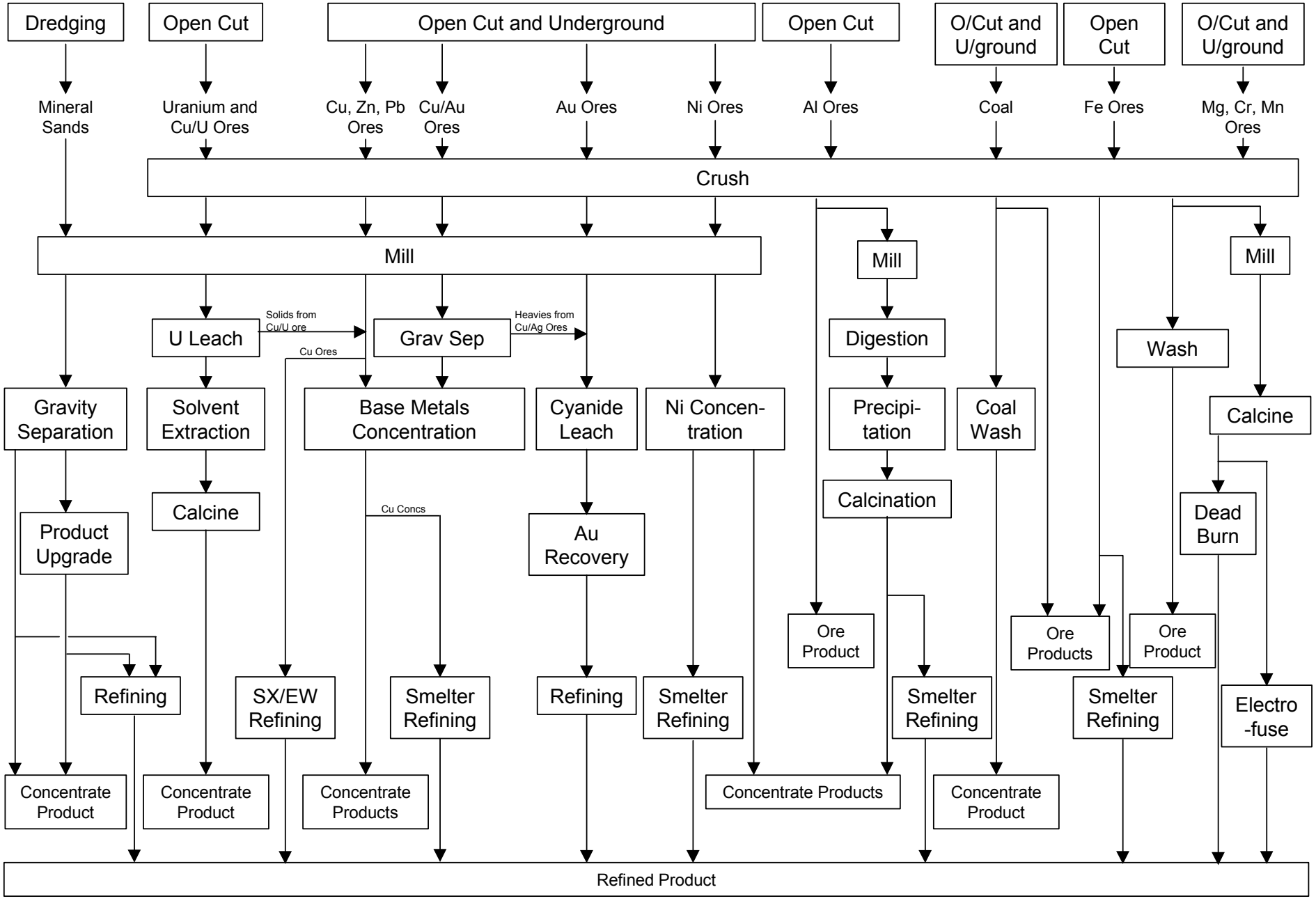











Dredging
Open Cut
Open Cut and Underground
Open Cut
O/Cut and U/ground
Open Cut
O/Cut and U/ground
Mineral Sands
Uranium and Cu/U Ores
Cu, Zn, Pb Ores
Cu/Au Ores
Au Ores
Ni Ores
Al Ores
Coal
Fe Ores
Mg, Cr, Mn Ores
Crush
Mill
Mill
Mill
U Leach
Solids from Cu/U ore
Grav Sep
Heavies from Cu/Ag Ores
Cu Ores
Digestion
Wash
Gravity Separation
Solvent Extraction
Base Metals Concentration
Cyanide Leach
Ni Concen-tration
Precipi-tation
Coal Wash
Calcine
Calcine
Cu Concs
Calcination
Dead Burn
Product Upgrade
Au Recovery
Ore Product
Ore Products
Ore Product
Refining
SX/EW Refining
Smelter Refining
Refining
Smelter Refining
Smelter Refining
Smelter Refining
Electro -fuse
Concentrate Product
Concentrate Product
Concentrate Products
Concentrate Products
Concentrate Product
Refined Product

Advantages

- Companies are comfortable with representation of data
  - Retains company-specific confidentialities
- Structured to ensure that LCA retains sufficient information
  - Technology Improvement and Optimisation
  - Technology Integration
- Used to support decision making for process design in Minerals Processing

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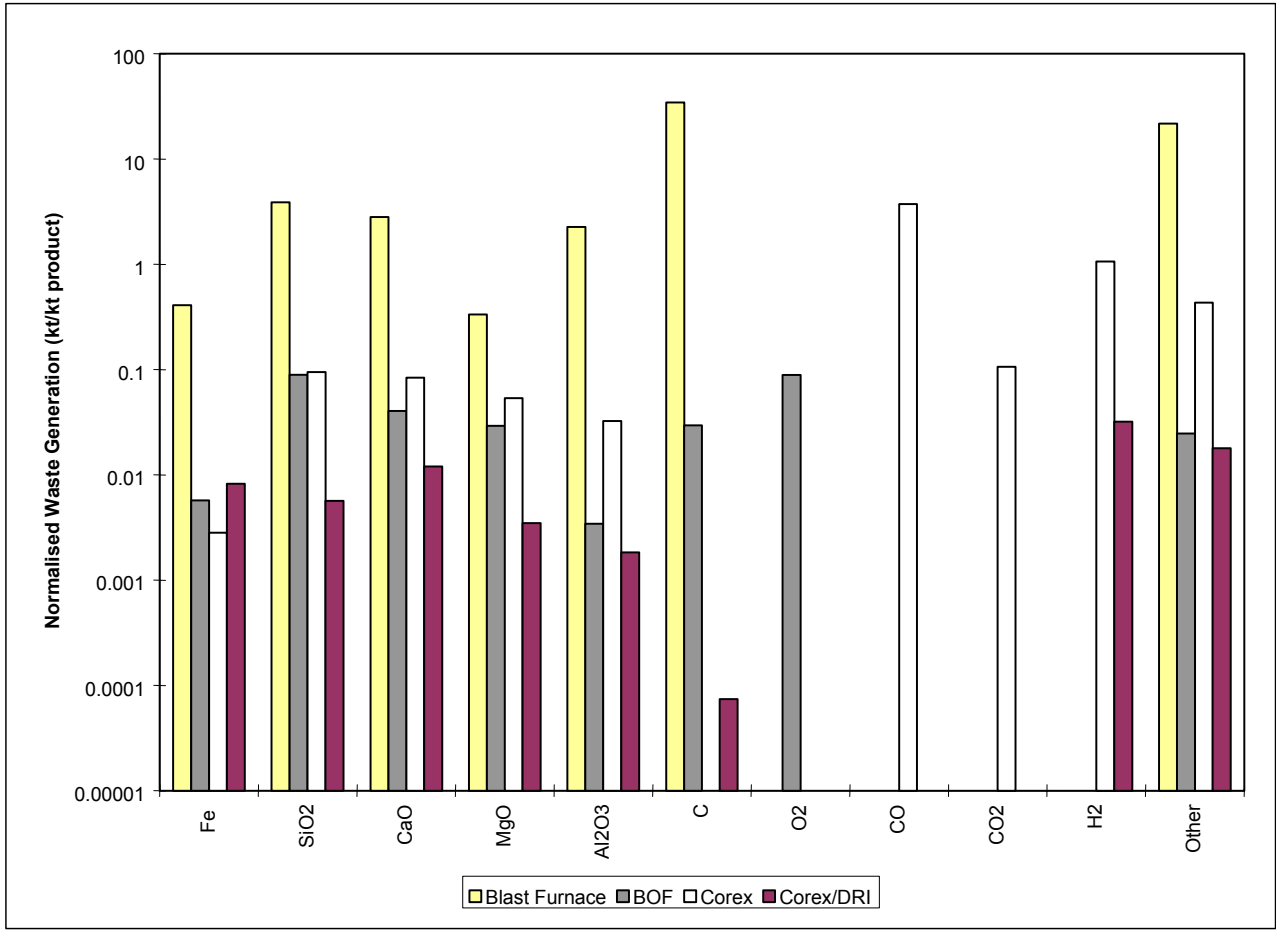
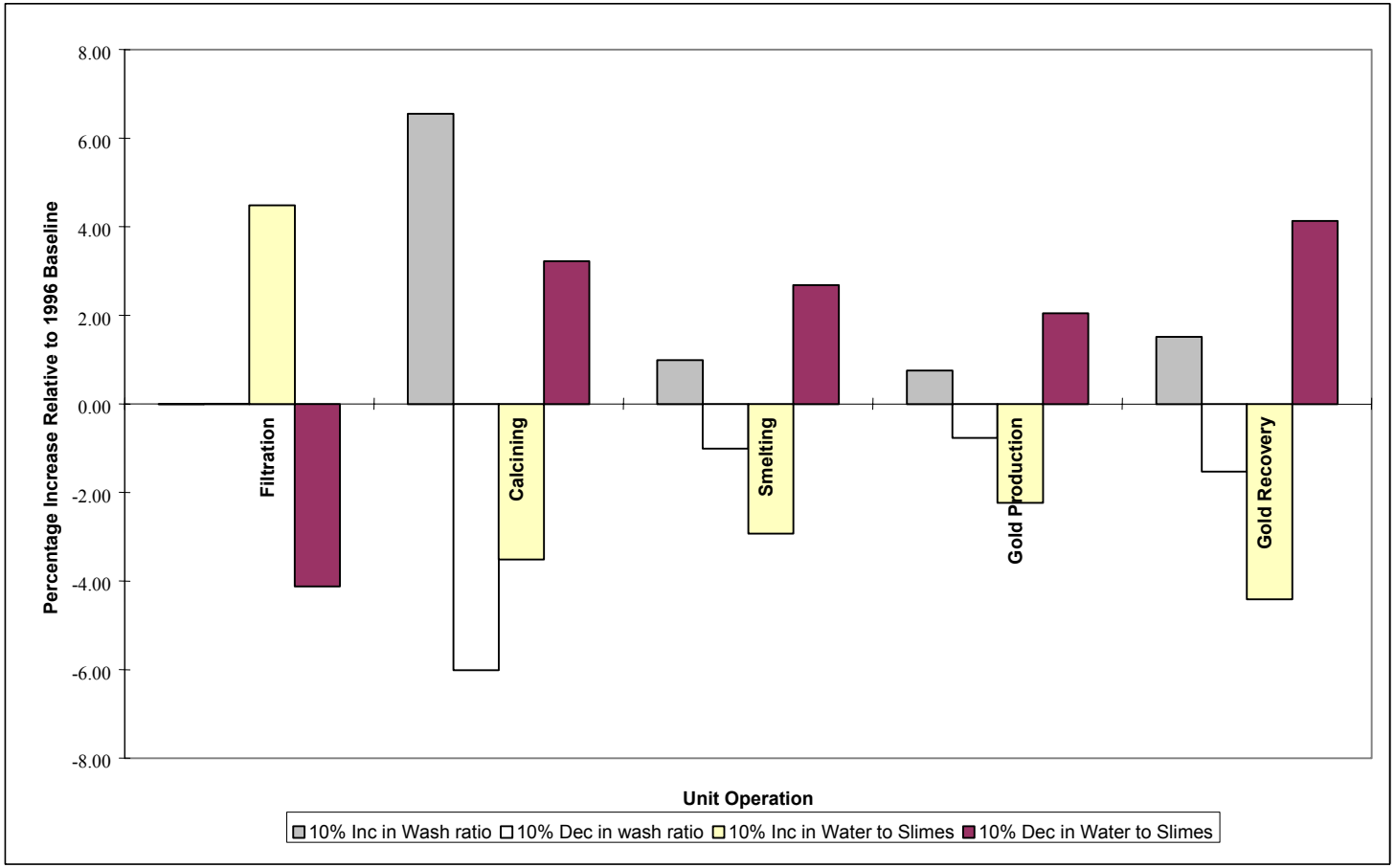
Case Study - Technology Trends

- Future Technologies in the Steel Industry



Changing Process Performance

- Gold Industry - Change in Filtration Performance



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Cross-sectoral Considerations

- Employment

Sub-sector	Waste Generated (t) per Job offered
Gold	14644
Coal	624
Platinum Group Metals	703
Base Metals (excl Phosphate)	5885

- Sales Value

Sub-Sector	Waste Generated (kt) per Sales value (R000 000)
Gold	41
Coal	5
Base Metals	8
PGMS	12
Ferro-alloys	4
Sands (Titanium est)	14

- Energy

Sub-sector	Production for 1995		Electricity Used		Electricity Consumption	
	Mass (kt)	Value (R000 000)	Concentration (GWh)	Purification (GWh)	Mass (GWh/kt)	Value (GWh/R000)
Gold	0.52	24 000	4 700		8 900	190
Base Metals						
Initial Conc	400	820	850		2.1	1 000
Aluminium	170	800		2 900	17	3 600
Copper	130	1 400		220	1.7	160
Zinc	94	290		420	4.5	1 400
PGMs	0.17	6 300	1 700		10 000	280
Ferro-Alloys						
Initial Conc	35 000	3 400	450		0.01	130
Ferrochrome	830	880		3 300	4.0	3 800
Mn-Alloys	1 700	1 200		6 300	3.6	5 300
Silicon	100	160		1 000	11	6 600
Steel	7 600	4 100		27 000	3.6	6 600
Mineral Sands	100	1 500	2.1		0.02	1.0

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