Introduction

- Metal accounting is about reporting information regarding mineral processing plant performance and in-process mineral inventories
- Provides the diagnostic information required for effective metallurgical decisions
- Provides insight, helps monitor and addresses remedial measures for:-
  - production variability
  - unexplained gains and losses
  - process inefficiencies
  - production forecasting problems
- Translates into economic figures that appear in financial statements!
Typical metal accounting envelope for a gold refinery

**Physical**
- Annual stock counts
- Quarterly stock counts
- Monthly stock counts

**Deposit analysis and acceptance**
- Deposit analysis
- Deposit analysis
- Acceptance

**Refining**
- Work-in-progress

**Storage & dispatch and waste disposal**
- Bars and coins
- Slag and sweeps
- Spent electrolyte

**Inventory**
- Pre-allocated
- Unallocated
- Allocated products

**Ownership**
- Self-owned
- Foreign central banks
- Commercial banks
- Mines and other refineries
- Other customers

**Metal accounting equation**
\[
(Closing\ Stock + Output) = (Opening\ Stock + Intake)
\]
- Measured by a stock count
- From product dispatch & waste disposal records
- Measured by a stock count of the previous period
- From product deposit analysis & intake records

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Complex interrelationships in metal accounting

Closing Stock = Opening Stock + Intake - Output

STOCK COUNT
- preparation
- accuracy

FIXED
(Closing Stock of previous period as measured from previous stocktake)

DEPOSIT ACCEPTANCE
- money paid
- quality
- quantity

SHIPMENTS
- quantity
- quality
- money received

WASTE DISPOSAL
- quantity
- quality
- money received

LOCATION AND TYPE OF MATERIAL
- gold awaiting shipment
- rejects (visual)
- rejects (quality)
- deposits accepted and awaiting
- processing
- deposits yet to be accepted
- work-in-progress:
  - metallics
  - electrolyte
  - slag
  - recoveries
  - chlorides

OPERATIONS AND TREASURY
- weighing
- sampling
- assaying
- work-in-progress
- monies paid
- monies received
- shipment protocols
- waste disposal protocols

INVENTORY and OWNERSHIP
- daily metal book inventory
- adjustments to Ownership

FINAL RECONCILIATION AND ADJUSTMENT OF INVENTORY TO MATCH PHYSICAL
Self-assessment FAQs

• What is my metal accounting envelope?

• Do I have adequate controls on Intake, Output, inter-departmental transfers, sampling, assaying, work-in-progress, electrolyte, stock counts, security, ways of identifying leakages at each step, etc?

• Do I know the specific errors and systematic errors in my process?

• How do I know the amount of gold contained in electrolyte?

• How do I know the amount of gold contained in the work-in-progress?

• How do I get the operational technical data into my ERP system?

• How do I keep track of reconciling items that have timing issues?

• How do I ensure a thorough and timely preparation for stock counts to avoid risks of an inaccurate stock count?

• Are the standard operating procedures (SOPs) for the tasks in my metal accounting envelope adequate?

• Do the existing SOPs do the job?

• How do I enter assay data into the IT or ERP systems?

• How do I change assay estimates?

• What is the chain of command?

• Does my metal accounting process and the relevant SOPs comply with the AMIRA Code?
The Deloitte approach
Focus areas – Physical

- Frequency of stock counts
- Preparations
- Thoroughness of stock count processes
- Weighing of inventory
- Sampling of inventory
- Inspections
- How is work-in-progress dealt with
- Availability and completeness of SOPs
- Adherence to SOPs
- Procedures for counters, independence and team composition
The Deloitte approach (cont’d)

Focus areas – Book Inventory

- Intake procedure
- Adequacy of sampling points
- Sampling procedure
- Weighing
- Calibration of weighing equipment
- Assay methods and QAQCs
- Correction factors applicable
- Entry of data into IT systems
- Inter-departmental transfers and custodianship
- Inherent errors
- Dispatch of product
- Disposal of waste
- Handling of low-grade products
- Theft prevention
- Leakage prevention
- Data storage, access and retrieval protocols
- Availability and completeness of SOPs
- Adherence to SOPs
- Protocols of dealing with rejects
- Estimation of lock up and metal in circuit
The Deloitte approach (cont’d)
Focus areas – Ownership

• The link to finance
• Controls around the dispatch process
• Prevention of leakage and theft
• Availability and completeness of SOPs
• Adherence to SOPs
The Deloitte approach (cont’d)
Focus areas – the metals custodianship & reconciliation function

• Daily maintenance and update of the metal book inventory
• Change of assay estimations
• Capturing of stock count data
• Processing of work-in-progress data
• Adjustments of Book Inventory to match Physical
• Process efficiencies, gains and losses
• Adjustments to Ownership
• The reconciliation process
• Treatment of reconciling items
• Availability and completeness of SOPs
• Adherence to SOPs
Conclusions

What I hope I have reaffirmed

- Multi-variable playbook
- Complex
- Get it right and keep it right
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