

# Applying Sigmafine in Mining & Metallurgy

Metal accounting supported by data verification transforms data into key performance metrics for effective operations and financial decisions

Metal and mining companies had the vision to implement a full and rigorous metallurgical accounting solution at their facilities. The implementation of Sigmafine has fulfilled our customers' vision: The implementation of a single metallurgical balance management tool used by financial accounting, mining, metallurgy, and operational departments.

## Effective Metallurgical Accounting

Metallurgical accounting requires tracking of all valued materials as they travel through the process. The task is an imperative for any company, but the question is how a customer can make use of the metallurgical accounting process to achieve higher levels of operational excellence. The answer relies on implementing a solution that accurately accounts and reconciles all metallurgical information at every process stage and that can expose the information to engineers and operators to effectively operate the process to increase efficiencies, such as metal recovery and uptime.

For our customers, an important requirement is the transparency and auditability of the metallurgical process. From that point of view, the system

must have the proper segregation of data depending on the user roles. This segregation prevents any unapproved changes to business rules, which have to be aligned with the customer metallurgical practices and auditing controls. Ultimately, customers need a system based on consistent information flows and business rules and thus independent of human bias.

An effective reconciliation process does not come without challenges, among these are: overwhelming amounts of information, low confidence and lack of consistency of data, unbalanced information from the flow rate and composition measurement perspective, and complexity to use information within the proper context. Sigmafine reduces the barrier to implement and manage infor-

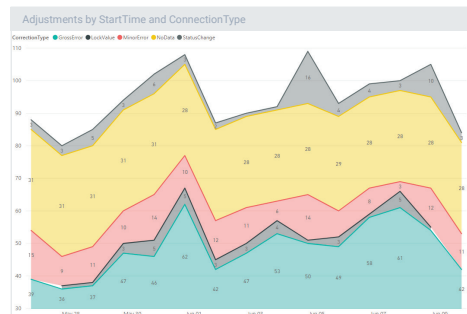
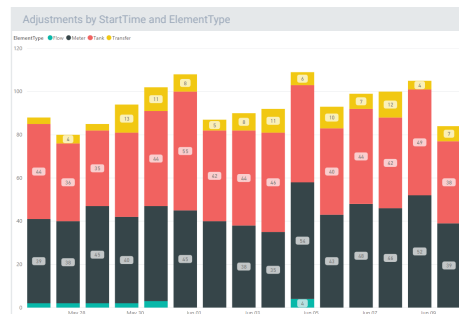
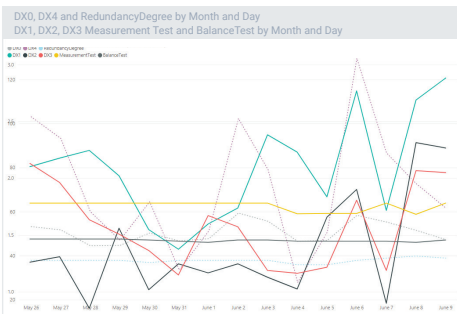
**Solution Area**

- Production accounting
- Yield accounting
- Shipping optimization
- Inventory & loss management

**Benefits**

- Plant mass-balances
- Water balance
- AMIRA compliance
- Enterprise reporting
- Corporate compliance

mation efficiently, and to validate and reconcile data based on business rules and conservation principles as specified by the company's accounting rules or international standards, such as the AMIRA standard. Beyond the features and functions that the platform gives to the end user, the Sigmafine solution enables a focal point to support the metal accounting process that serves as the source of information for operational systems as well as business systems, such as an ERP.



## Comprehensive Metallurgical Accounting

Customers using Sigmafine have a solid foundation of a comprehensive metallurgical system, which provides validated, secured, and audit-able information to the financial systems and accurate information to operation managers that can make use of this data to optimize the operations using a unified set of data. In addition, engineers and operators, using Sigmafine generated data, can compute process recoveries or other KPIs with a lower degree of uncertainty.

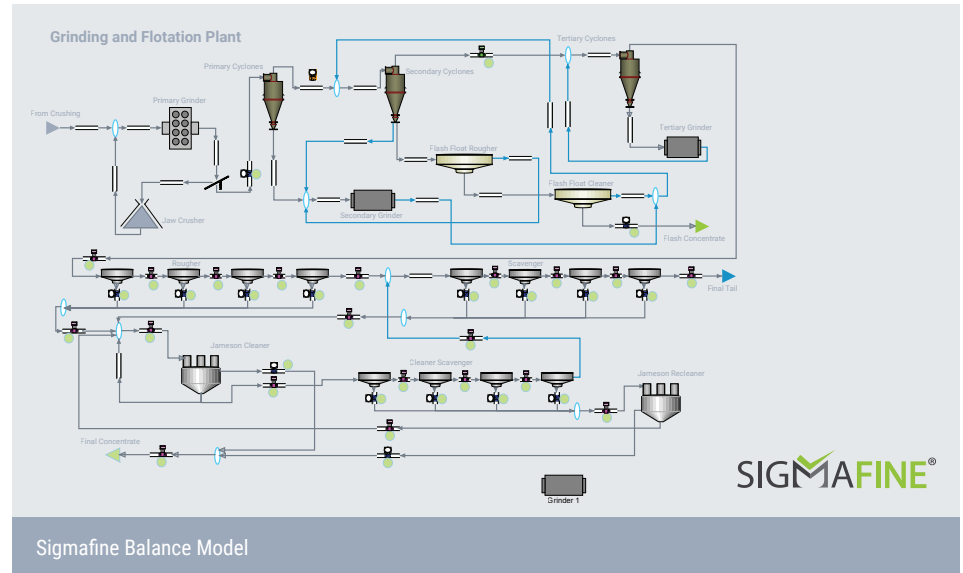
The Sigmafine system is configured to perform metallurgical balances for the whole metallurgical complex with the use of the Component Balance Analysis rule. The Component Balance is a standard component of the Sigmafine Server and implements powerful algorithms to estimate reconciled metals concentrations that comply with concentration laws of processing units across the metallurgical process network. As a first step, Pimsoft uses the PI Asset Framework to create “process

templates” of the different processes and related equipment (e.g., mill, concentration, flotation cell, etc.). After the initial setup, the solution requires the development of a connectivity model that represents the material flows of the facility. During the last step, meters and analyzers are represented to receive information from the process data historian using out-of-the box connectivity.

ID	Name	Value	Description	Category
SI_200	BalanceTest	1.402	Balance test results	
SI_201		47.428122689 %	Non-Reducible Quantity Indicator (137%)	
SI_202		2.883274217898 %	Balance Indicator (137%)	
SI_203		2.207949235944 %	Reconciled Quantity Indicator (137%)	
SI_204		2.05893654644 %	Tolerance Indicator (1-Delta and D2D)	
SI_205		61.78843812735 %	Reconciled Difference Indicator	
SI_206	MeasurementTest	1.703	Measurement test results	
SI_207	RebalanceChange	0	Degree of imbalance	

### Recovery Analysis

Component	Feed	Tailing	Concentrates	Units
Au	108.31	43.10	65.22	g/h
Cu	1.77	0.19	1.58	t/h
Fe	3.69	3.20	0.50	t/h
S	3.00	2.05	0.95	t/h
SiO2	138.83	137.75	1.15	t/h
<b>Au Recovery</b>	<b>60.2%</b>			
<b>Cu Recovery</b>	<b>89.2%</b>			



### Sigmafine References in Mining & Metallurgy

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## Business Impact

Many Sigmafine customers have achieved the implementation of a standard metallurgical accounting tool across all of their sites, where the official information of all production figures and metallurgical analysis are safeguarded, and where any quantity of materials and respective availability required by production planning are available and easy to access. Furthermore, customers also found unexpected benefits: data generated by Sigmafine also supports production planning based on environmental strategies, maximizing and optimizing overall production according the company objectives, but minimizing environmental impact.

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