Data Driven Mine-to-Mill Optimization with MineSense Solutions

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2023

PRESENTATION OVERVIEW

1 MineSense Technologies

2 Mine-to-Mill data gap

3 MineSense Mine-to-Mill Optimization

5 Conclusions

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MineSense Technologies

Unique technological solution in the world

- Canadian company with headquarters in Vancouver.
- Regional Office and Service Center in Santiago de Chile.
- Presence in markets of America (North/South), Africa and Asia.
- Global cleantech company
- + 150 employees in the world
- + 12 years in the market

2022 GLOBAL CLEANTECH 100 COMPANY

500 Technology Fast 500 2022 NORTH AMERICA Deloitte.

50 Technology Fast 50 2022 CANADA CLEAN TECHNOLOGY WINNER Deloitte.

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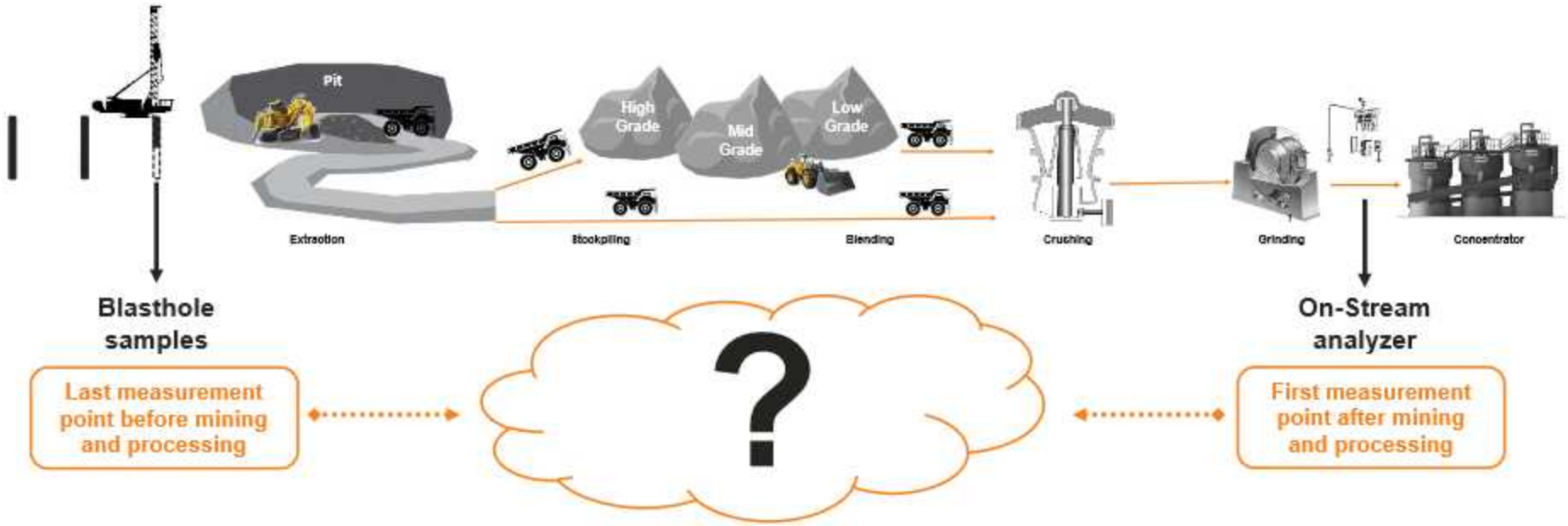
Mine-to-Mill Data Gap

Variable grades, hardness and changing mineralogy lead to plant sub-performance



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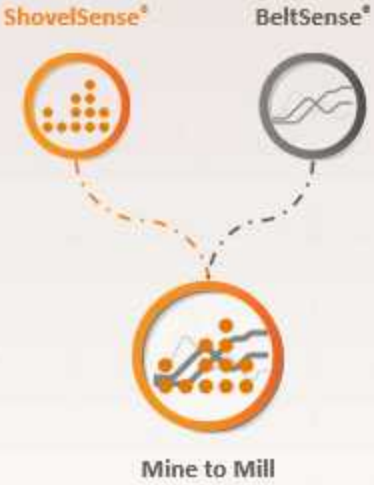
MineSense Mine-to-Mill Optimization

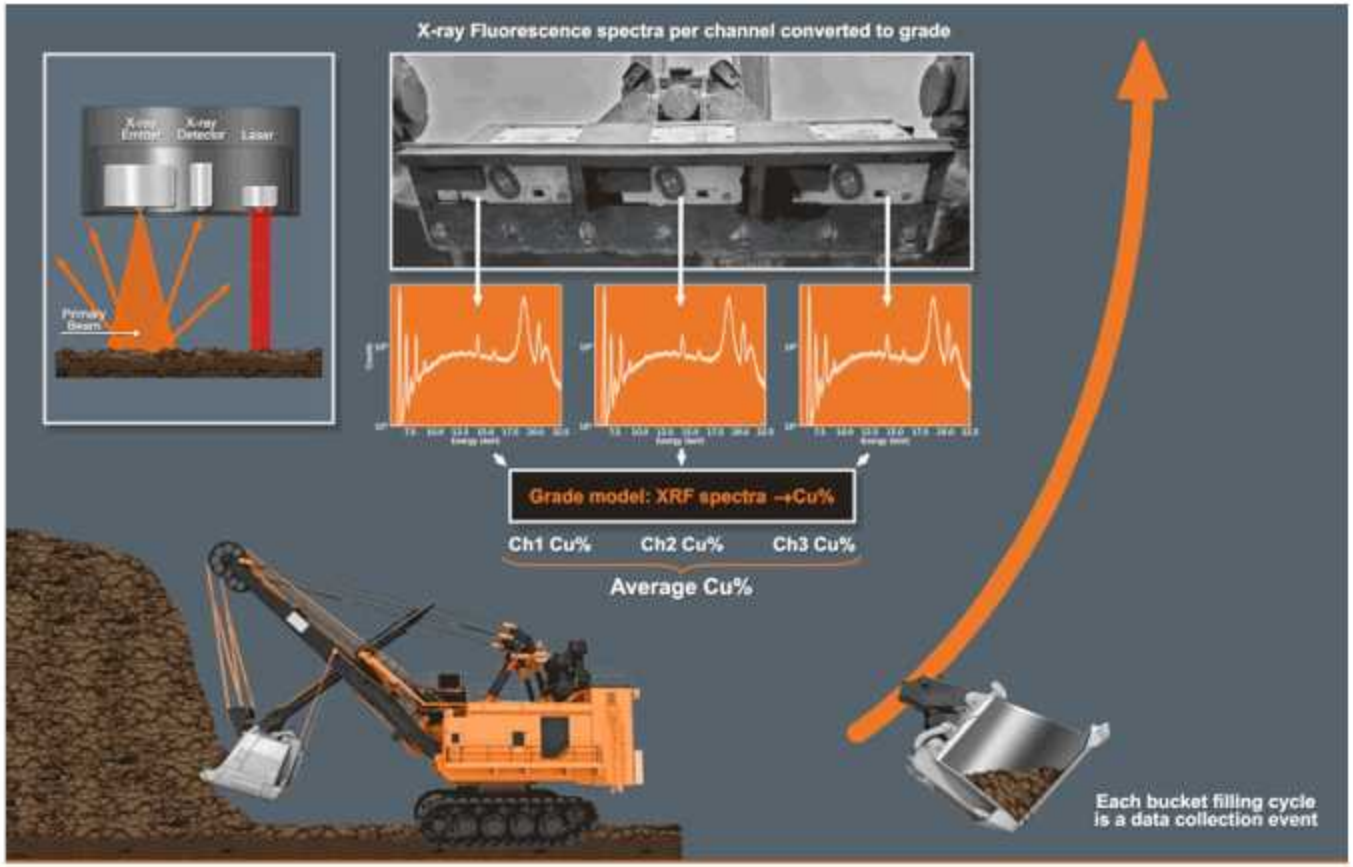
Get ore grade in real-time

Mine-to-Mill Reconciliation

Connect pit grade to concentrator grade and optimize blending and campaigning decisions.



ShovelSense



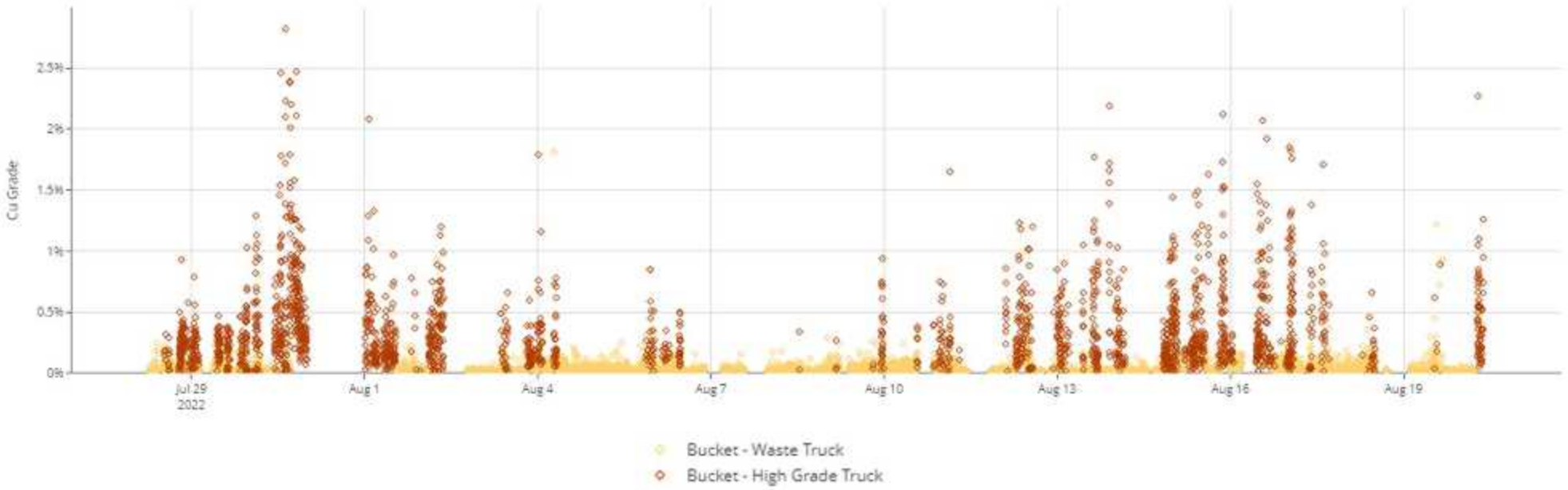
Rope Shovel

Hydraulic Shovel

FEL

Bucket Grades in Real-Time

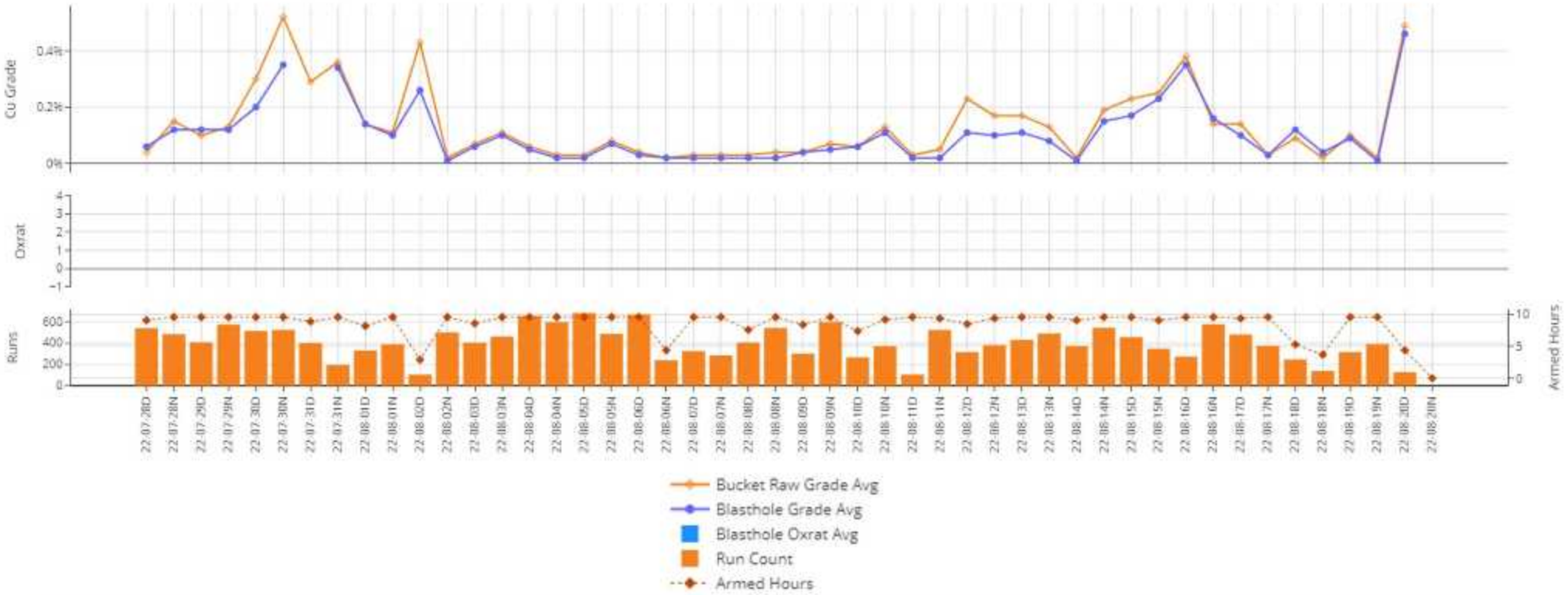
Waste and High Grade



PRIVILEGED AND CONFIDENTIAL

Shift Grade Trend Comparison

Copper Grade



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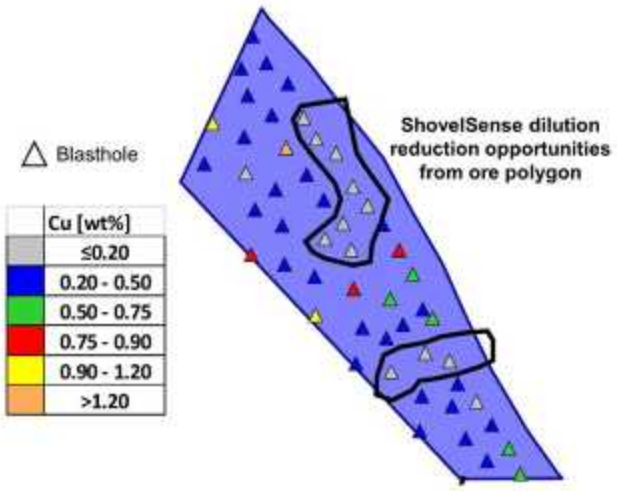
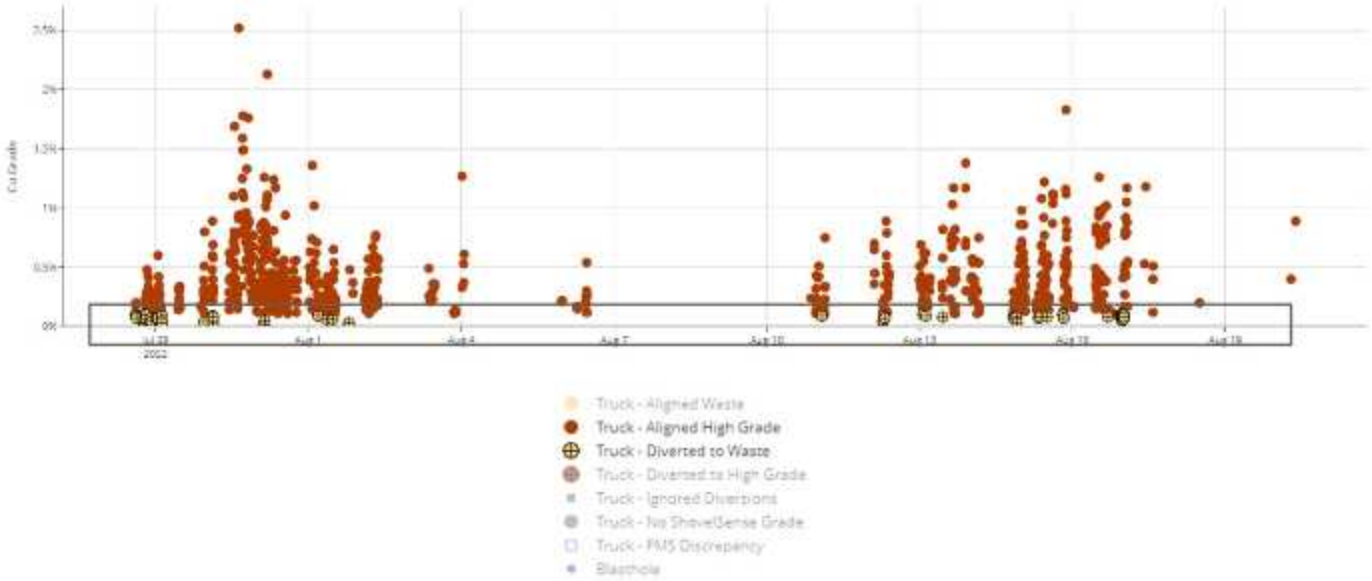
ShovelSense Ore Polygons Truck Grades

Dilution Control





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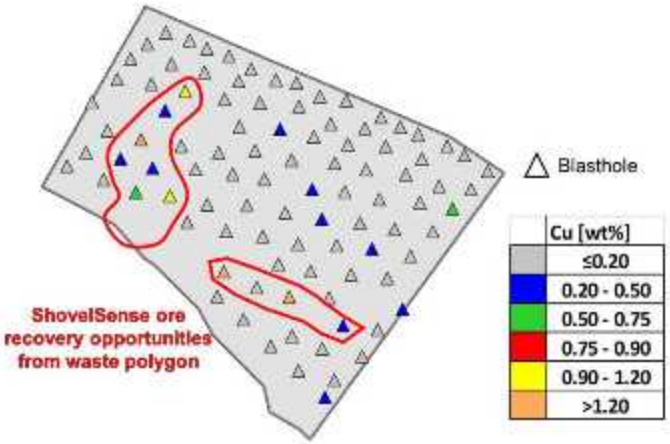
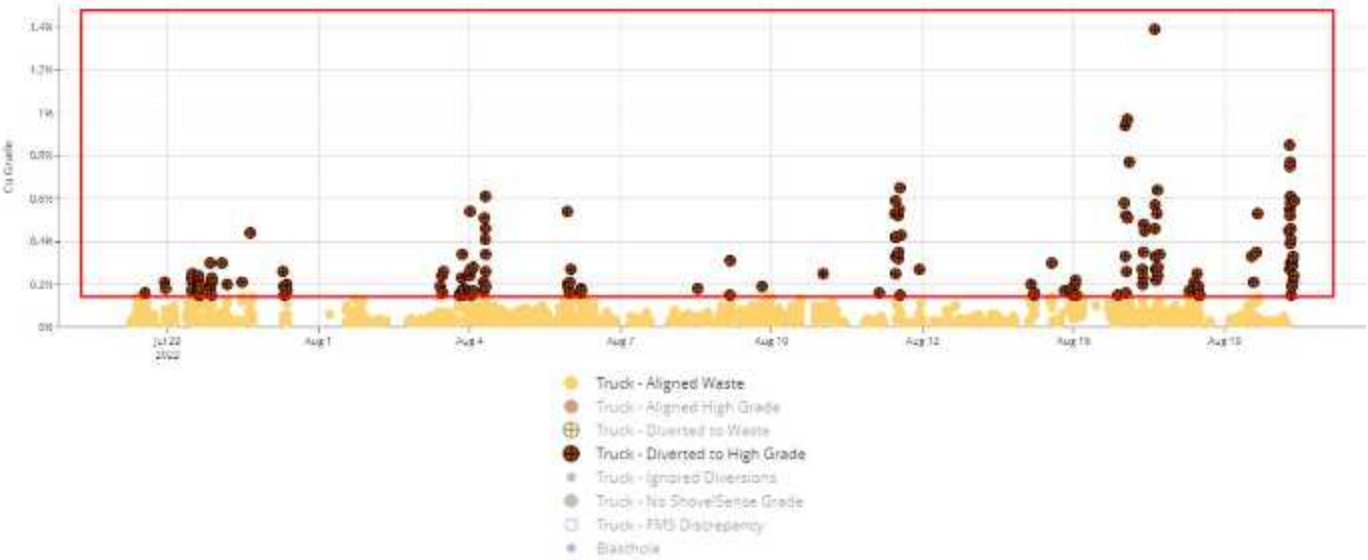
ShovelSense Waste Polygons Truck Grades

Ore Recovery





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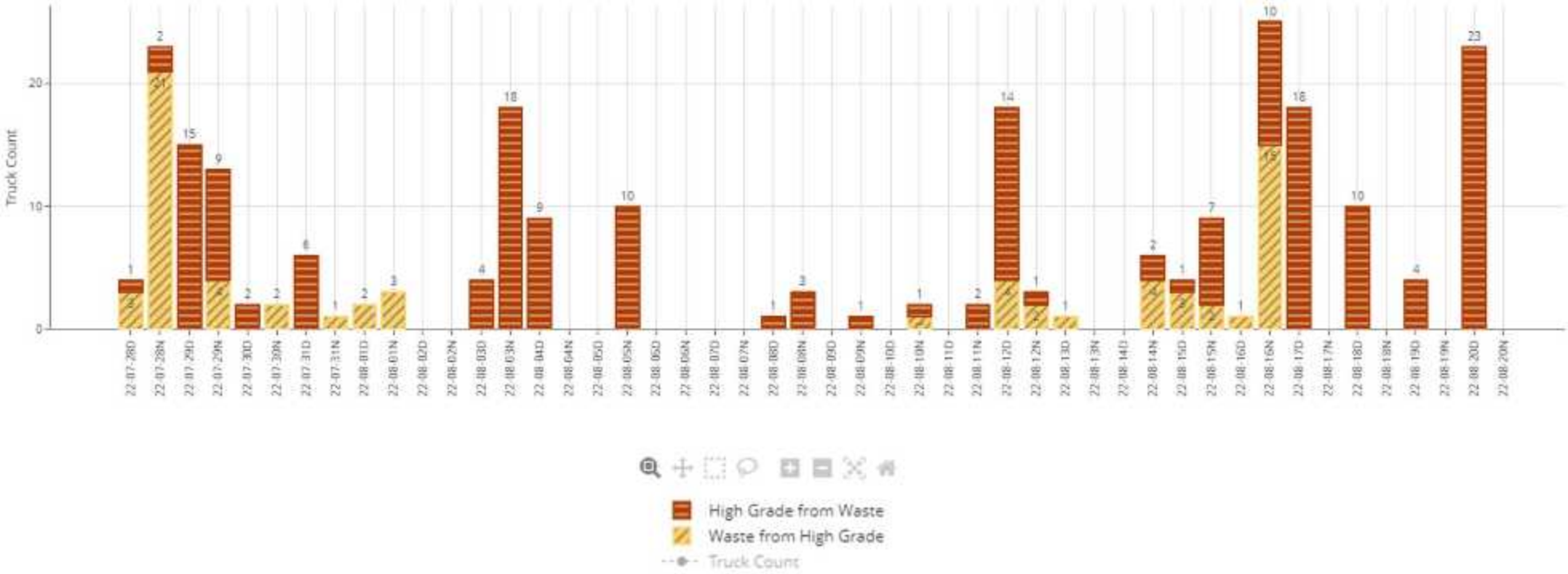
ShovelSense Grades in Real-Time

Truck Summary



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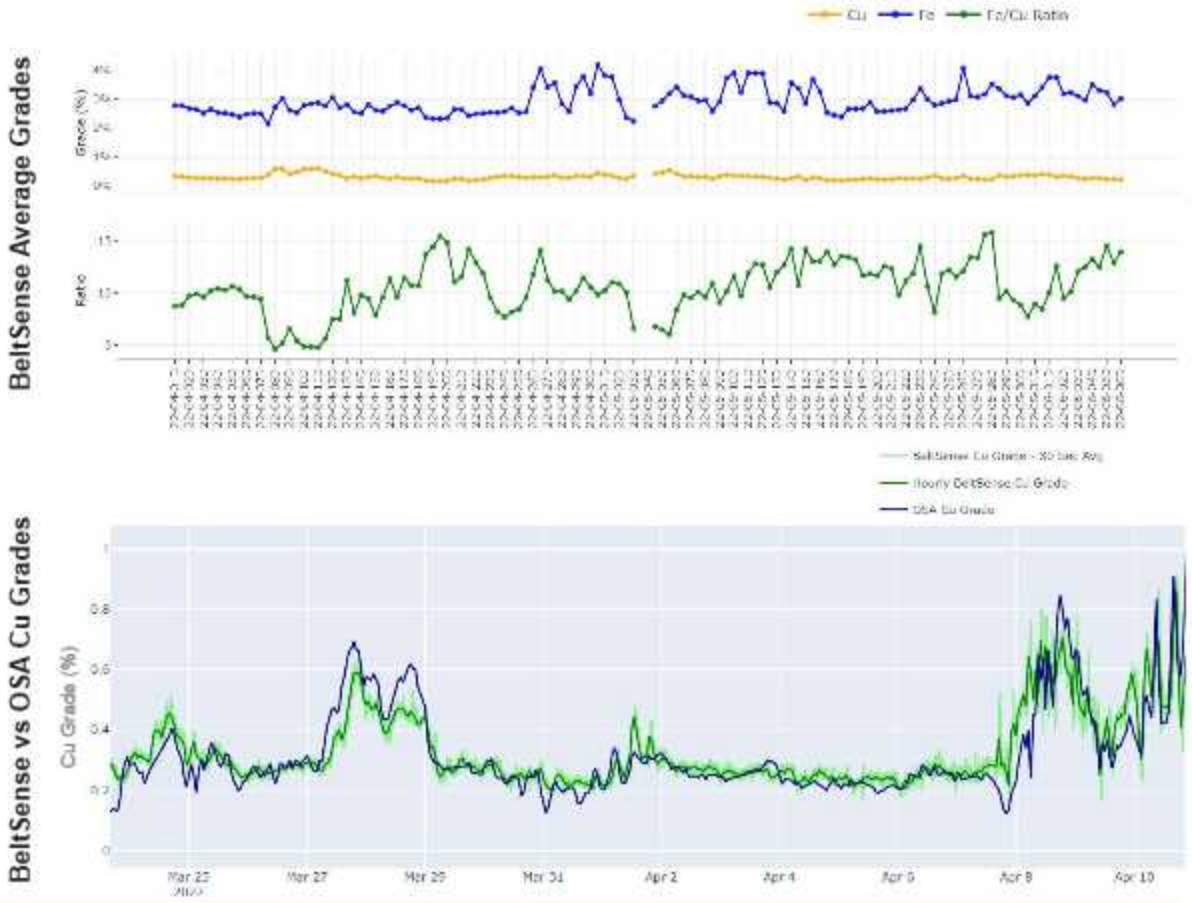
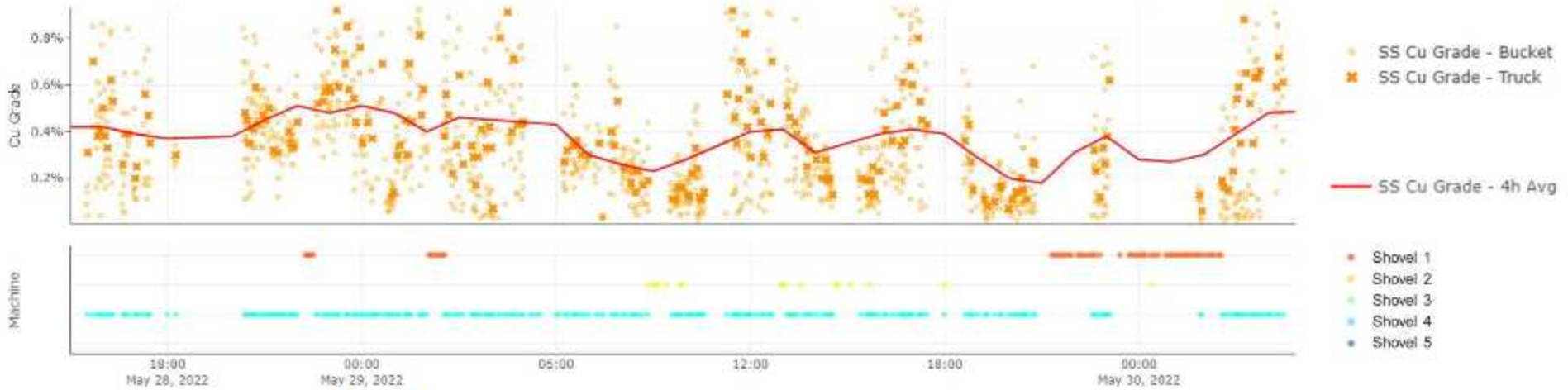
BeltSense Grades in Real-Time

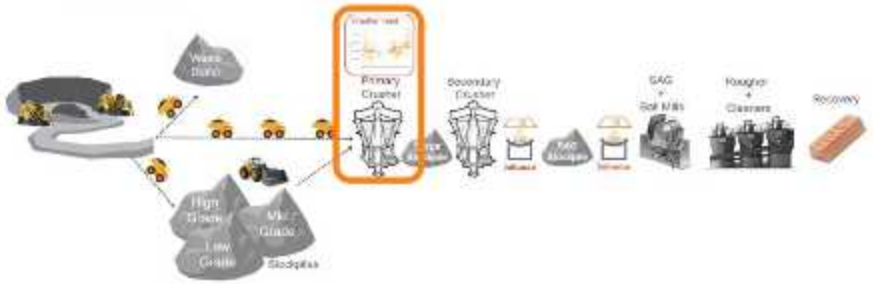
Mill Process Optimization



Aggregation of ShovelSense data to the crusher

Strong grade variability at the mine face – opportunity for grade engineering into the crusher

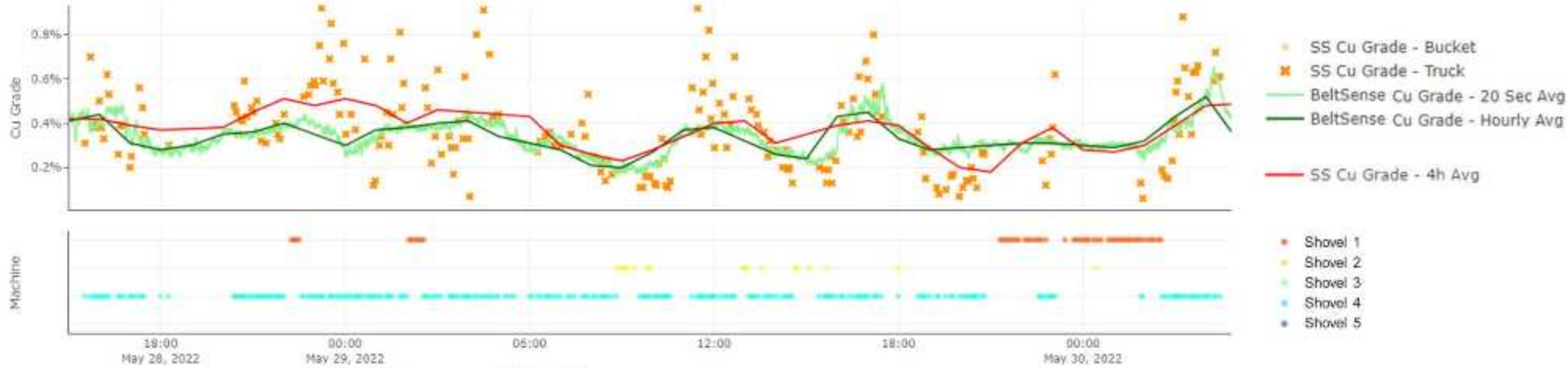


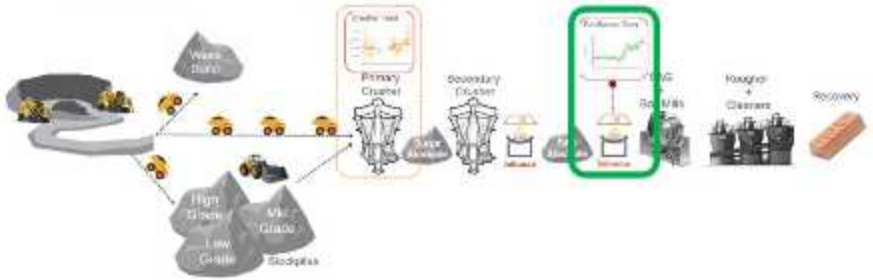


- Significant variation in Cu feed grades to crusher
- Potential to optimize feed sequencing to improve processing plant efficiency

Alignment of aggregated ShovelSense grades with BeltSense

Mixing through crushers and stockpiles reduces grade variability, but not entirely

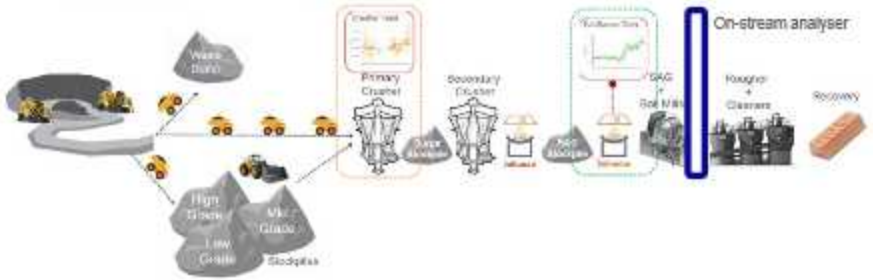




- BeltSense aligns with ShovelSense
- Feed grade variation lesser after mixing during crushing and stockpiling

Alignment of MineSense grades with on-stream analyser

Remaining grade variation confirmed by on-stream analyser



- BeltSense and on-stream analyser align closely
- Opportunity to reduce grade variation through stockpiling and targeted truck sequencing?

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Conclusions

- **High resolution and selectivity** at the face generates an improvement in the average head grade and stabilize downstream throughput grades.

- Having MineSense Mine-to-Mill Solutions allows a real-time reconciliation, **reducing uncertainty and operational risk.**

- MineSense Digital Solutions include the following **characterizations:**
  - Lithological
  - Mineralogical
  - Acid Generation
  - Acid Consumption
  - Grindability

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