Process water quality changes in mineral processing plants operating with **closed water circulation** can be **predicted** based on laboratory experiments.

Dissolution protocol for estimating water quality changes in processing plants operating with closed water circulation

Background and test program with Boliden Kevitsa ore

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Introduction

- Partial or full closed water circulation are needed to save freshwater resources and comply with environmental regulations in mineral processing operations.
- Water recyling -> changes in water quality -> affect on the flotation performance and plant maintenance

Water quality management is usually not included in the plant design and process selection

OBJECTIVE: Design a laboratory protocol for prediction of water variations owing to closed water circulation and its affect on the flotation performance

Methodology

- Dissolution loop: laboratory flotation procedure without reagent addition (except pH modifier with monitoring) and removal of the froth

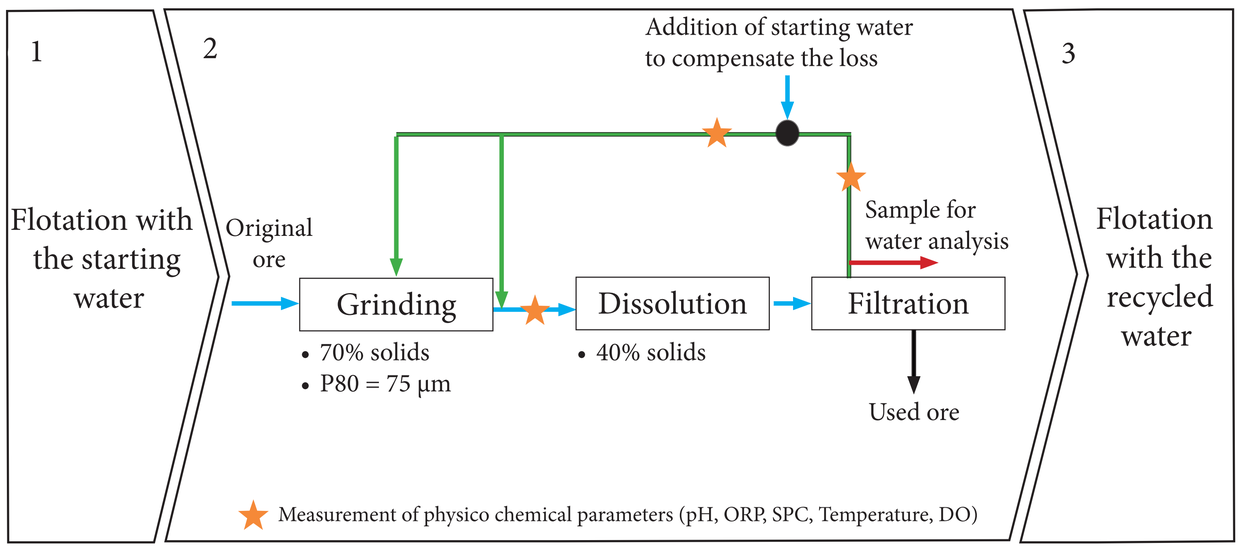

Fig 1: Overview of the Flotation-dissolution test procedure

Table 1: Water types and dissolution conditions

Water types	Abbreviation	Temperature (°C)
Distilled water	DW	5, 20, 35
River water	RW	20
Process water	PW	20
Final tailings water	FTW	20

Results

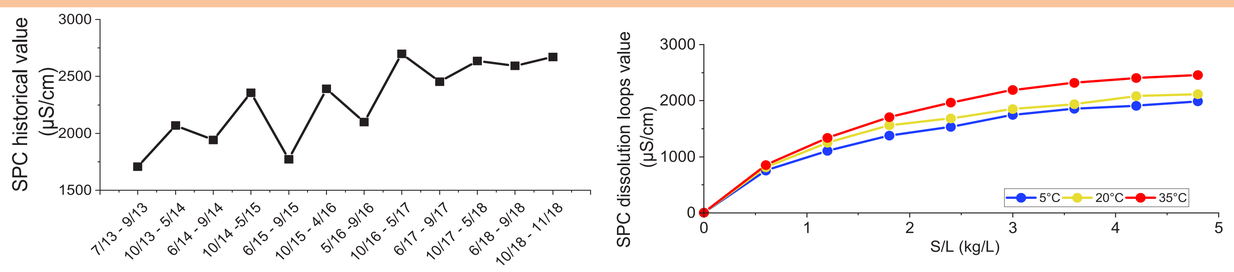

Fig 2: Process water specific conductance (SPC) as a function of operational time at Kevitsa mine (left) and the change in SPC in the recycled water as a function of the dissolution loop (right)

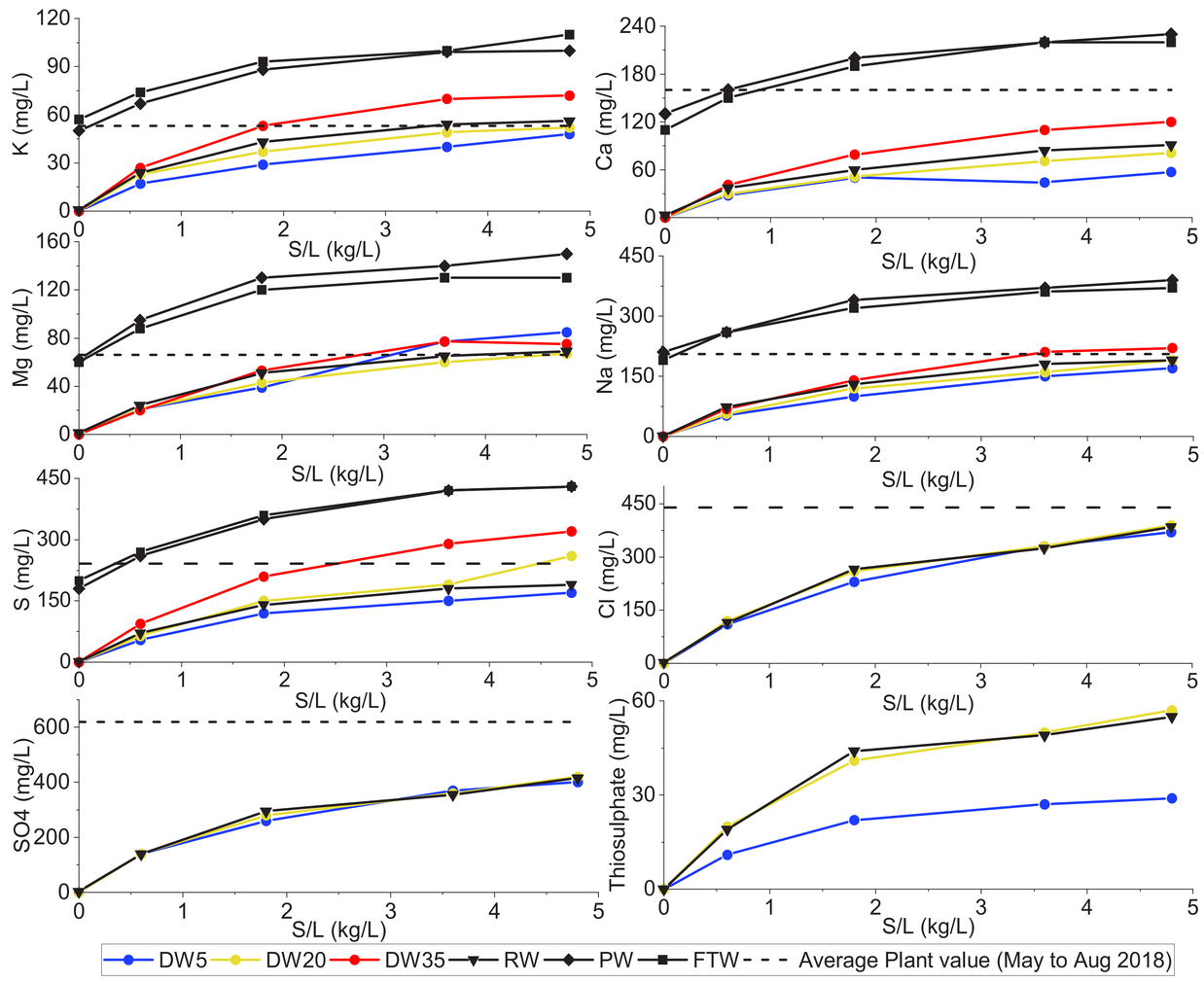

Fig 3: Concentration of major elements in the recycled waters as a function of solid-to-liquid ratio (S/L)

Conclusion

- This laboratory protocol is an important tool that allows the prediction of the water quality variation over time due to the dissolution of the ore when the plant is operated in a closed water circulation. It defines the main direction into which the water matrix will evolve.
- It should be used as a tool to complement the traditional processing plant design and water treatment facility selection and dimensioning.

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