



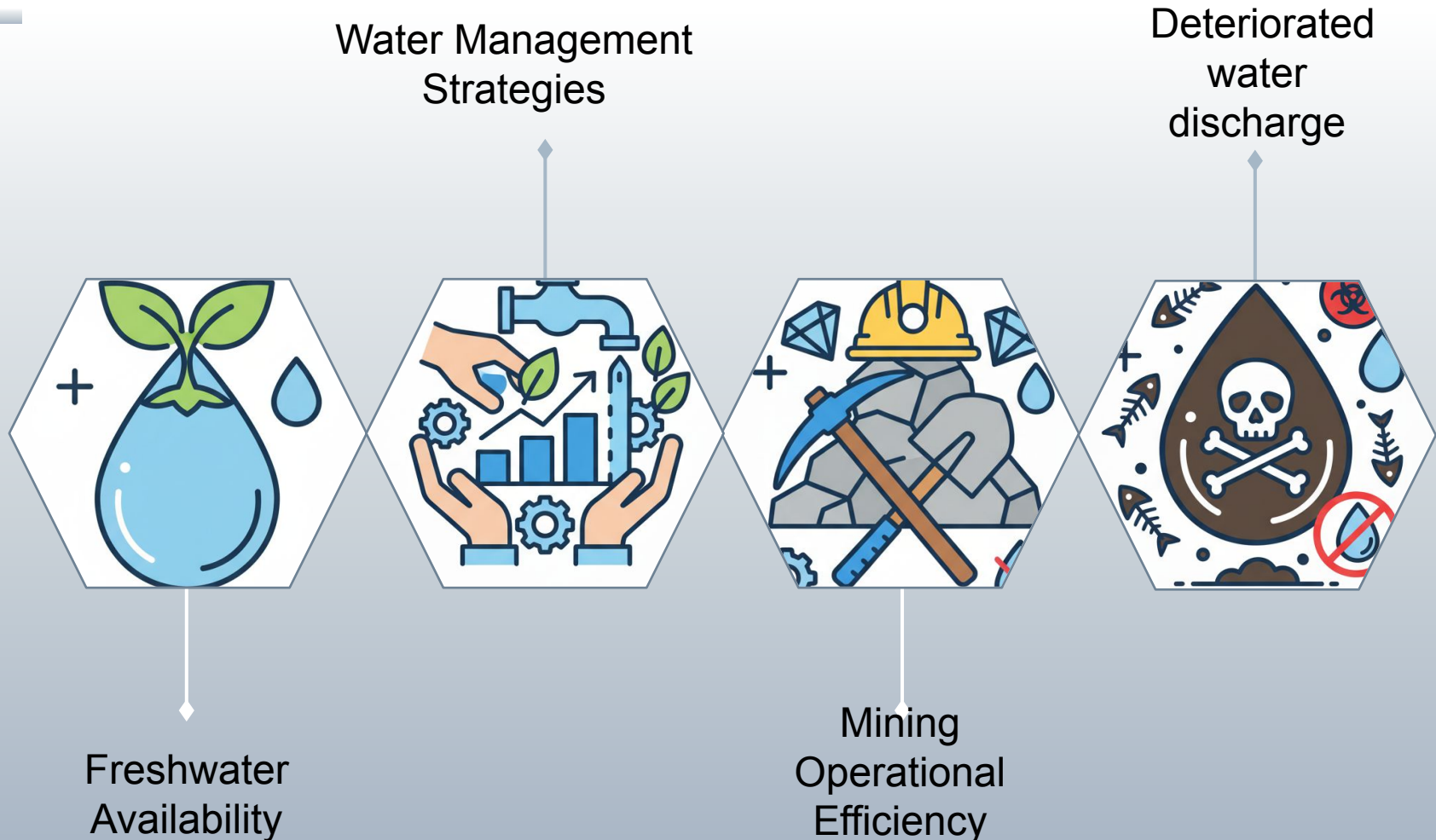
PGM Ore Flotation Under Degrading Water Qualities

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October, 19, March, KQ 2025

26 - 28 October 2025, Sun City, NW, South Africa





Problem Statement and Research Objectives

- The build up of ions in recycled process water presents dual challenges that can negatively affect the flotation performance.
- But it also offers the opportunity to reduce frother consumption due to the enhanced characteristics of high ionic strength conditions.
- Current operations often overdose frothers without the knowledge of the dual impact of increased frother dosage and ionic strength of process water

1

Understand the interplay between increasing ionic strength of water and frother dosage on flotation performance

2

Demonstrate the feasibility of reducing frothers with increasing ionic strength of process water while maintaining or improving flotation performance.

Experimental Methodology

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The concentration of ions present in synthetic plant water (Adapted from Wiese et al. (2005) and Manono et al. (2018))

Water type	Ca ²⁺	Mg ²⁺	Na ⁺	Cl ⁻	SO ₄ ²⁻	NO ₃ ⁻	CO ₃ ²⁻	TDS	Ionic Strength
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(mg/l)	[M]
1 SPW	80	70	153	287	240	176	17	1023	0.0242
3 SPW	240	210	459	861	720	528	51	3 069	0.0620
5 SPW	400	350	765	1435	1200	880	85	5 115	0.0977
10 SPW	800	700	1 530	2 870	2 400	1 760	850	10 230	0.1860

Frother(Dowfroth200)

- 30 g/t, 40 g/t, 50 g/t

Collector dosage(SIBX)

- 150 g/t

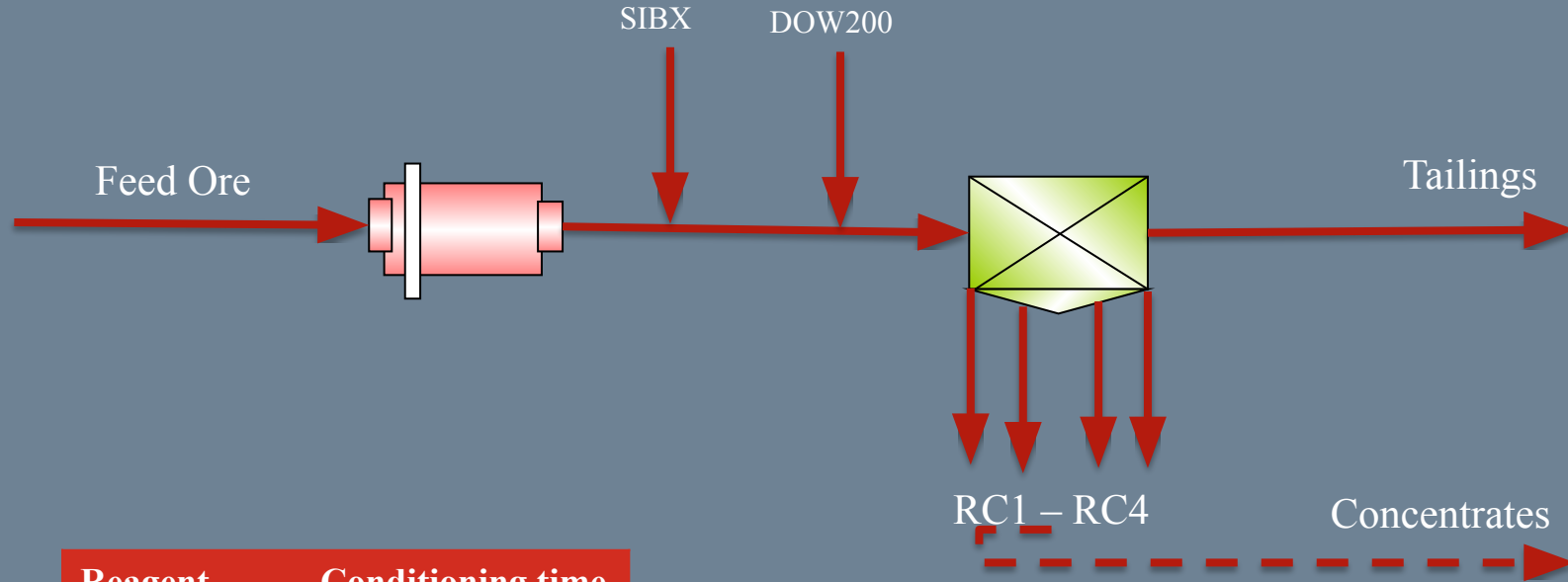
Ionic Strength of Process Water

- 3 SPW, 5 SPW, 10 SPW

Experimental Methodology

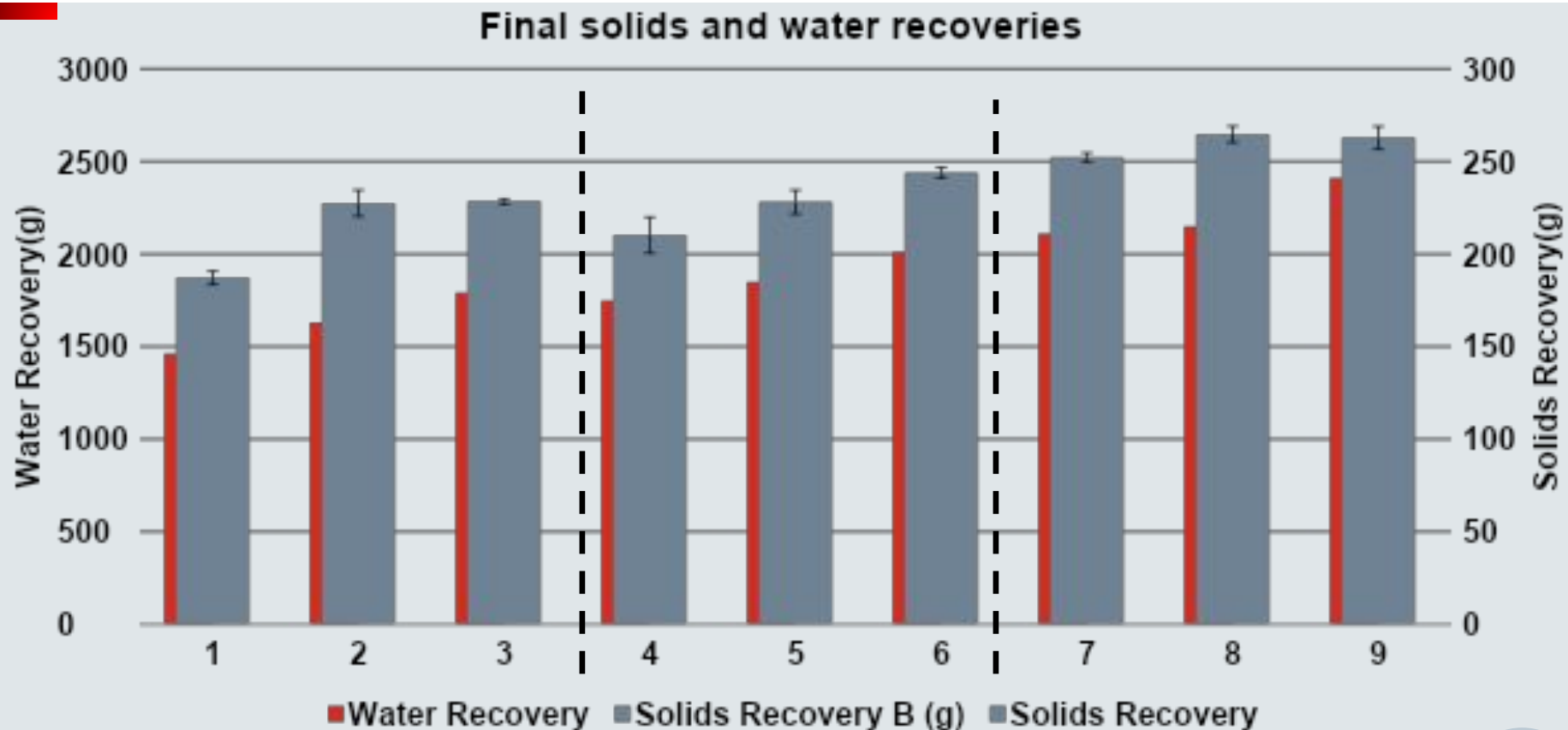
**Primary
Milling**
52 Minutes

**Primary Rougher
Flotation**
20 Minutes

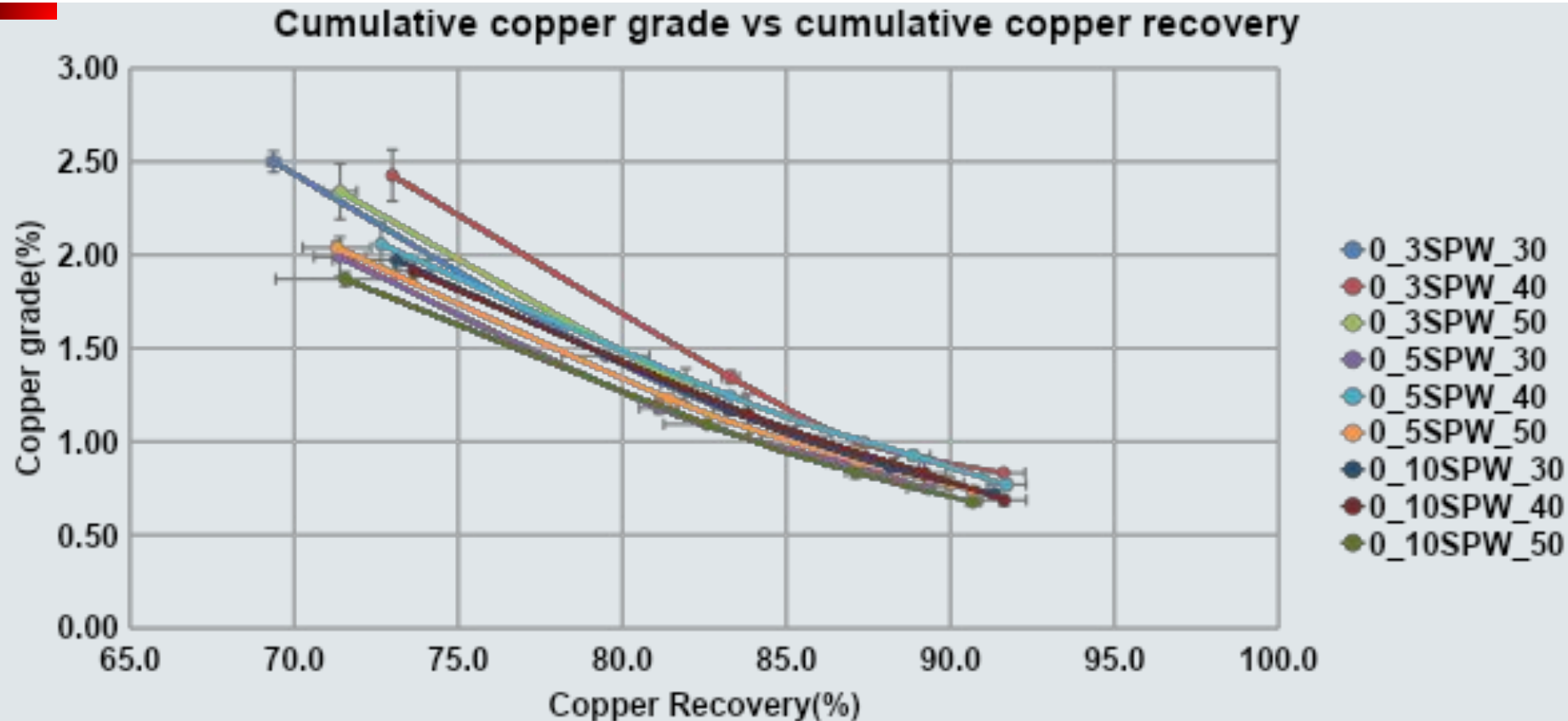


Reagent	Conditioning time
SIBX	3 minutes
DOW200	1 minute

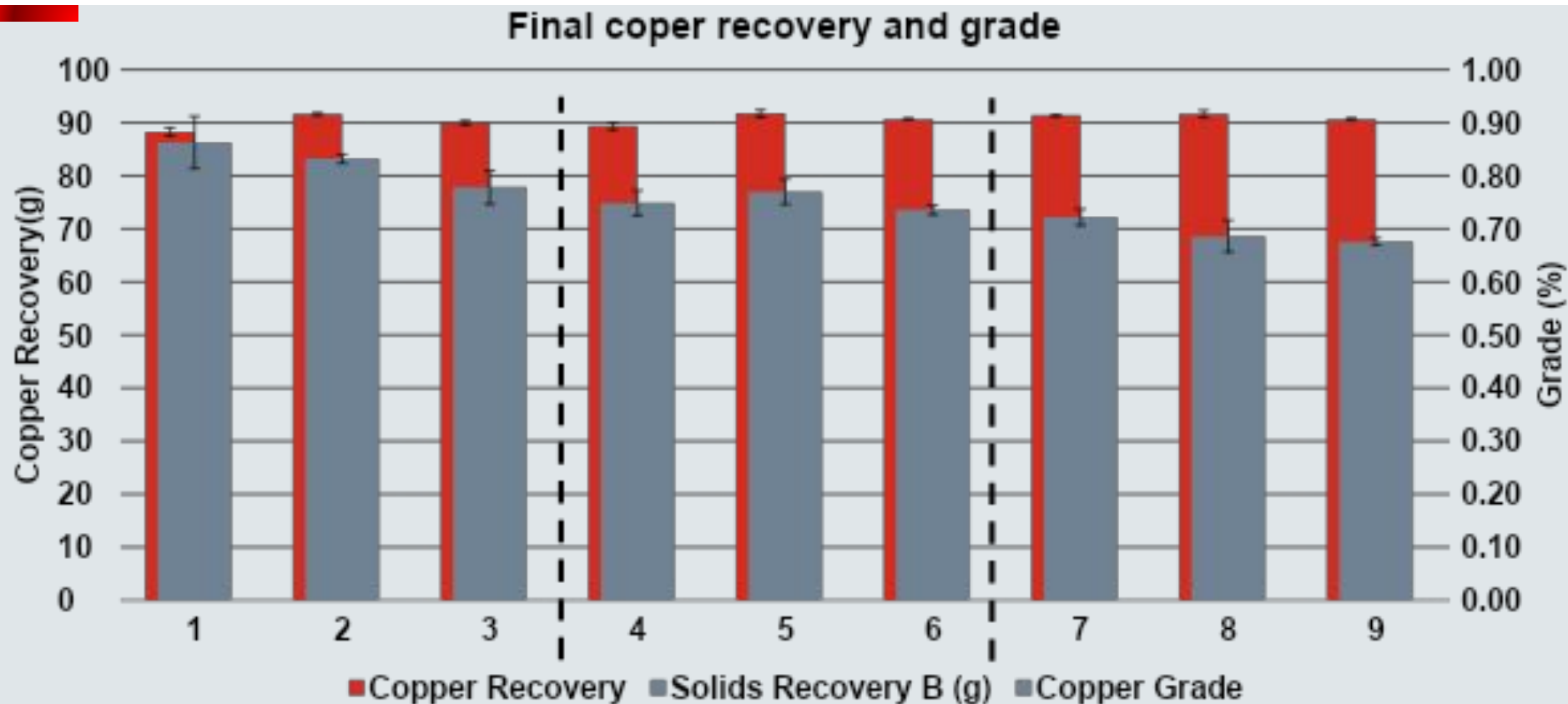
Key Results: Final Solids and water recoveries



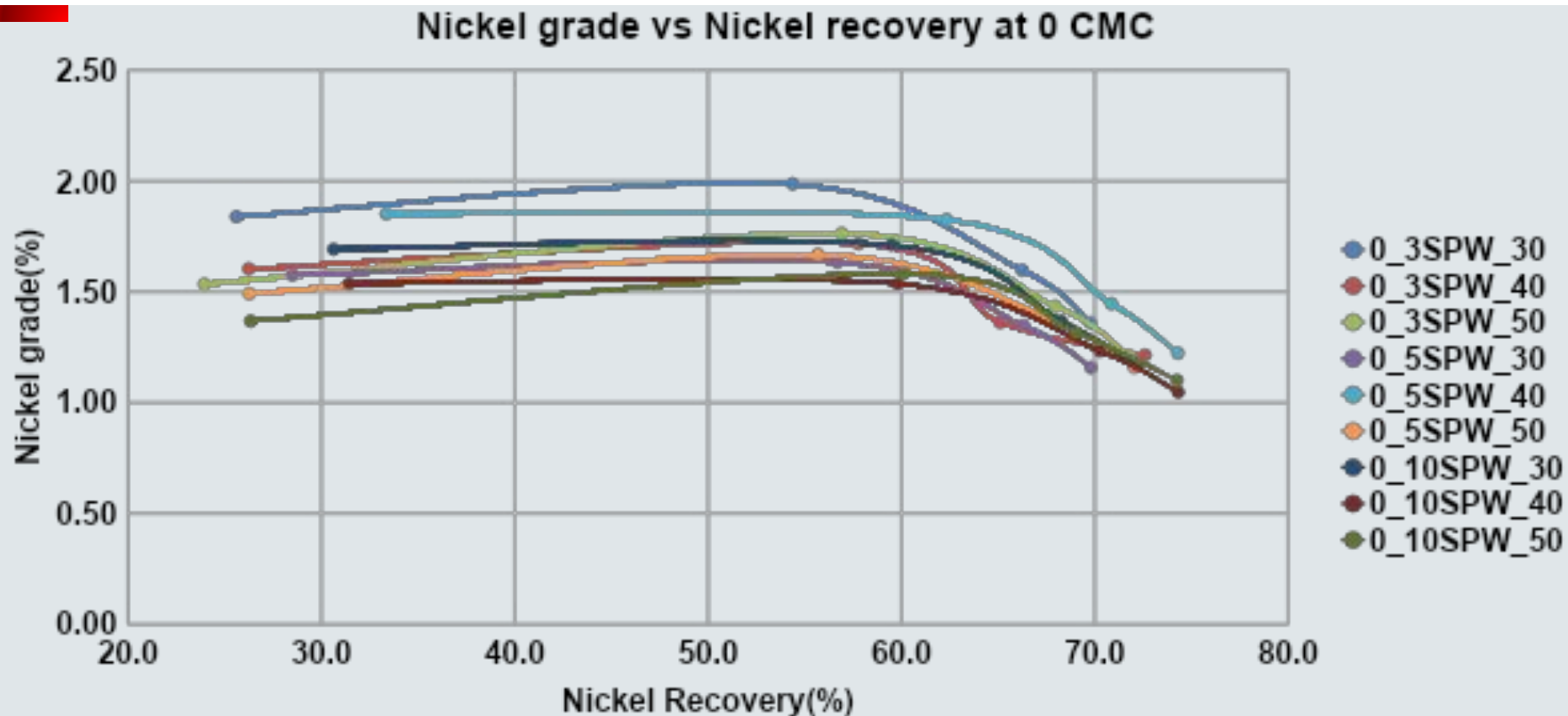
Key Results: Copper Recovery and Grade



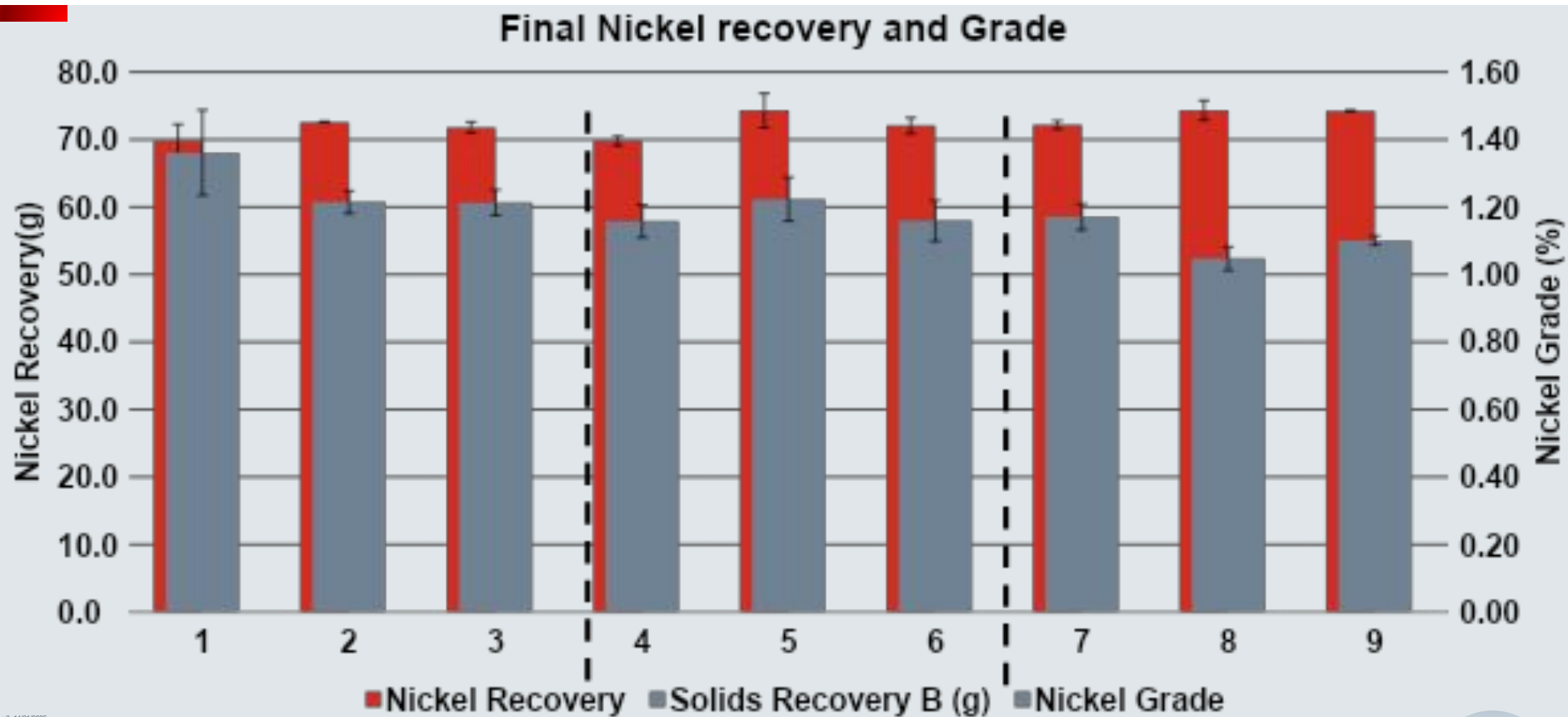
Key results: Final Copper Recovery and Grade



Key Results: Final Nickel Recovery and Grade



Key Results: Final Nickel Recovery and Grade



Conclusion

Froth Stability

- Froth stability is enhanced through increase in the ionic strength of water leading to high solids and water recoveries.

Frother Reduction

- Reducing frother dosage with increases in the ionic strength of water maintains the flotation performance for copper recovery.

Grade-Recovery Trade-off

- Cleaner stages need to be optimised as a result of grade-recovery trade-off in the rougher stage.

Optimal Conditions

- The best operating conditions is 10 SPW at 30 g/ton of frother where copper and nickel are not affected with respect to recover and grade .

Future Work



1

Perform tests on the cleaner stages to optimise for the losses.

2

Perform gangue assays on the samples to understand gangue behaviour and entrainment.

3

Perform pilot studies to simulate water recycles

Acknowledgements



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