

GOLD FIELDS



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pH Modifier in Leach Circuit Using Eluate

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KLOOF NO. 2 PLANT

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Outline



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- Objectives
- Kloof No. 2 Plant Process Description
- Literature Survey
- Laboratory Scale Testwork
- Plant Scale Testwork
- Results
- Conclusion
- Recommendations
- Questions???

- To evaluate the possibility of using smelt-house effluent (Eluate) as a pH modifier in the leach circuit.
- Maintaining the normal pH degradation cycle with Eluate as the pH modifier.
- Determine the effect of Eluate on the leaching kinetics and recovery.

Kloof No. 2 Plant



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Project Background

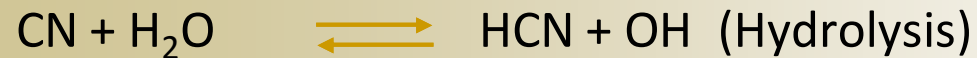


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- Electrowinning of gold from pregnant solution is done on a batch basis; this generates a barren solution (Eluate) ~ 80 m³ per batch.
- Eluate pumped into the leach circuit from the Smelt house – resulted in high pH in the Leach Circuit.
- Investigate the possibility of utilizing eluate as a pH modifier in conjunction with the slaked lime or on its own.
 - Eluate Solution pH: 12.60 – 13.0
 - Slaked lime pH : 12.8
 - Sodium Hydroxide : pH of 13.6.
- The eluate is very close to these two solutions in pH.
- Add Eluate and Lime to reduce lime consumption and save on Costs

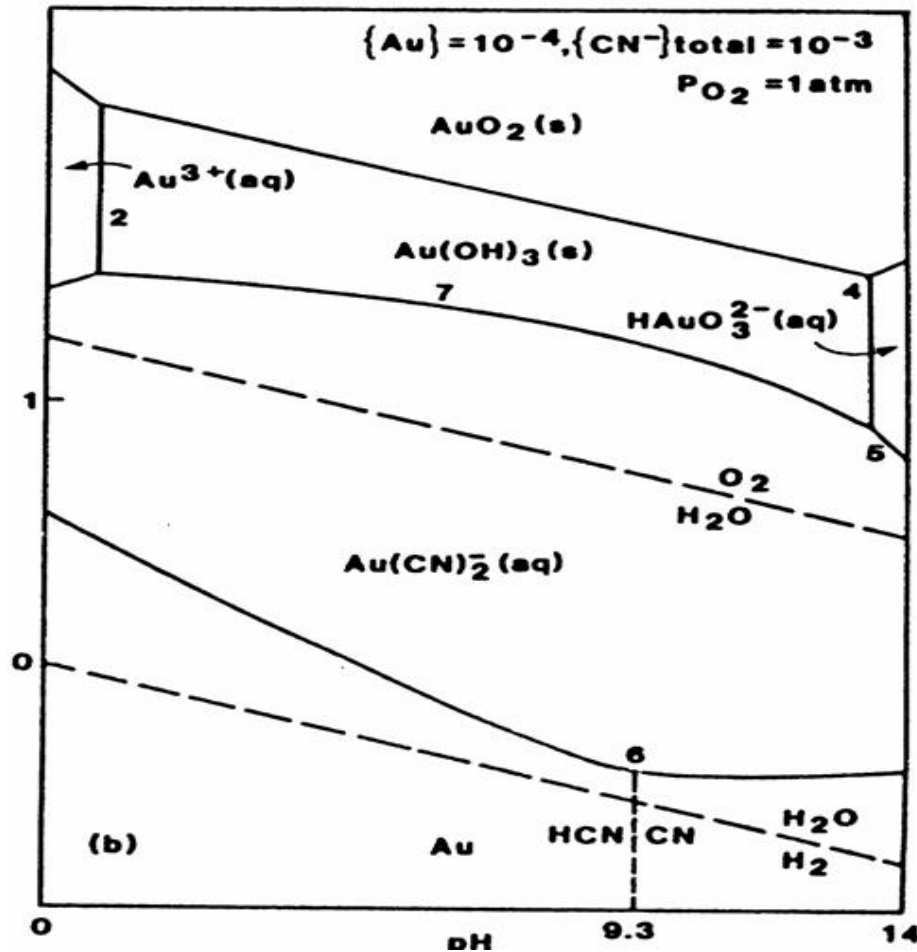
- Any pH modifier must take into account the pH requirements of subsequent processes and should try to match these as closely as possible.
- The most commonly used pH modifiers in gold extraction are calcium hydroxide and sodium hydroxide.
- pH modifier is also used to aid settlement of particles in the thickener
- Affects scale-forming tendency of slurries and solutions downstream.
- Calcium hydroxide has a greater tendency to form scale than sodium hydroxide.
- Benefits of Calcium hydroxide:
 - cheap
 - beneficial coagulation effect on the particle settlement at thickener
 - making it more effective for use in solid-liquid separation processes.

Dissolution of Gold



The extent to which hydrolysis proceeds depends primarily on the amount of free alkali

Effect of Alkalinity on Gold Dissolution



- At pH of 9.3 hydrolysis of cyanide into HCN takes place.
- Prevent excess loss of CN by hydrolysis.
- pH level of the cyanided pulp during leaching is an important parameter, prevent formation HCN.

- Key focus Areas:
 - pH degradation
 - NaOH is not effective as a settling agent
 - Estimated Eluate consumption figures
 - Effect on the leach kinetics and recoveries when using eluate as pH modifier.
 - Comparison of two pH modifiers : Lime and Eluate

pH Modification with Eluate Testwork



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Bottle Roll Test work

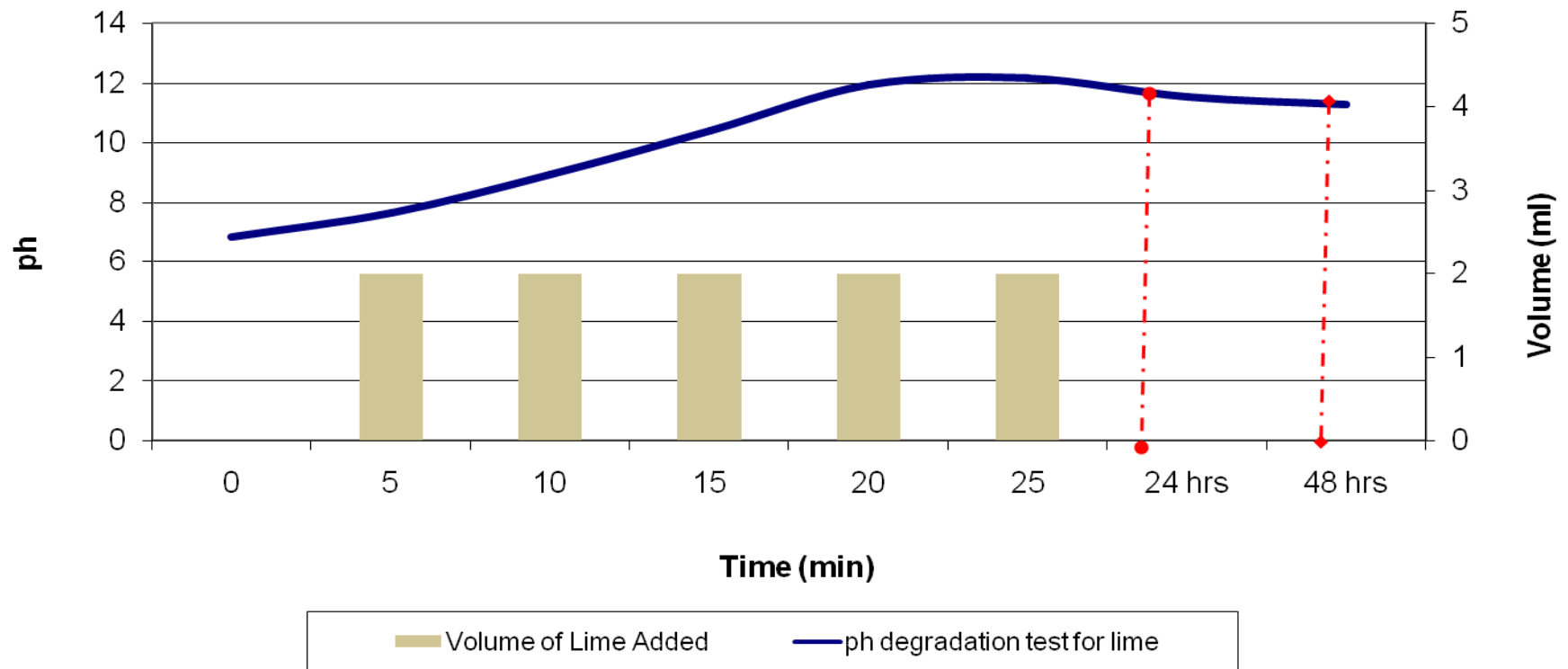
- Test Parameters:

- Initial pH: 8.1 – 8.6
- Stabilized pH: 11.1 – 11.26
- Cyanide Concentration: 500ppm
- Solids: Liquid 1:1
- Final Metal Balance: 97% -103%
- Bottle Roll Period: 48hrs
- pH modifier 1 Lime
- pH modifier 2 Eluate

Results



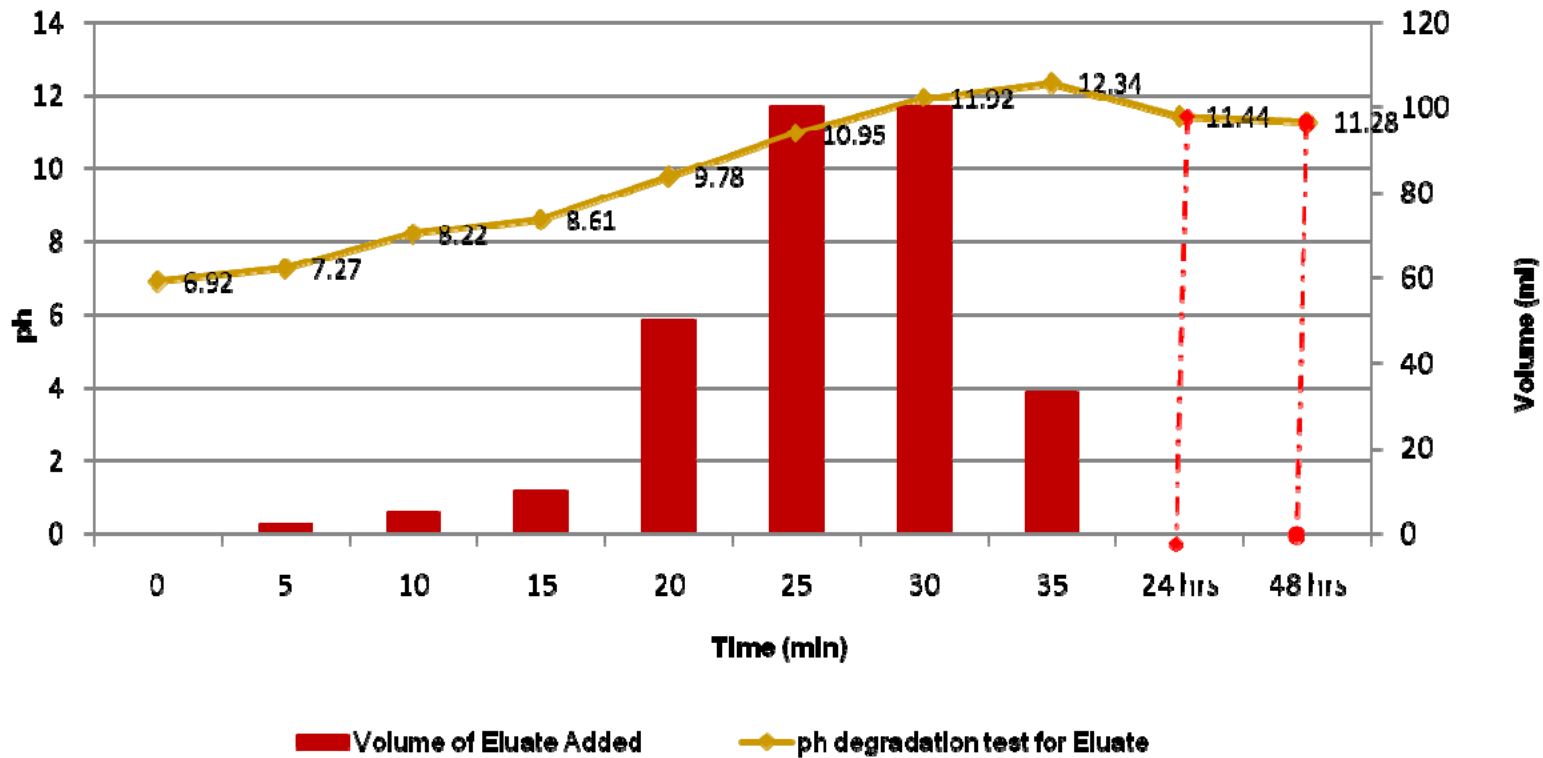
Decreasing rate of ph when lime is used as a ph modifier.



Results



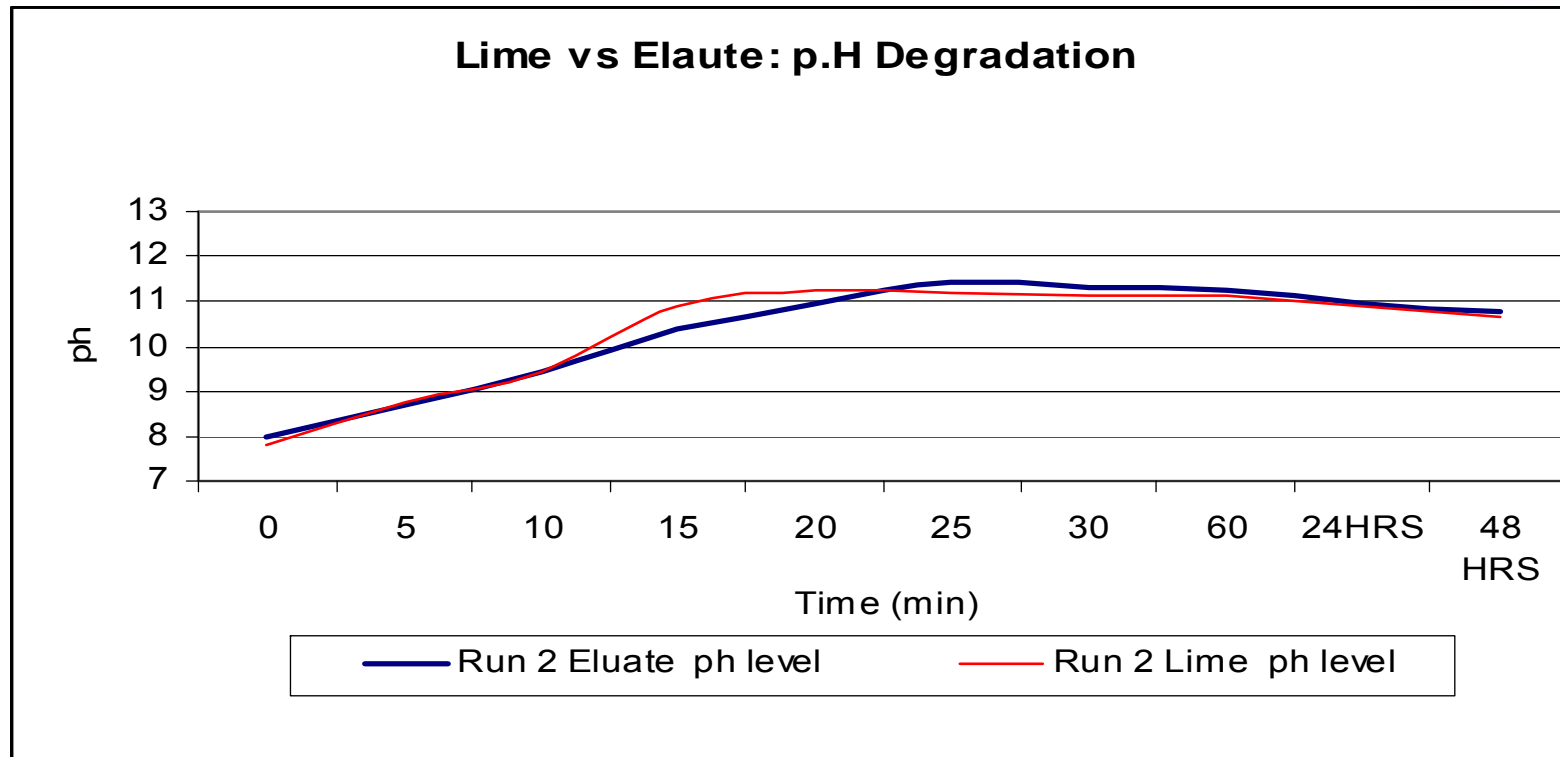
Decreasing rate of ph when Eluate Solution is used as a ph modifier.



pH Degradation for Lime and Eluate



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- Eluate solution is a weaker alkali containing smaller amounts of caustic in the solution.
- No real difference in pH Degradation between lime and eluate
- Calculated Consumption of 12kg/ton, 64 – 72 tons per day to obtain pH of 11.

Au Recoveries: Lime vs Eluate



pH Modifier	% Recovery
Elution 1	96.21%
Elution 2	96.08%
Elution 3	96.49%
Lime 1	96.37%
Lime 2	96.28%
Lime 3	96.42%

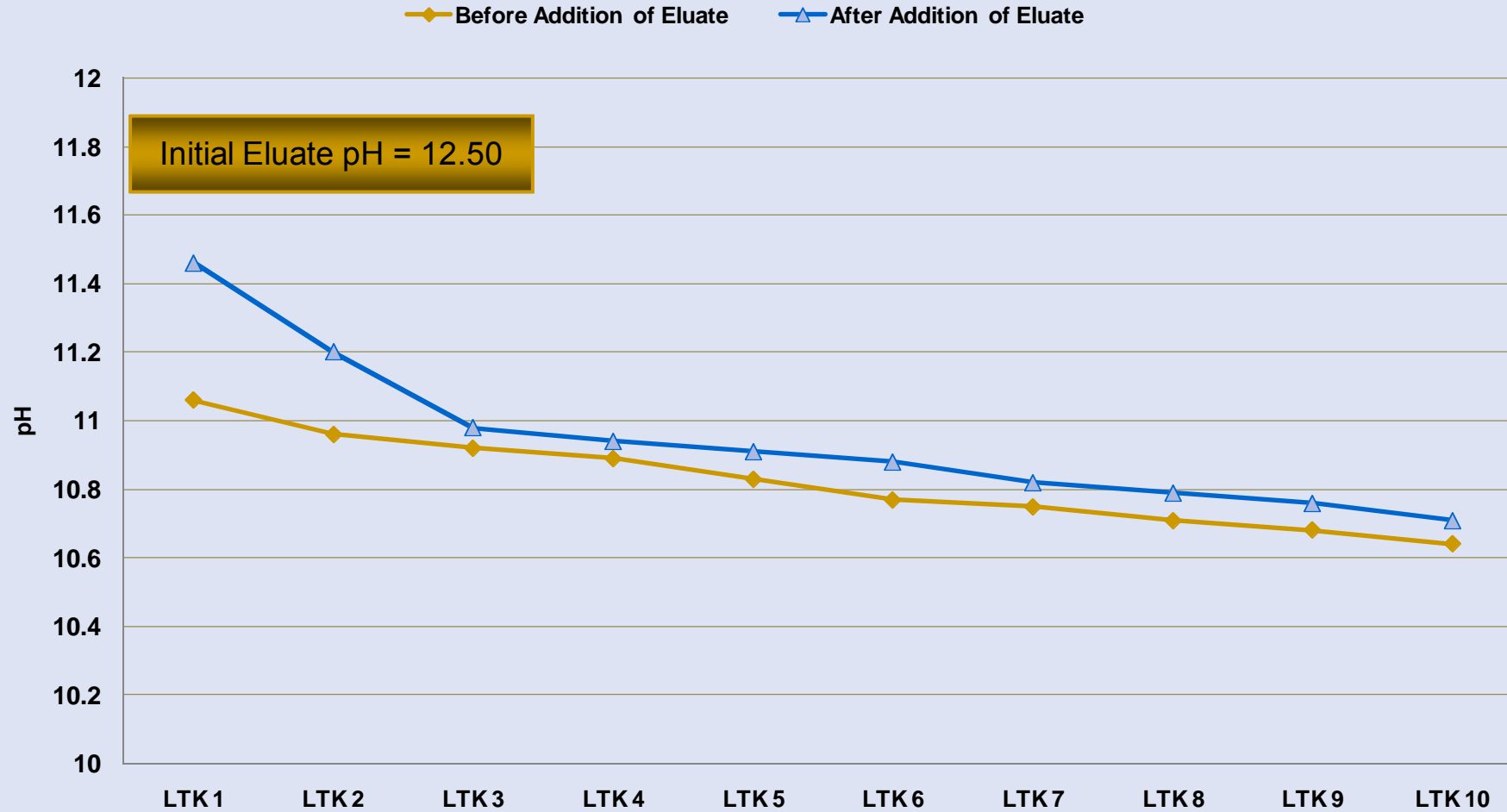
- Recovery using Eluate : 96.26 %
- Recovery using Lime : 96.36 %
- Use of Eluate as a pH modifier has no significant effect on the recoveries

Plant Scale Eluate Testwork



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70% lime and 30% Eluate

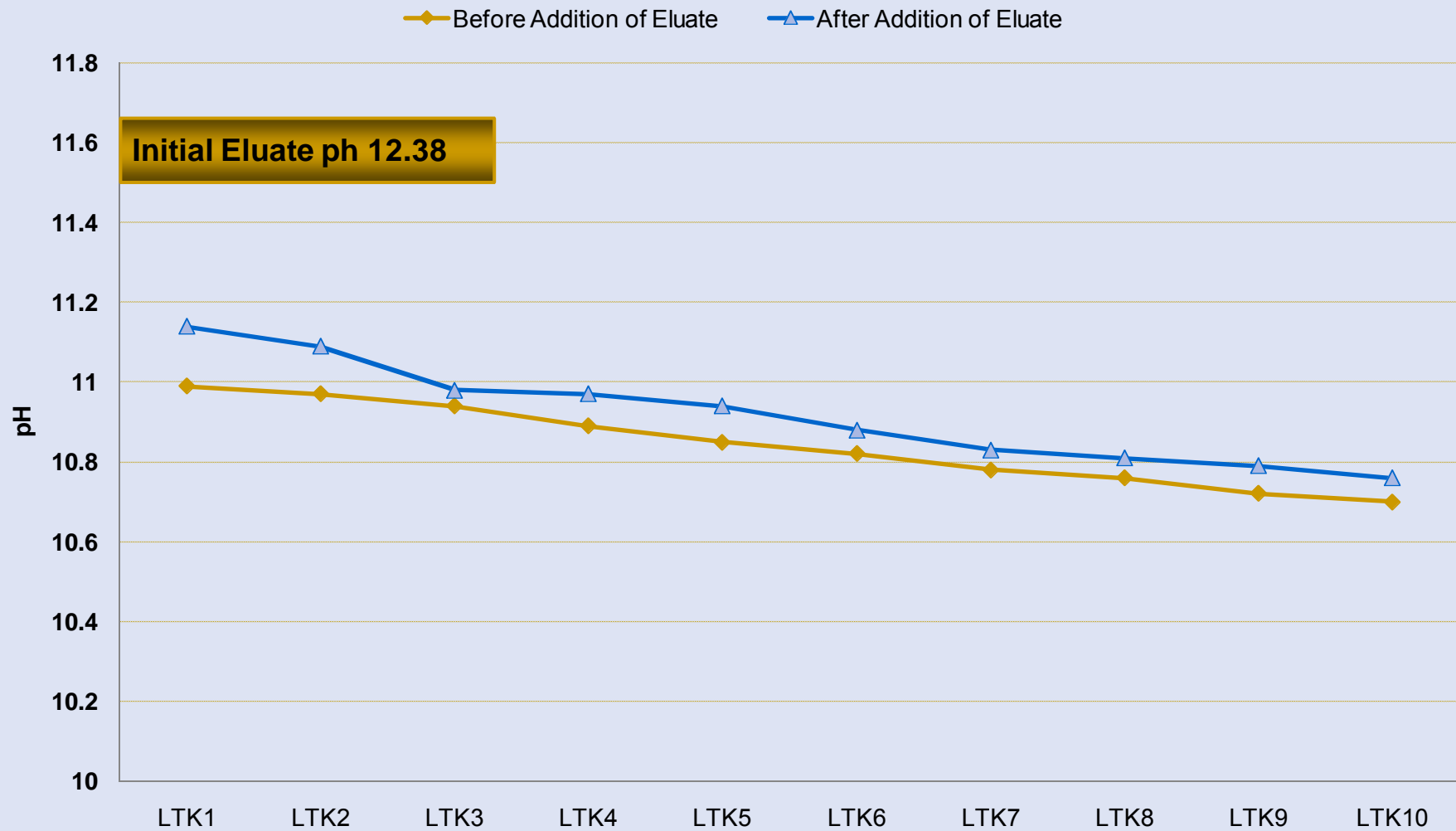


Plant Scale Eluate Testwork



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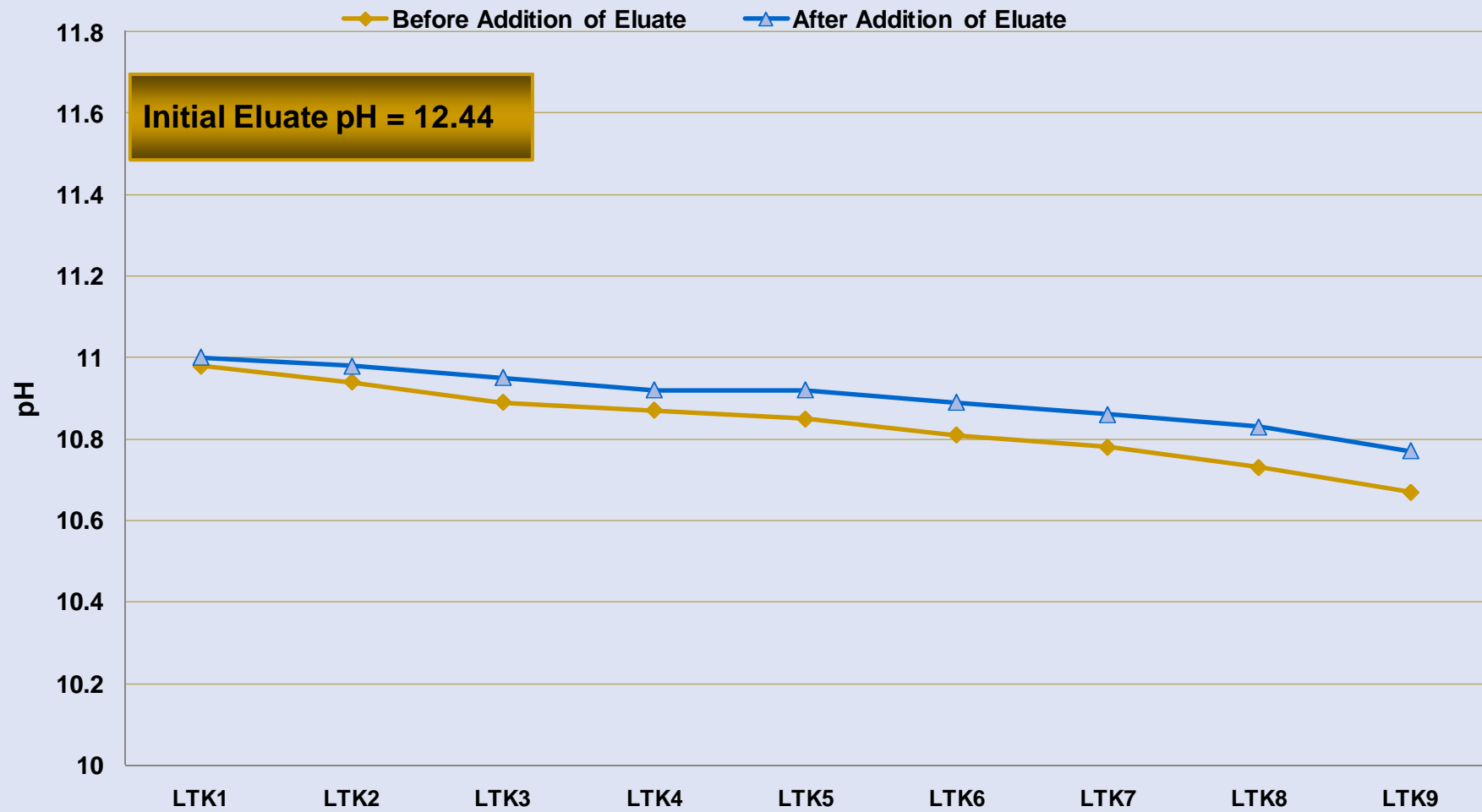
65% Lime and 35% Eluate



Plant Scale Eluate Testwork



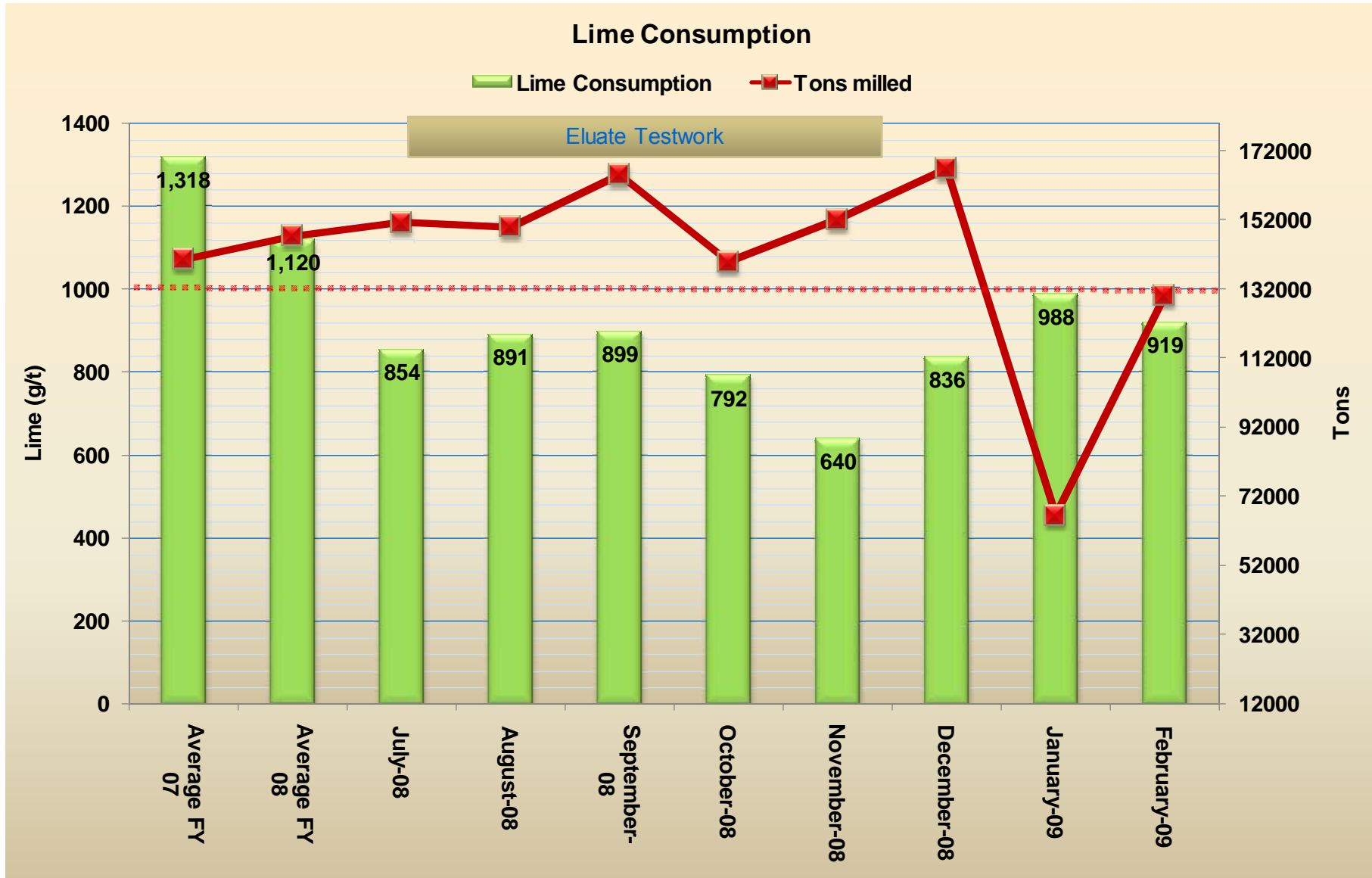
60 % Lime and 40% Eluate



Lime Consumption



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Lime Delivery Costs	
34 tons	Lime delivery
R719.94	Per Ton of Lime (excl VAT)
25.5% Lime Strength	0.255 Factor
R 6278.00	Per Delivery
R 12557.00	Savings per week on Delivery
R 50228.00	Savings Per month

- Costs savings of **R 50,228.00** per month could be realized
- Calculations based on the testwork period Oct – Nov 2008

Conclusion



- pH well controlled in the leach circuit.
- Degradation rate of the two pH modifiers was steady, no significant difference.
- No significant effect on the leaching kinetics
- Recovery of 96.26% and 96.36% were achieved when Eluate and Lime were used respectively.
- It is possible to control the pH of the cyanided pulp using Eluate without sacrificing optimum metal recovery.
- Savings on costs could be realised when adding eluate as a pH modifier.



- Investigate the effect of Eluate on settlement of solids in the thickener.
- Further testwork to be done using only Eluate as a pH modifier
- Automation of the Eluate Addition in the Leach circuit



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