



MaxiFlox[®] Used To Improve Operational Efficiency In Processing Mineral Sands Tailings

CASE STUDY • 2021





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MaxiFlox® used to improve Operational Efficiency in Processing Mineral Sands Tailings

MaxiFlox® chemistry, supported by SciDev's engineering and professional services delivered significant improvements in the operational efficiency of treating mineral sands tailings.



Background

A Minerals Sands ore deposit (zircon and titanium minerals, including rutile and ilmenite) are formed mostly in new or ancient beach environments. They are referred to as "Heavy Minerals" due to the high specific gravity of the valuable minerals.

Australia is one of the four main mineral sands sources in the world. Australia is also one of the largest producers of titanium minerals and accounts for over half the global zircon production.

01.

In this case the ore is dry mined and then washed to form a slurry which liberates the ore via mining units. The slurry is upprocessed through a concentrator to de-slime the slurry using cyclones and spiral classifiers, separating the sand tailings and mineral clay (or "slimes") leaving a high quality heavy mineral concentrate (HMC) for further downstream processing.

02.

The slimes are processed through a thickener and then recombined with a portion of the sand tailings. The sand and slime tailings slurry is pumped to the tailings area and treated with polymer to reclaim the process water.

A high molecular polymer is used to treat the tailing as it quickly releases clean water for reuse in the concentrator. Polymer works by binding together coarse and fine particles creating a dry, stable deposit for mine rehabilitation.

It is important the deposited tailings are dewatered, consolidated and stabilised quickly.

03.

During the early stages of a new mining cut, typically the ore is of lower grade whilst there are higher volumes of mineral clay and other materials that can impact processing times and water usage. This mineral clay is often susceptible to pH changes and other such issues.

Using the incorrect flocculant, or too much of the right one, can negatively impact the rate of processing and slow down the mining process.

In some cases where increased flocculant dosages are required, the maturation time of the flocculant is reduced thereby reducing its effectiveness.



Problem

This particular client required a specific flocculant to ensure both fast hydration and dissolution. They needed something that would work well with sodium-rich process water and varying clay levels.

Our client's key challenges were:

- » Process water quality with high salinity levels, which were higher than sea water type total dissolved solids (TDS). This slows down the processing time for the flocculant to dissolve and have its desired effect.
 - » Conventional flocculants don't work properly in sea water type TDS environments.
 - » The client's flocculant system was only reaching 75% of its target dissolution rate, which was limiting performance and ultimately increasing costs.
- » Feed variations due to the variable ore body:
 - » The thickener design was not suitable across all slime variations. Multiple solutions were required to address these variations.
 - » The feed solids percentage was too high and more flocculant was required.
- » Not enough automated control systems in place and inconsistent existing manual input.





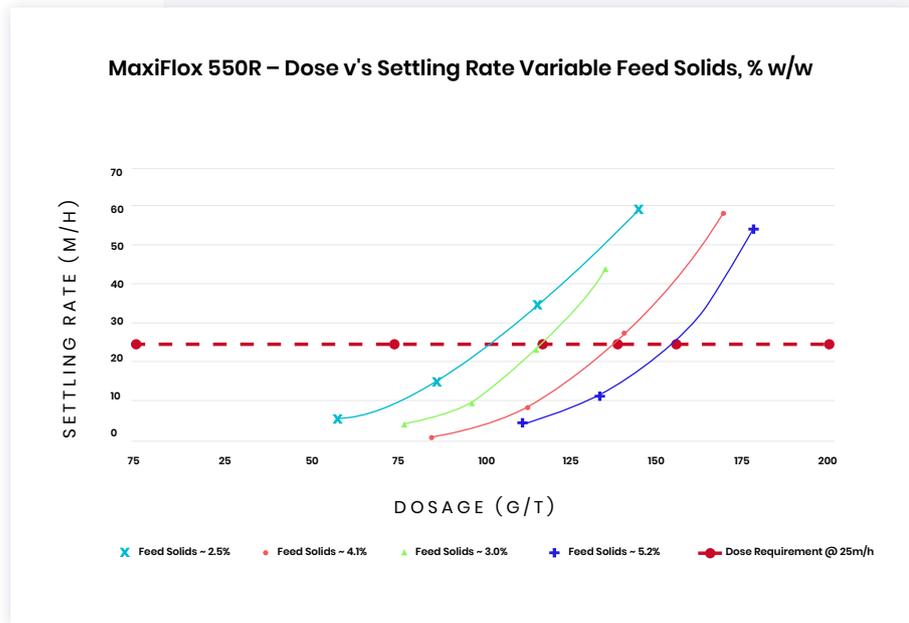
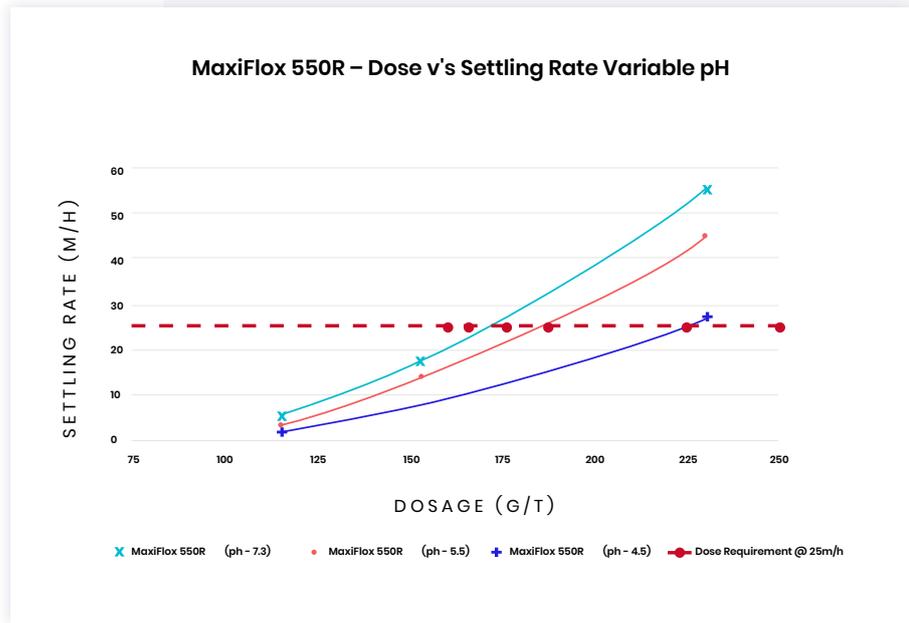
Solution

The client recognised that their flocculant usage and overall treatment cost was the second largest consumable spend on-site. The traditional approach of looking for the lowest unit cost per kilogram of chemistry was unsuccessful and another approach was required.

SciDev solved these problems by focusing on opportunities to improve operational efficiencies, designing bespoke chemistry, providing professional services and applying our engineering expertise.

Our team completed the following:

01. An audit of the flocculant delivery system was conducted in order to understand the operational demand, provide recommendations and ensure we delivered an effective chemical solution.
02. Our recommendations following this audit increased their system capacity by 25% and their dissolution time by up to 50% without using any chemicals. These efficiencies resulted in roughly 30% savings for our client.
03. **MaxiFlox® 550R** was designed to operate in highly saline water and with short hydration times. Highly effective in both the thickener and co-disposal processes, this new chemistry offered a more stable solution for our client.
 - » Our team continue to monitor the performance of this chemical to ensure operating efficiency and identify opportunities for improvement.
 - » Through these assessments, we recognised that using an alkaline solution to stabilise the operating pH would decrease the dosage required, thereby providing cost savings to our client.
04. Installation and integration of the OptiFlox automated dosing unit. Onsite calibration and optimization has lead to much tighter control of flocculant dosage to the thickener. This has resulted in reduced flocculant use and a more stable tailings operation.
05. We also identified the need for a defined dilution program to be implemented utilising the available thickener, Turbodil. By targeting an optimum feed solids in the feed well, we reduced the required dosage of MaxiFlox 550R by about 50%, delivering further cost savings to our client.



We developed the **OptiFlox SRt system**, specifically designed for this type of process. This system enabled our client and team to automatically control the MaxiFlox 550R chemistry through consistent system monitoring.



Results

The client now can operate more effectively across a wide operating range allowing productivity to be maintained at target levels.

Through partnering with SciDev, our client has achieved the following:

- » A 30% reduction in overall flocculant dosage, which decreases operating costs.
- » A more stable and automated thickener process through the installation of the OptiFlox System, reducing production downtime.
- » Technological developments that streamline their systems and deliver efficiencies at each stage of the process.
- » Increased return water.
- » Improved water quality.
- » Improved processing time.





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