



Thickener upgrade achieves productivity & sustainability benefits at large Australian gold mine

FLS retrofitted feed-systems into two thickeners at a gold operation located in Australia. This resulted in a large improvement in solid-liquid separation in both the thickener units. This improved separation performance facilitated a further flowsheet change to remove a bottleneck from the plant.

The project in more detail

At an Australian gold mine, we improved throughput and underflow density, without increasing flocculant use, while reducing make-up water consumption. Here's how.

When one of Australia's largest gold mines first approached us about their thickeners, it was operating a 34 m diameter leach feed and 44 m tailings thickener, both of which had been supplied by a third party. Nameplate capacity was 700 tph.

We initially supported the customer with a successful upgrade of the leach feed thickener. This saw the installation of an E-DUC® autodilution system and E-Volute™ feedwell. The project increased leach feed thickener underflow density from 48% to 54% at 850 tph of feed solids, resulting in significant savings in both lime and cyanide consumption, as well as increasing CIL residence times. Flocculant consumption also fell by 34% on a gram/tonne basis. Return on investment had been achieved in less than six months.

Discover more about the initial optimisation project here: [Thickener upgrade with its weight in gold](#)

After several years of successful operation, the mine again approached us to help with further debottlenecking of their process.

Net results included:

- 9% throughput improvement
- 3% reduction in in water going to the tailings dam (even with the higher tonnage)

The feed-system performance moved the tailings thickener from an underflow water ratio of 0.85 t water to 0.75 t water per tonne of solid processed – an 11% reduction.



Taking the next step

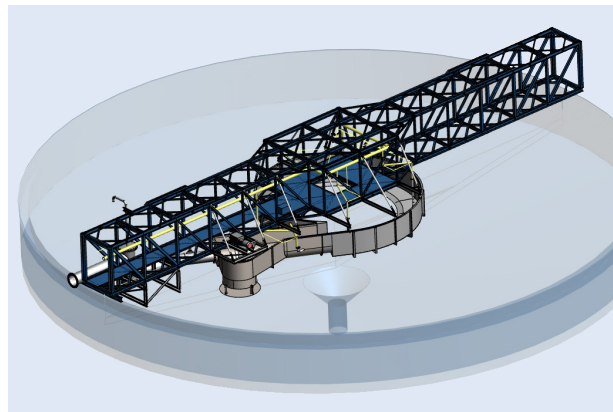
Their proposal was to swap duties between the 34 m leach feed and 44 m tailings thickener. It was an idea that we tested through comprehensive onsite test work, as well as through process evaluation and structural analysis of both thickener bridges.

Through this work, we observed that the leach feed thickener experienced continuous pluming in proximity to the overflow launders, with solids in the overflow visible at elevated throughputs. Meanwhile, test work on the tailings thickener material showed faster settling and compaction times. This work proved the viability of the swap to unlock additional capacity, as the faster settling and compacting of the tailings material could be treated in the smaller thickener, with the larger thickener utilised in the leach feed application.

To move forward with the upgrade, we recommended installing P-DUC powered autodilution mechanisms on both thickeners and an E-Volute feedwell on the 44 m tailings thickener:

- The P-DUC system would allow the mine to target ideal feedwell solids concentration over varied feed rates and density.
- The E-Volute feedwell provides optimal shear profiles to maximise floccule growth and provide even feed distribution into the thickener tank.

A model of the tailings thickener, with the upgrades, is shown below.



FLS P-DUC powered dilution system and E-Volute feedwell fitted to the tailings thickener

Following the proposed upgrade, both thickeners would have E-Volute feedwells and P-DUC autodilution systems installed. We also recommended a larger feed box to allow for increased throughput and improved deaeration of the feed.

Moving forward

The mine approved our recommendation, and we moved forward to design, engineer, fabricate and install the upgrades. This included a replacement bridge for the 34 m thickener, which was supplied in a single piece.

Meeting a tight schedule

That may make it sound simple: it was not, however, a simple project to execute.

Working within the complexities and constraints of a brownfield site, with only partial drawings of the as-built installations, our engineering team had to ensure perfect alignment within the battery limits. We also had to design and install reinforcement for the existing 44 m bridge – with minimal drawing details. Our design therefore had to make provision for variations in as-built conditions.

As an added complication, we had to meet a tight timeline to a scheduled shutdown. Our Australian engineering team completed the design and detailing of the replacement bridge in only four weeks; fabrication and assembly (including utilities) followed within 12 weeks, including full trial assembly before dispatch.

Our specialised site team succeeded in removing the existing 34 m bridge and installing the new one, including swapping over the existing third-party drive mechanism – safely and all within the allotted shutdown schedule. Despite losing six days to road closures, which prevented access to the mine.



Design to dispatch of the new bridge was accomplished in just 16 weeks.



During installation, all components were noted to be within the required tolerance of +/- 1mm, which our site team achieved through the use of 3D-scanning technology and measurements onsite.



The results

Despite the challenges and complexities, the upgraded thickeners are now achieving an increase in sustained throughput, which has gone from 1060 tph to 1160 tph. Average leach feed thickener underflow density has increased from 54% to 56% solids, while sustained average tailings thickener underflow density has gone from 54% to 57% solids. There has also been no increase in flocculant consumption on a gram/tonne basis, nor is plumbing now visible in either thickener.

Analysis of operating data has showed that mud bed levels have dropped significantly following the upgrade, even at higher throughput and increased underflow density. Indeed, performance of the smaller 34 m tailings thickener now exceeds that of the previous 44 m tailings thickener. Mud bed levels of 0.8 m on the 44 m leach feed thickener and <0.1 m on the tailings thickener have been recorded.

	44 m Tailings Thickener (Before Upgrade – Feed System by others)	34 m Tailings Thickener (Following Upgrade – Feed System by FLS)
Solids Feed Tonnage (tph)	1060	1160
Average Underflow Density (% Solids)	54	57
Heavy Mud Bed Level (m)	~0.8	<0.1
Solids Flux (t/(m ² .hr))	0.70	1.28

The bottom line: thickeners no longer present the hold-up to performance that they did before the upgrade. Payback has been achieved in under 12 months, with the benefits of increased throughput, with the same fixed costs, enhancing profitability.

Sustainability wins

The upgrade has also realised a number of sustainability benefits at the mine.

- Increasing the underflow density from the leach feed thickener allows for additional residence time in the CIL circuit, improving recovery at a given throughput. This allows the mine to produce more, without increasing the amount of material mined – an economic and sustainability double win.
- Increased underflow density from the tailings thickener results in less water reporting to the tailings dam, where there are typically significant losses due to seepage and evaporation. This helps to reduce consumption of make-up water – another sustainability win.

These operational benefits align with our MissionZero sustainability programme to drive sustainable productivity – and demonstrate the complementary value this sort of project can bring to a mine's productivity and environmental performance.

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