GR Engineering Services

ENGINEERING CONSULTANTS AND CONTRACTORS

Paste Backfill Projects

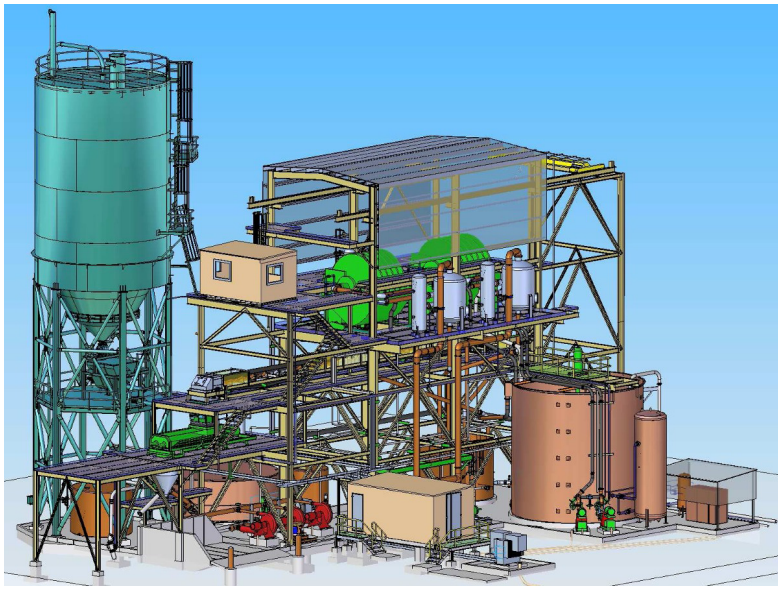
GR Engineering are Paste Backfill Experts

Cemented paste backfill has become an increasingly popular method of optimising underground mine support and tailings management systems to increase project revenue. Cemented paste mine fill is a product that can be pumped or directed underground by gravity, but does not release liquid after placement.

GR Engineering has demonstrated capability to assist with all phases of paste backfill projects from initial scoping studies and metallurgical test work to detailed design, plant construction and project management. Principals of GR Engineering were heavily involved in the Kanowna Belle paste backfill plant definitive engineering study and subsequent detailed design, construction and project management. Kanowna Belle was the first continuous paste backfill plant commissioned in Australia. GR Engineering personnel supervised the metallurgical test work, completed the definitive engineering study and carried out the design and construction of the facility under a lump sum contract.

Paste backfill plant services provided by GR Engineering include:

- Metallurgical test work including size analysis, cement consumption, paste strength testing and flow loop testing.
- Flowsheet development and equipment selection.
- Paste pumping and underground distribution piping design.
- Studies ranging from concept or scoping to bankable and definitive.
- Operating and capital cost estimating services including preparation of asset management plans.
- EPC or EPCM delivery.



Savannah Paste Backfill Project, GR Engineering's first design and construction project.

Key Projects:

Kathleen Valley Lithium Backfill Project

Liontown Resources appointed GR Engineering to design, supply, construct and commission the Kathleen Valley Backfill Project. The design provides for two identical 160 m^3/h plants that can be operated together or separately to feed two positive displacement pumps to transfer paste underground. The facility also enables Liontown Resources to stockpile tailings filter cake (when paste is not required) to reduce the water content of lithium concentrator tailings and hence site water consumption. The project is located approximately 60 km north of Leinster in Western Australia.

Abra Paste Backfill Plant

Galena Mining commissioned GR Engineering in August 2021 to relocate, refurbish and recommission the Higginsville paste plant (built by GRES in 2009) for use at the Abra lead mine in Western Australia. The project was successfully completed under a lump sum contract in March 2023.

Wassa Paste Backfill Plant

Golden Star Resources owns and operates the Wassa Gold Project located 150 km west of Accra, the capital of Ghana. GR Engineering was awarded the design and supply contract for a 133 m^3/h paste backfill plant at the Wassa operation in August 2019. The scope of work included the provision of construction assistance and commissioning of the facility. The design incorporated the use of ceramic disc filters, a first for GR Engineering paste plants. The complete design of the underground distribution piping system formed part of the scope. The project was completed in August 2020.

Thunderbox Paste Backfill Plant

GR Engineering was awarded the design, engineering, procurement and construction of the paste backfill plant at the Thunderbox Gold Project in June 2020. The project is located in the north eastern goldfields region of Western Australia, near the town of Leinster. The paste plant is capable of producing 150 m^3/h of cemented paste for filling underground stopes. The paste plant was commissioned in May 2021.

Project	Capacity	Filter
Kathleen Valley	320 m^3/h	Vacuum belt
Abra	73 m^3/h	Vacuum disc
Thunderbox	150 m^3/h	Vacuum belt
Wassa	133 m^3/h	Ceramic disc
Fosterville	65 m^3/h	Vacuum disc
Carosue Dam	120 m^3/h	Vacuum belt
Jabal Sayid	114 m^3/h	Vacuum disc
Nova Nickel	70 m^3/h	Vacuum belt
DeGrussa	120 m^3/h	Vacuum belt
Prominent Hill	90 m^3/h	Vacuum disc
Renison Tin	50 m^3/h	Vacuum disc
Porgera	100 m^3/h	Vacuum disc
Higginsville	79 m^3/h	Vacuum disc
Savannah	63 m^3/h	Vacuum disc

Experience overview

Carosue Dam

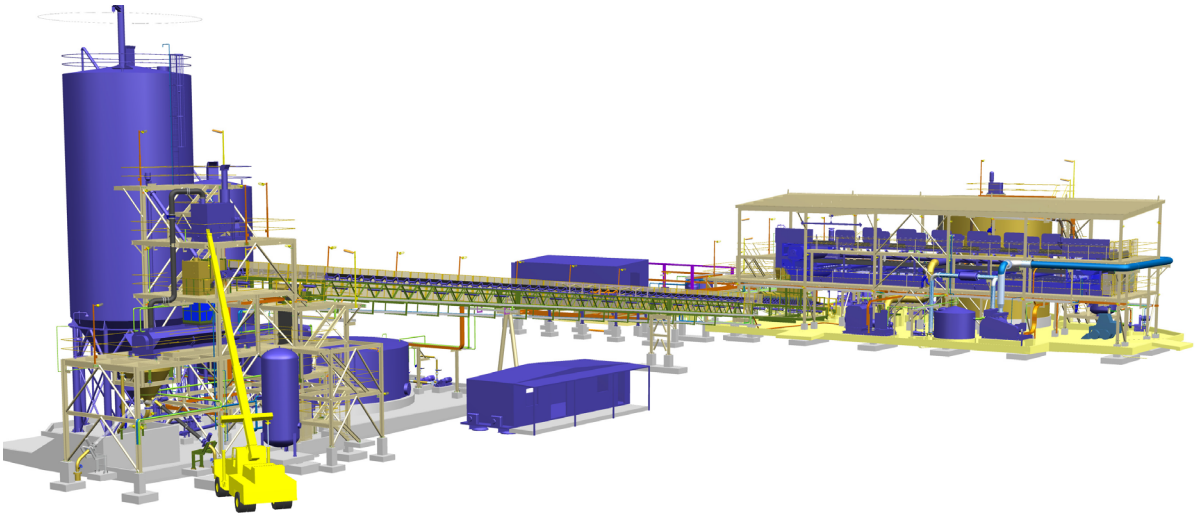
Fosterville Paste Backfill Plant

GR Engineering was awarded the design, engineering, procurement, construction and commissioning of a 65 m^3/h paste plant at the Fosterville Gold Mine in Victoria. The scope also included works at the existing Fosterville processing facility to transfer tailings, water and other services to the paste plant. Tailings filtration was achieved using vacuum disc filters. The project was completed in January 2020. The Fosterville paste plant was located at the edge of Fosterville's mine lease and relatively close to neighbouring properties. As such, it was designed to strict noise limits which required the entire facility to be enclosed within an acoustic clad building.

Carosue Dam Paste Backfill Plant

GR Engineering was appointed to construct a paste backfill plant capable of producing 120 m^3/h of paste for filling stopes in the Karari Underground Mine. The design utilised a vacuum belt filter with allowance for expansion to incorporate additional stope filling requirements for the nearby Whirling Dervish deposit. The plant was completed in April 2019 under a design, engineering, procurement and construction contract. In 2021 GR Engineering completed the design and construction of a 2.4 km overland paste pumping and pipeline contract to deliver paste to Whirling Dervish.

GR Engineering retains a high level of practical and pragmatic process and delivery knowledge in-house.



Nova Nickel Paste Backfill Project

GR Engineering was awarded the detailed design and commissioning for the paste backfill plant at the Nova Nickel Mine as part of a design, engineering, procurement and construction lump sum contract for the delivery of the nickel concentrator and non-process infrastructure in March 2015. The paste plant design utilities the low sulphide tailings filtered using a belt filter to produce 70 m^3/hr of paste. The plant was commissioned in March 2016.

Jabal Sayid Paste Backfill Project

GR Engineering was awarded the detailed design of the paste plant for the Jabal Sayid Mine located in Saudi Arabia in January 2013. Due to change of ownership the project was halted in 2014 and recommenced in 2015. The paste plant is designed to produce 114 m^3/h of paste from 176 t/h of cycloned tailings using vacuum disc filters. GR Engineering also assisted with construction and commissioning under an EPCM contract.

DeGrussa Paste Backfill Plant

GR Engineering was awarded the design, engineering, procurement and construction of the paste backfill plant at the DeGrussa Project in March 2012. The plant utilised a 96 m^2 horizontal belt filter to produce 120 m^3/h of cemented paste. Paste delivery to the mine borehole was pumped. The plant was completed in November 2012.

Renision Tin Paste Plant

The Renison Tin operations managed by Bluestone Mines Joint Venture commissioned GR Engineering to design, engineer, procure and construct a new paste plant under a lump sum contract. The project included filtering, dry tails storage, cemented paste mixing and discharge capable of 50 m^3/hr production. The project is located on the west coast of Tasmania..

Prominent Hill Paste Backfill Project

GR Engineering was awarded the design, engineering, procurement and construction of a paste plant for OZ Minerals at Prominent Hill in January 2011. Tailings from the existing treatment plant were deslimed as part of the paste project. The paste plant is designed to produce 90 m^3/h of paste from 146 t/h of cycloned tailings using vacuum disc filters. The scope included design of the underground distribution piping system.

Porgera Paste Backfill Project

GR Engineering completed the detailed design of a paste plant for Barrick Gold's Porgera Gold Mine in Papua New Guinea in 2008/09 and provided Project Management services for the construction of the facility. The Porgera paste plant is designed to produce 100 m^3/h of paste from 140 t/h of cycloned tailings using vacuum disc filters. The paste is pumped to the stopes via positive displacement piston pumps capable of operating at over 15,000 kPa.

Higginsville Paste Backfill Project

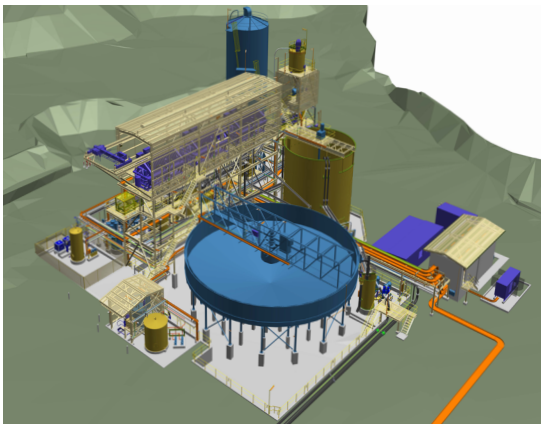
The Higginsville paste plant was designed for a throughput rate of 123 dry t/h of tailings, producing 79 m^3/h of paste, using vacuum disc filtration. Design and construction of the facility was completed in 2009 under an engineering, procurement and construction contract. The facility was commissioned on schedule and under budget in October 2009.

Savannah Paste Backfill Project

The Savannah paste plant was designed to filter plant tailings delivering cemented paste underground via a dedicated borehole and underground reticulation system. The plant has a design throughput rate of 63 m^3/h. The plant was commissioned on schedule in November 2007. The Savannah paste backfill plant was GR Engineering's foundation design and construction project.

Market leaders in the provision of paste backfill design, construction and management services.

DeGrussa



Wassa

Kathleen Valley

Thunderbox

Fosterville

About GR Engineering

A leading process engineering, design and construction organisation that strives to provide workable, innovative, cost effective solutions and quality services to the global resource and mineral processing industry. GR Engineering has a proven track record of delivering turn-key projects in over 20 countries.

The company guarantees integrated, efficient and practical designs whilst maintaining a high level of safety and operational performance.

Personnel at GR Engineering have the capability and track record to undertake projects from the initial evaluation and study phase through to design, construction, commissioning, operational support and asset management.

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