



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.

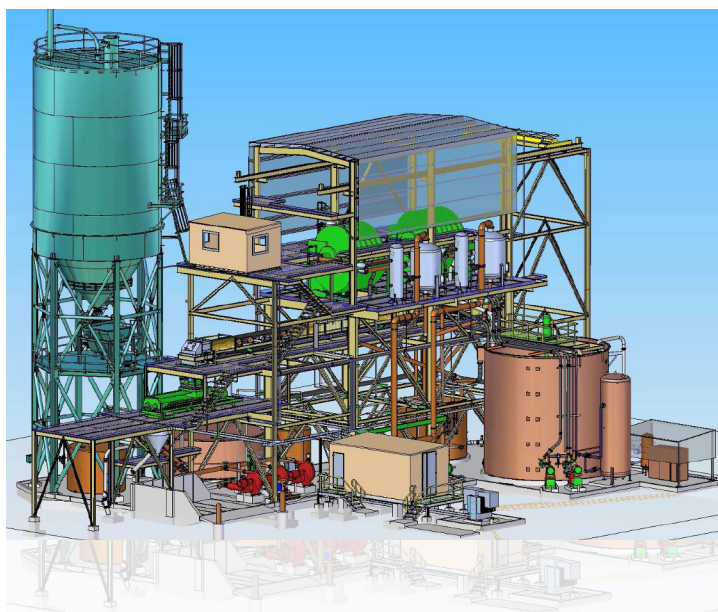
GR Engineering has demonstrated capability to assist with all phases of paste backfill projects from initial scoping studies and metallurgical testwork to detailed design, plant construction and project management. Principals of GR Engineering were heavily involved in the Kanowna Belle paste backfill 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 testwork, 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 testwork including sizing analysis, cement consumption, paste strength testing and flow loop testing;
- ♦ Flowsheet development and equipment selection;
- ♦ Paste pumping and underground distribution piping design;
- ♦ Feasibility studies ranging from scoping studies to bankable and definitive feasibility studies;
- ♦ Plant operating and capital cost estimating services including preparation of asset management plans;
- ♦ EPC delivery services.

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



Key Projects:

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 new paste plant will be capable of producing 150m³/h of cemented paste for filling underground stopes. The paste plant is scheduled to be completed during the second quarter of 2021.

Wassa Paste Backfill Plant

Golden Star Resources Ltd owns and operates the Wassa gold project located 150 km west of Accra, the capital of Ghana. GR Engineering was awarded a contract to design and supply all equipment and materials for a new 133 m³/h paste backfill plant at Wassa in August 2019. The scope of work includes the provision of construction assistance and commissioning of the facility. The design incorporates the use of ceramic disc filters, a first for GR Engineering paste plant designs. The complete design of the underground distribution piping system is included in the design and supply contract. The project is scheduled to be complete during the third quarter of 2020.

Project	Capacity	Filter
Thunderbox	150m ³ /h	Vacuum Belt
Wassa	133m ³ /h	Ceramic disc
Fosterville	65m ³ /h	Vacuum disc
Carosue Dam	110 – 120m ³ /h	Vacuum belt
Jabal Sayid	114 m ³ /h	Vacuum disc
Nova Nickel	70m ³ /h	Belt filter
Degrussa	120 m ³ /h	Horizontal belt
Prominent Hill	90 m ³ /h	Vacuum disc
Pogera	100 m ³ /h	Vacuum disc
Higginsville	79 m ³ /h	Vacuum disc
Savannah	63 m ³ /h	Vacuum disc

Experience overview



Carosue Dam

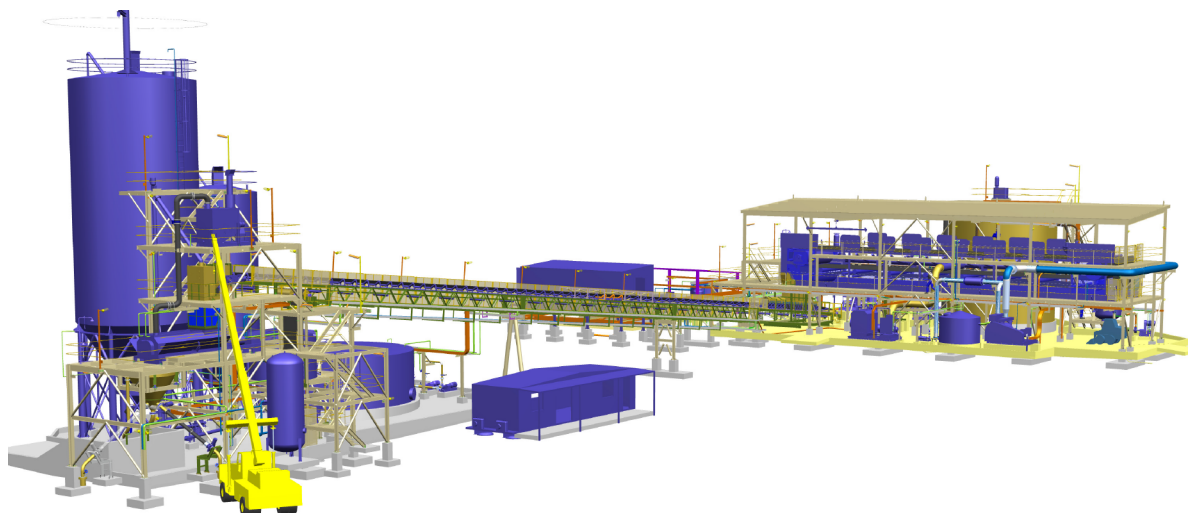
Fosterville Paste Backfill Plant

GR Engineering was awarded the engineering, design, procurement, construction and commissioning of a 65 m³/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.

Carosue Dam Paste Backfill Plant

GR Engineering was appointed to construct a paste backfill plant capable of producing 110 to 120 m³/h of paste for filling stopes in the Karari underground mine. The design utilised vacuum belt filters and allowed for expansion to incorporate additional stope filling requirements for the nearby Whirling Dervish deposit at a later stage. The plant was completed in April 2019 under an EPC design and construct contract.

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



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 recommissioned in 2015. The paste plant is designed to produce 114 m³/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 and construction of the paste backfill plant at the Degrussa project in March 2012. The plant utilised a horizontal belt filter of 96 m² to produce 120 m³/h of cemented paste. Paste delivery to the mine borehole was via a pumping arrangement. The plant was completed in November 2012 under an EPC contract.

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 an EPC lump sum contract for the delivery of the concentrator plant and non-process infrastructure in March 2015. The paste plant design utilises the low sulphide tailings, filtered using a belt filter to produce 70 m³/hr of paste. The plant was commissioned in March 2016.

Prominent Hill Paste Backfill Project

GR Engineering was awarded the detailed design and construction of a paste plant for OZ Minerals at Prominent Hill in January 2011. Because the tailings from the existing treatment plant are too fine to economically produce paste, the paste plant includes a desliming cyclone stage to produce a coarse slurry for use in paste production. The paste plant is designed to produce 90 m³/h of paste from 146 t/h of cycloned tailings using vacuum disc filters. GR Engineering were also appointed to design the plant's 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 site construction of the facility. The Porgera paste plant is designed to produce 100 m³/h of paste from about 140 t/h of cycloned tailings using vacuum disc filters. The paste will be pumped to the stopes via positive displacement piston pumps capable of operating at over 15,000kPa.

Higginsville Paste Backfill Project

The Higginsville paste plant was designed for a throughput rate of 123 dry t/h of tailings and produced 79 m³/h of paste using vacuum disc filtration. Design and construction of the facility was completed in 2009 under an alliance style contract. The facility was commissioned on schedule and under budget during October 2009.

Savannah Paste Backfill Project

The Savannah paste plant was designed to filter and then repulp existing plant tailings with cement and deliver the resulting paste underground via a dedicated borehole and underground reticulation system. The plant has a design throughput rate of 96 dry t/h of tailings at a feed density of 65% solids. At nominal cement dosing rates, a design throughput rate of 100 dry t/h of paste (63 m³/h) is achieved. The plant was successfully 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



Kanowna Bell



Prominent Hill



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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