

RAVENSTHORPE NICKEL PROJECT

Leading engineering and construction company GRD Minproc, in joint venture with Hatch Associates, successfully partnered with BHP Billiton to create the world's most technically-advanced nickel laterite processing plant, the Ravensthorpe Nickel Project.

The GRD Minproc team was involved in multiple stages of the project's lifecycle, from feasibility study through to project implementation, with the company's expertise utilised in performing detailed engineering, procurement and construction management for the project.

The Ravensthorpe Nickel Project involves the production of nickel/cobalt hydroxide intermediate product at Ravensthorpe in Western Australia, which is then shipped to the BHP Billiton Yabulu Refinery in Queensland for further refining.

Showcasing Australian engineering talent and capability, the innovative flowsheet for nickel laterite processing involves high pressure acid leaching (HPAL) and atmospheric leaching. Ravensthorpe Nickel Project is the first of the new generation HPAL operations to be commissioned in the world.

Designed in Western Australia, the Ravensthorpe Nickel Project is globally regarded as an important project for a number of reasons, including the technology and its contribution to world nickel supply.



GRD Minproc is a leading independent Australian engineering construction business providing high value services and specialising in the design, procurement and construction of mineral resources and waste-to-resources projects. GRD Minproc's process engineering reputation and project record are internationally recognised.

GRD Minproc is proud to have contributed to the successful engineering, procurement and construction management of the Ravensthorpe Nickel Project for BHP Billiton.



At its peak, more than 2,500 personnel were working on the construction of the Ravensthorpe Nickel Project. It is a tribute to GRD Minproc, BHP Billiton and all those involved that the construction site achieved a low classified injury frequency rate, which was recognised as the best safety outcome for a major metallurgical project (under construction) in BHP Billiton's history.

Significant care was also taken in mine planning and project design to mitigate the environmental footprint of the project.

GRD Minproc's engineering, procurement and construction management role has been further endorsed with the company engaged to provide ongoing engineering services at the Ravensthorpe Nickel Operation for BHP Billiton Nickel West.

Engineering information about the **RAVENSTHORPE NICKEL PROJECT**

Client:	BHP Billiton
Location:	Ravensthorpe, south east coast of Western Australia
Capacity:	Up to 50,000 tonnes per annum of nickel equivalent
Product:	Nickel/cobalt mixed hydroxide product
GRD Minproc Office:	Perth, Western Australia
Start Date:	Quarter 2, 2004
Completion Date:	Quarter 3, 2007
Project Duration:	42 months
Contract Basis:	EPCM contract with Ravensthorpe Joint Venture
Client's Project Value:	US\$2.2 billion
Client's Operations Workforce:	650 personnel

Scope of Work: A 50/50 Joint Venture with Hatch to act as EPCM Engineer on behalf of BHP Billiton for the Ravensthorpe Nickel Project.

Flowsheet

- Two separate streams for receivable, crushing and stacking of limonite and saprolite ores
- Two separate streams for reclaim, sampling, scrubbing and beneficiation of limonite and saprolite ore
- Agitated slurry storage for limonite and saprolite ore
- Two trains of High Pressure Acid Leach (HPAL) for limonitic ore, titanium lined autoclaves
- Two trains of titanium heaters and brick lined flash tanks
- Atmospheric leaching of HPAL product and saprolite ore in brick lined agitated tanks
- Primary neutralization of slurry with limestone
- Six stages of Counter Current Decantation of slurry
- Final neutralization of solids prior to disposal of tailings
- Impurity removal from liquor stream
- Precipitation of Mixed Hydroxide Product (MHP)
- Washing of MHP on horizontal filter
- Dewatering of MHP using a high pressure filter
- Loading of MHP containers for transport to port of Esperance
- 3300tpd acid plant with two 15,000t storage tanks and sulphur handling facilities
- 44MW steam turbine power plant with auxiliary boilers and emergency diesel engines
- Seawater intake and 40km pipeline to plant site
- Desalination and demineralization plant to produce water for steam raising and process
- Water distribution systems for raw water, hypersaline water, potable water
- Storm water collection and recovery to process
- Reagents handling and preparation including limestone, quicklime, hydrated lime, magnesia, flocculant
- Heavy vehicle workshop for servicing of mining vehicles
- Site buildings including administration, workshop, warehouse, laboratory, construction stores
- Borefield development for construction water
- Construction camp and permanent operations village
- Diesel fuel supply and distribution
- Fire water services central control room and process control system.

