SINGLE CELL TANDEM IRON ORE RAIL CAR UNLOADER

STEEL AWARDS 2012

WINNER CASE STUDY

AUSTRALIAN STEEL INSTITUTE

ENGINEERING PROJECTS

STATE WINNER (WA) 2012

DESIGN MERIT

Metso Minerals were awarded a contract to supply a single tandem car dumper to Hamersley Iron for the Cape Lambert Port B Iron Ore Upgrade in North Western Australia. Civmec was awarded a contract by Metso Australia in June 2011 to supply, fabricate and deliver a fully assembled single cell tandem rotary rail car dumper to the Australian Marine Complex. This is the largest and most advanced car dumper developed by Metso Minerals and features a unique single cell tandem configuration with design output of 4 million cycles.

The rail car dumper's purpose is to receive incoming loaded iron ore railway wagons which pass through the central U shaped cage two at a time. Once located and positioned inside the cage structure, special hinged gravity clamps lock the wagon in position. At the same time, the car dumper, which sits on rotators, rotates on the two geared racked end supporting rings. During the rotation, the iron ore load carried by rail wagons is discharged and the wagons are moved forward ready to receive the next two in continuous operation.

The contract involved the procurement of approximately 400 tonnes of Australian AS/NZS 3678/9 Grade 250-300 steel plate ranging from 8mm through to 250mm thick.

Due to the high fatigue cycle of the structure, the design engineer Metso Minerals specified welding to the Australian standard code AS1554 part 5 code for high fatigue structures. Special welding procedures and welding techniques were developed to cater for the strict specification, which required each welder to pass specific qualification tests in various welding positions in order to be permitted to participate in the project. Each weld was required to undergo special toe and contour grinding followed by non destructive testing.

> Special welding procedures and techniques were developed to cater for the strict high fatigue specification.

A large, purpose-built, gas-fired furnace was erected on site by Civmec to carry out the post-weld heat treatment of the completed structure prior to any machining taking place. The two end rings, which measured over 10 metres in diameter,

were transported to Camco's workshop in Canning Vale where the external face was machined to tight tolerances. The large cage was machined inside the Civmec workshop.

INNOVATION IN THE USE OF STEEL

Using Civmec's state of the art plasma profile cutting machine, it was possible to cut elements to a high degree of accuracy and with minimal wastage. These pieces could then be accurately fitted together off-site in order to minimise the number of components and simplify the assembly process.

EFFICIENT USE OF STEEL PRODUCTS

Steel was selected because it is the only cost-effective material that provides strength, durability, easy weldability, and is reliable and predictable to work with for this application.

The steel plate was carefully nested and cut on Civmec's plasma profile cutting CNC machine for maximum production efficiency and in order to minimise waste. A large portion of welding was carried out by semi-automatic and fully-automatic welding systems. During the welding process, special temperature controlled preheating of adjoining plates was required.

Shift work was scheduled to allow continuity of welding to maximise productivity and maintain the schedule. The work, which took around 9 months to complete, consumed in excess of 12 tonnes of welding consumables.

ENVIRONMENTAL PERFORMANCE

The design of the equipment allows for lower maintenance down times through a reduction of large, high fatigue components and higher material output due to new design operating at 4 million cycles.

The unique design means that spare parts, technical assistance during installation, pre-commissioning, commissioning and performance testing are all able to be applied and sourced locally.

Once fabrication is complete, steel has no ongoing environmental impacts, making it a logical choice.

The overall project is made up of only five major large components and several smaller components. This unique design significantly simplifies the assembly process.

BUILDABILITY

The complexities associated with the material thickness, grade, diversity and the specialist high fatigue welding requirements notwithstanding, the overall project is made up of only five major large components and several smaller components. This unique design significantly simplifies the assembly process both at the fabrication yard and at the final installation point, as well as having distinct advantages in operational maintenance and efficiencies.

A trial assembly took place in the Civmec workshop to ensure ease of construction at the installation site.

PROJECT TEAM

Designer:	Metso Minerals
Structural Engineer:	Metso Minerals
Head Building Contractor:	Civmec
Steel Fabricators:	Civmec, Camco Engineering (machining)
Steel Detailer:	BDS VirCon
Steel Manufacturer:	BlueScope
Steel Distributor:	BlueScope Distribution
Coatings Contractor:	Cape TCC
Coatings Supplier:	International Paint