



Benguela Gem

OVERALL STEEL AWARDS WINNER

The **SAISC Annual Awards judges were unanimous in their praise of the overall winner** – also the winner of the mining category – the Benguela General Treatment Plant mining facility. The treatment plant is on board the central section of the MV Benguela Gem Vessel, which is Debmarine Namibia's brand new purpose-built ship that is 177m long and 27m wide.

Owned by Debmarine Namibia, the Benguela Gem is a 50/50 joint venture between De Beers Group and the government of the Republic of Namibia.

International collaboration

The Benguela Gem is an international collaboration – designed in Norway and Poland, built in Romania and fitted out with its proprietary mission equipment by De Beers Marine South Africa. Diamond recovery by Debmarine Namibia takes place at 90m to 150m below sea level. The exceptional design, fabrication and installation of the 3 000-ton diamond treatment plant on the vessel was carried out ahead of schedule by local engineers and fabricators in the midst of restrictions due to the Covid-19 pandemic.

Shining like a ‘gem’

This project stood out in several different ways and presented a first in the history of the Steel Awards. It operates offshore, is floating (not stationary and anchored) and is a truly distinctive applicant within the awards categories. As a sea-faring structure, it is furthermore subject to unusual engineering loads from a naval engineering perspective, unique in Africa, and can carry out the entire under-sea diamond dredging and treatment process.

This project was an exceptional showcase of the use and application of steel featuring South African design, fabrication and construction for an international client.

Project brief

The Benguela Gem vessel must deliver safe and sustainable value for the shareholders of Debmarine Namibia and the people of Namibia, which is home to some of the most sought-after diamonds in the world.

The US\$420 million custom-built vessel will add an additional 500 000 carats of high-value diamonds to Debmarine Namibia’s annual production, which is an increase of about 35%, while creating 160 high-skill jobs for Namibians.

PBA Projects, which is part of the De Beers Group, was required to design a treatment plant to process recovered diamonds mined within the stated bottom and top cut-off figures.

Concept

PBA Projects had two main types of structures to design:

1. A beam-column braced structure with vertical and horizontal braces.
2. A plated structure with stiffeners, which were designed as composite members.

The structures were designed to withstand ship motions, vibratory equipment and reverse loading for rigging end connections that were considered pinned, but moment connections were considered where required.

The project phases/involvement were from conceptualisation to detailed design, implementation and commissioning. 3C Metal Belmet was required to perform the fabrication, supply, delivery, site assembly and disassembly of the structural and mechanical platework and piping, and the installation of all free-issued mechanical equipment.

The vast majority of the above are made of steel – all components were modelled in detail in PBA Projects’ 3D environment, to create a fully integrated (live) 3D model. The in-house integration modelled everything right down to the nuts and bolts, lights, cameras, instruments and cable racks.



Steel Awards 2022 overall winner – members of the project team with Amanuel Gebremeskel, CEO of the SAISC (5th from the left)

Construction

The vessel took two years to construct and is the most technically advanced diamond recovery vessel in the world, underpinned by high standards of sustainability and safety.

Benefits of steel in this application

The vessel is made of steel, and it was logical to make the treatment plant using steel as well. Because of the interface with the vessel deck, the steel structures are welded onto the shelter deck.

Benefits include:

- Modular aspects of steel are beneficial, quayside construction and rigging onto vessels.
- Speed of erection.
- Vessel weight considerations, as there is a weight limit determined by the naval architect.
- Structures are designed for much more loading and boundary conditions than land-based mining structures, and steel is well suited to this because of its versatility.
- Steel can handle variable loads and temperatures.

Additional awards categories showcase steel sector diversity

INTERESTING FACTS:

- Will increase Namibia's annual diamond production with 35%.
- This is an international collaboration.
- Unique in Africa, the Benguela Gem is a sea-faring offshore structure.
- A fully integrated live 3D model was modelled to ensure success.
- The project was completed ahead of time during the pandemic.

This year's awards introduced more categories and consequently an increased number of winning entries than previously. The Steel Awards were extremely well attended and were hosted by the Southern African Institute for Steel Construction (SAISC) at Emperor's Palace, Gauteng.

This event, which demonstrates excellence in the use of steel in construction, was the first in-person Steel Awards held since 2019, prior to the Covid-19 pandemic. The 2022 Awards very effectively highlighted how the local steel sector has triumphed over adversity in the past two years; as well as showcasing a typically South African 'can-do' approach to the challenges endured during this time.

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