



The most technologically advanced marine diamond sampling and exploration vessel in the world – the Debmarmine-owned mv SS Nujoma pictured in Cape Town's harbour.

## SS Nujoma sea vessel gets advanced hydraulic-sampling tool

In its biggest sea vessel project ever undertaken, Hytec has successfully designed, manufactured, installed and commissioned all the hydraulics for three systems on board the SS Nujoma, the most technologically advanced marine diamond-sampling and exploration vessel in the world.

For its client, De Beers Marine, Hytec, part of the Hytec Group, was responsible for all hydraulic related aspects of the heave compensation system, the launch and recovery system (LARS) and a world-first advanced sub-sea sampling system called Seabed Tool (SBT) for the brand new Debmarmine Namibia-owned sampling vessel, the mv SS Nujoma.

Contracted by De Beers Marine South Africa in Cape Town, Hytec Cape Town was brought into the project as far back as 2012 for the pre-feasibility and feasibility studies. These were completed during the first half of 2015 and Hytec received the hydraulic orders for the SBT in July 2015 and for the LARS in September the same year. Design, manufacture, assembly and successful testing of the SBT were completed in July 2016, while the manufacture and assembly of the LARS system modules, carried out in Johannesburg, was completed and delivered to De Beers Marine in Cape Town, in August 2016.

The LARS and the SBT hydraulic systems were both designed and manufactured by Hytec and the passive heave compensation system was designed and manufactured by Bosch Rexroth in Bostel, Netherlands. All systems were designed using high quality Bosch Rexroth equipment. The passive heave compensation system comprises cylinders connected to a hydraulic power unit and accumulator banks.

The hydraulic ring main for the LARS comprised a central hydraulic power pack. The power pack supplies oil through the ring main to the equipment used to launch and recover the SBT and consists of multiple winches and handling systems.

The SBT hydraulic system has power units with a combination of Bosch Rexroth open and closed loop pumps to power the subsea mining equipment. "The hydraulic system is designed for subsea use at depths of up to 200 m," explains Herman van Rensburg, regional technical manager for Hytec Cape Town.



The from-the-deck view of the Seabed Tool (SBT), a world-first advanced sub-sea sampling system aboard the mv SS Nujoma.

### Installation, commissioning and hand-over

The vessel arrived in Cape Town harbour in mid-August 2016, where De Beers Marine commenced the installation of the Mission Equipment, which included the sampling system and a high tech batching diamond treatment plant constructed in modules on the quay for rapid installation onto the vessel. The sampling system's on-board pipe

installation was conducted during September and October 2016 with Hytec staff working 12-hours a day, 7-days a week. In-harbour commissioning began at the end of October with maiden sea trials conducted just outside of Cape Town in November 2016. Subsequent to a short in-port stay, the mv SS Nujoma began additional sea trials and final commissioning on the West coast of South Africa during December 2016. The vessel was delivered to Debmarmine Namibia in March 2017 and is currently in full sampling operations.

The sampling system modules, with the heaviest weighing more than 220 t, were lifted onto the vessel using the second largest super-lift crane in southern Africa.

The ship was constructed by Kleven Verft Shipbuilding Company in Norway, and named after Namibia's founding president, Sam Shafishuna Nujoma. However, all the mission equipment was built in South Africa. The majority of the equipment for the hydraulic systems was imported from Bosch Rexroth in Germany in component format, with most

of the modules built in Hytec's Johannesburg facility. "In fact," points out van Rensburg, "we stretched our manpower by utilising Hytec resources from around the country in order to put this system together. This is indicative of Hytec's internal collaboration to ensure we provide, not only optimum machinery and equipment to our clients, but optimum service too."

The US\$157-million mining exploration vessel is 113 m long, 22 m wide with a displacement of 12 000 t. It accommodates a crew of 80 and will carry out sampling for a three-year exploration operation before returning to port for maintenance.

Hytec Cape Town has been providing hydraulic services to DeBeers Marine for over 30 years, and the last time a project of this magnitude was undertaken was in 2006, when DeBeers Marine converted a second-hand vessel to a crawler-mining vessel.

Hytec is a subsidiary of the Hytec Group of Companies, a joint venture with Bosch Rexroth. □



A front view of the launch and recovery system (LARS) and SBT during installation.

## Turnkey 400-ton thermoplastic press for aerospace

Hytec Cape Town has designed and constructed a 400 t thermoplastic press for composite materials supplier AAT Composites, a Recaro Group subsidiary based in Somerset West. The press is capable of deep-moulding composite materials of up to 1.0 m<sup>2</sup> and is used for manufacturing components such as seat pans and interior panels in the aerospace industry.

Awarded over considerable competition from international manufacturers, Hytec, with the assistance of a local mechanical engineering company and an electrical company, was able to supply a complete, integrated press machine, a turnkey solution from a single supplier that was tailored to suit AAT Composites' specific production requirements – as opposed to modifying an imported press.

Resin-impregnated cloth is first suspended in trolley frames for moulding. The machine has an in feed loader to pre-load trolleys while a cycle is in operation, plus an automated feeding system to precisely transfer the trolleys from one station to the next. A preheater with two sliding drawers, each containing 99 ceramic heating elements, preheats the resin-impregnated cloth to 450 °C prior to moulding and curing. The material then has to be transferred into the press within three seconds and the pre-heated moulds closed quickly in order for moulding and curing to take place at a maximum temperature of 280 °C.

Once the thermo-forming duration has

been completed, the press opens and the part is transferred to the out-feed station for manual removal. All of these functions require precise real-time control, as neither of the individual functions has the same operating duration. The machine design includes a range of safety and operator protection and a SCADA system to provide visualisation and control of the production process.

"Special consideration had to be given to avoid heating of the press structure, and in particular the platens and guides, as any fluctuations would alter the 0.2 mm flatness tolerance of the platens," explains Max Hoffmann, systems engineer for Hytec Cape Town.

"An insulating layer together with cooling platens directs the heating to the press moulds as opposed to the platens. This also serves to reduce energy consumption, as heating is limited to the size of the moulds installed. Press platen cooling was excluded on request of the customer, however it can be easily retrofitted," he adds.

A range of Bosch Rexroth hydraulic components is used across the system. These include a standard press-control manifold with latest EU safety features, and proportional displacement and pressure control with a 30 kW electric motor on the hydraulic power unit.

The main ram, supplied by sister Hytec Group company Hytec Engineering, is a single-acting displacement unit with a

450 mm diameter and 700 mm stroke. Fast extend and retract utilises two 80/50×700 slave cylinders, one with LVDT for position monitoring. The automated feeding system is powered by two VSD drives with a pneumatic in-feed loader.

"This was an exciting project to be a part of, and is a great advertisement of the technical competency and capabilities of the Hytec Group to the country and the world," Hoffmann concludes. □



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