



150 ton active heave compensation system aboard diving support vessel

SBM uses special vessels to position valuable and sensitive equipment on the seabed at depths down to 3,000 metres. The use of a 150 ton active heave compensation system from Bosch Rexroth enables SBM to carry out this work in a more reliable, efficient and safe manner. The system is located below deck and is fully able to withstand the harsh marine environment.

To perform work at depths greater than 3,000 m below sea level, the ships used by SBM are equipped with many advanced systems and technologies. One of these is the active heave compensation system. This system, which compensates for heave caused by ocean swell, allows sensitive equipment or other loads to be placed on the seabed – gently, and under full control. At the same time, it protects the hoisting cable from potential breakage due to internal resonance caused by wave movement.

Linear heave compensation

SBM's active heave compensation system operates continuously based on measurements made by the Motion Reference Unit, or MRU. These measurements describe the vertical movements of the ship, and thereby the wave motion that needs to be compensated for. An advanced and extremely fast controller processes this data and uses it to control a hydraulic cylinder. The cylinder is extended or retracted to tighten or relax the hoisting cable, such that the load is suspended motionless in relation to the seabed.

Demanding application

Active heave compensation for wave movements of ± 3 m.

Advanced solution

The development, assembly, testing and commissioning of an active heave compensation system that uses hydraulics to compensate for dynamic aspects and air to compensate for the static load.



Effective

Based on MRU measurements, the system achieves a compensating capacity of no less than 90% of the load movement at the overboard point.

Facts

- ▶ Accumulator for energy conservation
- ▶ Wave amplitude: ± 3 m
- ▶ Mean wave periodicity: 10 s
- ▶ Depth: 3,000 m
- ▶ Maximum acceleration: 7m/s^2
- ▶ Compensating capacity for at least 90% of the load movement (less than 10% residual movement)
- ▶ Capacity: 150 ton
- ▶ HPU capacity is a fraction of winch theoretical peak capacity



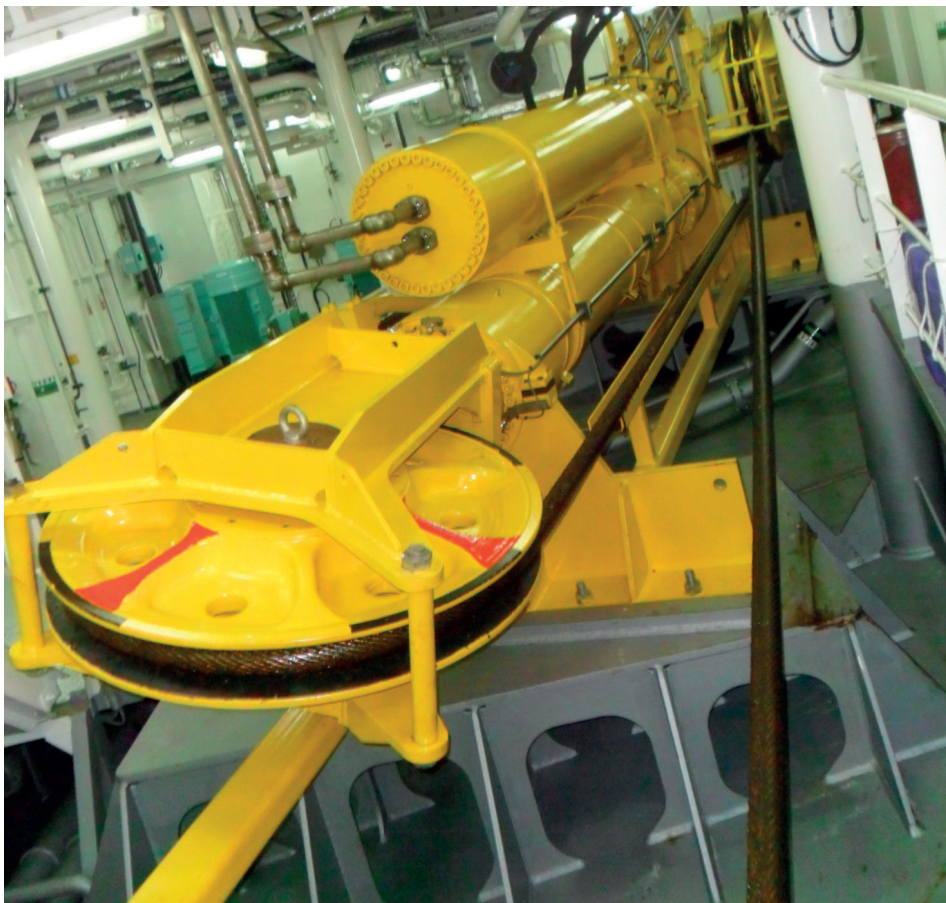
Combined hydraulics and air

Mounted below deck, the system can achieve a compensating capacity of at least 90%. What makes this solution unusual is the specially-designed compensation cylinder, which combines both a pneumatic and hydraulic cylinder. The pneumatic compartment bears and compensates for the static load, while the hydraulic compartment provides the dynamic forces to almost entirely compensate for movements of the load. Thanks to this unique combination, the required hydraulic capacity is only a fraction of the theoretical peak capacity that would be required from the winch if there were no heave compensation installed. This has resulted in considerable energy savings. To ensure reliable operation under harsh conditions at sea, the hydraulic cylinders have been treated with Enduroq 2200 surface technology, an extremely wear-resistant and corrosion-resistant cylinder rod finish,

especially developed for offshore applications. In addition, essential system components are dual or multiple-redundant; for example, to guarantee the continuity, reliability, and safety of employees and the costly load of up to 150 tons, the Bosch Rexroth CIMS measuring system integrated into the cylinder is equipped with three sensors.

From design to commissioning

Bosch Rexroth developed the entire system for SBM, also providing the required system components, which were virtually all manufactured in-house. These include the drive section including the hydraulic power unit and the hydraulic cylinder, the air supply unit, all pipework, plus the control section with software, control cabinets and operator panels. Bosch Rexroth also performed the commissioning. The second system delivered to SBM incorporates additional features, such as remote monitoring.



Bosch Rexroth Products & Services

- ▶ Concept, system and software engineering
- ▶ Project & quality management
- ▶ Certification
- ▶ Control panel
- ▶ Cylinders on mounting frame with guide
- ▶ Hydraulic Power Unit on mounting frame
- ▶ Control system including Motion Reference Unit
- ▶ Air system with air management
- ▶ Compressors & air treatment equipment
- ▶ Valve blocks
- ▶ Accumulator sets
- ▶ Installation, commissioning and supervision
- ▶ Sea trials