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Primary active heave compensator
Increases positioning capabilities during complex offshore activities

With the benefit of its many years of experience, Bosch Rexroth provides complete active heave compensation systems, including the required motors or cylinders, power units and controllers. Besides linear and secondary (rotating) variants, the company markets a primary active heave compensator. Like the other two systems, this one uses proven technologies and components and for the user it has the added advantage of lower investment costs.

There is a growing need for advanced heave compensation systems because of the increasing activities on and below the sea. The activities include building and maintaining offshore wind turbines, working on pipeline layers, installing subassemblies on drilling rigs and fitting (and removing) various devices on the seabed. All of these activities would be exceptionally hazardous to people, machines and the environment if it were impossible to compensate for ship movements caused by wave action.

Active heave compensation

Bosch Rexroth has dozens of years of experience in developing, commissioning and maintaining these Active Heave Compensation (AHC) systems. Three variants have so far been developed. They are the linear AHC
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(LAHC), rotating or secondary regulated AHC (RAHC) and now the new primary regulated AHC (PAHC).

The systems have in common their ability to compensate for the movement of the ship as a result of wave action. This occurs by measuring the movement by means of MRU (motion reference unit) acceleration sensors. The data is relayed to the main controller that uses the information to control – depending on the type of AHC - a hydraulic motor connected directly to a winch (RAHC), a variable pump (PAHC) or a proportional valve (LAHC). These components power the winch so that the load hangs idle relative to the fixed world (i.e. the drilling rig or the seabed). So when the ship moves upwards, the winch pays out and when she comes down again the winch hauls in. This makes it possible to position loads accurately and safely and gives ship personnel the ability to continue working safely even in rough weather.

The differences between the systems lie in their components and how they are controlled. With a linear system, the stroke of the cylinder determines the length of the winch cable and thus the position of the load. The rotating or secondary system is based on use of a secondary regulated motor connected directly to the winch. By varying the capacity of the motor, it is possible to vary the speed and direction of the winch.

PAHC

The latest development in AHC systems is the primary active heave compensation, or PAHC. This involves regulating speed and direction of the winch by varying the swivel angle of the pump and thus regulating the volume flow rate. To change rotation direction of the winch the hydraulic pump swivels over center and works as a motor. Hence, the PAHC is a closed loop hydraulic system. A digital controller type HNC 100 is used to control the swivel angle of the pump according to the signals from the MRU. The main advantages of this primary system are the lower investment costs and the compact construction that takes up a minimum of deck space. Moreover, the concept is so simple that its benefits extend to installation and maintenance. The system has standard functionalities that make it possible to position the load at the required place safely via different modes. Bosch Rexroth can adapt the software to meet customer-specific requirements.

Another characteristic feature of PAHC is that this type of heave compensation – like the rotating/secondary variant – is suitable for recovering energy in different phases of compensation. Among other things the energy released by
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easing the load (when the ship moves upwards) can be stored in a hydraulic accumulator. This energy becomes available again when the ship comes down and the load must be taken up. This energy-efficient system is achievable by using a modular kit with safety components, a brake and the required accumulators.

Simulation

To choose the right type of AHC system early on, Bosch Rexroth has its own simulation department equipped with state-of-the-art software. This allows precise simulation of the movement of the ship and the load so as to determine the required capacities and the heave compensation system best suited to achieve the required accuracy. This model stores all required data, ranging from the pressure and available power all the way through to the load, moment of inertia, winch details and wave movement.

Bosch Rexroth can supply a complete solution that includes the desired AHC system, the power unit, the motor and the system controller. Based on current developments a solution will soon be available whereby the user will have a single control unit to operate both the heave compensation system and the power unit. This solution will help to lower investment costs still further – because there are no separate PLCs and fewer interfaces are necessary – and will also reduce the risk of mistakes.

Used worldwide

Bosch Rexroth heave compensation systems are in use worldwide. Thanks to its global presence, Bosch Rexroth is capable of providing service and maintenance in all major harbors or wherever your vessel is at the moment.

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Economical, precise, safe, and energy efficient: drive and control technology from Bosch Rexroth moves machines and systems of any size. The company bundles global application experience in the market segments of Mobile Applications, Machinery Applications and Engineering, Factory Automation, and Renewable Energies to develop innovative components as well as tailored system solutions and services. Bosch Rexroth offers its customers hydraulics, electric drives and controls, gear technology, and linear motion and assembly technology all from one source. With locations in over 80 countries, more than 36,700 associates generated sales revenue
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of approximately 5.7 billion euros ($7.6 billion) in 2013. To learn more, please visit www.boschrexroth-us.com.

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