

Primary active heave compensator

Increases positioning capabilities during complex offshore activities

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Bosch Rexroth's active heave compensation uses proven technologies and components and lowers investment costs.

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. This and similar technologies will be on display in booth 1205 during the Offshore Technology Conference (OTC) May 6-8, 2019 in Houston, Texas. Besides linear and secondary (rotating) variants, Rexroth markets a primary active heave compensator. Like the other two systems, this one uses proven technologies and components and has the added advantage of lower investment costs.

There is a growing need for advanced heave compensation systems because of 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

Rexroth has dozens of years of experience in developing, commissioning and maintaining these active heave compensation (AHC) systems. Three variants

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have been developed: linear AHC (LAHC), rotating or secondary regulated AHC (RAHC) and the primary regulated AHC (PAHC).

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The systems 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 the load hangs idle relative to the fixed world (e.g., the drilling rig or seabed). When the ship moves upwards, the winch pays out and when it 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're 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's 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 the winch's rotation direction, 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 lower investment costs and compact construction that takes up minimum 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. And, 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

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energy in different phases of compensation. Among other things, the energy released by 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, Rexroth has its own simulation department equipped with state-of-the-art software. This allows precise movement simulation of the ship and its load to determine the required capacities and the best-suited heave compensation system 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.

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

Used worldwide

Rexroth heave compensation systems are used worldwide. Thanks to its global presence, Rexroth is capable of providing service and maintenance in all major harbors or remotely on a vessel.

About Bosch Rexroth

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, and Factory Automation 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 29,500 associates generated sales revenue of approximately 5 billion euros (\$5.5 billion) in 2016.

To learn more, please visit www.boschrexroth-us.com

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About Bosch

Having established a regional presence in 1906 in North America, the Bosch Group employs nearly 32,800 associates in more than 100 locations, as of December 31, 2016. In 2016 Bosch generated consolidated sales of \$13.7 billion in the U.S., Canada and Mexico. For more information, visit www.boschusa.com, www.bosch.com.mx and www.bosch.ca.

The Bosch Group is a leading global supplier of technology and services. The company employs roughly 390,000 associates worldwide (as of December 31, 2016) and generated sales of 73.1 billion euros (\$80.9 billion) in 2016. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT company, Bosch offers innovative solutions for smart homes, smart cities, connected mobility, and connected industry. It uses its expertise in sensor technology, software, and services, as well as its own IoT cloud, to offer its customers connected, cross-domain solutions from a single source. The Bosch Group's strategic objective is to create solutions for a connected life, and to improve quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life." The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiaries and regional companies in some 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. The basis for the company's future growth is its innovative strength. At 120 locations across the globe, Bosch employs 59,000 associates in research and development.

Additional information is available online at www.bosch.com, www.bosch-press.com, <http://twitter.com/BoschPresse>.

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