X-Wave motion compensation for offshore lifting

The world's first self-learning motion compensation system aims to plug the gap in the market for a versatile, portable and low cost solution that can be installed on new or existing marine and offshore applications.

Handling loads at sea

There is an increasing push in the marine and offshore sector to better utilise assets, whatever the weather conditions. Nowhere is this more critical than when lifting, lowering and accurately positioning or transferring loads, equipment and machinery either above the sea or beneath the surface.

Although these loads are generally large and heavy, they are relatively fragile and easily damaged, requiring delicate and precise handling and positioning. This is especially important when landing or interfacing loads from a moving vessel onto a fixed structure either in air or subsea. Handling such loads with any degree of precision or accuracy is difficult from a lifting device located on a floating vessel, as the motion of that vessel caused by wave excitation is directly transmitted to the load. Other activities, for example launching and recovering subsea vehicles (ROVs) that require docking of the vehicle into a tether management system (TMS) prior to recovery, are dependent upon stable position of the docking head.

As a result, such operations are significantly limited by weather conditions and much operational time is lost as a result. This leads to high cost of downtime, low asset utilisation and operational inefficiencies.

Active heave compensation

For this reason, active heave compensation is now the norm amongst most Tier 1 offshore contractors. It cancels the vessel vertical or heave motion in a single degree of freedom by introducing an equal and opposite vertical motion in the lift path. Such systems are referred to as 'heave compensation' and while many of the large operators and equipment manufacturers have access to the technology, many smaller ones do not.

Self-learning motion compensation

X-Wave, an advanced motion compensation system, helps fill this technology gap. Its designer, MJR Power & Automation, is patenting a series of innovations, including adaptive and predictive control strategies that provide self-learning capabilities for any active heave compensation and platform stabilisation system. The company is offering to integrate the system within any existing or new winch or crane control system.

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Automatic commissioning and self-optimisation

Quite often setting up and tuning an active heave compensation system can be time consuming. X-Wave's self-learning routines bring automatic commissioning and self-optimisation to the application, thereby ensuring the application comes on line faster than any other system or solution. This massively reduces set up costs.

This means the system automatically learns the process characteristics which dramatically reduces, and in some cases eliminates, commissioning. For instance it can learn the machine limitations in acceleration due to power restrictions or high inertia as well as learn fixed actuator delays, such as hydraulic valve or flow response lags caused by pumps and pipework. It can also predict sea motions including pitch, roll or heave.

The system adapts immediately should it experience load changes or suffer from aging, equipment failure, changes in friction, power supply characteristics or poor hydraulic valve response.

X-Wave automatically modifies and optimises control system behaviour in response to changing vessel dynamics. This means no vessel specific setup is required and the equipment can be transferred between vessels offering significant advantages to deployment of portable equipment.

The advanced motion compensation system is designed by MJR Power & Automation and features a range of automation, electrical and control equipment from ABB.

		Real Time Controller	HMI/SCADA	MRU
Power	Power Consumption	35 W	22 W	2 W
	Voltage Requirement	6..35 VDC	24 VDC	12..30 VDC
Interface	Ethernet Communication	Yes	Yes	No
	Serial Communication	Yes	Yes	No
	Analogue Interface	Yes	No	Yes
Environmental	Operating temperature	-20 to 55 °C	-10 to +50 °C	-10° to 65°C
	Storage temperature	-40 to 85 °C	-20 to +70 °C	-40° to 65°C
	Operating humidity	10 to 90% RH, noncondensing	5% – 85% non-condensed	10 to 90% RH, noncondensing
	Storage humidity	10 to 95% RH, noncondensing	10 to 95% RH, noncondensing	Sealed No limit
	IP Proteccion	IP 40	IP 66	IP 64 IP 68 Optional
	Vibration	IEC 60068-2-64	IEC 60068-2-64	IEC 60945 EN 60945
Accuracy	Angle Accuracy	N.A.	N.A.	0.02° RMS
	Resolution Angle	N.A.	N.A.	0.001°
	Resolution Heave	N.A.	N.A.	0.01m
Electromagnetic Compatibility	Electromagnetic Compatibility	EN 61326 (IEC 61326): Class A emissions;	EMC Directive 2004/108/EC + A1:2011	IEC 60945 EN 60945

Notes:

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