Electric Field Sensors and Electric Field Signature Control for Military Vessels

電界センサと防衛用船舶の電界シグネチア制御

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Historically magnetic and acoustic influences have been most commonly measured. However, the interaction of a vessel hull with its environment, notably the sea water gives rise to corrosion where metallic areas of the hull are exposed. The corrosion of a vessel can be minimised by the application and maintenance of suitable coatings. Since coatings cannot be applied or maintained perfectly an impressed cathodic corrosion protection system, ICCP, is used in order to impress current on to the hull such that the relative potential of hull relative to the seawater is such that corrosion is rendered energetically impossible.

In recent years the maritime electric influence has come to the fore with sensors being installed on ship signature measurement ranges whether as a retrofit or in a fully integrated multi-influence sensor package. In this paper, electric sensors as well as electric signature control and optimisation will be discussed with reference to onboard systems and configuration on a multi-influence range.

It is noted that electromagnetic signature management of a vessel begins at the concept stage e.g. evaluating the signature effects of the choice of drive type and hull coating. The electromagnetic design team is involved throughout the vessel design process determining the signature effect of the design proposed by the Naval Architect. Often a customer specifies the target signatures to be achieved with a contractor taking ‘signature responsibility’. The measured electric signatures can be optimised both for prevention of platform corrosion and minimisation of electric signature detection threat using a range with electric field sensing capability.

An overview of maritime electric sensor technology will be given using the example of the Ultra SMAP Multi-influence Underwater Sensors (MUWS) and Transmag range systems. Electric field measurement as part of range system commonly uses five or more sensors. Each sensor comprises 3 orthogonal pairs of silver-silver chloride electrodes and has been mounted on a flat concrete mattress to create a flat seabed area around each sensor to minimise distortion of the electric field by its mounting. Each sensor has a digital interface allowing Ethernet communications to an underwater network hub. The electric field range can be deployed in a line of up to 20 sensors. Several ranges can be connected at an underwater fibre optic interface box and cabled to shore via a common fibre optic cable for harbour detection purposes.

Multi-influence transportable sensor
可搬型多種類（物理量）測定センサ

Floating multi-influence sensor
浮遊型多種類（物理量）測定センサ