STL Overview of Deperming Ranges

Due to the increasing Navy's wide operational area in national and international missions, the threat by mines and torpedoes with magnetic igniter increases.
Therefore it is essential important that the Navy has the capability and the feasibility to reduce the own magnetic signature of ferromagnetic vessels by deperming systems where the magnetic field of the operational area can be simulated by an earth field simulator and treated afterwards by a deperming system.

The German Navy is one of the main customers of Earth Field Simulator where STL sensors and software is since several years in operation.

STL Systems is one of the system integrator and main supplier of Earth Field Simulators and as well of several types of Deperming Systems in different size and dimension, developed in accordance of the area of the vessels operation for Navy applications worldwide.

STL Systems has designed three types of deperming systems.

a) Overrun Deperming & Measurement Ranging System (ODMR)
b) Half Space Deperming & Measurement Ranging System (HDMR)
c) Cage Type Deperming & Measurement System (CDMR)

a) The ODMR system is typically installed at Navy bases where dedicated water depth, manoeuvring area environmental conditions and magnetic field situation are suitable for conducting non-magnetic underwater construction , coil laying in designed water depth and low noise magnetic measurement. The ODMR can be designed for all kind of surface vessels and submarines of any displacement, beam and length with respect to water depth and draught.

The ODMR allows retrieving the permanent and induced magnetic signatures of the ships and applying the magnetic treatment for signature reduction. Verification of the on-board degaussing systems (OBDS) functionality as well as the calibration of the OBDS's coefficients for above mentioned submarines and ships are available as optional features. For the operation of the ODMR it is mandatory that the vessel is moving across the sensor area and the deperming area various times resulting in a significant time consumption to deperm a single vessel.
b) The HDMR is assumed to be built on a Naval base alongside and next to a non-magnetic Jetty or pier.

The construction of the HDMR uses the jetty/pier construction for installing the coil system with tight construction and fixing systems ensuring no critical movements and vibration of the system components like coil and magnetic sensors to occur.
The HDMR will be capable of deperming submarines and surface ships as well as measuring and interpreting the ships signature with by means of data analysis and evaluation software of STL in a time and cost effective way.
It can also be used for functionality verification and calibration of OBDS. The vessel is stationary during the deperming and measurement process and, therefore, the HDMR is a time efficient solution.
c) Integration of deperming coils into a full size earth magnetic field simulator constitutes a CDMR system. It will be capable of deperming submarines and surface ships as well as measuring and interpreting the ships signature and can be used for functionality verification and calibration of OBDS. The deperming and measurement process is time efficient.

The comparison of all three deperming systems is shown in the following tables:

System	Coil Orientation	Operational Process	Technical efficiency	Budget
ODMR	Mandatory	Depending on manoeuvring capability of ships crew and ships size. Time consuming ranging and deperming process	High, Vertical and transversal alternating magnetic field moving in length direction of a vessel	Medium
HDMR	Arbitrary	Not depending on ships manoeuvring and ships size due to stationary system, Highly time efficiency	Higher, Vertical and transversal alternating magnetic field moving in length direction of a vessel.Arbitrary low deperming field frequency	Medium
CDMR	Arbitrary	Not depending on ships manoeuvring and ships size due to stationary system, Highly time efficiency	Highest, Homogeneous magnetic deperming field in length direction of a vessel. Arbitrary low deperming field frequency	High

During ships deperming and magnetic measurement processes the environmental conditions are essential for getting high accuracy of deperming and measurement results. Time consuming operation can occur due to ships manoeuvring area, high waves and wind causing a lot of trials for getting evaluable accurate data of Navy vessels.

The optimization of all these aspects is mandatory and part of the system design.

Following table shows dependence of environmental influences with regard to accuracy and the installation direction with physical feasibility as short summary as follows:

System	Waves & wind	Tide / water depth	Installation direction
ODMR	Strong dependence on smooth waves and light winds	Strong dependence on water tide and distance to coil system	Mandatory in East –West direction
HDMR	Independent to waves but slightly dependent to strong winds due to the huge cage structure necessary to fully include the vessel	Tide and water depth independent due to stationary system	Freely selectable due to 3 simulation coils
CDMR	Waves and wind independent due to stationary system	Tide and water depth independent due to stationary system	Freely selectable due to 3 simulation coils