

OFP Improvement of Magnetic Degaussing Facilities

One of the major vulnerabilities of Navy surface ships and submarines is their magnetic signature. Surface ships and submarines can set off underwater mines by their magnetic signature and both can be located by aircraft with magnetic detection systems. To protect against this vulnerability, the ship or submarines magnetic signature must be changed to a neutral value.

One of the major facilities needed to support the surface and submarine fleet is the Magnetic Silencing Facilities. These facilities consist of underwater sensors to measure the magnetic signatures of surface ships and submarines. After measuring the magnetic signature of the vessel, then the magnetic signature must be changes to a neutral value by a degaussing or deperming facility. These processes are particular critical for submarines which are a major part of our nuclear deterrent.

To deperm a surface ship or submarine, the vessel must be held in position inside a matrix of bottom sensors and cables wrapped around the circumference of the vessel and currents run through the cables to reverse the magnetic signature of the vessel so that it is neutral. For submarines, every time it submerges, the magnetic signature changes and has to be depermed when it returns to home port. In order to do this operation, the pier facility has to be non-magnetic. Thus, until 1984, they were always built with timber piling and non-magnetic bolts and the time required to drape the cables to perform the deperming was excessive.

Timber piling and fendering have an expected life of 7-10 years in a harbor. Thus, not only was the submarine taking a long time to get depermed but also had to wait in some cases while the facility was rebuilt every 7-10 years. A better solution to this problem was needed.

Jim Jenkins, a metallurgist at the Navy Civil Engineering Laboratory had participated in teaching engineers at the OFP Ocean Engineering course at CECOS about the problems with metals in a seawater environment. The OFP in 1982 determined a need for research on the deperming facility problem and this effort was assigned to Jenkins at NCEL. To solve this problem, the timber facilities had to be changed to concrete piles with non-magnetic steel reinforcing. Jim located a non-magnetic steel known as NITRONICS-32 made by a company in Florida. NAVFAC allocated research funds to NCEL to test this concept of using the NITRONIC's steel wire for use in pre-stressing concrete pilings. Several prestressed piles were manufactured using the non-magnetic steel and they were driven into the ground to determine that their non-magnetic properties did not change. Once proven, the OFP office briefed the NAVFAC-05 Construction



Submarine Being Depermed

Management personnel and suggested the next facility to be built be done with prestressed concrete piling whose service life is greater than 30 years as compared to wood piling at 7-10 years. On a

life-cycle cost basis, the concrete facility was less than half the cost of the timber facility. The OFP also made suggested improvements on how to suspend the cables so the submarine could steer into the deperming facility and its signature made neutral in record times. The first facility to be built using this new construction method was done in San Diego, CA in 1985-6. All new facilities build since that time use concrete versus timber. There are no longer delays in getting submarines depermed.