



## **Two ways of overcoating of World War II free-weathered weapons (an anti-aircraft gun and a searchlight) for outdoor coastal display.**

**Gesa Witt**

On the Belgian coast in Ostende the "Atlantik Wall Museum" has some World War II (WWII) weapons on outdoor display in the coastal dunes. Due to the constant exposure to the salty sea atmosphere and the abrasion by sand and wind the objects have suffered much corrosion and destruction. However, the Museum wants to keep the objects and continue to present them in the dunes, and therefore sought restoration work to try to preserve them in as original condition as possible for as long as possible, with the understanding that additional coatings would be needed to protect them in the harsh conditions. The two objects that will be discussed in this paper are an anti-aircraft gun and a searchlight.



Figure 1: The searchlight



Figure 2: The anti-aircraft gun

Initial investigation of the anti-aircraft gun showed that a previous restoration process had been carried out. Repairs were found that unfortunately had worsened the condition of the object dramatically as, while they were well meant, they were made of stainless steel which had caused bimetallic corrosion. Some of the flaps on the objects were also sealed with silicone, and the seat was mounted upside down. These factors strongly suggested that the treatment was done to prepare the object for sale to the museum (around 1990). Microscopic investigation of paint cross sections, especially of samples from areas protected under seals and flanges which were found during disassembly of the object, suggested that the object had had 3-4 layers of paint. These were compared with coating colors of the Wehrmacht to identify the most likely original colours.

This object had only 3-4 layers of paint, which strongly suggested that the paint was not original, and the topmost layer of paint was very thin and did not have good adhesion to the ground. In consultation with the museum we therefore decided that the coating of the anti-aircraft gun should be removed by sandblasting to allow areas of corrosion to be better recognized and treated. After de-rusting with a needle scaler and sandblasting, the old restorations were removed and holes and other areas of corrosion were cleaned and patched.

With the searchlight, we decided on a different path. Judging by the condition, the object had never been restored except for replacement of a fitted cap, and it was clear that the coatings were original. Colour analysis of paint cross-sections and colour "staircases" resulted in the identification of nine to eleven layers of color, with the entire color spectrum since production being available and readable. There was also a good connection between the upper and lower layers of paint and the metal substrate. Corrosion products that could not be removed with the needle scaler or mechanically were thinned with a sandblaster, with glass beads of 70 – 110 µm. When glass beads are used with little pressure they do not damage the existing paint layers but smooth and densify the surface. With this treatment we were able to preserve the well-adhered old coatings on approximately 85% of the surface, thus retaining the existing paint layer thickness of 300 to 400 micrometers. The material thickness of most of the parts was also a lot greater than on the anti-aircraft gun, so that after corrosion removal enough thickness often remained to be conserved.

Nevertheless, the structure needed additional support to provide the strength to carry the weight of the structure, so sheet metal work had to be carried out in many places, with weakened areas around holes being cut out and new patches welded in.

To preserve the objects in their exposed coastal display locations, we needed to apply protective coatings. When researching possible coating systems, we came across the Offshore Norsok Standards. The Norsok M-501 standard specifies the requirements for the selection of coating materials, surface preparation and application methods for protective coatings for offshore installations. Coatings should be low maintenance but also meet the requirements of rough sea weather. This corresponds exactly to the features we would like to have for our objects' protection.

The Norsok M-501 standard is now integrated into DIN EN ISO 12944 as category Cx. In the case of an offshore coating (Cx), however, surface preparation with blasting to SA 2 1/2 and application of a zinc dust primer coating is always mandatory. For the anti-aircraft gun a coating with this standard system would be possible, with Sika Permacor paints being used for the upper protective layers. Unfortunately, it turned out that these paints are only supplied in large quantities (minimum 20 kg).

The Cx standard of surface preparation could not be used for the searchlight, however, because of the pre-existing well-adhered coatings, as a zinc dust primer needs to be applied to a bare metal surface, and will not adhere well to remnants of old coatings. Instead we decided to coat the searchlight according to category C5 (a specification for onshore areas), which also corresponds to the actual location of the object. After priming, all slots and gaps were sealed with a sealant.

After both objects were weatherproofed some final touches were made to assist in the interpretation of the objects. Some missing parts on the visor of the anti-aircraft and destroyed plastic buttons were recreated by making 3D scans of similar items on intact identical objects, and then 3D printing replicas from the scanned data. The models were then colored, marked and installed.

After this treatment the objects were reinstalled in their display locations amongst the dunes, well-prepared to survive the difficult coastal conditions.