



Technical Report PolymerMetal[®]

TEC-# 007

The corrosion-chemical behaviour of PolymerMetals in combination with casting material (contact corrosion)

Used products

MM-metal SS-steelceramic / MM-metal SQ / MM-metal SS-steel 382 / MM-metal SS-steel / MM-metal oL-steelceramic / MM-metal UW / Ceramium[®] / MM-metal S-steel

Introduction

PolymerMetals are used for repairs of metallic constructions which were damaged by physical loads like tear, impact, erosion, abrasion, corrosion and cavitation or by chemical load.

Questions of customers concerning the contact corrosion of our PolymerMetals lead us to do tests.

The following report shows how the test has been carried out and what results have been obtained. Tests have been made with seven different PolymerMetals in artificial sea water (laboratory test) as well as in aggressive marshy soil. The PolymerMetals used were potentially equivalent or potentially superior to the base material (cast iron).

Place of repair

Moorland in the North of Germany and laboratory

Preparation of test samples

56 plates measuring 150 x 95 x 25 mm and 95 x 47 mm have been cut off cast iron. The surface of 23 plates has been treated mechanically. 2-3 bore holes of different diameters were installed in order to create different proportions between cast iron and PolymerMetals.

General information

An ordinary salt spray test proved insufficient. As the tested PolymerMetals are non-electrical conductive products it was decided not to measure the current density potential curves. The contact resistance in the Meg-Ohm-sphere was too high.

Test in moorland

Marshy soil is to be said very aggressive (DVGW rating no. -15 up to -19)

Reasons are:

- very low soil resistance (appr. 950-1200 Ohm x cm)
- very high salt content (chloride 800 - 1250 mg/kg / sulphate 4300 - 19000 mg/kg)
- very high moisture contents (appr. 55 - 85%)
- anaerobic conditions, proved by hydrogen-sulphide

The cast iron plates and PolymerMetals, machined and non-machined, were stored in a considerable depth of marshy soil for more than one year.

Test in artificial see water (laboratory test)

The cast iron plates and PolymerMetals - machined and non-machined - were stored in a laboratory in considerable depth of artificial sea water (DIN 50 900) for more than one year.



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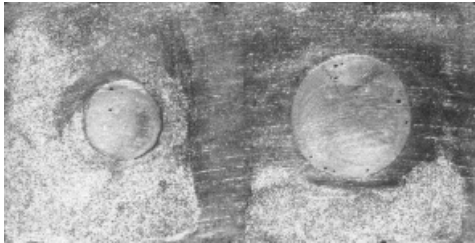
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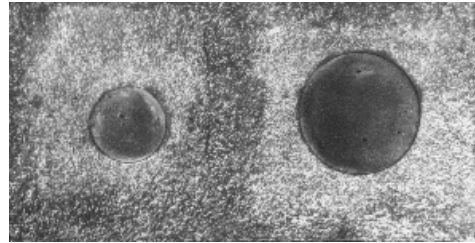
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Samples

The following photographs show the different PolymerMetals applied to cast iron which have been partly machined after full curing. After they have been stored for 12 months in aggressive moorland or artificial sea water the samples have been examined. The following four photographs concern machined samples which have been exposed to artificial sea water:



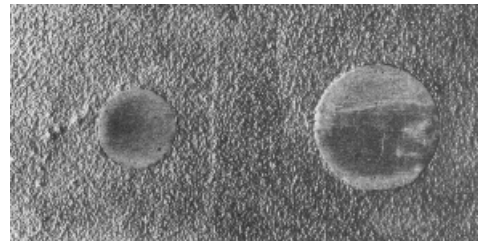
Sample MM-metal SS-steelceramic



Sample MM-metal SS-steel



Sample MM-metal oL-steelceramic



Sample MM-metal UW

Result

The results of both tests were nearly the same. Due to the strong reaction caused by the aggressive soil or by the sea water the cast iron plates were coated with ferric hydroxide. While the surface of the cast iron plates were differently affected, the PolymerMetals still remained unchanged after storage of more than 12 months. They were only covered with rust deposit. Even peak-to-valley heights from previous treatments could clearly be recognised. There was no contact corrosion, not even at the transitional point of the PolymerMetal and the cast iron. It was proved that PolymerMetals are not electrically conductive and cannot constitute any local element with cast iron.

Tested PolymerMetals

MM-metal SS-steelceramic
 MM-metal SS-steel 382
 MM-metal SS-steel
 MM-metal SQ
 MM-metal oL-steelceramic
 MM-metal UW
 Ceramium®
 MM-metal S-steel

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