

# drain TRADER



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September 2015 | Issue 209

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# AMP6

**WHERE IS THE WATER INDUSTRY IN ENGLAND AND WALES MOVING TO?**



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# M-Coating shaft rehabilitation has stood the test of time

In 1982 Rainer Hermes first coated inspection shafts using the centrifugal spray method in Germany. By 1999, M-Coating equipment was coating a large number of shafts in Leipzig. In 2010 two shafts were centrifugally coated in Dortmund: a heavily corroded concrete shaft and a brick-built shaft with leaking joints that was showing its age.

Work on both shafts was monitored by the MPA NRW from Dortmund, Germany. Every step was recorded, although today's automatic recording of cleaning and coating data was not available then. Both shafts were cleaned using the TSSR. The results were striking in the case of the concrete shaft.

In the case of the brick-built shaft, there was some incrustation and in places the brick had been baked very hard so that the surface was glazed. This called for sand & water blasting with the HDS-jet, which was able to remove the incrustation and roughen the surface of the brickwork.

A non-destructive test of compressive strength was then made using a Schmidt rebound hammer. All values were in the range above 20N/mm<sup>2</sup>. It was not possible to carry out tests of pull-off strength because the surfaces were wet and the concrete shaft was badly corroded. Holes and open joints were filled with ERGELIT-KS1. Now for the coating, mortar samples from the M-Coating continuous mixer were taken at the pump. Flow diameter was measured at around 140mm, using a Hegermann flow table as per DIN EN 1015-3. The concrete shaft was coated to a thickness of 30mm. This thickness was chosen to cope with the 50mm deep corrosion and to cover the coarse aggregate particles, which must be coated with at least 10mm of mortar.

The brick-built shaft was coated with approx 10mm of ERGELIT-KS1. Everything was recorded in the Quality Assurance handbook.

The brick-built shaft was stepped at a sharp angle, and varied from rectangular to oval and round. This posed no problem to the M-Coating equipment.

Mortar prisms of 4x4x16cm were made up on site. These prisms were later tested by the MPA for compressive strength and flexural strength. Flexural strength averaged 8.3 N/mm<sup>2</sup> and compressive strength 59.8 N/mm<sup>2</sup>. Tensile bond strength was tested for both shafts after 28 days. In the concrete shaft we achieved a failure load of 2.11 N/mm<sup>2</sup> between the pull-off head and the mortar, and in the brick-built shaft a failure load of 1.9 N/mm<sup>2</sup>. We may conclude from this that adhesion to the substrate is even higher.



TOP: Concrete shaft before and after cleaning (INSET)

ABOVE: Brick shaft before cleaning.  
LEFT: After cleaning



Sand blasted bricks

The MPA NRW was commissioned with evaluating the shaft rehabilitation by the M-Coating process, in respect of two wastewater shafts: in one case made of reinforced concrete, in the other of clinker brick. All operational requirements relating to preparation, assessment and coating of the shaft as per the DWA technical sheet and the QA manual were met in full. Thanks to the system's mainly automated procedures, each shaft could be rehabilitated by a team of 2 operatives within approx 3 hours. The values for tensile bond strength in the shaft and the values established for flexural and compressive strength for ERGELIT-KS1 met the specifications laid down by Hermes & Co.

As a result of the use of the M-Coating process, wastewater shafts were restored to their as new, fully functional condition."

Five years later (2015) the shafts were again examined by the MPA. Shortly before the end of the agreed period of warranty, all those involved met at the original site. First impressions were highly satisfactory. No corrosion cracks or leak were

visible. In order to confirm this positive visual impression, the following measurements were made:

- DIN EN 12504 – Testing concrete in structures – Non-destructive testing – Determination of rebound number (12/2012)
- Products and systems for the protection and repair of concrete structures - Test methods - Measurement of bond strength by pull-off; German version EN 1542:1999
- DIN EN 14630 – Products and systems for the protection and repair of concrete structures – Test methods – Determination of carbonation depth in hardened concrete by the phenolphthalein method (01/2007)
- DIN EN 1936 - Determination of real density and apparent density, and of total and open porosity (02/2007)

All tests confirmed the outstanding quality of the rehabilitation by the M-Coating process.

The compressive strength of the coating registered an average of 46 N/mm<sup>2</sup> although the rebound hammer did not give absolutely identical results to those provided by the test sample prisms. Bond strength readings at approx 2.5 N/mm<sup>2</sup> and 2.19 N/mm<sup>2</sup> was well above those taken 5 years earlier: no reduction in strength could be detected. Carbonation depth was 0 mm. Open porosity was around 9.69%, and to a very shallow depth.

#### To sum up

The combination of ERGELIT KS-1 and the M-Coating process is a reliable and durable method of rehabilitation. In the present example it proved outstandingly successful. This has been attested by the MPA NRW and by the City of Dortmund – and elsewhere. The detailed reports can be obtained from HERMES Technologie in Schwerte (Germany), on request. Once again, our experience of over 33 years has been positively confirmed. We thank all those who took part, in particular the City of Dortmund, for their support.



The finished brick and concrete (RIGHT) shafts

