WASTE WATER PLANT

The central sewage plant in Konstanz, Germany was built in seven stages between 1968 and 1982. It is a mechanical-biological plant with phosphorous precipitation and anaerobic sludge treatment, the gas produced in the process being used to provide 60% of the unit's power requirements. 30 years after the first Alocit coatings were used to protect concrete on the 5,660 m^3 buffer and interconnecting 8,200 m^3 rainwater settling tanks, Alocit was used again. But not on the originally protected concrete - the original coatings were still in perfect condition - this time it was on vulnerable parts of the screen and grit chamber structures.

The largest water treatment plant in the Lake Constance catchment area, the Konstanz works is designed to handle almost 280,000 inhabitant equivalent units of waste, on average 260 litres of waste water per inhabitant per day, which can include aggressive trade and industrial waste water as well as domestic sewage. Up to 50,000m^3 of waste water is cleaned daily at a maximum rate of 3,250m^3 per hour. It is a particularly important processing plant because 50% of the Konstanz region's waste water is purified at the plant and Lake Constance, where Germany, Austria and Switzerland meet, is one of the cleanest lakes in Europe. The purified water from the plant is returned to the Lake, which supplies over three million people with drinking water.

So in addition to meeting the standards of the waste-water management regulations valid throughout Germany, the discharge values in the guidelines for keeping Lake Constance clean must also be adhered to and improved for even higher water quality through reducing contaminants. The only way to achieve this was by repairing, modernising and improving the plant.

In 1995 Electrowatt Engineering of Zurich, Switzerland, who specialise in the building and renovation of sewage plants, were commissioned to assess the condition of the plant and make recommendations for its repair and upgrade the

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facilities. The company discovered that, in addition to structural damage in the form of cracks, there was damage to the concrete in the older buildings where Alocit coatings had not been used.

This damage was caused by corrosion of the reinforcement through an insufficient concrete covering and poor quality concrete, particularly in areas close to the surface. The damage was due to inadequate post-treatment and erosion of the original non-Alocit coating by the aggressive waste water environment, as well as inappropriate application of the different coating layers, some of which came off shortly after application through lack of adhesion.

Evidence supporting these finding came from laboratory tests based on the penetration depths of the various substances which had damaged the concrete and were part of the overall assessment of the individual structures on the site.

It was decided that particularly vulnerable parts of the repair of the screen and gritchamber would include coating of the concrete by Alocit. The company's products had been used in 1968 on the buffer and rainwater settling tanks and those original coatings needed no new treatment - after more than 27 years of constant use! This outstanding performance by the Alocit coating in circumstances where other coatings had failed, with all the resultant complications, made Alocit the natural choice. A further factor in deciding to use Alocit was its environmentally friendly composition - it is 100% solvent free - a feature that is important when the environment is such a critical factor.

Work started in April 1996 on individual sections. First high pressure water jets (up to 1800 bar) were used to remove old failed coating and the resulting chemically damaged concrete. Exposed corroded reinforcements had

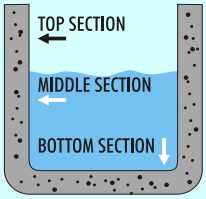
the rust removed and the application of mineral based protection. Then, with surface roughness generally at 2-3mm and in some places 8mm because of widely differing concrete quality and damage due to chemical attack in the concrete zones close to the surface, the walls and floors were reprofiled using a mineral surface filler to provide a smooth base for the Alocit primer and coatings.

The total thickness of the Alocit coating system when dry was specified as 600 microns on the walls and 1000 microns on the floors. The original Alocit coating specification was used - the primer was Alocit 28.95 and the top coat was Alocit 28.15. All of the coatings were applied by hand roller.

The plant continued to operate during the repairs, work areas being protected by bulkheads, and this stage of the project was completed in October 1997. Plant manager Herr Schroeder-Rauter, commented, 'We can recommend Alocit coating systems without hesitation for all types of sewerage environments.'

LOCATION OF SAMPLE	SAMPLE NO	FAILURE @	FAILURE LOCATION
TOP SECTION	BK 6	1.7 N/mm²	Failure Between Mortar And Concrete
	BK 8	2.2 N/mm²	
	BK 10	1.4 N/mm²	
MIDDLE SECTION	BK 14	2.9 N/mm²	Failure Between Mortar And Concrete
	BK 16	2.3 N/mm²	
	BK 18	2.2 N/mm²	
BOTTOM SECTION	BK 24	3.2 N/mm²	Concrete broke away at 20-30mm Depth
	BK 26	3.9 N/mm²	
	BK 28	3.5 N/mm²	

No of Measures	Sample 12	Sample 22	Sample 29
1	0.700	1.180	0.640
2	0.560	1.420	0.580
3	0.660	1.400	0.520
4	0.600	1.400	0.560
5	0.700	1.040	0.660
6	0.800	1.300	0.640
7	0.700	1.220	0.600
8	0.560	1.240	0.680
9	0.620	1.040	0.700
10	0.680	1.220	0.600
11	0.800	1.240	0.860
12	0.760	1.040	0.880
13	0.620	1.060	0.620
14	0.780	1.120	0.920
15	0.680	1.180	0.820
16	0.620	1.220	0.860
17	0.780	1.240	0.720
18	0.860	1.180	0.640
19	0.780	1.340	0.520
20	0.660	1.420	0.660



Shown right: A magnified section of a core sample with the four coats clearly showing. Note how the primer coat penetrates and smooths the substrate.

Diagram on left shows areas referred to in the chart above.

TEST RESULTS

Throughout the project coatings were regularly tested for quality. Drill cores were taken during the repair process and verified by laboratory testing. During the individual operating stages tests were carried out on site, including adhesion tensile tests and dry film thickness tests, all of which provided excellent results. The chart on the left shows that, during adhesion tests, there was only failure in the substrate - the Alocit coating remained secure. The second chart shows a sample of the DFT tests which showed excellent coverage throughout the project.