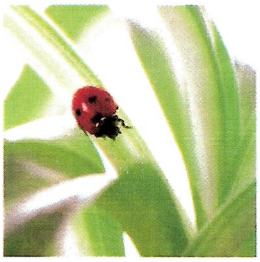
Analysis Report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Marsh Polylok Filter Pilot Test

Aims

The Polylok filter has been developed to extend the life of drainage fields by forming a biomat (biofilm) to remove suspended solids from sewage plant and septic tank effluent and thereby reduce the solids load passed forward from the tank to a drainage field or watercourse. The Polylok filter pilot test was undertaken for a preliminary assessment of its effectiveness for secondary effluent.

WRc Method Specification

The Polylok filter has rows of slots with a standard gap of 1.5 mm (1/16 in) for filtration of influent. The mechanism of suspended solids removal is through the growth of a biomat (biofilm) of sufficient thickness to bridge the slots and remove suspended solids from influent. Since biofilm thickness is quite variable (Table 1) and reduces with lower substrate concentrations in secondary effluent, the purpose of the pilot test was to assess biofilm growth and suspended solids removal.

The specified test method comprised passing a continuous supply of secondary effluent from a small activated sludge plant treating domestic sewage to a Polylok filter, observing biofilm development on the surface of the filter, and evaluating suspended solids removal at the end of the pilot test period.

The pilot test of a Polylok filter (PL-122) unit (rated for 5.7 m^3/d) was undertaken at WRc Swindon between 5th June and 30th June.

Sampling and Testing

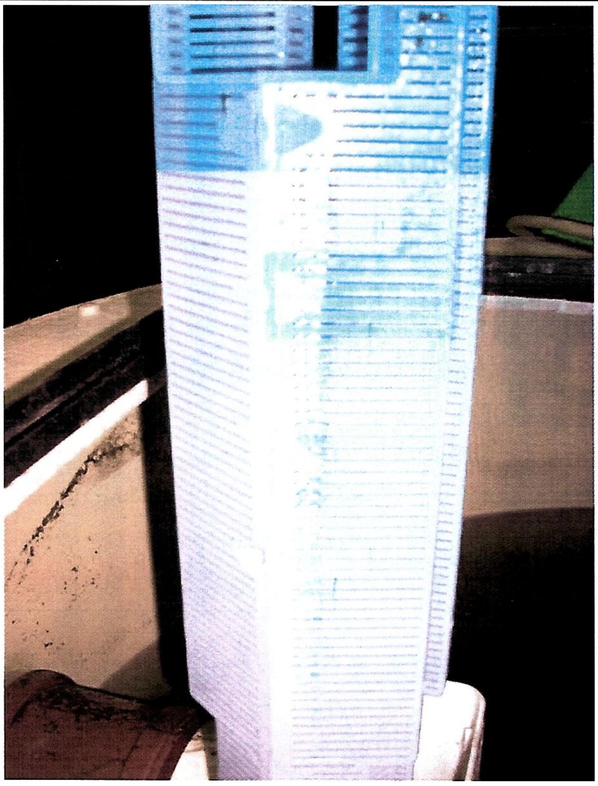
Photographs of the filter were taken to show biofilm development.

Spot samples of secondary effluent fed to the filter and filter effluent from the filter were taken during continuous operation for suspended solids (SS) analysis at the end of the test period.

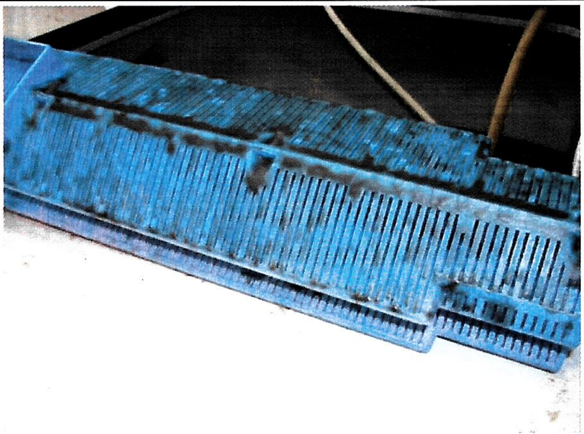
Results

Photographs of the filter at the start and end of the test period are given below. This solids build-up was insufficient to reduce the flow width of the slots (1/16 in) which allowed continued pass forward of fine suspended solids associated with secondary effluent into the filter outlet.

Figure 1 Polylok Filter photographs



A. Prior to test



B. End of test

Two spot samples taken on Monday 24 June gave a filter influent SS concentration of 5 mg/l and a filter effluent SS concentration of 5 mg/l. Subsequently, the mixed liquor suspended solids concentration in the activated sludge plant was reduced by increasing the wastage rate of the surplus activated sludge to increase the suspended solids concentration passed forward in the secondary effluent to the filter. Two sets of samples, taken towards the end of the test period, gave a filter influent SS concentration of 72 mg/l and a filter effluent SS concentration of 45 mg/l a reduction of 37.5%.

This result suggests the filter has the potential to minimise excursions from compliance when secondary effluent conditions become unstable. However, further exploration of the upstream plant operating conditions and their effect on biomat establishment for operational filters is required to validate this preliminary finding.

Table 1 Reported biofilm thickness for biological treatment

Reference	Thickness (mm)	Commentary
Kornegay and Andrews, 1967	0.16-0.21	Steady-state, heterotrophic, mixed population
Hoehn and Ray, 1973	0.03-1.3	Heterotrophic mixed population
Williamson and McCarty, 1976	0.15-0.58	Steady-state, nitrifying, mixed population
Rittman and McCarty, 1978	0.1	Steady-state, heterotrophic, mixed population
Rittman and McCarty, 1980	0.119-0.126	Heterotrophic mixed population
Rittman and McCarty, 1981	0-0.125	Heterotrophic mixed population

Kornegay, B.H. and Andrews, J.F. (1967) Characteristics and kinetics of fixed-film biological reactors, Final report, Grant WP-01181, Federal Water Pollution Control Administration, U.S. GPO, Washington, 1967.

Hoehn, R.C. and Ray, A.D. (1973) Effects of thickness on bacterial film, Journal of Water Pollution Control Federation, 46, 2302-2320.

Williamson, K. and McCarty, P.L. (1976) Verification studies of the biofilm model for bacterial substrate utilization, Journal of Water Pollution Control Federation, 48, 281-296.

Rittmann, B.E. and McCarty, J. (1978) Variable-order model of bacterial film kinetics, Journal Environmental Engineering Division, ASCE, 104, 889-900.

Rittmann, B.E. and McCarty, J. (1980) Model of steady-state-biofilm kinetics, Biotechnology and Bioengineering, 22, 2343- 2357.

Rittmann, B.E. and McCarty, J. (1981) Substrate flux into biofilms of any thickness, Journal Environmental Engineering Division, ASCE, 107, 831-849.

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