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Case Study

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CASE STUDY

North Hampshire — Trial Installation, CSO MITA Performance

ATAC Solutions have installed a MITA PECV 4/20 cloth filter at Trial Site wastewater pumping station (WPS). The installation is on hire to Water Company and is being used to trial the cloth filter at a WPS with the vision of further installations if the trial is successful. Trial Site WPS is located in North Hampshire and suffers from groundwater infiltration especially during wet weather periods and storm events presenting a risk of flooding to the villages downstream. One of the mitigation measures against the risks of groundwater infiltration/combined sewer overflow is over-pumping. This involves discharging to the local watercourse when the WPS cannot handle excess infiltration flows.

During an over-pumping event the risk of contamination to the watercourse needs to be minimised as much as possible. At Trial Site WPS, initially over pumped flows went through a screening process and then to UV light treatment equipment before being discharged to the stream. Currently the discharge can only be made when the Aquifer water levels reach a predetermined level, and this is often not reached, hence 24/7 tanker has to be used rather than discharging to the stream.
Water Company wanted to improve the discharge quality by removing suspended solids and any associated BOD and NH_3 concentrations in the effluent before discharging to the stream, so ATAC proposed installing a MITA 4/20 PECV cloth filter between the screening and UV process. The other advantage of installing the cloth filter was to improve the transmissivity of the effluent so that the UV treatment could achieve a higher Bacteria kill and achieve a better percentage coliform efficiency.

MITA cloth filters haven't typically been used to treat this type of effluent before. Groundwater infiltration causes the combined sewer to overflow and consequently the raw sewage tends to be very dilute. The purpose of this trial is to evaluate the performance of the cloth filter on this specific type of effluent with a view of trialling different types of cloth and assessing the results under different hydraulic & solids loading rates. This report will outline the findings during the trial.

Procedure & Setup

The existing process pumps influent from the wet well to the MNSS3T 6mm 2d screening equipment, screenings are disposed of into a regular domestic wheelie bin and the discharge from the screen is pumped directly to the UV equipment and then into the watercourse from here.

ATAC initially carried out a site visit to scope the feasibility of installing a cloth filter, gathering all information required and taking levels to ensure the hydraulics would work. The MITA 4/20 was installed on railway sleepers on top of a level type 1 base adjacent to the main MCC to raise the filter by 200mm ensuring the cloth filter could gravity discharge to the UV equipment. ATAC installed the inlet of the MITA filter on to the end of the screen outlet pumps via a flexible Bauer hose eliminating the need for additional diesel or electric pumps. The MITA filter outlet was installed in PVC pipework on pipe supports to allow it to discharge freely under gravity directly to the UV equipment. The cloth filter overflow pipework was joined into the outlet pipework to the UV equipment to provide a failsafe on the filter. The backwash pipework was installed in flexible Bauer hose and discharged back into the pump station wet well.

Figure 1. Over Pumping Pump Station

Figure 2. Screen Arrangement & Screen Discharge Pumps

Figure 3. UV Dosing Equipment

Trial Results

Sampling at Trial Site was carried out over 7 days during June & July with various parameters tested. Samples were taken prior to any treatment and post-treatment.

Pre-Treatment

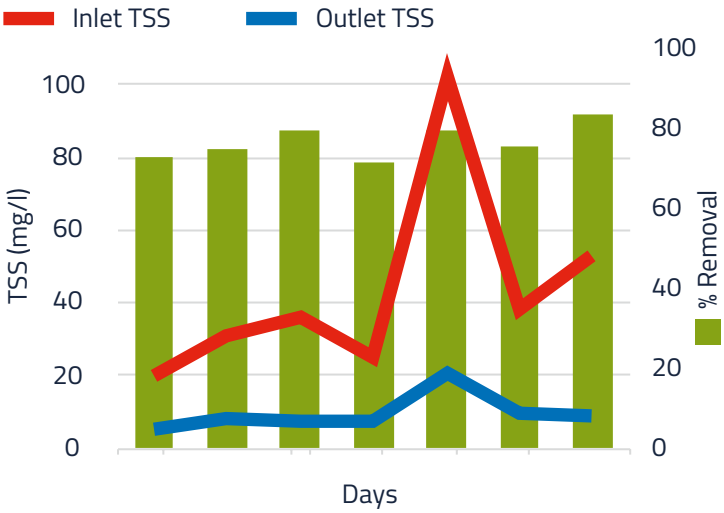
	2023						
Parameter	30/06	03/07	04/07	05/07	06/07	07/07	10/07
Ammonia							
(mg/l as N)	5.12	5.58	5.11	4.5	7.6	3.79	6.75
(mg/l as NH_4)	6.58	7.17	6.57	5.79	9.77	4.87	8.68
(mg/l as NH_3)	6.13	6.46	7.32	5.57	8.22	5.24	7.96
COD (mg/l)	89.1	92.5	47	44.2	155	42.8	89.6
BOD (mg/l)	36.1	25.3	19.9	11.1	76.7	20.2	35.1
Conductivity (usie/cm)	626	670	647	697	671	625	650
E. Coli (presumptive)	100000	100000	3800000	1000	4000000	1500000	2800000
Enterococci (species)	100000	100000	590000	100000	240000	210000	260000
Nitrate (mg/l as N)	6.54	5.4	5.88	5.88	3.87	5.84	4.89
Nitrite (mg/l as N)	0.355	0.398	0.332	0.235	0.357	0.327	0.429
pH	7.43	7.44	7.53	8.01	7.34	7.55	7.91
Phosphate (mg/l as P)	0.391	0.504	0.678	0.623	0.638	0.402	0.737
Suspended Solids (105°C) (mg/l)	19.8	31.1	36	25.2	102	38.6	52.7

Post-Treatment

	2023						
Parameter	30/06	03/07	04/07	05/07	06/07	07/07	10/07
Ammonia							
(mg/l as N)	3.41	3.9	5.62	4.93	6.97	5.2	5.21
(mg/l as NH_4)	4.38	5.01	7.22	6.34	8.96	6.68	6.7
(mg/l as NH_3)	4.22	5.55	5.71	5.79	7.53	6.1	6.85
COD (mg/l)	27	28	31	30.3	54.4	31.4	12.1
BOD (mg/l)	10.2	11.3	11.2	8.48	20.8	9.66	36
Conductivity (usie/cm)	616	677	657	660	649	634	668
E. Coli (presumptive)	60	10	50	2200	30	10	10
Enterococci (species)	21	10	10	11	10	2	10
Nitrate (mg/l as N)	5.69	5.45	6.23	6.43	5.73	5.91	5.62
Nitrite (mg/l as N)	0.352	0.441	0.348	0.248	0.418	0.381	0.46
pH	7.71	7.72	7.69	8.21	7.68	7.93	7.67
Phosphate (mg/l as P)	0.426	0.56	0.638	0.544	0.734	0.553	0.828
Suspended Solids (105°C) (mg/l)	5.35	7.9	7.45	7.25	20.9	9.5	8.85

TSS Removal

Date	Inlet TSS (mg/l)	Outlet TSS (mg/l)	% Removal
30/06/2023	19.8	5.4	73.00%
03/07/2023	31.1	7.9	74.60%
04/07/2023	36	7.5	79.30%
05/07/2023	25.2	7.3	71.20%
06/07/2023	102	20.9	79.50%
07/07/2023	38.6	9.5	75.40%
10/07/2023	52.7	8.9	83.20%



The purpose of the MITA cloth filter is to remove any suspended solid particles below 5µm and any Associated BOD / NH_3. From the data gathered that during the trial there was an average inlet TSS of 43.6mg/l and an average outlet TSS of 9.6mg/l giving an average percentage removal of 76.6%. Removal levels did not drop below 70% throughout the trial and the filter still removed 79.5% of solids when the inlet concentration exceeded 100 mg/l.

As a result of the high TSS removal rate, this has also reduced the BOD and COD levels in the effluent due to the insoluble and inorganic solids removed by the filter. Prior to treatment the average BOD and COD was 32.1mg/l and 80mg/l, respectively. After treatment the average BOD and COD was 15.4mg/l and 30.6mg/l, respectively. This is over a 50% reduction in both parameters.

Figure 4. MITA Pipework Arrangement

Figure 5. MITA temporary pipework Installation

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The UV treatment stage reduced the E. Coli and Enterococci species by an approx. 3 log reduction 99.99%. There were no considerable reductions in Ammonia, Nitrate, Nitrite or Phosphate during the trial, but this is to be expected as there are no stages of treatment for these parameters.

Results

The purpose of this report is to analyse how the MITA 4/20 cloth filter performed on CSO sewage over a 7-day sampling period at Trial Site WPS with the vision of potentially utilising cloth filters at further WPS that experience the same or similar issues with this type of sewage. This document aims to primarily identify the TSS removal rates that can be achieved at small WPS sites where CSO is treated to reduce the environmental impact when being discharged to the local watercourse.

The results from the trial showed an average suspended solids removal rate of 76.6% with 43.6mg/l before treatment and 9.6mg/l after treatment. Consequently, over 50% reduction was seen in BOD and COD concentrations on average, going from 32.1mg/l to 15.4mg/l and 80mg/l to 30.6mg/l, respectively. The results show that the MITA cloth filter is a good solution to reducing the suspended solids a significant amount before it enters the watercourse and can provide a proven method of treatment for storm / ground water discharges from overwhelmed pumping stations.

It must be considered that the limitation of this trial was that it was only carried out for a short period of time and during dry weather conditions in June & July. Wetter weather during the winter months may produce different results and this should also be trialled to confirm the performance of the filter all year round.

The trial was successful and proved that the MITA cloth filter can perform well on CSO influent and remove a high percentage of solid particles and associated BOD and COD. The success of this trial provides confidence in the capability of these filters being installed on further sites with similar issues like Trial Site WPS, helping to reduce the environmental impact on local watercourses. Water Company are actively involved in proposing to use these rigs for future ground water treatment including Cloth filters.