

CASE STUDY

Willand WwTW - Temporary Tertiary Treatment plant

PILE CLOTH MEDIA FILTRATION (PCMF)

During the beginning of August 2012 Hydrok were approached by South West Water with regards to a problematic treatment works. The solids discharging from the works at Willand WwTW near Exeter were periodically at higher levels at the works outlet and causing concern to South West Water operations. The following solution developed after detailed discussions with South West Water's engineers resulting in the provision and installation of an innovative emergency tertiary filter.

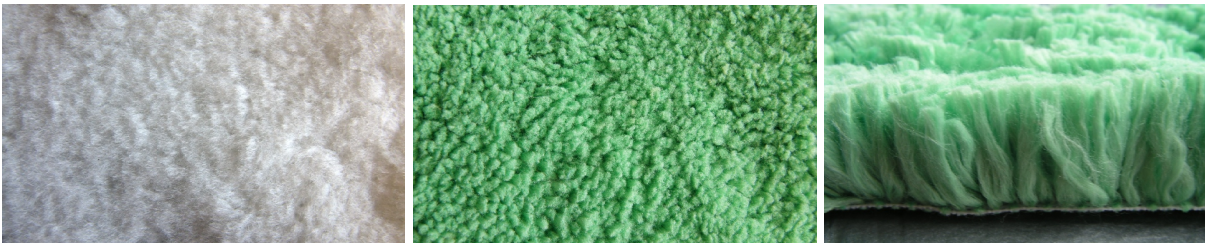
The approach taken when addressing the issues at Willand WwTW was further aided by results from previous pilot trials with SWW on their site at Gwennap WwTW in Cornwall. These trials were conducted on a small scale pilot rig taking a sample flow from the main works to prove solids removal of up to 90%.

Hydrok operate in close association with Mecana, a Swiss based company with 45 years of experience in treatment of wastewater. Their Pile Cloth Media Filters (PCMF) provide a unique filtration patented technology. It was this technology which had previously been trailed as a pilot plant at South West Water's WwTW at Gwennap WwTW in Cornwall which was further developed as the solution for Willand WwTW.

The key feature to the efficiency of the pile cloth media filter technology is the filtration material, a fabric that is carefully engineered to maintain the quality, durability, and performance. It is a unique long pile type material that allows filtered solids to be stored in the whole depth of the pile to provide consistent removal of very fine particulate matter. This provides a filtration process in which solids removal efficiencies are very high and similar to those of conventional sand filters, and with far greater efficiency than Micro-screens. Additionally the pile cloth media filters are capable of handling very high influent solid concentrations unlike many other alternative solutions.

Two different types of cloth have been developed: a standard pile fabric (100% polyamide) and a microfiber pile fabric (100% polyester). The cloth choice depends on the application and the required outlet quality. Microfibre fabric, woven from finer and denser fibres, is capable of retaining smaller particles and therefore producing higher effluent quality.

The cloth media has been adapted into two mechanical configurations depending on the flow rate and solids concentration: drum configuration for smaller water volumes and disk configuration for larger flows. In the latter discs are placed vertically on a central filtration collecting tube therefore their real footprint is very low keeping the surface loading capabilities at a high rate of 40 – 50 m/h.



Standard cloth (white) and microfiber cloth (green)



Pile Cloth Media Filter in a drum configuration at Willand WwTW

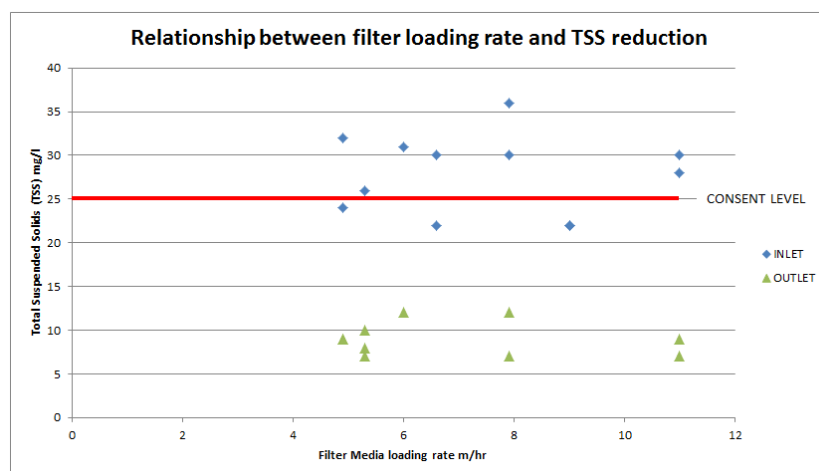
The filtration process is kept simple. Secondary effluent is filtered from the outside of the pile cloth media to the inside, allowing larger particles to settle and be removed separately by the bottom sludge pumps provided. It prolongs the cloth lifespan and improves the process as the media does not become blocked by larger solids as in case of inside-outside Micro-strainers. Backwashing, which initiates automatically once water reaches a certain level, uses pump suction to remove the solids from the pile cloth. Its efficiency is very high as the fibres raise during the suction, which allows for the proper removal of the accumulated solids. The filtering operation is continuous and never interrupted during the backwash process.

Pile cloth filters are low maintenance systems with automatic control. They require no chemicals for cleaning the cloths and have low power consumption due to energy only being required during the short backwash events, the rest of the filtering being typically gravity flow.

The low overall head loss required across the system (500 mm) allows the system to suit most hydraulic profiles.

In the UK, the performance of the pile cloth media filter has been tested in two locations, which are owned and operated by South West Water: Gwennap WwTW and Willand WwTW. Both of the sites needed a robust and reliable solution to TSS removal as previously installed equipment on both sites had failed to deliver consistent effluent total solids below consent levels. PCMF have demonstrated good performance on both of these sites and kept the effluent solids below the required 25 mg/l at Gwennap WwTW despite complications caused by landfill leachate, and 30 mg/l at Willand WwTW with only partial flow to the filter.

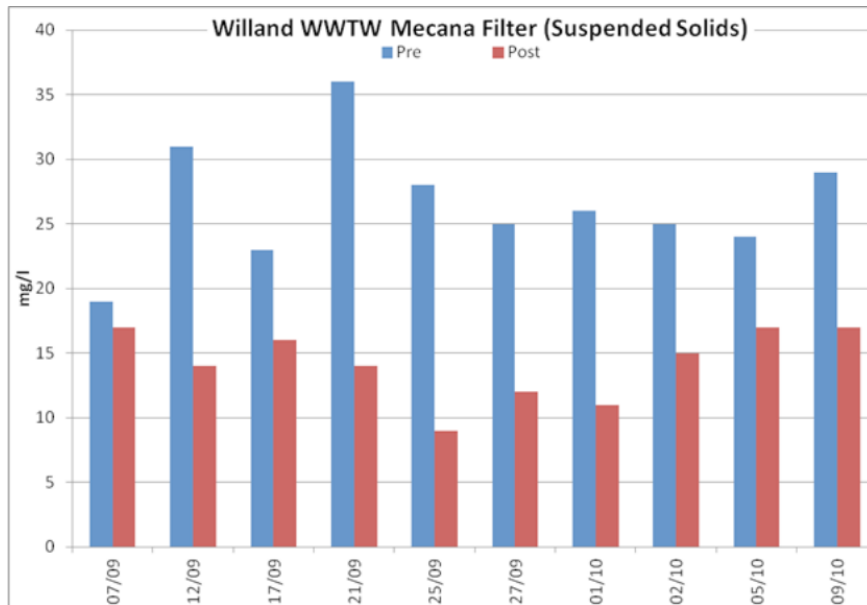
The wastewater in Gwennap WwTW which is a mixture of municipal sewage and landfill leachate was tested for several days with the Mini pilot Filter. The average TSS reduction rate was 70% (without the aid of any chemicals).



Summary of results from Gwennap WwTW

Wastewater at Willand WwTW is a standard municipal sewage; however, the problems associated with the fluctuation of flow and solids concentration create the difficulty of controlling the levels of solids discharge.

The pile cloth in a drum configuration remains in operation as a temporary solution to these problems and has been in operation since September 2012. The drum size is capable of filtering up to 90m³/h with the TSS loading below 40mg/l (max. treatable flow rate decreases with the solids concentration increase). The unit has not yet operated at its full capacity; however the results collected so far with a smaller loading are very promising.



SWW operational results from Willand WwTW: not full flow to treatment



Mini Filter (Gwennap WwTW)



TF10 (Willand WwTW)

The Pile Cloth Media Filter responded well on both sites where the traditional Micro-strainers and sand filters had failed. The effluent at Gwennap WwTW is affected by waste from the landfill leachate plant which forms poor settling and poor filterable solids. At Willand WwTW the frequent capacity change in flow and solids resulted in complicated control of the existing sand filters, which could not handle sudden solids peaks. The Pile Cloth Media Filter has succeeded on both sites proving security of operation for SWW and also offers a benefit of very low power consumption with only periodic operation of the back wash pump and sludge pump, both at less than 0.35kw operating from a fully automated control panel.