

Floating Baffle Curtains / Storage Pond Liner

Waste Water Treatment Plant Upgrade Ngaruawahia, New Zealand

Client: Spartan Construction / Waikato District Council

Date: March 2009

The Ngaruawahia Waste Water Treatment Plant receives domestic wastewater from several towns for treatment. Any plant's upgrade required that the flow of the wastewater into the plant is never disrupted and that the quality of the water leaving the plant has received as much treatment as possible.

The latest stage of the plant upgrade included removal of sludge and other deposits such as grit and sand from the treatment pond. This material was required to be dewatered and permanently deposited in designated area of the treatment plant's wetlands.

A temporary dewatering pond was commissioned for this part of the project and Permathene has supplied 3,250 m² of Permaliner 500 Flexible Polypropylene Geomembrane. We were able to fabricate whole geomembrane in three separate parts approximately 1100 m² each, with consequent on-site welding of these parts together, to form one 3250 m² pond liner. This area was used for storage of dewatered sludge.

Five new floating baffle curtain walls were fabricated and installed into the treatment pond. Installation of the baffle curtains system allowed creation of an extended flow path through the pond and separation of the pond into a facultative and four maturation zones. Baffles 1, 2, 5, and 6 had range of square openings, allowing controlled water flow throughout four maturation zones towards outlet.

This work significantly improved the performance of the treatment pond and prepared the pond for future upgrades.

The six baffle curtains were fabricated from two grades of FPP Permaliner: 1000 micron for top part, forming buoyancy part, and Permaliner 750 for skirts and ballast parts. Five separate baffles were fabricated from combination of standard 30 m long units and units of non-standard length, allowing building baffles of specified length, interconnected by overlapping with secure connection. Along top buoyancy element baffle units were connected by strong reinforced 2 mm thick HDPE plate. All baffle's slope parts had secondary skirts installed along bottom part of the slope section, allowing fixation of the slope parts to the wave bund for prevention of baffle's erosion due to the friction with wave bunds surfaces.



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Construction of maturation zones inside existing pond required baffles connection not under right angle, but included 3 "T" connections and one complex Cross-Connection.

All connections were made by welding additional 2 m wide flaps to the baffle curtains. Firstly, all connecting baffles were connected via tension members. Then, after adjusting tension of the mooring lines, additional flaps were brought together and interconnected by sliding slotted HDPE pipe along reinforced sides of the flaps from the surface of the water. This allowed creation of watertight connections at all "T" connections and Cross-connection. Later position of cross-connection was secured by installed cross-anchors (short mooring lines 4 m long, connected to heavy concrete anchors on the pond's floor).

Baffles supporting system consists from 8 mm 316 stainless steel flexible wire rope, 6 on-shore anchors, several cross-anchors, and range of wooden poles, remaining in the pond from the times of the earlier installations.

Baffles 1, 2 and 3 have been laterally stabilized by connection with pre-existing in the pond wooden poles. These connections were designed to allow accommodation of the pond's water level variation. Permathene engineers were supporting installation crew during whole installation process.

The total length of the baffle curtain system is 787 meters and to date is probably the longest floating geosynthetic baffle curtain system used in wastewater applications in New Zealand.

Case Study by Nikolai Vakhroushev.

Turbidity Barrier (Baffle Curtain)

Flexible Polypropylene (Permaliner®) for oxidation pond

Client: Delta Utility Services

Date: November 2008

DELTA offers a comprehensive design, build, maintenance & repair service for a wide range of infrastructural assets such as electricity networks, recreational facilities and roading. As an operator for Cromwell WWTP in the Otago area, they needed to redirect the wastewater flow of the Cromwell Oxidation Pond.

Permathene Baffle Curtains were chosen for the project due to the durability and excellent chemical resistance of Permaliner FPP (Flexible Polypropylene) – one of the primary materials used in the fabrication of Baffle Curtain Systems.

The pond with total width of 142 meters and 1.3 m depth (where 0.3 m is an approximate depth of the sludge). The baffles were built from a combination of 1mm & 0.75mm Permaliner Flexible Polypropylene membrane with a 150 mm buoyancy element at the top. The floatation devices were enclosed in a low density polyethylene tube which in turn was sealed inside the 1 mm FPP floatation enclosure. 1 mm Permaliner is highly UV stabilised and has an expected prolonged life expectancy in harsh New Zealand UV conditions of 15 years.



The baffle skirt was fabricated from 0.75mm FPP Permaliner for both weight and cost considerations. Galvanised chain enclosed in a seam was utilised for ballast with flexible SS Wire rope used for tensioning. The baffle's modules consisted of 3 units 33.3m in length each, to form one 100m long baffle. Connections between the units was established by creating Y-shaped 100 mm wide seams on the leading edges and single rope reinforced seams on the trailing edges. The procedure of the installation was easy and straight forward. First, a 10 mm nylon rope was stretched across the pond. One end of the rope was attached to the baffle's tension member, another one to a light truck. Baffle units packed in ZIG-ZAG position on specially made pallets were released into the water one-by-one, the individual units being interconnected during this procedure. Then additional stretch of the wire rope installed in the pond to connect in-pond side of the baffle to the anchor point on the opposite side of the pond, and both sides fixed to the anchor points. 6 cross-anchors were installed (3 from each side of the baffle at inter unit connection points and at the in-pond side of the baffle) for additional lateral stabilisation of the baffle.

Several weeks after the installation the area experienced a series of storms with heavy winds. The units have remained stable and show no signs of stress or misplacement. Designed and manufactured to specification the units were properly deployed by Delta Utility Services. These baffle units should improve the ponds performance for many years.

Lagoon Barrier

Flexible Polypropylene (Permaliner®) Water Treatment Plant, Maraetai

Client: Manukau Water, New Zealand
Date: September 2000

Manukau City Council operates the Beachlands Maraetai Water Treatment Plant (WTP) in Whitford. The upgrading of the plant was undertaken in August through September 2000, which included the installation of the Lagoon Barrier Curtain. The purpose of the curtain is to separate the existing lagoon, which is approximately 60 m x 15 m, into two different biological process sections.

The lead section which receives the normal inflow and re-circulated, is intended to maintain anoxic conditions. The subsequent section will be aerated as at present. The intent is to allow for the curtain separating the two zones to be movable up and down the lagoon over a distance of approximately 8 m.

The curtain was fabricated from Permaliner FPP (Flexible Polypropylene) 1 mm membrane, which is suitable for effluent containment facilities. Permaliner is a co-extruded (triple-layered), virgin polymer based, polypropylene and has excellent tensile strength and flexibility to withstand ground settlement and loading stresses, high tear and puncture resistance, and is free from additives such as plasticisers, adhesives and lubricants. It is manufactured to food hygiene grade standards for suitability to potable water (BS 6920) and is highly UV resistant.

Permaliner FPP is resistant to a wide range of chemical agents, including the surfactants that often exacerbate environmental stress cracking in other polymer materials. The mechanical properties are virtually unaffected by prolonged exposure to a wide range of organic and inorganic agents. It is very resistant to leachate from Municipal Solid Waste (MSW) facilities.

Note: As at August 2008 the curtain had recently been decommissioned. Upon examination absolutely no deterioration had occurred to the material.



Silt Curtain

Reinforced PVC, Monofilament Geotextile Marine construction, Waiheke Island

Client: Auckland City

Date: August 2004

Kennedy's point Waiheke Island is a bay used by ferry's carrying people and vehicle's from Bucklands Beach and Auckland central to the Island. Due to the exposed nature of the bay the ferry's dock at, Auckland city planned for a new breakwater to be constructed in the bay to provide shelter to the vessel's docking at Kennedy's point, for smooth loading and unloading of people and vehicles.

The plans called for the creation of a breakwater to extend 180 m from the shore to a depth of almost 4m. The method adopted was for large armour rock to built up to a sufficient level, in this case about 2 m above high tide mark, thus providing shelter from incoming waves.

Due to the sensitive environment of Auckland's Hauraki Gulf, a popular destination for tourists, pleasure boaters and fishermen, Auckland City council was very conscious about protecting the sensitive marine ecosystem which Waiheke Island plays a major part in.

This large breakwater was made from rock placed on the sea floor to build up the structure and it was clear that this would create a lot of silt which is a potential killer for marine organisms.

It was determined that before any works could begin the entire site had to be screened by a dedicated floating silt screen, which would hang vertically stopping any silt from leaving the construction zone.

As this is one of the first projects in New Zealand that a dedicated floating silt screen had actually been specified, Permathene was approached as a leading Civil and environmental engineering supplier to offer solutions for this problem.

Permathene supplied a dedicated floating silt screen made from the highest quality products. This screen consisted of a 300mm floatation device sealed in a PVC sleeve, the silt screen itself is made from a mono-filament woven geotextile, with openings small enough to trap silt, but also allowing water to pass through the screen. The whole fence was held in place with anchor ropes tied to weights sitting on the sea floor. The screen its self extended over 3m from the surface of the water.

Monofilament is a superior fabric because typical woven fabrics that are slightly cheaper in general have a far lower flow rate, or sacrifices filtration. The monofilament traps any silt (in this case any particles larger than .4mm) and additionally allows normal flow of tides and current.

This type of screen can be manufactured in almost any lengths and floatation devices also can be modified for varying waters, ie. Lakes, rivers and open seas.



Pond Baffles

Flexible Polypropylene (Permaliner®) Retention pond

Client: NZFS Training Facility, Rotorua

Date: March 2006

Retention ponds were created at this facility for the treatment of stormwater by allowing the settling of hydrocarbons and suspended solids through a baffle system.

To maximise productivity 5 baffles, each 6.5 m x 2.2 m were specified by SKM, manufactured by Permathene Limited and installed by Ebert Construction.

The baffles were made to fit the width and height of the pond with a 300 mm square opening located 300 mm from the bottom of the pond and 500 mm from the side of the pond. The baffles were installed so that the openings were at alternate sides of the pond to maximise the length of flow path.

Every unit was fabricated from Permaliner FPP with flotation and tension wire rope at the top of the baffle and galvanised anchor chain, fitted through 50 mm pipe, inserted into welded seam at the bottom of the baffle.

Permaliner FPP has excellent UV resistance, is fully flexible, suitable for potable water (BS 6920), and has a high tensile strength, tear and puncture resistance.



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