MENTANZA PTY LTD

The Australian Boom and Baffle Company

Water Treatment Baffle Systems

2-4 Hale St Botany NSW Australia 2019
Ph: +61 2 96692260 Fax: +61 2 93415760

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An Introduction to Baffle Systems

Baffle systems are commonly used in water treatment facilities to improve or augment the hydraulic and treatment efficiency of ponds, tanks reservoirs and other water containment devices. These devices are typically poor structures for use as treatment mediums having a problematic geometry resulting in short circuits and dead spots. The baffles will redirect and control the flow to eliminate these.

The careful installation of baffle systems can economically and significantly improve treatment efficiency limiting the need for substantial expenditure at facilities where there is insufficient room to allow larger ponds or other treatment facilities to be constructed.

Figure 1: Typical floating baffle installation dividing a waste water pond into four treatment cells. Flow is controlled between each cell through the use of flow through windows.

The use of floating baffles offers the flexibility of being able to modify or refine the configuration post installation.

Baffle systems are utilised at both waste water and potable water treatment facilities and can be configured with either permeable or impermeable skirts.

Potable Water Treatment with Baffles

In potable water treatment facilities using fixed or floating baffle systems can greatly enhance water treatment by increasing chlorine/chemical contact time, while making the most efficient use of the water treatment method. Fixed baffles are normally fitted to enclosed structures and floating baffles are used in treatment ponds and dams. The baffles create current directing walls that channel flowing water over specific paths that increase the amount of time that water is exposed to treatment processes. The baffles can greatly reduce water treatment chemical requirements by improving mixing.

Waste Water Treatment with Baffles

In waste water there are a number of applications of baffle systems most notably the segregation/separation of aerators with a ponds system (see figure 1) the sub-division of large ponds and the installation in detention ponds to increase detention time.

Determination of Baffle Requirements

The determination of baffle requirements for a particular installation can be undertaken using complex hydrodynamic computer modelling using input data sourced from strategically placed current meters. From this information cross sectional velocity profiles and plan is developed. This will reveal low flow areas, short circuits and dead spots.

Whilst not as accurate surface flow can also provide some indication of these areas. Flow generally contours to the surface in large ponds. The highest velocity being in the centre of the stream and the flow rate decreases closer to ponds banks and the bottom. Dead spots can be identified by carefully monitoring the surface flow, for example, if there is a tendency for weed to accumulate at certain times of the year on a pond systems this will often concentrate and radiate from the dead spots.

Using the flow data baffles can be positioned to better utilise the pond area and minimise shortcutting of the flow stream from the inlet to the outfall.

Types of Baffle Systems

There are two types of baffles manufactured by the Australian Boom and Baffle Company. These are: Fixed Curtain Baffles and Floating Baffle Curtains.

Fixed Curtain Baffles

Figure 2: Typical fixed baffle curtain located inside a water treatment facility

Figure 3: Floating baffle fitted with filtering flow through windows to limit sludge movement in pond

The fixed baffle curtain uses a supported geo-membrane material to make a vertical impermeable barrier inside a tank or reservoir. The are secured to the roof and the floor of the water impoundment and are often fitted with flow through windows to direct the flow on a specific path.

The are most frequently manufactured from HDPE (1 to 2mm) geo-membrane material.

Floating Baffle Curtains

Floating baffle curtains are used in a wide range of installations and applications.

They are most frequently used in aeration and detention ponds.

They also are suited to installation in lined ponds as they are contoured to the banks and ballasted using

galvanised or stainless chain enclosed in a pocket [minimising linier damage] and can usually be configured from the same material as the pond is lined with.

Construction of Fixed Baffle Curtains

Fixed baffle system construction typically includes a high performance flexible geomembrane, stainless steel cables and mounting hardware. They can be designed with materials suitable for potable, industrial or wastewater applications. Because of their construction, baffles typically can be rolled for shipping. When installed, they become tensioned semi rigid walls.

Fixed baffles are typically suspended from ceilings, columns and are often secured to floors with bolted anchor systems. Fixed baffle systems are usually anchored by the following methods:

- the top of the baffle is attached via a hemmed stainless steel wire. This wire is attached to head walls using chemsets and stainless steel turnbuckles are used to tension the wire. In most installations a pocket is welded into the membrane into which a HDPE small diameter pipe is installed to act as a wear and abrasion limiter. Where required and possible to do so the top of the fixed baffle can also be supported using stainless steel eye bolts chemset into the roof of the tank or containment cell.
- for fixed baffles over 3m deep it is usual to include, at 1.5 to 2m intervals an additional longitudinal support integrated into the baffle the same as the top support.
- The bottom of the baffle can be attached as the top or alternatively the pocket can house a galvanised or stainless steel chain or it can be chemset to the bottom of the tank using a 50mm x 6mm or 50m x 10mm HDPE sheet stainless steel flat bar.
- the ends of the baffle are chemset to the head wall using either 50mm x 6mm stainless steel flat bar or 50m x 10mm HDPE sheet

For the integrated flow through windows a general rule is 1 square metre of flow through window will allow 1.6 megalitres of flow per day. Caution should be exercised when determining window size as the baffles will not be effective at damming the water the window size must equal the system input capacity otherwise mechanical damage to the baffle system will occur

Figure 4: Typical STP baffle installation product HDP baffle using a B6400 series reinforced membrane

Baffle curtains are frequently constructed and installed in modular sections up to 7m wide. Each curtain overlaps with the next to create a seal between sections. With modular curtains sections can be easily removed and replaced. This allows operators to change the path of the water in their system when needed and to replace sections of the curtain as they wear.

Construction of

Floating Baffle Curtains

In the case of a floating baffle the floatation is provided by either of the following methods:

- Closed cell foam logs integrated into a sealed pocket formed by the baffle membrane
- Rotationally moulded polyethylene bolt on floats
- Extrusion welded bolt on floats manufactured from HDPE encasing closed cell foam
- Foam filled HDPE pipe

The method of floatation used is usually determined by a number of factors including but not limited to:

- The length of the baffle
- The chosen membrane material and the
- Ease of installation

Floating baffle systems are usually anchored by the following methods:

- the bottom is anchored using a continuous galvanised or stainless steel chain located in a pocket formed in the bottom of the baffle membrane. Where non reinforced HDPE and polypropylene materials are used a appropriate diameter HDPE pipe is used inside the pocket to act as a wear and abrasion protector.
- Additional concrete bottom anchors can be placed at 6 to 10m intervals attached to the bottom ballast chain. These are usually attached using a stainless steel quicklink of an appropriate size
- The top of the baffle is moored to shore using and appropriately designed mooring post to which is attached the baffles top tension member using stainless steel bottle screws
- Where the top of the baffle is attached to a head wall or other structure this can be attached using a 50mm x 6mm stainless steel flat bar chemset to the head wall. Where this is the case care should be taken to ensure that top tension member is also attached to the head wall by a appropriate load bearing chemset eye bolt

Typical baffle installation will either:

- Form a barrier across part of a pond, tank or reservoir and allow flow around the end of the baffle or
- provide a full barrier across a pond, tank or reservoir and the flow will be directed through flow through windows.
    - Where flow through windows are installed the size and number of windows should be determined on the basis of 1.6 mega litres of flow per square metre per day
    - Caution should be exercised when determining window size as the baffles will not be effective at damming the water the window size must equal the system input capacity otherwise mechanical damage to the baffle system will occur

Typical Baffle System Specification

This section is provided as a guide for the development of specifications in relation to the supply of floating baffle systems.

Specification Scope

The baffle curtain will consist of a fabric wall that is anchored at the bottom;

- In the case of a floating baffle by a galvanised/stainless steel chain integrated in a pocket formed from the membrane material.
- In the case of a fixed baffle either a galvanised/stainless steel chain or a 50mm x 6mm flat bar fixed to the tank floor

and is supported at the top;

- In the case of a floating baffle by buoyant logs either integrated into a pocket of the membrane material or constructed from a rigid material and bolted to the membrane material
- In the case of a fixed baffle through the use of an appropriately sized stainless steel wire rope tension through the use of bottle screws

Depending on the deployment location the baffle will usually be contoured to any banks to reduce excess material

A typical installation will comprise of a number of components:

Membrane

The baffle will be constructed from a geo-membrane material; typical baffle membranes include but are not limited to:

- HDPE geo-membrane 1 to 2mm
    - Material carries a 20 year warranty subject to flex cracking should be chosen for installation where water level is relatively static
- Polypropylene geo-membrane 0.75 to 1.5mm
    - Material carries a 15 year warranty more flexible than HDPE however more vulnerable to mechanical damage
- Reinforced polypropylene
    - Material carries a 10 year material warranty scrim can be subject to wicking and delamination
- Reinforced evaloy: branded products include XR5 and XOR
    - Material carries a 10 year warranty (conditional) optimum high strength fabric for baffle installations
- Potable water reinforced PVC: eg SIOEN 6400 series fabrics
    - As per reinforced evaloy

Where non reinforced HDPE and Polypropylene geo-membranes are used an appropriate method of maintaining membrane longitudinal stability must be shown to be integrated into the design.

Float Assembly

In the case of a floating baffle the floatation is provided by either of the following methods:

- Closed cell foam logs integrated into a sealed pocket formed by the baffle membrane
- Rotationally moulded polyethylene bolt on floats
- Welded bolt on floats manufactured from HDPE encasing closed cell foam
- Foam filled HDPE pipe

The method of floatation used is usually determined by a number of factors including but not limited to:

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Anchoring of the Baffle System

Fixed Baffle Systems

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Baffle Connections

Where floating baffles are provided in sections a suitable joining system should be provided that:

- provides a seal at the joins
- transfers longitudinal strength from one panel to the next

Flow Through Windows

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