

Avonmouth - 1Mld Effluent Treatment Plant to remove heavy metals from groundwater & leachate

By
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The objective of this project relates to the establishment of new effluent treatment facilities at an old St Modwen industrial site (Britannia Zinc Ltd), at Avonmouth industrial estate near Bristol. The new treatment facilities, which effectively replace the old treatment plant, are required to provide satisfactory treatment of the current and future flows of contaminated waste water arising on the site prior to their discharge to a local estuary. The old ETP will then be demolished.



Avonmouth (St Modwen) Effluent treatment plant - Actiflo® clarification system

courtesy Veolia Water Solutions & Technologies

The waste water streams comprise leachate and groundwater originating from capped and uncapped landfills that were associated with the original zinc smelting works, as well as surface water run-off from adjacent concrete areas from which process plant and equipment had already been removed. The waste water contains significant levels of Zinc, Lead and Cadmium, concentrations of which need to be substantially reduced to allow discharge of treated effluent to the nearby estuary via the local watercourse, in accordance with the existing effluent discharge consent.

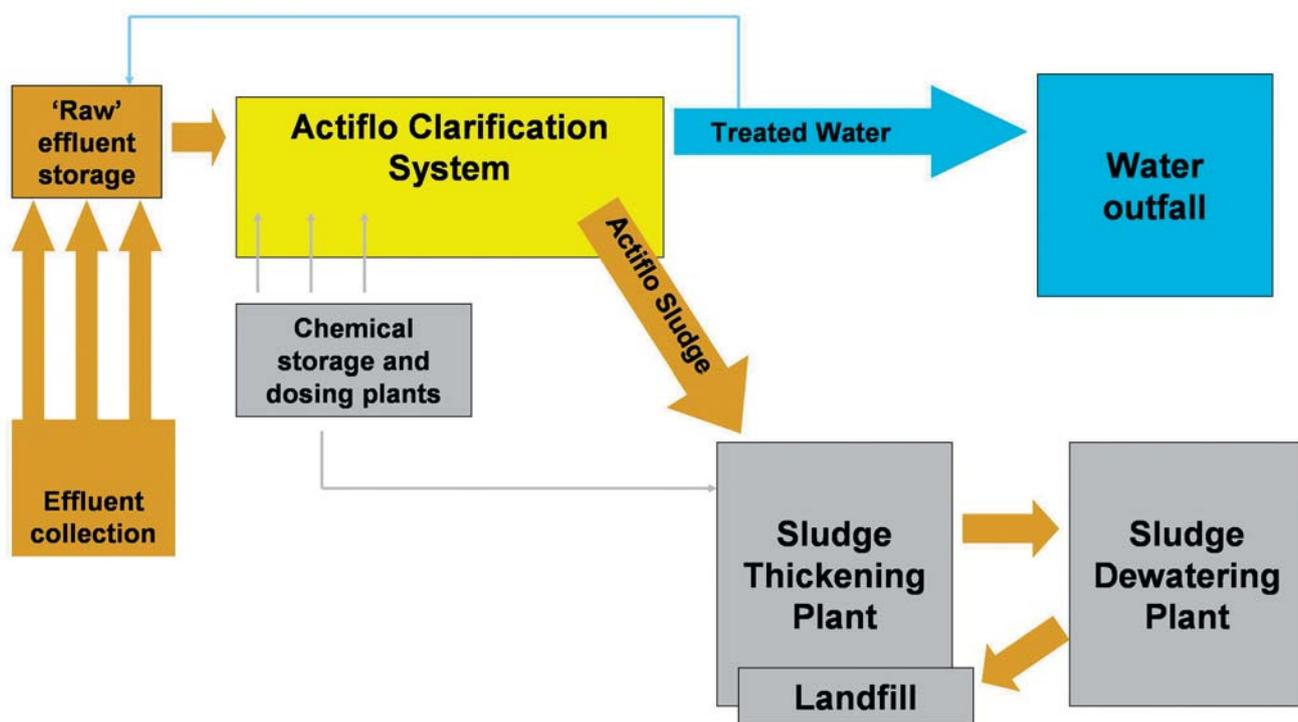
The plant

The build area for the new Effluent Treatment Plant (ETP) is situated within the existing site and comprises a long narrow strip of land (approx. 50m x 10m), bounded on one side by one of the site roads, and on the other by the raised area of land that comprises the old waste landfill (used for smelter waste).

An existing in-ground structure of approximately 400m³ capacity is located adjacent, and is used for the collection and buffer storage/balancing of the contaminated wastewater flows arising on the site prior to treatment in the new ETP.

Process solution

The VWS technical solution centres upon the ACTIFLO® process, which is ideally suited for difficult-to-treat sources with variable loads of metals and solids. Actiflo® is a patented extremely versatile, high rate, sand ballasted clarification system that effectively removes suspended solids present in surface water by coagulation/flocculation and lamella settling, achieving extremely low levels of outlet turbidity. Microsand (known as Actisand®) is utilised as a seed for floc formation, providing surface area that enhances flocculation and acts as a ballast or weight. The resulting sand ballasted floc enables clarifier designs with high rise rates and short retention times, having a typical footprint between 5 and 20



Avonmouth: Broad process overview

courtesy of Veolia Water Solutions & Technologies

times smaller than conventional clarification systems of a similar capacity.

The high degree of operational flexibility afforded by the Actiflo® process includes rapid start up and shut down. This proved highly valuable to the St Mowden site to process the variability of the influent characteristics.

As a suitable treatment technology Actiflo® is well proven with currently 451 references worldwide including 19 within the UK. (See Process Flow Diagram above)

All the potentially contaminated waste water arising from the site is transferred to an open collection sump and pumped to the ETP.

The quantity and quality of wastewater arising on the site is subject to considerable variations, both day-to-day and week-to-week, since

it is governed largely by daily rainfall and the management of the various pump stations that facilitate transfers from the site-wide drainage systems.

The plant has been designed with sufficient diversity to accommodate the range of contaminants and flows indicated below.

Scope of Works

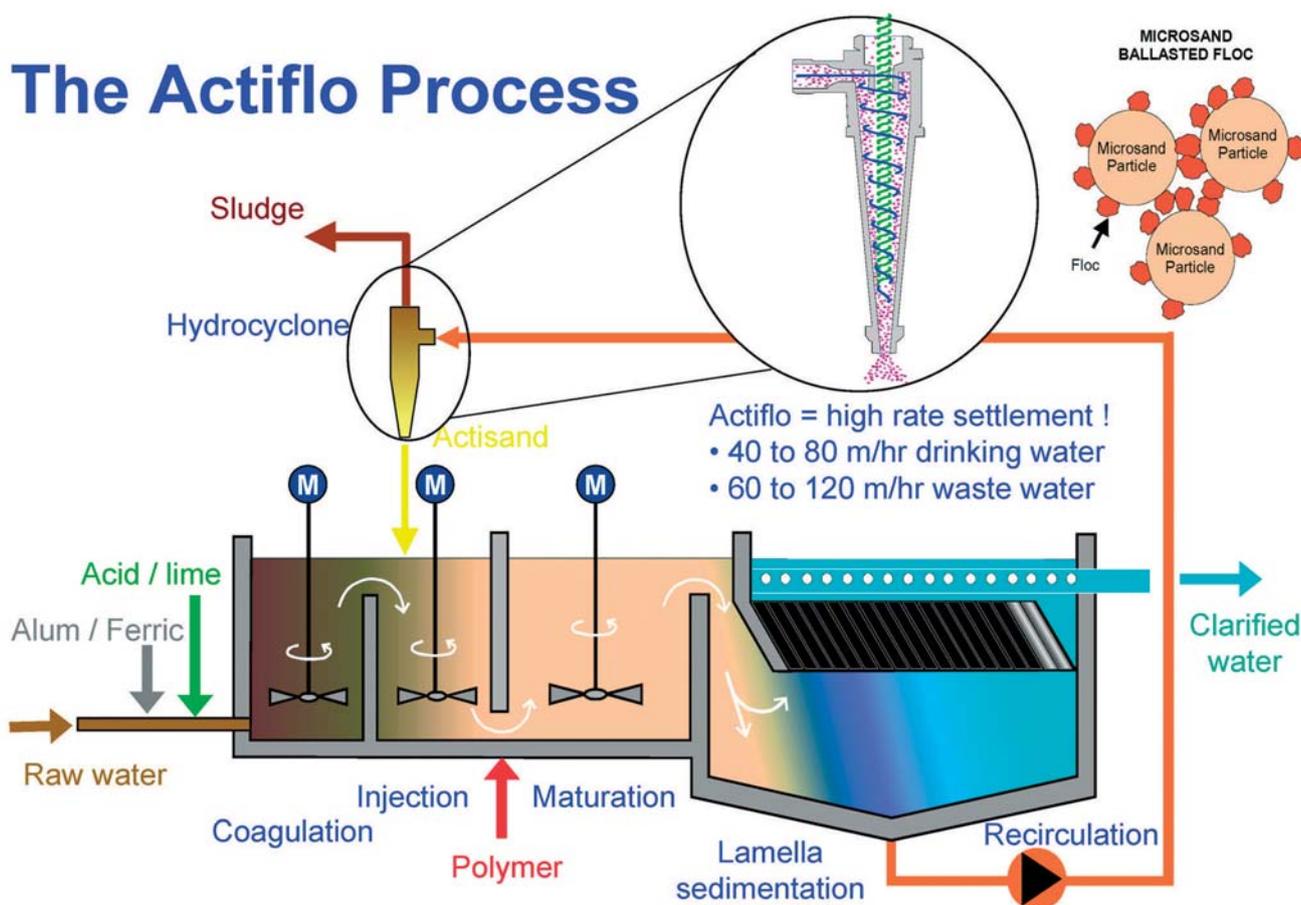
The construction works were carried out by VWS as the specialist Process Contractor, with the civil/building elements carried out through Halcrow-Yolles. The equipment scope comprised:

- * Inlet pump station, drawing from an existing open pit (“West Wedge”);
- * Actiflo® Package Clarifier Plant (1 No AS1 Unit) including Integral Rapid Mixer, Flocculation Mixer, Lamella Settlement and Microsand Recycle System/Hydrocyclone separator;

| | INFLUENT DESIGN CHARACTERISTICS | | DISCHARGE CONSENT | CLARIFIED WATER |
|--------------------------|---------------------------------|------------|-------------------|-----------------|
| | Avg. | Max. | | |
| pH | 7.5 | 4.3 – 11.5 | 7 – 11.5 | |
| Zinc (mg/l) | 25 | 150 | 0.9 | 0.45 |
| Lead (mg/l) | 7.7 | 76 | 0.3 | 0.14 |
| Cadmium (mg/l) | 2.1 | 17.7 | 0.2 | 0.08 |
| Total COD (mg/l) | - | 350 | 120 | 32 |
| Suspended Solids (mg/l) | - | 1000 | 100 | 14 |
| Thallium (mg/l) | - | 2.5 | 2.5 | 0.17 |
| Visible Oil & Grease | - | Nil | Nil | |
| Flow (m ³ /d) | 493 | 999 | | |

Design parameters and operating results

courtesy of Veolia Water Solutions & Technologies



A general schematic of the Actiflo® process

courtesy Veolia Water Solutions & Technologies

- * Ferric chloride storage plus dosing to the Actiflo® plant;
- * Caustic soda storage plus dosing to the Actiflo® plant;
- * Polymer batching units plus dosing to the Actiflo® Plant & Sludge Thickener;
- * Sludge picket fence thickener and storage tanks;
- * Dewatering sludge plate press with ram feed pump, housed at first floor level within a simple building;
- * GRP kiosk to house Actiflo® plant, MCC, polymer batching units and various dosing/sludge pumps;
- * MCC & Control System.

The plant is designed to be available for operation 24 hours per day/7 days per week, subject to the volume of wastewater treatment requirement i.e. the degree of water inflow to the collection sump, colloquially known as the ‘West Wedge’.

The plant is designed to run efficiently and nominally continuously with a flow regime that can vary in quality and quantity depending upon the prevailing weather conditions. For example in periods of high rainfall and sustained periods of rainfall there will be high flows

of run-off water and ground water reaching the ‘West Wedge’.

Conversely, after long rain free periods the leachate and ground water flows reaching the ‘West Wedge’ will be very low.

Key dates:

- * March 2006: Jar testing to demonstrate Actiflo® suitability;
- * January 2007: Contract Award;
- * August 2007: Completion of construction;
- * Sept to Nov/07 Commissioning and Take Over
- * March 2008-04-07 Performance Tests (28 days)

Client information

Purchaser: St Mowden Developments Ltd

Project Managers (on behalf of St Mowden): Halcrow Yolles

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