Shoreham WwTW

new compact treatment system used in £11m upgrade

Shoreham wastewater treatment works serves a population equivalent of 60,000 and is divided into two distinct sites – Albion Street inlet works and the Shoreham plant itself, which are separated by the Shoreham Harbour basin and linked by a 1.2m dia. tunnel constructed at a depth of 25 metres within the chalk strata beneath the harbour. The plant has already undergone a £22m scheme (completed in 1996), to provide chemically assisted primary settlement to meet the UWWTD standards of the day. A new compact wastewater treatment system invented by a senior Southern Water engineer has now been installed at Shoreham as part of a £11m environmental improvement system to deliver today's more stringent UWWTD standards. The site has also seen construction of additional secondary treatment processes, following new classification on standards of wastewater treatment at coastal works and the removal of HNDA status to the English Channel.

New spiral separators with the inventor David de Hoxar *(courtesy Southern Water)*

Treatment works

Located in the midst of Shoreham's industrial heart and port related businesses the plant **now** consists of:

* screening & grit removal;
* two spiral separators for primary settlement;
* three aeration tanks;
* four final settlement tanks;
* intermediate pumping station;
* sludge treatment;
* odour control

All flows arriving at the inlet works pass through three 6mm two dimensional screens before being pumped to the main works. The inlet works is capable of accepting flows of up to 2400 l/s during storm conditions with a pass forward rate of 652 l/s to the main works achieved. The balance of the flow is released through a consented short storm outfall.

Wastewater entering the main works passes through two aerated grit channels where grit and fine silt is settled out before removal to skips.Grease and oils are directed to the end of the channel by a scraper and on to a grease digester.

Partially treated flows pass to an intermediate pumping station, consisting of two duty, one standby, variable speed mixed flow canister pumps, where flows of up to 322 l/s are pumped to two 11m high, 400m^3 spiral separators for primary settlement. Flows between 322 l/s and 652 l/s bypass the main treatment process and are forwarded to a storm manhole at the outfall pumping station.

New spiral separators with the inventor David de Hoxar *(courtesy Southern Water)*

Spiral separators

The innovative spiral separators, invented by Southern Water engineer David de Hoxar are deceptively simple, using giant plastic fins formed into interlocking spirals in the circular treatment tanks and offer three major benefits:

a) a very small footprint;
b) excellent sludge thickening abilities that allows cost savings at sludge treatment plants;
c) a very small surface area reducing costs for covering tanks and providing odour control.

The gravity settlement device was developed by de Hoxar from lamella plate separator technology. Although lamella separators are compact when compared with conventional settlement tanks, the spiral separator is even more so, taking up between one third to one quarter of the area of an equivalent lamella separator.

Plate packs are assembled from glass reinforced plastic (GRP) plates. Each plate is made up of a number of platelets, which look like giant plastic fins and is in the shape of a helical cone, with a typical plate pack comprising thirty six interleaved plates. Flanges on the platelets bolt together to form a central cylindrical core.

The shape of the plates provides built in strength and stiffness, which means that no spacers or structural connections between the plates, other than the core, are needed to keep the whole of the plate pack in shape.

An inlet pipe enters the side of the tank and passes up the central core of the plate pack. The effluent flows along the inlet pipe and down the central core which acts as a baffle before flowing up through the plate pack. Suspended particles, which are heavier than the dirty water,settle on to the plates.

Settled water passes up through the plate pack and leaves the separator via the outlet launder while solids, which have settled on the plates, coalesce and form a sludge. The sludge then slides down the plate to the annular gap between the plate pack and the tank wall and then on to the floor of the tank.

The plate pack is continuously rotated, which increases the relative velocity of settling particles on the plate and improves solids removal efficiency. The rotation also assists movement of the sludge off the plates and stops sludge from blocking the annulus. Further, gentle shearing action in the annulus may contribute to the sludge thickening.

When used for the primary treatment of sewage, solids settle and are removed from the bottom of the separator while fats, oils and greases and any gases rise to the underside of the plates and slide to the central core. Ports in the central core lead off to a scum collection zone at the top of the spiral, from where the scum is removed.
Following primary treatment flows are passed to a new activated sludge plant where the biological treatment process takes place, with construction of three aeration lanes measuring 27m x 5m x 7m (945m^3).

Final settlement tanks

Southern Water undertook further ‘good housekeeping’ when it converted four former primary treatment tanks (22m diameter) to final settlement tanks, where any remaining solid matter is removed. The fully treated flows are then passed to the outfall pumping station and combined with the earlier bypassed flow and released through the 3.1km long sea outfall.

Shoreham WwTW provides preliminary sludge treatment producing 7.8 tonnes of dry solids equivalent per day, with two centrifuges. The sludge is then transferred in sealed skips to a sludge recycling centre a few miles along the coast at Ford WwTW for further processing before it is recycled to land as agricultural fertiliser. ■

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