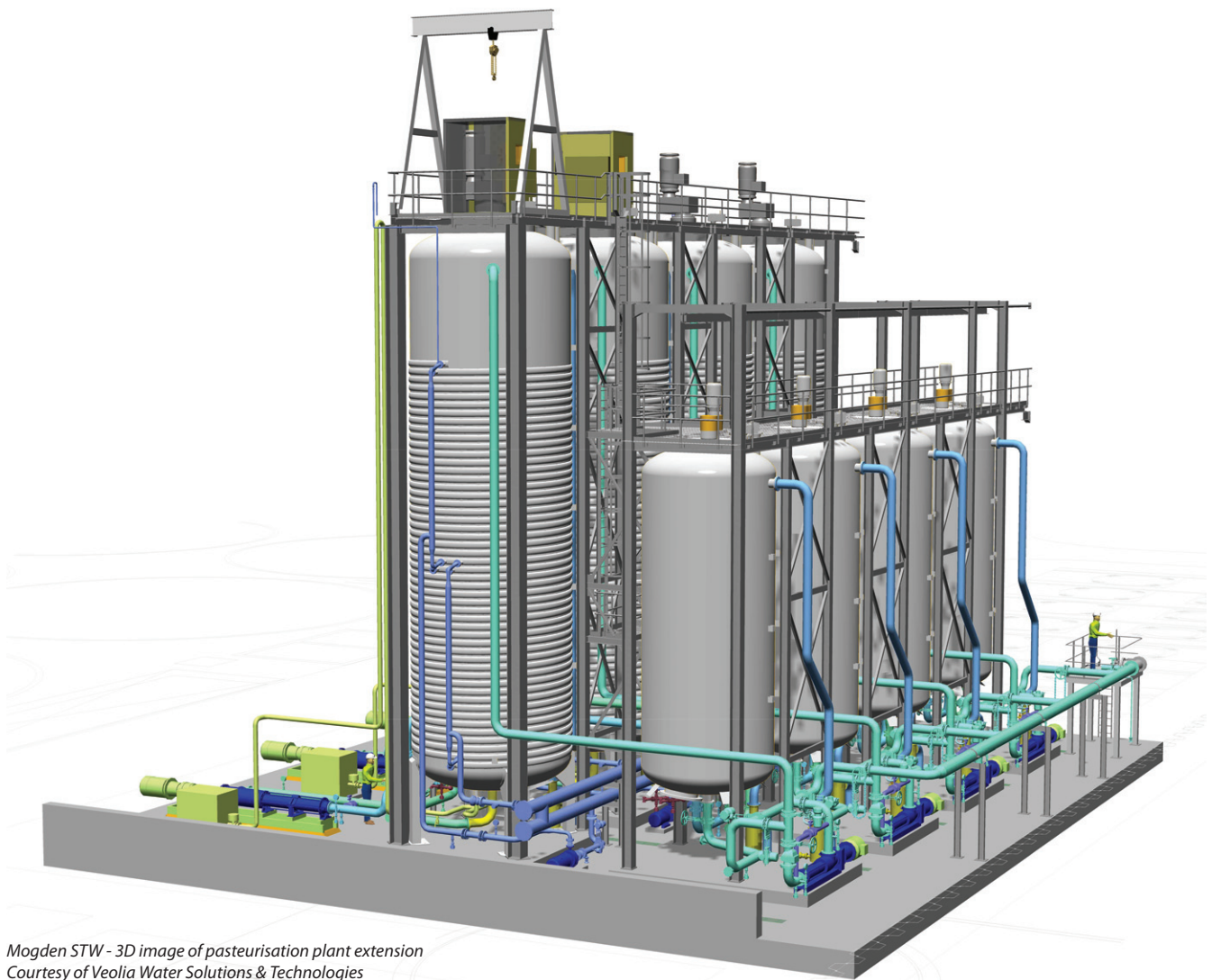


# Mogden STW

## sludge pasteurisation plant to treat sewage sludge for safe use in agriculture

by Ray Tillier FCIWEM

Thames Water's Mogden STW, near Twickenham, West London, is one of the largest in the UK. The original works was built in the 1930s and has since been extended and up rated a number of times and now covers an area of about 55 hectares. The works serves around 1.9 million people, and some of the wastewater has travelled over 20 miles by the time it reaches Mogden. In 2007, as part of its improvements to sludge treatment, Thames Water commissioned a pasteurisation plant to eliminate harmful pathogens in the sewage sludge which is produced prior to anaerobic digestion, making it suitable for use as a fertiliser or soil conditioner for the growing of all types of crop. The Mogden Pasteurisation Plant is currently being expanded, and is due for completion in October 2012.



Mogden STW - 3D image of pasteurisation plant extension  
Courtesy of Veolia Water Solutions & Technologies

The original pasteurisation plant commissioned in 2007 comprised 8 (No.) reactor streams and ancillary equipment. The current contract for addition of 4 (No.) new reactor streams, was awarded to Black & Veatch in July 2010.

As with the original plant, the chosen technology for the extension was the Biotherm® process from Veolia Water Solutions & Technologies (VWS). The biosolids produced by mesophilic anaerobic digestion following pre-treatment by the Biotherm® process at Mogden is classified as an 'Enhanced Treated Product' under the 'Safe Sludge Matrix' published by ADAS, Water UK and

the British Retail Consortium, and is free from salmonella and with 99.9999% of pathogens destroyed (i.e. a 6 log reduction).

#### Each reactor stream comprises:

- Reactor tank.
- Heat exchanger.
- Reactor blowers.
- Thickened sludge transfer pumps.
- Pasteurised sludge transfer pumps.
- Local control panel.
- Structural support and access steelwork.

Each new stream will treat an additional 25m<sup>3</sup> of sludge per batch with twelve batches being processed by each stream per day (i.e. a total of an additional 1,200m<sup>3</sup> capacity). The Biotherm<sup>®</sup> process is being supplied by Alpha Umwelttechnik of Switzerland, who together with Veolia Water Solutions & Technologies successfully completed the original 2004 contract.

#### Pasteurisation process

In the pasteurisation process, sludge from the anaerobic digestion plant is pumped into the pasteurisation reactor where it is held at a temperature of 70°C for one hour whilst being mixed. This *lock-in* period ensures that the sludge has been fully treated and it is then passed through a heat exchanger where heat is recovered and used to pre-heat the next batch of sludge in order to maximise the thermal efficiency of the process.

The Biotherm<sup>®</sup> plant is designed for disinfection and conditioning pre-thickened sludges of 5.0 to 8.6% dry solids concentration.

#### The reactors

Each reactor has a useable liquid volume of 120m<sup>3</sup>. Height overflow is 12.15m and the overall height to the top of the stirrer motor is 14.3m. The vessel diameter is 4.0m, and the wetted cylindrical height is 9.2m. The hydrostatic sludge level is 10.0m above floor, and the freeboard is 0.8m.

The support heating system is designed as a double tubular coil welded onto the outer surface of the reactor well. The height of cylindrical heater coil is 9.1m and the diameter of the coiled tube is 0.11m.

#### Disinfection process

The actual disinfection process takes place in the reactor, and preheated raw sludge is pumped batch-wise from the heat recovery unit into the reactors. Inside the reactor the sludge is homogeneously dispersed by means of the stirrer.

Simultaneously, from the base of the reactor, compressed process air is introduced into the sludge body. The oxygen in the air is consumed by thermophilic micro-organisms. The result of this biological activity is a degradation of organic substances in the sludge, and an increase of sludge temperature by means of autothermal heat generation.

#### Scum suppression

The effect of agitation by the stirrer, together with aeration and the bacterial production of carbon dioxide, can lead to the formation of scum on the sludge surface. Excessive scum formation is suppressed by means of a *scum cutter*. A sight-glass with wiper and lighting on the inner side, and an inspection opening are installed on the roof of each reactor. This allows the plant operator to observe the activity in the reactor.

Off-gas from the reaction is withdrawn from the reactor through a pipe connection and transferred to the biofilter for odour control. An overflow pipe connection is installed above the maximum admissible sludge level as protection against overflowing the reactor.

#### Maintaining degradable organic substances

Approximately 65% of the dry solids in sewage sludge is biodegradable. A portion of these organic substances is consumed in the disinfection process through activity of microorganisms, accompanied by heat generation.

However, it is desirable to have the amount of degradable organic substances as great as possible to be available in the subsequent mesophilic anaerobic process for the production of methane gas as source of energy. Therefore, the Biotherm<sup>®</sup> process is so designed, that not more than a maximum of 6% of the volatile solids are degraded in the process.



*Pasteurisation reactor streams at Mogden STW  
Courtesy of Veolia Water Solutions & Technologies*

#### Conclusion

Cooled, pasteurised sludge is then dewatered and distributed to farmers for land spreading, thereby securing Thames Water's route for the safe disposal of its sludge. At the time of writing (July 2012) the Mogden STW Pasteurisation Plant extension is progressing well and is due for completion in October 2012.

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