

CLONMEL THERMAL DRYER

South Tipperary County Council is developing a “sludge hub” at Clonmel Wastewater Treatment Plant (WWTP) by installing a thermal dryer to treat wastewater sludge from Clonmel WWTP and surrounding wastewater treatment plants within the county. The sludge hub, which is being developed under a Design Build Operate Maintain (DBOM) contract model, will have the capacity to treat sludge containing up to 1.8 tonnes of dried solids per day, and will produce a pasteurised, almost odourless granular material similar in appearance to coffee grounds, which can be used as a fertiliser or soil improver. The finished product will achieve the standard of a “Class A” biosolid in accordance with the “Code of Good Practice for the Use of Biosolids in Agriculture” (DoEHLG).

Introduction and Project Background

Clonmel town is the administrative capital of South Tipperary and the major economic centre for South Tipperary and Northwest Co. Waterford. Clonmel WWTP is located approximately 1.7 km east of the town centre, on a 6.5 Ha site bounded on the north by the Davis Road, and to the south by the River Suir. The WWTP was constructed between 1997 and 1999 with a design capacity of 80,000 PE.

The need for a sludge dryer at Clonmel was identified in the Sludge Management Plan for Tipperary South Riding (1999). Clonmel WWTP was identified as a “hub” for South Tipperary, as it was the largest single source of sludge in the region, it had existing high quality wastewater treatment and sludge treatment systems in place and it was the focal point for the local road network. The Plan concluded that mesophilic anaerobic digestion of sludge followed by thermal drying was the most appropriate form of treatment for sludge at Clonmel WWTP. A sludge dryer would facilitate the landspreading of sludge to agricultural land as it would produce a high quality, pathogen free, stable and high nutrient value biosolid which would allow the material to be more easily managed and controlled. This approach would also be in compliance with the requirements of the Urban Wastewater Treatment Directive (91/271/EEC).

Environmental Impact Statement (EIS)

An EIS for the scheme was prepared by Atkins in 2002 and approved by An Bord Pleanála in December of that year. The EIS demonstrated that the scheme complies with legislation and that no significant adverse environmental impacts result from the proposed sludge dryer at Clonmel Wastewater Treatment Plant. The scheme was assessed under a number of specialist study areas including human impact, flora and fauna, water and air. The EIS was also prepared with reference to the original EIS for the WWTP prepared by Atkins in 1991, which was the first EIS prepared in Ireland for a wastewater treatment plant.

Given the nature of the development and its location on the eastern edge of Clonmel, detailed odour modelling exer-

cise was undertaken to assess the existing environment, to establish a baseline odour level for the site and to develop a minimum odour treatment standard to mitigate odour risks to nearby receptors. A specification was developed to mitigate odour risk specifying stack height, minimum emission velocities, minimum exhaust gas temperature and the maximum odour unit emission rate.

In addition, the EIS concluded that

- Noise emissions produced by the drying process will be contained within the building and will not have a significant impact on the environment or human health.
- After mitigation measures are applied to odour, the predicted impacts are negligible and the proposed installation will comply with the requirement of the original Environmental Impact Statement for the Wastewater Treatment Plant at the site. Air emissions will be insignificant
- Landscape impacts will be minor and minimised through mitigation measures.
- The proposed scheme will not have any significant impact on soils and geology, flora and fauna, water quality, cultural heritage or traffic.
- The proposed Sludge Dryer will have a positive long term social impact by facilitating future domestic and commercial activity and by providing necessary sludge treatment capacity.

Tender Procedure

It was recommended that a Design Build Operate Maintain (DBOM) model was the most appropriate procurement model for the provision of the sludge dryer. The DBOM contract allows the local authority to best transfer the risk associated with designing and operating the thermal dryer and disposing of the biosolids satisfactorily. The DBOM model ensures compliance with the required performance standards and provides innovative solutions at best value for money. The contract was formulated to include a 20-year Operation and Maintenance period.

Following a pre-qualification process, three applicants were invited to Tender for the DBOM contract and two Tenders were received by the due date and time. A detailed assessment was carried out on each Tender on technical and financial grounds. The assessment also includes the calculation of Net Present Values for each contract based on weighted estimates of sludge volumes over the duration of the contract. It was concluded that the Tender of Aecom Ltd (then known as Earth Tech Ireland) was the Most Economically Advantageous Tender in accordance with the tender documents.

Development Description

The Design and Build element of the contract includes for the provision of a new administration building at the WWTP to serve the sludge dryer, as well as a new, self-contained sludge reception and treatment building.

The sludge building is a 550 m² facility which will house all of the sludge reception, treatment and export facilities.

A purpose built administration building has also been constructed to serve the sludge dryer. This building will incorporate a control room, offices, meeting rooms and a fully equipped laboratory to provide analytical and testing services.

Process Description

Sludge Thermal Drying is now a well established process worldwide. The process has been increasingly adopted by wastewater treatment plant operators in Western Europe, as a result of increases in the restrictions, regulations and particularly the costs, of sewage sludge disposal. Sludge thermal drying removes water through heating sewage sludge to drive off water vapour. The process goes through three phases of increasing rate, constant rate and falling rate evaporation. The dried sewage sludge undergoes changes in its physical properties during the process. Three basic types of dryers are available; direct dryers, indirect dryers and infrared dryers. The most commonly used dryers in the water industry are direct dryers and indirect dryers. With direct dryers, the heating medium is in direct contact with the sludge. It is a direct drying process which is being used in Clonmel WWTP.

It is important to emphasise that this is a heating process rather than a burning process, and is analogous to the domestic tumble-dryer. Currently, the sludge that is produced at Clonmel WWTP is pressed, de-watered and mixed with lime to pasteurise and stabilise it. The sludge is then transported off-site for spreading on land as a fertiliser. Under this process the dry solids content of the sludge is increased from approximately 18% to 25% and volumes are increased through the addition of lime. The installation of the thermal dryer will enable the sludge to be further de-watered to a product with approximately 95% dry solids content.

Sludge imported from other municipal waste water treatment plants in the County will be taken in sealed containers into a totally enclosed delivery hall and tipped into an underground concrete bunker. The sludge will be removed from the bunker using a push floor and screw conveyor system. Progressive cavity pumps will then pump the sludge to the dryer.

At the dryer, an extruder unit will transform the sludge into thin threads which will be distributed evenly over the upper belt of the dryer. This upper belt will move through the dryer to give a retention time of approximately 50 minutes. The sludge will be heated to evaporate water as it travels along the belt. Natural gas burners will be used.

At the end of the upper belt, the sludge will be moved out of the drying zone through a sluice and will be discharged onto a lower belt. This is then moved back through the drying zone. Retention time on this belt will be approximately 60 minutes. From the lower belt, the now dried and granulated sludge will be passed through an air cooling zone for a period of 2.5 minutes. The material will then leave the dryer and pass onto a belt conveyor. This is the preferred conveyor type to minimise dust generation. Dried product will be conveyed from the dryer into a loading hall where it will be loaded into bulk transporters for delivery.

Temperature and dry solids probes will constantly measure the sludge properties and adjust temperature and residence

times accordingly. Level control on the sludge will also be an important feature to ensure that the sludge thickness on the belts is not so high that it inhibits drying.

The entire operation will be conducted indoors in the sludge building. The building will be constantly maintained under negative pressure to mitigate odour risk.

The granulate product will achieve the Class A pasteurised biosolid standard, which is a requirement of the Sludge Management Plan for South Tipperary. The water that is evaporated from the sludge is removed as condensate from the dryer and is fed back into the treatment plant.

Heat exchangers will be used to reduce energy requirements. The dried product will be exported for land spreading or for mixing with composted green waste to provide additional bulk and nutrients.

Exhaust gases from the process will be fed through up to three filters. The filters include an acid scrubber, a bio-trickling filter incorporating caustic soda dosing, and an activated carbon filter in order to achieve the stringent odour limits.

Project Team

Client: South Tipperary County Council; Sean Keating, Director of Services, Water and Environmental Services

Client's Representative: Atkins

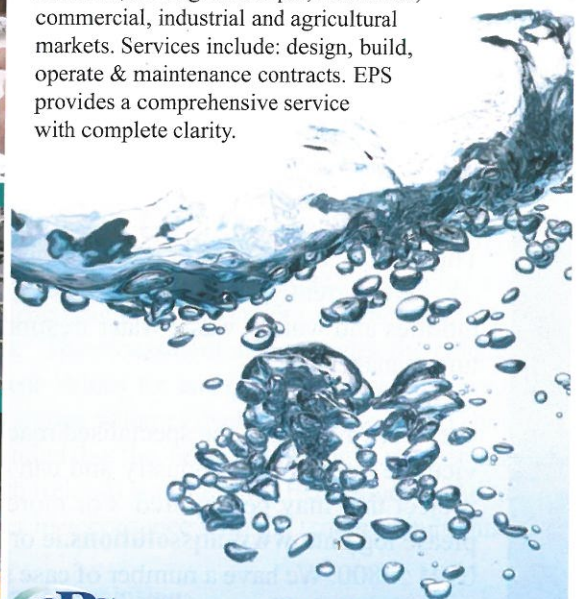
DBOM Contractor: AECOM

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