Rural Generation Ltd

Specialists in Organic Waste Recycling

Linwoods, Monaghan Road, Armagh,
Waste Water Treatment
Case Study

Client and Background

Linwoods milk processing and bakery operation near Armagh produces a wastewater which arises from the cleaning of equipment used in the processing of milk and in the bakery. The bakery contributes about 10% of the wastewater production. The processing plant operates six days a week and wastewater is produced seven days a week. Wastewater production is currently 385 to 400m^3 weekly (20,000 – 21,000m^3 annually) rising to approx 26,000m^3 annually. The raw wastewater is treated in a surface aerated tank. Aeration operates continuously for 15 hours daily. It is then switched off to allow particulate matter to settle with the effluent being drawn off the top and stored, while the sludge is removed to a sludge tank. Currently, the final effluent from the treatment facility is taken by road tanker to the Water Service sewage treatment works at Armagh on a daily basis. There is no facility for discharging the effluent direct from Linwoods premises.

Objective and Challenge

The client required an alternative method of managing its wastewater which would be more sustainable, lower cost and support the local farming economy. Partially treated wastewater was transported 7 miles by road tanker to the Water Service sewage treatment works at Armagh. This was expensive and emitted around 7.5 tonnes of carbon annually to the atmosphere. In addition, the Water Service was unable to accept any additional wastewater from Linwoods which limited any potential expansion of the bakery and milk processing facility.

Rural Generation Solution

A plantation of short rotation willow coppice was established on a neighbouring farm which is irrigated with the partially treated effluent. The high density planting – typically 15,000 plants per hectare, and high growth rate mean that the willow readily takes up the water and nutrients applied in the wastewater. A well established plantation of SRC willow will produce 10 to 12 dry tonnes of wood annually. Plantations are harvested every two to three year, which keeps the plants vigorous and ensures rapid growth. Short rotation coppice willow is a method of producing large quantities of wood fibre, principally for use as a fuel.

Irrigation pipe work has been installed on 7.2ha of willow plantation (ultimately a total of 12.9ha allowing for un-irrigated margins and buffer zones at the edges of the willow plantation). The irrigation system consist of a storage tank, duty & standby pump, automatic and manual valves, filter, flow meter, main header pipes and irrigation pipe work with patented drip feeder caps. The whole system is automatically controlled and run with the minimum of input from the farmer. The willow coppice has been divided into zones approximately 0.5 ha in size to facilitate careful control over effluent application. Phase 1 comprises 13 zones and Phase 2 has 10 zones. Each zone is atomically irrigated (controlled by the PLC) depending on soil temperature, soil moisture, rainfall, zone irrigation volume history etc. Data regarding the volumes irrigated and monitoring data will ultimately be uploaded via GPRS to an on-line data handling application.

Monitoring and Nutrient Loading

The regulator enforces compliance with the 'Quality Conditions of the Waterway', the 'Conditions of Discharge', 'Conditions for Application' and the other 'General Conditions' with their own and the consent holders individual monitoring regimes. Soil Moisture and Volume of Effluent supplied to the plantation (by Zone) is monitored daily and the data supplied to the regulator on a yearly Basis. A small stream crosses the proposed site which is sampled every two weeks to monitor its quality upstream and downstream however there is no discharge to this waterway. Upstream and downstream water samples are analysed fortnightly for (BOD, SS, ToN, ToP, pH, Dissolved O_2), these are also reported to the regulator as soon as they are available. The soils are analysed for P in accordance with the 'Phosphorus (Use in Agriculture) Regulations (Northern Ireland) 2006' and monitoring of the effluent continues at the Linwoods factory prior to discharge to willows (COD, BOD, SS, ToN, ToP, and pH).

The nutrient loading on the system at present tends to be approximately 2800 m^3/ha/Year of effluent. This supplies about 150Kg Nitrogen/ha/Year and 6Kg Phosphorus/ha/Year – both of which are well within the sustainable level of nutrient assimilation by src willow.

Benefits

Financially - The present costs of transportation of the effluent the 7 miles to the treatment works will be replaced by the pipeline (from factory to irrigation site). The cost (COD based) charged by the treatment works is now replaced by the gate fee charged by the farmer per m^3 of effluent (This alone is providing significant savings to the factory and earnings for the willow farmer.). The irrigation system is robust, needs little maintenance and requires minimal operational and running costs.

Environmentally - There is no outfall to the stream with all the dirty water being recycled. There are carbon savings in taking a vehicle off the road and diverting a waste stream from the treatment works activities and subsequent energy requirements. There is also the production of carbon neutral wood fuel for biomass boilers diverting energy use derived from fossil fuels.

Community - This project is stimulating and supporting the diversification of farming as well as ensuring the supply of local non fossil fuel wood biomass energy for the community.