

# A taste for waste

New wastewater treatment facilities for Dairy Crest mean good news for rivers.  
Tony Robinson, general manager at Wehrle Environmental, explains

The recent successful installation of a Wehrle system at Dairy Crest's Davidstow Creamery led the company to call in the Oxford, UK-based waste experts again – this time to upgrade the wastewater treatment system at its Foston site in Derbyshire, UK.

## The site

Dairy Crest's dairy facility at Foston opened in 2002. The site had existing wastewater treatment equipment comprising DAF (dissolved air flotation) and BAFF (biologically aerated flooded filter) systems, with final discharge originally to a local sewer.

These facilities worked effectively but with a planned expansion of processing on site, Dairy Crest knew that additional wastewater treatment capacity would be required to make sure the highest quality effluent would be discharged from the site. Dairy Crest's objective was to make sure its environmental responsibilities were exceeded by utilising proven high quality, best available technology at the forefront of innovation.

Based on the successful installation of a Wehrle MBR system at Dairy Crest's Davidstow advanced cheese manufacturing plant in Cornwall, UK, Wehrle's expertise was called upon to evaluate requirements prior to expansion of the wastewater treatment plant. Extensive investigations and pilot trials were undertaken at Foston over a three-month period. The result was a recommendation



from Wehrle's engineers to continue using the existing balance tank and DAF, but with the latter retained and re-optimised to treat the waste prior to entering a new crossflow MBR system.

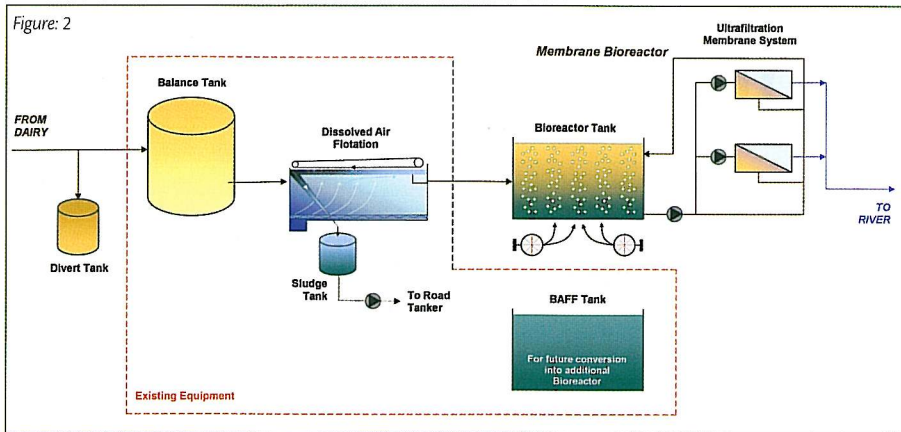
Wehrle's system design now allows the direct discharge of the highly treated water to a local river. The specific site objective for the upgrade was to design for an initial increased plant capacity of 650 cubic metres per day (m<sup>3</sup>/d). The Wehrle crossflow MBR process offers a number of advantages, including enhanced treatment performance. The system provides excellent and reliable final water quality, as well as a small footprint, minimal sludge yield and relatively low environmental impact.

At Foston, the UF filtration stage is supplied as a containerised, pre-assembled and tested plant, minimising site work associated with installation and commissioning. The UF plant incorporates robust tubular membranes with two UF 'loops', each loop being equipped with six membrane modules. Membranes are currently fitted to three modules on each loop, providing for the possibility of 100 per cent expansion of membrane treatment capacity in the future.

The additional organic load to be treated (due to increased flow of 650m<sup>3</sup>/d) required the



Figure 2



optimised and reliable operation of the existing preliminary DAF treatment stage. This was to ensure that total loading to the Wehrle MBR system did not exceed design limits.

For additional process security, as is required for the potential upgrade of the plant capacity to 1,000m<sup>3</sup>/d in the future, it is intended that the BAFF tank be upgraded, removing the internal packing media and aeration system, to convert the tank to an additional bioreactor. At that stage, both bioreactors would feed the UF system, each loop then having all six membrane modules operational.

### The technology

Wastewater from the dairy enters a new 200m<sup>3</sup> divert tank if necessary before being directed to the existing balance tank. With a capacity of 400m<sup>3</sup>, the balance tank provides an equalised flow with a hydraulic retention time of over 14 hours at maximum hydraulic throughput.

Equalised effluent from the balance tank is pumped through the existing DAF process. This was designed to treat 28 cubic metres per hour (m<sup>3</sup>/h) and provides enhanced flotation for removal of gross suspended solids and FOG (fats, oils and greases). Wastewater next enters the new 650m<sup>3</sup> bioreactor, operating at an activated sludge concentration of typically 15,000mg/l.

The MBR system is designed to treat an influent flow. Activated sludge from the bioreactor is pumped through a header system feeding two identical membrane loops each containing tubular UF membranes housed in modules and arranged in parallel.

The activated sludge is pumped along the membrane surface at high velocity, with a proportion recycled back

through the feed pump and the remainder diverted back to the header system for return to the bioreactor. The high flow velocity ensures adequate turbulence which minimises membrane fouling, which is the main advantage of using a tubular cross flow membrane system.


A proportion of the activated sludge is filtered through the membrane wall, which provides an absolute barrier to form solids-free MBR permeate. The amount of permeate produced is a function of the system pressure and activated sludge flow velocity. The MBR system typically operates at a high level of flux rate (permeate flow rate per unit membrane area), in excess of 170 litres per square metre per hour, producing treated waste water suitable for direct river discharge. Additional membrane modules can easily be added in the future to increase MBR capacity by up to 100 per cent.

Advanced monitoring instruments constantly measure temperature, pH, total organic carbon, turbidity and ammonia parameters in the treated effluent to confirm the river discharge consent is being met. The upgraded system is automated using programmable logic control (PLC) and interfaced via the installed In Touch system. PLC units monitor the discharge parameters and if the effluent is out of specification, fail-safe controls are used to divert the flow back to the inlet of the system.

The control system, motor control centre and the UF membrane system are all installed in a standard container. This allowed pre-installation and testing at Wehrle's fabrication facility prior to delivery to site, thus reducing on-site time and minimising the commissioning period.

All aspects of plant monitoring and control can be accessed via the PC-based In Touch system. Pressures, flows and process parameters are measured at strategic points within the process and fed back to the PLC which automatically controls all aspects of normal process operation, and provides warning alarms to Wehrle as required. Wehrle operates the system on behalf of Dairy Crest as part of a service agreement.

### Job done

The upgraded wastewater treatment system at Dairy Crest's Foston plant is a versatile advanced solution able to deal with shock-loadings and produce a high quality effluent that consistently exceeds the quality required for river discharge. 

### Wehrle: At a glance

- The company has over 20 years' experience in the UK market, backed by the Wehrle Group's turnover of \$50 million (€39m)
- It employs 220 people
- It is a specialist solutions provider, providing turnkey solutions to a range of problems associated with liquid effluent handling and waste processing

Wehrle Environmental  
Tel: (+44) 1993 849300  
Visit: [www.wehrle-env.co.uk](http://www.wehrle-env.co.uk)

CONTACTS