Cookstown Wastewater Treatment Works

£14m treatment plant breathes new life into local river

by Kieran Grant

Cookstown Wastewater Treatment Works in County Tyrone was commissioned in 1965 by the district's local authority. Situated on the edge of the highly-respected Ballinderry River, the original works was designed to cater for an equivalent population of 11,500. Within a relatively short period of the old works being commissioned (and following the establishment of Water Service in 1973), it became apparent that the systems installed - although modern in their day - were not going to be able to deal effectively with the sewage from the town as well as the surge in volume of effluent being produced from the area's rapidly expanding pork industry. The trade effluent was extremely high in strength due to the quantities of blood and fat associated with pig processing and was subsequently putting unprecedented pressure on the works.

Aerial photograph of new Cookstown WwTW under construction *courtesy of Northern Ireland Water*

By the 1980s Cookstown's population had increased beyond 24,000, and while the existing works had been extended to cope with the growing domestic and trade pressures, it was clear by the mid 1990s the sewage plant was operating well beyond its initial capacity. In addition, many of the tanks required unpleasant and labour-intensive operational procedures to maintain them; whilst other items of plant, such as the detritor. had become ineffective. Operational problems, such as blockages, were also frequently encountered.

Despite the processes being well maintained, the fact remained that the works was substantially overloaded both hydraulically and biologically. As a result, the works had failed on a number of occasions to meet consent standards which meant that fines by the EC were imminent.

Location for the new works

During the 1990s, extensive studies were carried out in relation to the building of a new sewage treatment works in Cookstown. The planning authority ruled out the existing site for a bigger works on the grounds that it was too close to housing and that any development of the site would inhibit further residential expansion in that area of the town.

Overall a total of seven sites were considered for the location of the new works with Environmental Impact Assessments drawn up for each option. An extensive public consultation exercise was undertaken to present the various sites to key stakeholders but all options were deemed unacceptable.

Having exhausted all avenues, Water Service's designers went back to looking in greater detail at ways in which they could overcome the constraints posed by the existing works site.

The main problem with the site surrounded the restricted footprint that was available for introducing new infrastructure. However

Ballinderry River *courtesy of Northern Ireland Water*

research showed that by utilising more modern treatment processes, Water Service would be able to incorporate a new higher capacity works within a much smaller area. From an environmental point of view, we knew that careful planting and screening of the new works would overcome any visual objections and that by introducing robust odour control systems, the tightest of standards would be satisfied.

With this option offering the most economically advantageous option, Water Service proceeded with a design to replace the existing Cookstown WwTW with a modern new plant on the same site.

Tender

The contract for the new works was tendered to a consortium of suitably qualified contractors who had been previously selected as part of Water Service's restricted list competition. Using the NEC 2 Option C conditions of contract, the scheme was tendered as a design and build project and was awarded in December 2003 to the joint venture contracting team of Seamus Gillen Contracts (civils) and Williams Industrial (process/M&E).

Bringing the JV on board initially as preferred bidders, the tender design went through a detailed design and development stage. This involved all parties and stakeholders working together under a partnering ethos for a period of four months. During this time, the JV engaged with their supply chain and appointed preferred subcontractors and suppliers who could work on solutions as part of the overall team.

The tender was flexible in its approach to allow the JV and their supply chain to bring forward their own innovations and ideas. This early collaborative working enabled all parties and sub-contractors to be involved in the development period and to "buy in" to the final solution. This resulted in a more efficient detailed design and procurement phase for the project e.g. value engineering of the design resulted in cost savings to the project of £400,000 which meant that the target cost for the scheme was reduced.

The Process

Five alternative treatment processes were economically and practically appraised for their construction within the confines of the existing works site.

The most suitable option deemed for the new Cookstown Works was a Sequential Batch Reactor (SBR) process- a compact footprint plant which did not require a separate secondary settlement stage (an element that would take up additional valuable space on site).

Also, because the SBR process could be integrated into the existing works and operate without a short-term requirement for primary treatment, it eliminated the need for the provision of a significant temporary treatment plant

In terms of whole life costs, the SBR option proved to be the most economically viable solution to produce high quality effluent.

Construction

The two-year contract got underway on site in March 2004. All construction work was carried out in phases with sections of the new plant being built and commissioned sequentially to allow portions of the existing plant to be taken off line.

This phased approach required meticulous planning and a constant flow of communications to ensure that operations at the old works were not affected by the construction/commissioning process. To promote health & safety, maps were produced on a regular basis which showed clearly the areas of the site which plant operators could safely access to control treatment processes at the existing works.

With December 2005 set as the target to bring the works into line with the 'old' discharge standard, weekly meetings were held on site with the contractor to keep the project on programme. A second date of March 2006 was established as the target timescale for the works to be operating in line with the most recent EU directives.

Constraints

Working within the confines of the existing site footprint, coupled with the need to keep the existing works live was probably the biggest challenge that faced the construction team. Logistically the storing of materials also proved to be a significant problem and while 'just-time' deliveries were scheduled as far as possible to maximize space, NI Water were keen to reuse as much of the excavated spoil as possible. To enable this to happen, stockpiles of rock and indigenous landscaping were created in the area just above the works itself.

Much of this existing material was used during phase one of the construction programme (building of the SBR tanks and the inlet works) when much of the river improvement work was also undertaken.

River improvements

Prior to construction work getting underway, NI Water's Engineering & Procurement team, set up a special river improvement workshop to offer a common platform for all those with an interest in the river to come together to discuss their concerns and put forward ideas for enhancing the river quality and its long-term protection.

During the initial workshop, NI Water highlighted how the design of the works had been developed with cognisance of the adjacent Ballinderry River. To improve the conditions in the river and protect it from construction work in the short term, NI Water took the decision to carry out ancillary upgrades to the existing plant to temporarily raise the quality of the treatment process until the new works was brought on line and compiled with current discharge consents.

The first meeting proved a most valuable exercise and from the outset of the scheme, provided a crucial stepping stone to building strategic links with some key project stakeholders. The knowledge gleaned from the Ballinderry River Enhancement Association (BREA) was fundamental in introducing the most effective river improvement methods to ensure minimal disturbance to the existing fish or invertebrate life.

To the delight of the NI Water team, their joint venture contractors for the new works wholeheartedly bought into the idea of improving the river. Ahead of construction, all river banks were strengthened to prevent future erosion and a total of six weirs and groynes lying above and below the works were repaired using indigenous stone. A boom downstream of the works was introduced so that any silt or debris from the working site was caught and removed and a number of gravel spawning beds were introduced at agreed locations for the migrating fish such as salmon and dollaghan.

The timing of the works was also taken into account with all construction work in the river undertaken to coincide with the migration of fish.

Looking to the future, NI Water in conjunction with its stakeholders, also developed a special aeration system that would introduce air into the river and disperse any settlement should a pollution incident (from any source) occur at times of low flow.

Present situation

Coming to the end of JV's two-year commissioning period and the benefits of the collaborative working relationships with both the project team and the BREA have been fully realised. Results recorded on the river in terms of invertebrate and fish life present, show that fish are returning in much higher numbers to breed and enjoy this much improved habitat.

With the new works due to be handed over to NI Water in November 2008, our operational team can be confident that they will be acquiring a cost-effective. modern treatment plant; whilst the high standard discharge now being produced will ensure that the river quality and natural habitat currently being enjoyed by the aquatic environment is sustained for many years to come.

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