PRESS INFORMATION

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TITLE: **DERRYLIN WwTW**

KEE fixed film technology provides a high standard wastewater treatment in south-west Northern Ireland.

What are the options for Water Utility Companies, Private Wastewater Treatment Providers and Industry to treat wastewater to the high standard which requires low levels of BOD, Suspended Solids, NH_4-N and Total Nitrogen? Conventionally, Process Engineers tasked with finding a solution would have looked at ASP or MBR to provide the solution.

Increasingly, Process Engineers are now looking at technologies which provide a reliable solution with low lifetime costs, together with a simple regime of operation, maintenance and servicing. Fixed film technologies provided the answer at Derrylin, Northern Ireland Water (NIW).

NIW installed RBCs to provide final effluent with BOD less than 5mg/l and Suspended Solids less than 5mg/l on a 95 percentile compliance basis with the lowest lifetime costs and carbon footprint.

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During 2006, for the site at Derrylin, NIW had a consent from NIEA (the EA at the time) to achieve a final effluent with a consent of less than 5mg/l BOD and Suspended Solids on a 95 percentile basis.

Their Project Managers and Process Engineers were tasked with finding suitable process to achieve the discharge standard set down by the NIEA. Having worked with KEE Process as their 'Framework' partner for Western & Southern Division RBC Framework, the Project Team instructed KEE Process to produce a design which would be capable of consistently providing the consented effluent standard.

It was also necessary to design the system for flows and loads for the 2010 horizon and ensure that this could be further expanded to account for almost 50% increase in flows and loads for the 2035 horizon whilst maintaining the performance objectives. The design requirements for the 2010 horizons were:

DESIGN PARAMETERS FOR DERRYLIN WwTW

Population Equivalent	PE	1969
Average Dry Weather Flow (ADWF)	$m^3/d.$	369
Average Dry Weather Flow (ADWF)	$m^3/hr.$	15
Peak Flow rate	$m^3/hr.$	39
Total Influent BOD load	kg/d	118
Influent BOD concentration	mg/l	320
Total Influent SS load	kg/d	128
Influent SS concentration	mg/l	347
Total Influent NH_4-N load	kg/d	14
Influent NH_4-N concentration	mg/l	38
Total Influent TKN load	kg/d	23
Influent TKN concentration	mg/l	61

Final Effluent Consent – 95 percentile basis

BOD	< 5 mg/l
Suspended Solids (SS)	< 5 mg/l
Ammoniacal Nitrogen (NH4-N)	< 5 mg/l

Together with the NIW's Project Manager, Technical Advisers and Consultants, KEE Process designed a plant which aimed to provide modular phased construction with an objective to reduce on-site workload and concrete tank construction. The plant design was simplified and consisted of the normal municipal wastewater treatment system unit operations.

The inlet works consisted of coarse and fine screens, grit removal and FOG reduction. The discharge from the inlet works was directed to a flow-splitting chamber from where the flow was fed to two 6m diameter prefabricated hopper-bottomed GRP primary settlement tanks, with fully automated sludge and scum draw-off facility.

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The flow from the primary settlement tanks was split into five equal streams by a built-in mechanism within the RBC to feed five prefabricated RBCs housed in GRP tanks with sectional insulated covers. The feature in RBCs which enables flow splitting, either equally or in any desired proportions, means that the Process Engineers have the flexibility of using the system to its optimal capability and to phase the plant construction as required.

Each RBC consisted of four stages with 8000m^2 of media surface area, with the first stage acting as a flow control device. The five RBCs operate in parallel and are designed to remove all soluble BOD and Ammoniacal Nitrogen to a level which would provide the final effluent BOD on a 95 percentile basis.

The RBCs have a design life in excess of 30 years with a warranty on all structural components of 20 years; this enabled NIW to minimise the 25 years lifetime costs. The RBC is a simple, self regulating biological stage in a wastewater treatment system and requires very little operational input and maintenance.

The mechanical items per RBC include two spherical roller bearings and a high-efficiency helical bevel geared motor with scheduled lubrication change for bearings every six months and for the gearbox every two years.

The energy consumption per RBC is minimised due to low speed of rotation of a balanced dynamic load mounted on a horizontal axle; this leads to the drive on each RBC to be rated at 1.5kW with the demand power on a continuous basis to be 0.8kW.

The Drive is rated to provide in excess of 50 years average life and this again provides optimised life time costs.

The summary of the process plant specified:

Number of Tanks	unit	2
PST Diameter	m	6
Sludge holding tank capacity	m^3	89
RBC	5 X 3m diameter RBCs	
Number of tanks	unit	3
Final Clarifier Diameter	m	6

The biologically treated wastewater from the RBCs is divided to feed into three 6m diameter prefabricated hopper-bottomed GRP final settlement tanks with fully automated sludge and scum draw off facility. The sludge and the scum are returned to the inlet works for co-settlement with primary sludge.

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The discharge from the final tanks is fed into slow gravity sand filters for polishing up the effluent to reduce suspended solids.

Sludge from the primary settlement tank is fed into a sludge storage tank where it is thickened and stored for disposal off site. The supernatant from the sludge silo is decanted on an automated basis for return to the inlet works during early morning. The plant also includes an internal 'recycle system' and this is used to optimise the biological stage, the settling character of the fine solids and control of nitrogen from the plant.

The plant was built and commissioned during 2009 and has consistently produced effluent within consent and with considerable savings in capital costs, operational labour costs and energy.

NIW have looked at other sites and carried out a case study on a 7.000PE works. Compared to other process technologies for 25 years life-time, the power cost saving with RBC is £1.20m; maintenance and operational labour, sludge disposal, and spares saving of £1.01m, making a total 25 years operational life-time saving of £2.21m.

Michael McAlary, Wastewater Services Manager with Northern Ireland Water, says,

> *"In today's economic climate Northern Ireland Water are looking at ways of reducing our whole life-time costs and at the same time having to meet the ever tighter environment consent standards as agreed and published by the local Environment Agency (NIEA). I need a simple, easy to maintain process in order to meet these requirements.*
>
> *I have experience in other processes which can easily facilitate these standards but at an ever increasing resource to myself. I essentially needed something which has been tried, tested and trusted and I was more than satisfied to engage KEE Process to meet these demands.*
>
> *In the rural areas of the West, NIW have a large number of RBC Plants ranging from small package units installed through the Rural Works programme to the larger systems, installed under the RBC Framework.*
>
> *The RBC offers a very robust process achieving good consistent discharge standards requiring minimum operational and maintenance input and very importantly, low power consumption. This has given me the confidence to accept the RBC process for Derrylin where consistent and tight effluent quality was stipulated by the NIEA".*

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