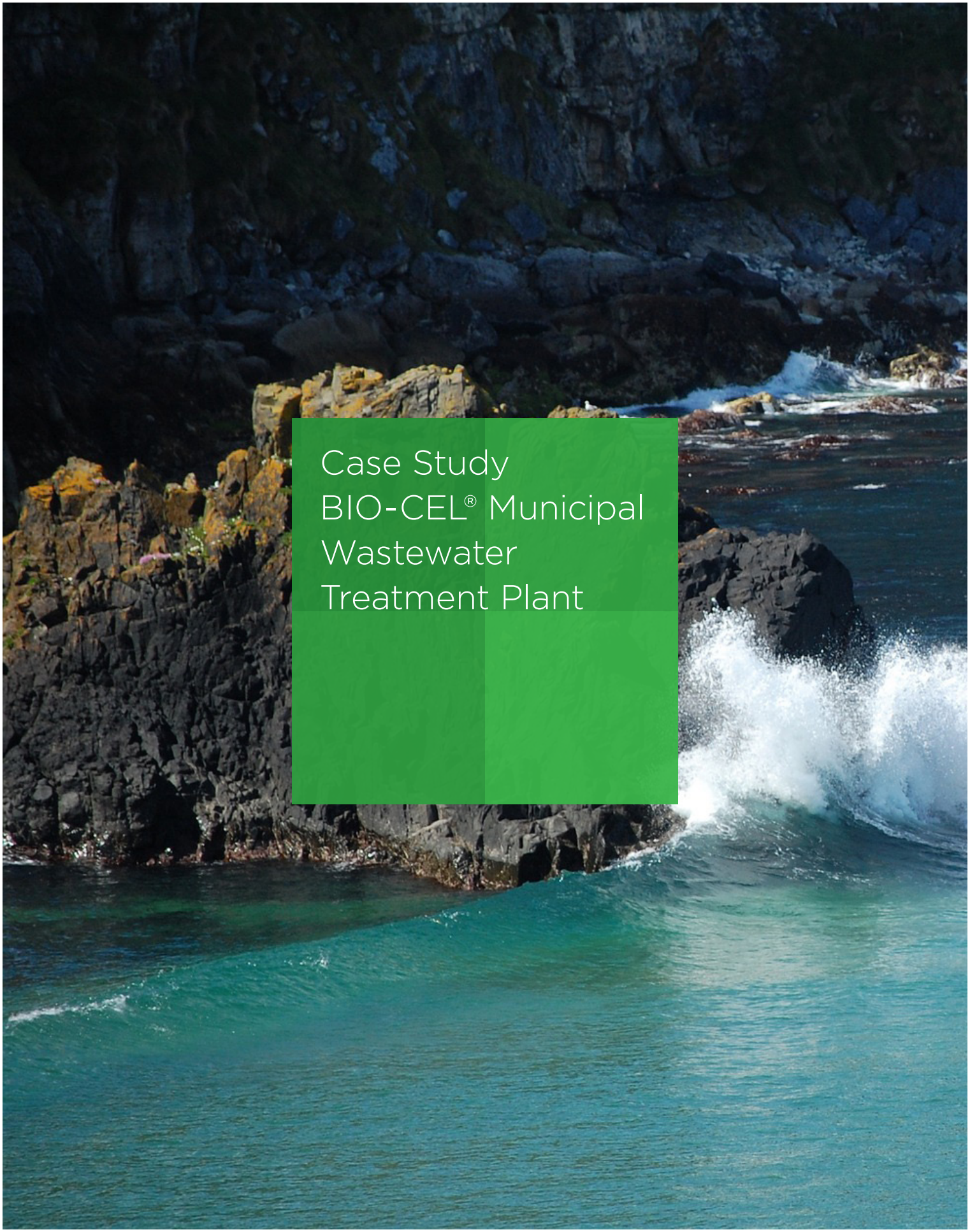

Case Study BIO-CEL® Municipal Wastewater Treatment Plant

MANN+HUMMEL

Case Study: Municipal BIO-CEL® MBR Modules

Retrofit an existing municipal wastewater treatment plant with new BIO-CEL® L-1 modules, while keeping the plant operational.

PROBLEM
Competitive MBR system could not increase capacity

SITE
Large wastewater treatment plant in Northern Ireland

OUTCOME
Increased capacity by 50% without additional tanks

OBJECTIVE

Dundrum WwTW is a municipal wastewater treatment plant operated by Northern Ireland Water (NI Water) in a small coastal town in Northern Ireland. The discharge limit for BOD and suspended solids is very strict as this site is located near a popular beach.

The plant was equipped with 12 Kubota ES150 modules, but satisfactory performance was becoming more difficult to maintain and the membranes were at their maximum limit regarding throughput and would not be able to deal with any increase in wastewater flow. The main challenge was the limited space on site - the plant had to be upgraded for a larger flow rate without changing the existing tanks or adding new tanks.

MATERIALS & METHODS

MANN+HUMMEL Water & Fluid Solutions (WFS) received the order to replace the old Kubota modules with BIO-CEL L-1 modules. Each existing tank comfortably fit two BIO-CEL L-1 modules. Due to the higher packing density of the BIO-CEL L-1 module, the total membrane surface per tank was almost tripled. (**Table 2**)

The plant had to remain operational during the exchange, so the retrofit was done one tank at a time. In addition to the new membranes, the plant was also equipped with new 2mm fine screens to replace the old 3mm fine screens, and a new RAS selector tank to allow for a more even feed to the four aeration tanks.

The old Kubota MBR was operated by

Figure 1 Blocked Kubota module

Figure 2 BIO-CEL® L-1 modules submerged in aerated sludge

Tables & Data

Table 1 Operational Parameters

Parameter	Value
Module Type	8 x BIO-CEL® L-1
MLSS	10-12 g/L
Sludge Retention Time	10 d
Hydraulic Retention Time	5.7 h
Minimum Temperature	10°C (50°F)
Flow Rate	735 m³/d, 56 m³/h
Max Design Population Equiv.	2600 PE

Table 2 Comparison

Step	Kubota	MANN+HUMMEL WFS
Membrane Surface	12 x 120m² = 1440m²	8 x 480m² = 3840m²
Flux	6-25 lmh	8-14.5 lmh
Flow Rate	8.5-36 m³/h	30.4-56 m³/h

Table 3 Analytical Results (Initial)

Step	Feed	Permeate	Target
COD (mg/L)	377	7	
BOD (mg/L)	171	2	< 5
NH4-N (mg/L)	54	11	
SS (mg/L)	260	< 1	< 10

gravity. This was changed to a more flexible design that can be operated by pump or by gravity.

The plant is now operating at lower fluxes but is still able to treat 50% more wastewater. The lower flux reduces the stress on the membranes and allows for more stable operating conditions.

RESULTS

The BIO-CEL® modules are performing excellently based on initial post-commissioning results. A high-quality effluent is supplied by the BIO-CEL L-1 modules, with 98% COD reduction and 99% BOD reduction. The effluent is clear of all solids. The incomplete nitrification was caused by insufficient aeration at the time of sampling. The BIO-CEL system has noticeably greater BOD and COD removal compared to the old Kubota system. Samples taken at the same time showed a COD of 21mg/L and BOD of 4mg/L in the permeate of the Kubota MBR, which is twice as high as the effluent of the BIO-CEL MBR. This higher quality effluent is achieved by the tighter pore size of the BIO-CEL membranes. The aeration pattern on the old membranes was uneven, pointing towards blockages between the sheets. This was confirmed by a visual inspection. (**Figure 1**) The aeration pattern of the BIO-CEL modules is uniform over the entire module surface. (**Figure 2**)

CONCLUSION

With the installation of the BIO-CEL L-1 modules, NI Water was able to increase the capacity of their treatment plant by 50% without extending their membrane tanks. The system allows NI Water to reliably meet discharge limits and have adequate reserves for a future increase of flow.

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