University of Surrey include Chelsea Instrument's MINI*tracka* II in assessments for design improvements to effluent quality.

The Centre for Environmental Health Engineering (CEHE) of the University of Surrey have been co-operating with Southern Water at Lidsey WTW to investigate efficiencies of faecal coliform removal in the tertiary stages of the treatment process. The tertiary stages of the plant entail three tertiary lagoons of similar geometry and dimensions. These were termed the north, central and south lagoon. This plant provided an ideal layout for comparing results of modifying lagoons in identical climatic conditions.

Wastewater Stabilisation Pond (WSP) efficiency has been shown to be closely related to hydraulic variables, geometry, location and input-output device design. There are 3 flow patterns governing the type of flow that predominates in WSP systems; complete mixture, plug flow and dispersed flow. Recent work conducted by the University abroad has shown gains in efficiencies by reducing wind-induced short circuits and increasing the length-width ratio to produce near plug flow. Based on this success, the south lagoon of the tertiary stage at Lidsey was modified by dividing it into three channels, but still maintaining a single current flow from input to output. This work was completed in the summer of 2001.

Figure 1

The University then embarked on a study programme, comparing the modified (south) and unmodified (central) lagoons by analysing the retention time, flow patterns, wind effects, sunlight exposure time with faecal coliform and faecal streptococci removal. The study included tracer studies using Rhodamine WT together with measurements of pH, temperature, turbidity, conductivity, suspended solids, faecal coliform and faecal streptococci performance.

For the tracer studies a portable system was required, capable of operating over periods of 5 – 7 days without mains power, taking readings regularly at 2 to 5 minute intervals. A Chelsea Instrument's Minitracka II *in-situ* fluorimeter monitored the Rhodamine WT for the tracer studies. (The Minitracka II fluorimeter can also be configured to detect chlorophyll a, fluorescein and configured as a nephelometer). This fluorimeter was chosen as it was relatively inexpensive but offered excellent resolution (0.01 μg/l) over a wide range (0.03 to 100 μg/l). It also offered the advantage of low power consumption (0.7W). The logger supplied with the Minitracka was a Flexidata Minilogger manufactured by Marine Informatics of Ireland. The Flexidata data logger was offered by Chelsea Instruments as it seemed ideal for the application, being of rugged construction and capable of powering both itself and the Minitracka II over the demanding periods required via an internal rechargeable battery. The Flexidata unit was also relatively inexpensive, and provided a simple and easy to operate user interface. A 30 metre length of strain bearing data cable was provided to complete the system, allowing the University of Surrey to place the Minitracka II fluorimeter at any point within the two lagoons.

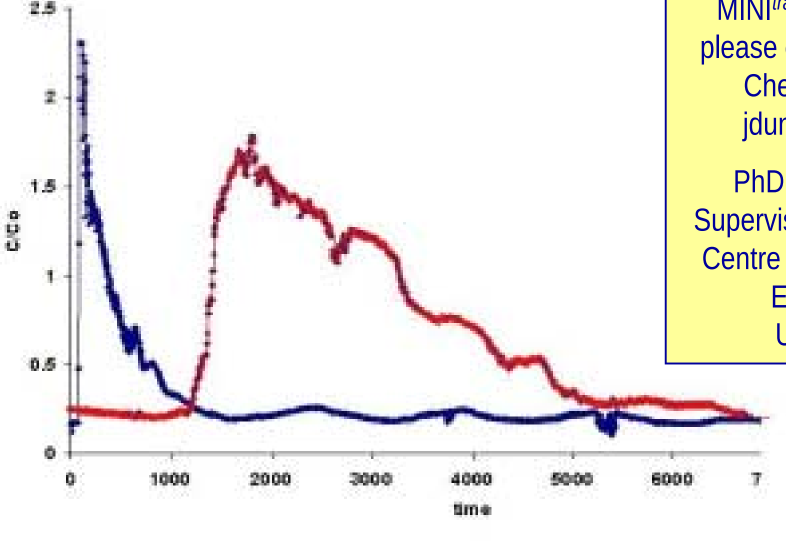
The Minitracka II was placed in the flow on the outlet of each lagoon (Figure 1) and left for 5 days. Rhodamine WT was injected in the inlet to commence the study (Figure 2). Concentrations had to be matched to the differing flow rates of each lagoon. The Flexidata logger was programmed to store a reading every 5 minutes in the south lagoon and every 2 minutes in the central lagoon, switching the Minitracka on 5 seconds (programmable) prior to taking the reading to allow for instrument warm-up.

Figure 2

Figure 3 presents two profiles showing the Rhodamine WT concentration against time graphically. The blue trace, taken from the central lagoon, presents a typical complete mixture for a common WSP. The red trace, taken from the south lagoon (modified), presents an atypical profile that is closer to plug flow.

It was therefore demonstrated that the modifications to the south lagoon produced increased efficiencies to faecal coliform and faecal streptococci removal, thus improving the water quality. The modifications to the south lagoon may therefore be considered an appropriate engineering solution in order to improve the bacteriological quality in the tertiary lagoons.

Figure 3



For details regarding the MINI*tracka* II fluorimeter system please contact Justin Dunning at Chelsea Instruments Ltd, jdunning@chelsea.co.uk.

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