



**TAKE THE
GUESSWORK
OUT OF
WASTEWATER
TREATMENT**

RESPIROMETRY

RESPIROMETRY MADE SIMPLE!

- ▲ Plant Optimization
- ▲ Toxicity Management
- ▲ Operational Troubleshooting
- ▲ Treatability Studies
- ▲ POTW Influent Screening



Case Studies

Yorkshire Water Bradford, England

Yorkshire Water has a large wastewater investment program to deliver the requirements of the Freshwater Fish Directive over a five year span.

In order to achieve the high effluent quality required at various sites, several large new activated sludge plants will be built.

It is intended to pilot the process at each of these sites to provide appropriate design parameters, and the Strathtox instrument will assist with the data collection on the plant's bacterial performance during the piloting.

Strathtox will provide data on activated sludge health, oxygen uptake rate, nitrification inhibition and respiration inhibition and will more than pay for itself over the planned experimental program. The data provided will also be more appropriate as any test is completed usually well within an hour of the mixed liquor sample being taken so it will not suffer from sample deterioration during transportation to the lab, which can be important with this type of analysis.

The unit is readily transportable so it can be moved from site to site for analysis as required. This is important not only for the piloting program but for the ongoing monitoring of the new plants, once built.

Benefits: **Rapid test results**
Transportable resource
ROI in pilot phase

Avecia Pharmaceuticals Grangemouth, Scotland

At the same time as Avecia commissioned its biological waste treatment plant they purchased a Strathkelvin Activated Sludge Respirometer with the intention of using it to maintain absolute control of their wastewater treatment operation. The unit has been in continuous use ever since giving many years of trouble-free operation.

The instrument has played a significant role in enforcing Avecia maintain their impressive record of compliance with discharge content and environmental improvement.

The respirometer has found further application during their early-stage product development. It is used to optimize the establishment of environmentally friendly technologies, and to allow batch releasing of stored wastes to the waste treatment plant should this be required as part of standard operating procedures.

Benefits: **Discharge consent compliance**
New product introduction and licensing
Excellent control of discharge the WWTP

Harviestoun Brewery Alva, Scotland

The success of Harviestoun Brewery has seen them move into a brand new purpose-built brewery in Alva. The new facility has been designed to facilitate Harviestoun's particular requirements with a unique Mash Tun system, Fermentation Vessels, bespoke cleaning and heat exchange systems, cask management systems, and a biological treatment plant. This bio-plant deals with the vast majority of the liquid waste that the brewing process generates.

After completion of the bio-plant construction, problems were experienced with inadequate bacterial performance from the plant. Following an initial investigation, various physical modifications were carried out to the plant to increase its biodegradation capacity, improve the screening of organic matter and to improve the operation of the aeration system to promote biomass growth and influent mixing.

Essential to this process was the need to monitor the improvements in the biomass and investigate the plant's capacity to withstand the toxic effects of the various liquid wastes from the brewery. Strathtox was utilized for plant-side and laboratory testing due to its rapid test times and the quick provision of automated reports. These features have the significant benefit of enabling rapid decision-making, leading to the quick implementation of the biomass-seeding program and further modifications to both plant and brewery operations. This has produced a dramatic improvement in the bio-plant's performance levels with a reduction of COD:BOD levels.

Benefits: **Assured regulatory compliance**
Control of production wastewaters
Increased bio-plant capacity

Waste Recycling Group Leeds, England

WRG - located in Leeds - receives trucked waste delivery from industries producing waste as diverse as acids from metal production to food and beverage wastes.

In 2001 WRG purchased an earlier version of Strathtox and it is used on a daily basis to test each arriving truckload for toxicity. Eventual discharge is to a downstream Yorkshire Water biological treatment plant. The instrument allows WRG to develop strategies for treating toxic wastes or indeed to reject waste shipments which would cause it to fail its consent limits with Yorkshire water.

Toxicity testing takes less than 15 minutes to complete and ensures no demurrage charges are incurred.

Instead of limiting the number of trucks they receive WRG can now work hand-in-hand with customers to handle wastes that would otherwise have been considered too toxic..

Benefits: **Assured regulatory compliance**
Control of accepted waste deliveries
Quantifiable direct savings (=\$30K per annum)

Case Studies

Fine Organics Teesside, England

Respirometry plays a vital role in protecting Fine Organic's Wastewater Pipeline operations that saves them over £400K per year.

Trucking their wastewaters from their pharmaceutical batch production processes to the adjacent Wastewater Treatment Plant (WWTP) was costing Fine Organics over £400K per annum. Clearly this was an area for cost reduction, which was achieved by injecting their wastewaters into a nearby pipeline that feeds directly into Bran Sands WWTP. With the carefully negotiated arrangement with the owner of the pipeline, and with the approval of the WWTP operator, Fine Organics saved themselves considerable time and effort in managing their trucking operations and reduced their operating costs by over Four Hundred Thousand pounds, every year.

The Fine Organics plant is a batch production facility that produces a variety of wastewaters, a number of which are highly toxic to the bacteria in activated sludge systems. The requirement, therefore, was for a rigorous management system for control of wastewater discharges that was robust, flexible and easy to operate.

Therefore, Fine Organics developed a system of wastewater collection, segregation and pre-treatment that focuses on the actual ability of the WWTP to biodegrade their combined wastewaters while ensuring the integrity of the plant by protecting it from toxic shock or kill-off. This is achieved by testing the wastewaters destined for the pipeline using an Activated Sludge Respirometer from Strathkelvin Instruments, which critically uses the activated sludge from the WWTP to give a precise indication of how the bacteria will respond.

This allows Fine Organics to define a particular pre-treatment and segregation regime for their wastewaters that are collected in a storage system before being pumped into the pipeline. This might typically be over 400,000 liters of wastewater that needs to be biodegraded every day.

Fine Organics follows a strict regime of testing that replicates the tests carried out by the WWTP operator to audit their pre-treatment and segregation processes to confirm that the treated wastewaters can be pumped through to the WWTP. The respirometry tests are quick and effective with tests being completed typically within 10 minutes, with the respirometry software producing a comprehensive set of graphs and results allowing their operators to proactively determine the appropriate pre-treatment regime.

The opportunity to substantially reduce their costs on an ongoing basis is critical for Fine Organics, and they protect this yearly saving of over £400K by employing rigorous standards that ensure the integrity of the WWTP operation and provide protection for the operations of the other pipeline users. This protection is achieved by using Strathkelvin respirometry that is simple to use, produces easily understood auditable reports and graphs, and allows quick and effective testing so that all the testing data can be easily acted upon by a wide range of staff, regulators and end users.

Benefits: **£400K Operational Cost Reduction**
Evidence Regulatory Compliance
Wide Operational Usage

Corus Staal BV Umuiden, The Netherlands

Dutch-Anglo iron and steel producer, Corus, installed a biological wastewater treatment plant that was put into operation at their major production facility in Umuiden, following the first year of operation serious problems were encountered. The most probable cause was toxic components in one of the wastewater flows that dramatically decreased the removal efficiency of the plant within a short period of time.

After the process was re-established it was decided that there should be better control of the influent composition and sludge health. Since it was not known which particular components in the influent could cause inhibition or toxicity, extra chemical analyses were not useful. Corus decided that controlling bacterial performance and regularly analyzing the possible effects of the different wastewater flows on the biomass would give extra information needed to prevent toxic or inhibiting shocks.

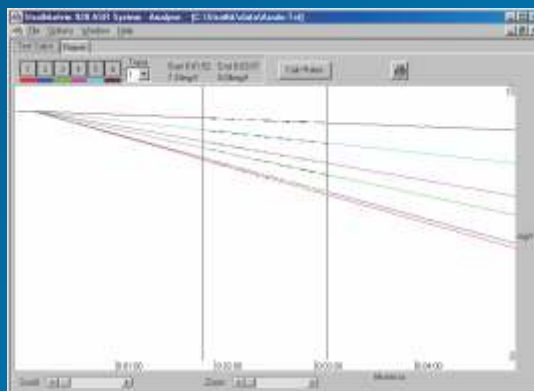
After exhaustively researching the alternatives, Corus decided to use respirometry since that would give them a direct measure of the bacterial performance of their plant so that they could quickly react to any critical changes to their plant's operational capability. Corus needed an instrument that would be easy to use by a range of plant personnel, would produce results and reports that needed no intervention, and provide them in the quickest time possible.

Corus chose Strathkelvin Instrument's Strathtox respirometer, and commenced a trial in late 2004 that has been so successful that they have acquired the unit. Strathtox is now an integral part of their daily program of plant testing and analysis. Its operation is mission-critical to the Coke plant operation at Umuiden, and the security that Strathtox provides will ensure that the plant will no longer be subject to the risk of highly expensive toxic events and provide the opportunity to reduce operating costs by increasing the plant's bacterial performance.

Benefits: **Early warning of bacterial inhibition**
Discharge consent Compliance
Ensuring production continuity

RESPIROMETRY MADE SIMPLE!

Respirometry of activated sludge is an important tool in wastewater treatment. Until now, it has not been widely adopted because respirometers have been difficult to use. Strathkelvin has solved this problem by developing robust instrumentation with simple operating procedures and advanced Windows-based software.



The result is a respirometer that is extremely simple to operate with test results and tables that are easily understood by anyone with basic wastewater treatment skills.

Strathtox is a compact benchtop unit. It uses fixed volume respiration cells and has integral temperature regulation. Six high-precision oxygen electrodes, whose output is displayed on your PC or laptop, monitor respiration rates. It is fast, and tests can be completed in just 5-10 minutes.

TECHNICAL SPECIFICATIONS

- Sensors: 6 Strathkelvin Instruments 1302 oxygen electrodes, bias voltage 650 mV.
- Communication: USB 1.1
- Power supply: AC input: 110 to 250 volts, 50 to 60 Hz, 150VA maximum.
- Ambient temperature range: +10°C to + 40°C, 20% to 80% RH.
- Controlled temperature range: . . Ambient -10°C to 40°C.
- Temperature accuracy: ±0.1°C.
- Bath capacity: 700 ml. Stock flask capacity: 650 ml.
- Storage temperature range: - 20°C to + 60°C.
- Environmental: Indoor use at altitudes up to 2000 m. Pollution Degree 1.
- Safety: Complies with EN61010-1
- EMC: Complies with EN50081-1 and EN50082-1
- Weight (dry): 15kg.

Table 1: Test results

Time	Concentration (%)	Flow (mg/L)	Respiration Rate
0	Control	115.0	0.0015
1	80	85.0	0.0015
2	80	85.0	0.0015
3	80	85.0	0.0015
4	80	85.0	0.0015
5	80	85.0	0.0015

Table 2: ATU balance

Time	Concentration (%)	Flow (mg/L)	Respiration Rate
0	Control	88.0	0.0015
1	80	88.0	0.0015
2	80	88.0	0.0015
3	80	88.0	0.0015
4	80	88.0	0.0015
5	80	88.0	0.0015

SUPPLIED WITH SOFTWARE FOR:

- ▲ Respiration Inhibition Tests
- ▲ Nitrification Inhibition Tests
- ▲ Short-term BOD
- ▲ Nitrification Status
- ▲ Sludge health monitoring
- ▲ Customizable Respirometry Tests

Each unit comes with a comprehensive and easy-to-follow manual.

APPLICATIONS

Strathtox is in use worldwide in the following wastewater treatment plant applications:

- ▲ Toxicity management
- ▲ Aeration efficiency optimisation
- ▲ Nutrient deficiency assessments
- ▲ Bioaugmentation requirements
- ▲ Nitrification management
- ▲ Ensuring environmental compliance
- ▲ Process optimisation
- ▲ Plant specification and design



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CUSTOMER CARE

Directly and through our worldwide network of distributors we pride ourselves on our customer care, and we support our customers globally. We will demonstrate the instrument to you using your own Activated Sludge and influents, and arrange for your installation and training for your personnel. Thereafter support and maintenance agreements provide for expert technical support on-site or by phone, fax, or email. **Respirometry has never been easier!**



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