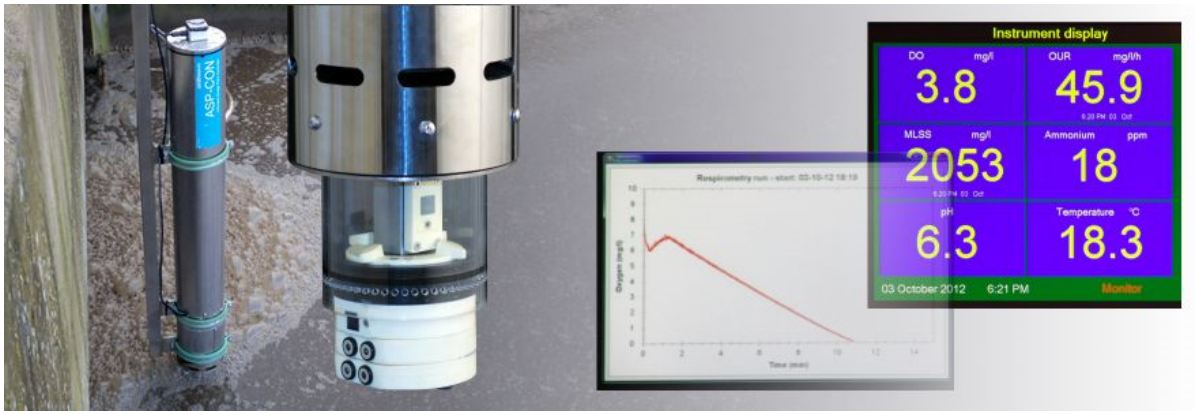
The Benefits of Using Strathkelvin Instruments' Activated Sludge Plant Controller (ASP-CON) in Wastewater Treatment Plants



Background

This information sheet is written to introduce Strathkelvin Instruments' Self-Cleaning, Self-Calibrating "Activated Sludge Plant Controller" (ASP-C0N), highlighting it's capabilities and to give some examples and case studies of results achieved during the instrument's proving trials in several varying types of plant installations.

Technology Introduction.

Sensors in the wastewater treatment industry rapidly lose their effectiveness due to fouling and calibration drift. The Strathkelvin Instruments' ASP-CON has been designed to be fully self-cleaning and self-calibrating. The picture below shows how after several weeks in a highly challenging aeration basin the sensor heads remain very clean. This is mainly due to the action of the Instrument's medium pressure wipers, but also the use of a slightly acidic flush followed by a slightly basic flush, during the auto-calibration of the sensors.

The Strathkelvin Instruments' ASP-CON is a multi-sensor instrument measuring over 16 important Wastewater treatment control parameters in one unit. These are detailed below

Parameters used to directly control WWTP set-up

1) DO – Dissolved Oxygen is used as a control parameter to control airflow to the basin.
2) Ammonium – used as a control parameter or a monitor.
3) MLSS – plants run to target Mixed Liquor Suspended Solids levels – the measure is used to increase or decrease wasting rates.
4) SVI – Settlement Volume Index - used to monitor plant performance and an indicator of Final Settlement Tank (FST) issues.
5) SSVI – considered a more indicative measure than SVI by some operators.
6) TSS – Predicted – we measure the turbidity of the SVI test supernatant. This will indicate if there is likely to be a clean or dirty discharge. It is not an exact measure, as we cannot account for the FST design.
7) pH- plants have discharge consents for this measure and nitrification improves in alkaline conditions.

8) Temperature – required for DO calibration, but also an important parameter in Nitrifying plants, as the nitrification rate is strongly affected during winter conditions.

Parameters used in advance control and monitoring regimes

9) OUR – Oxygen Uptake Rate - this is a measure of bacterial loading at the point of sampling – a low figure indicates biodegradation complete or toxicity.

10) SOUR – Specific Oxygen Uptake Rate – is a measure of bacterial health, changes can indicate chronic toxicity – advanced control systems use it for loading control on plant.

11) % Nitrification- measures % of SOUR used for Ammonia removal – measure of nitrification health.

12) F:M ratio - some plants load their treatment works to work on specified F:M (Food: Mass) ratios.

13) Critical Carbonaceous DO level – point at which BOD removal is maximised, and below which, extended running should not occur as risk of sludge bulking and foaming increases.

14) Critical Nitrification DO level – point at which Ammonia removal is maximised and allows the control system to remove the required level of Ammonia without over-treating.

Plant Protection Parameters

15) Toxicity - impact that an influent will have on bacterial health. This is determined by a matrix analysis, simultaneously considering OUR, Ammonium & Flow (if available).

And Finally

16) Potassium- measured because of it's relationship / interference with the Ammonia measurement.

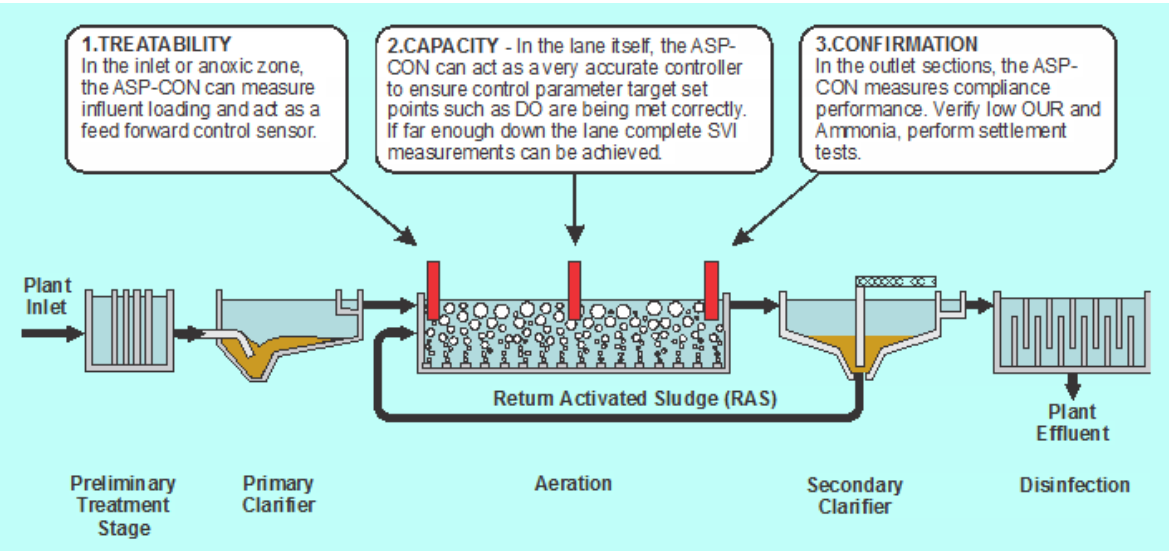
Installation Locations

The ASP-CON can be installed in a number of positions within the activated sludge part of the secondary treatment process, depending upon the desired control and monitoring strategy of the WWTP, be that

1) In the inlet or anoxic zone it can measure influent loading and act as a feed forward control sensor.

2) In the lane itself it can act as a very accurate controller to ensure control parameter target set points such as DO are being met correctly. If far enough down the lane you can complete SVI measures.

3) In the outlet sections it can measure compliance performance.

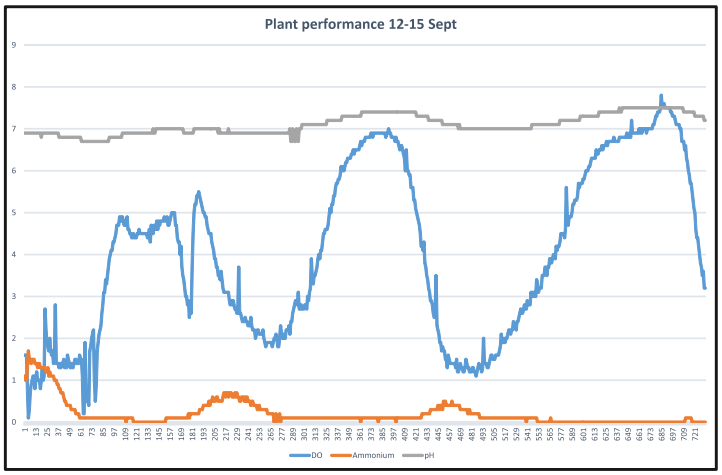


Case Studies

The following case studies highlight how the installation of a Strathkelvin ASP-CON has delivered significant information and benefits within the activated sludge treatment areas of WWTP's during some of Strathkelvin's extensive trials.

Case Study 1

This case study shows results when the ASP-CON was installed at around 70% of the treatment lane footprint in a facility in Northern USA. The graph shows how treatment load varies over a 72 hour period. As can be seen from the measurement data gathered, 3 separate measures – namely DO, Ammonia and pH are all indicating that an alternative control strategy can be implemented under low loading conditions.

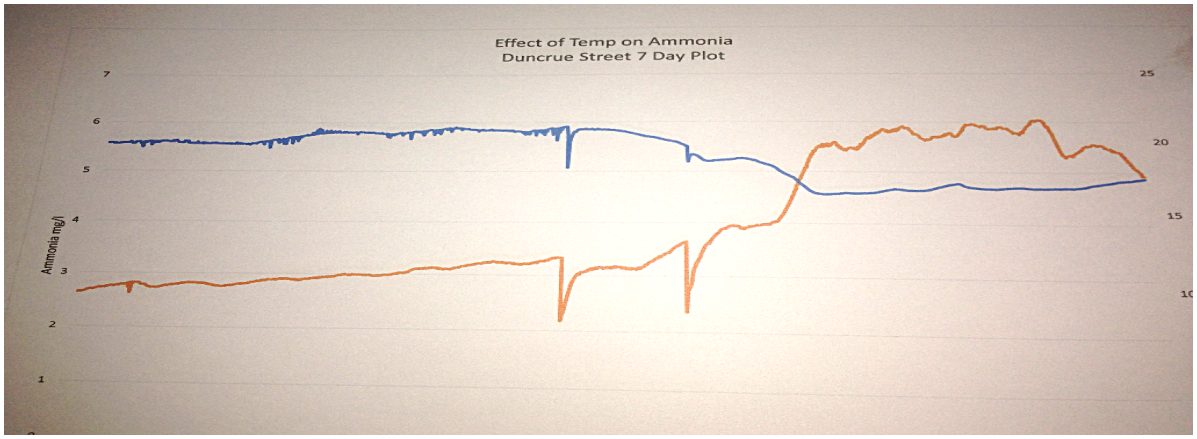


It has been estimated that by implementing alternative control strategies during the period of low loading that this plant could save in excess of $40,000 per annum.

The plant has a population equivalent of 16,500, and 4.3MGD

Case Study 2

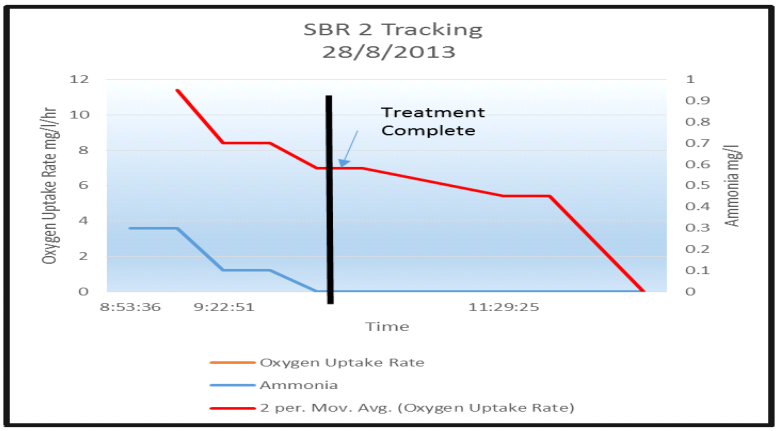
This graph shows the direct link between residual Ammonia and treatment basin Temperature.



In this example the blue line is the temperature of the mixed liquors in the treatment basin, and the Orange line is the Ammonium level. During the review period we can see a rapid drop in temperature levels, associated with a weather cold snap. The Ammonia levels which had been stable for some time suddenly increased. This is due to the fact that Nitrification is a temperature dependent reaction. By the end of the period under review the DO had been increased to offset for the temperature change and you can see Ammonia levels starting to reduce back towards normal.

Case Study 3

This case study shows how an SBR's performance could be optimised for either energy consumption or capacity.



This plant has a population equivalent of 7,500 max flow and 5,000 M^3/day

The time period shown is a single SBR aeration cycle. Set up studies indicated that BOD is well within consent when the OUR is less than 9mg/l/hr and the site consent for Ammonia is 5 mg/l/hr. A simple examination of the graph produced shows that the basin could have been discharged after 1 hour of aeration (rather than the 3 hours used). Applying a weighting to this cycle time reduction based on historical flow and load data a saving of £18,000 per annum on aeration energy could be achieved on this plant or alternatively a 35% increase in flow through the plant could be achieved.

For more information on the Strathkelvin ASP-CON, you can visit our websites below, email or call our sales and support team at:

Info@strathkelvin.com

www.asp-con.com

www.strathkelvin.com

Strathkelvin Instruments Ltd,
Rowantree Avenue,
Newhouse Industrial Estate,
North Lanarkshire,
ML1 5RX.
Tel +44 (0)1698 730400
Fax +44 (0)1698 730401