



ACTIVATED SLUDGE PROCESS OPTIMISATION

Dissolved Oxygen Control through measurement of Ammonium: **ISE vs Wet Chemistry**

Application Note
XAUK 201-05-1017

xylem
Let's Solve Water

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INVESTMENT REAPS REWARDS

A recent trial of the WTW VARiON Ammonia ISE against a competitor's wet chemistry analyser on the inlet to a major ASP on a flagship works in the UK revealed just how far the ISE technology has come through the intensive investment in R&D that Xylem has made. 6 weeks of data is presented across the plots below.

Two ISE sensors were installed: one with additional air cleaning and one "straight out of the box". These sensors were calibrated to the liquor matrix during the initial commissioning and then remained untouched for the remainder of the trial.

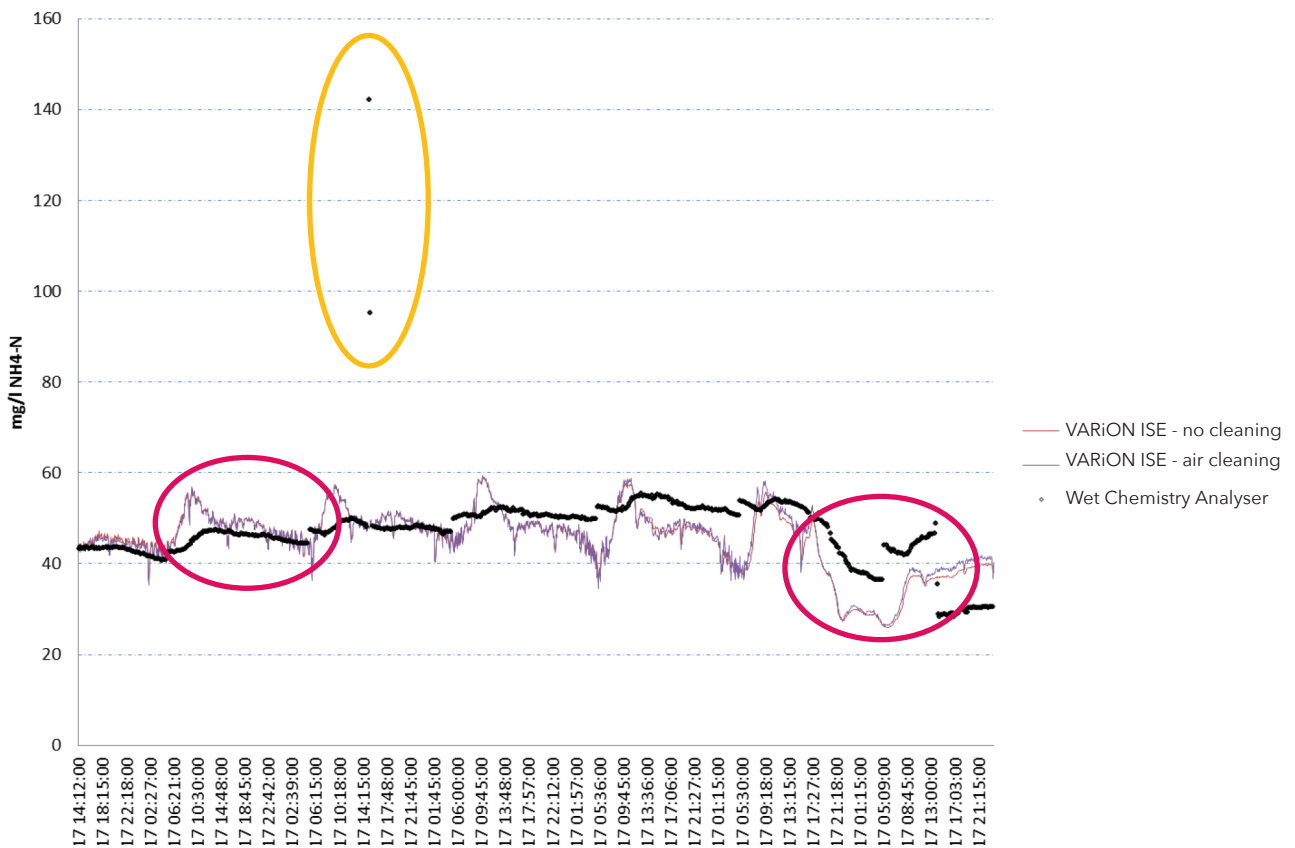


Figure 1. Week 1: WTW Trial data VARiON ISE vs Competitor Wet Chemistry Analyser. Highlighted regions show missed diurnal peaks and troughs in analyser data (red) and unactionable analyser data (orange)

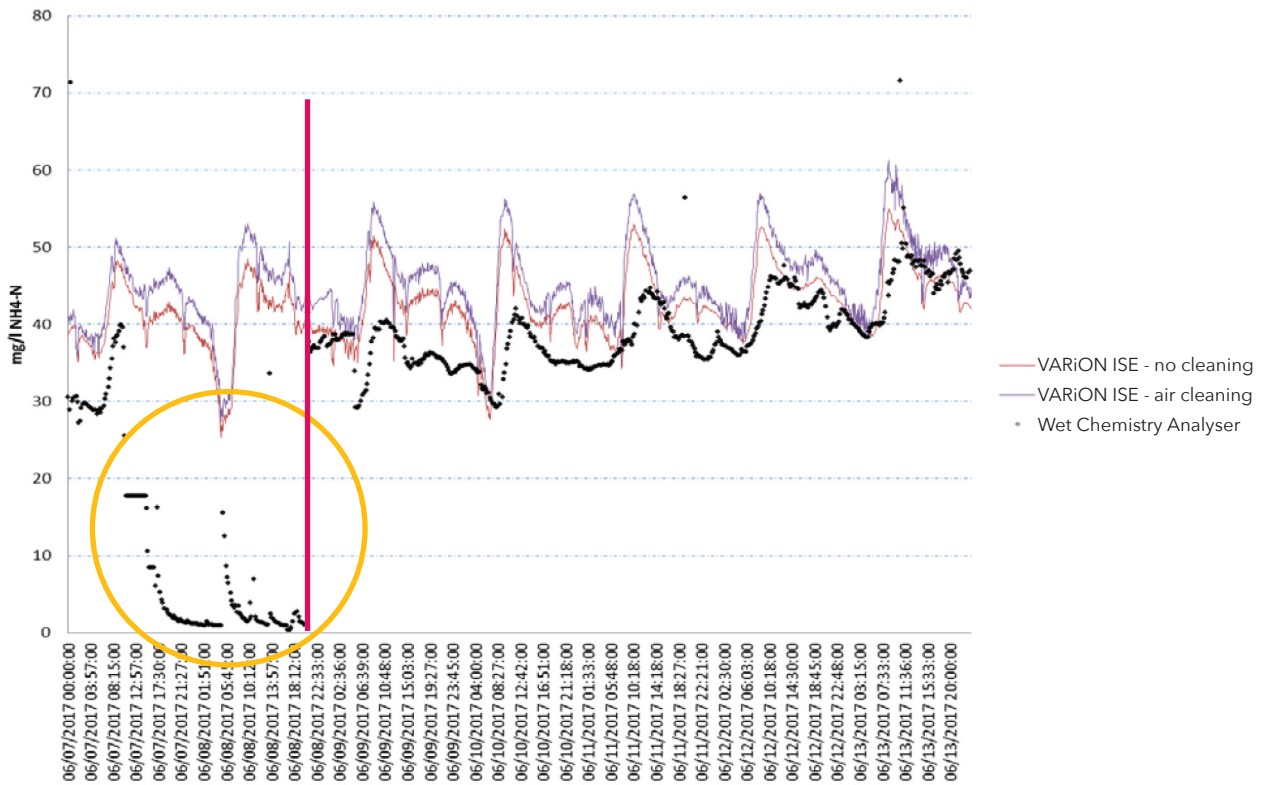


Figure 2. Week 2: WTW Trial data VARiON ISE vs Competitor Wet Chemistry Analyser. Highlighted regions show unactionable analyser data (orange) leading to emergency service visit (red line)

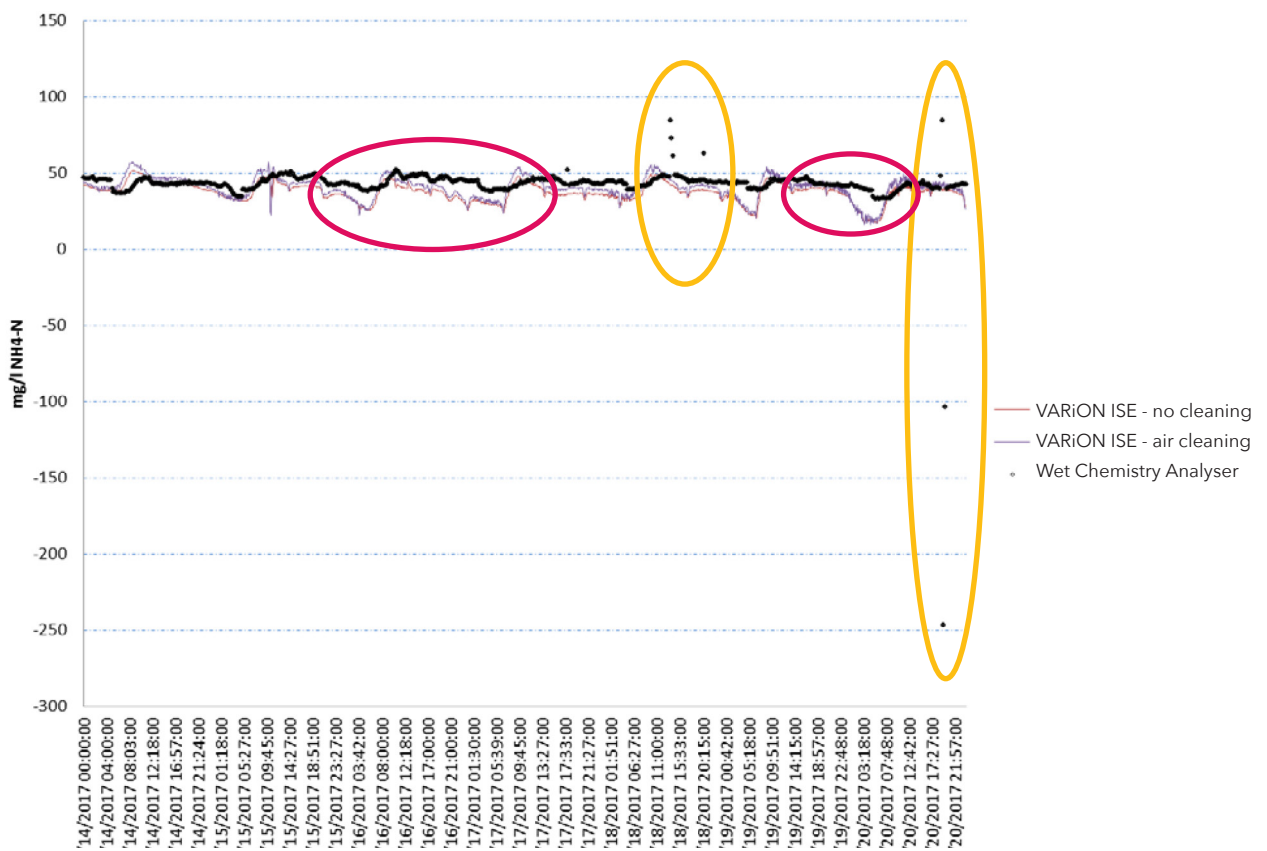


Figure 3. Week 3: WTW Trial VARiON ISE vs Competitor Wet Chemistry Analyser. Highlighted regions show unactionable analyser data (orange) and missed diurnal peaks and troughs (red)

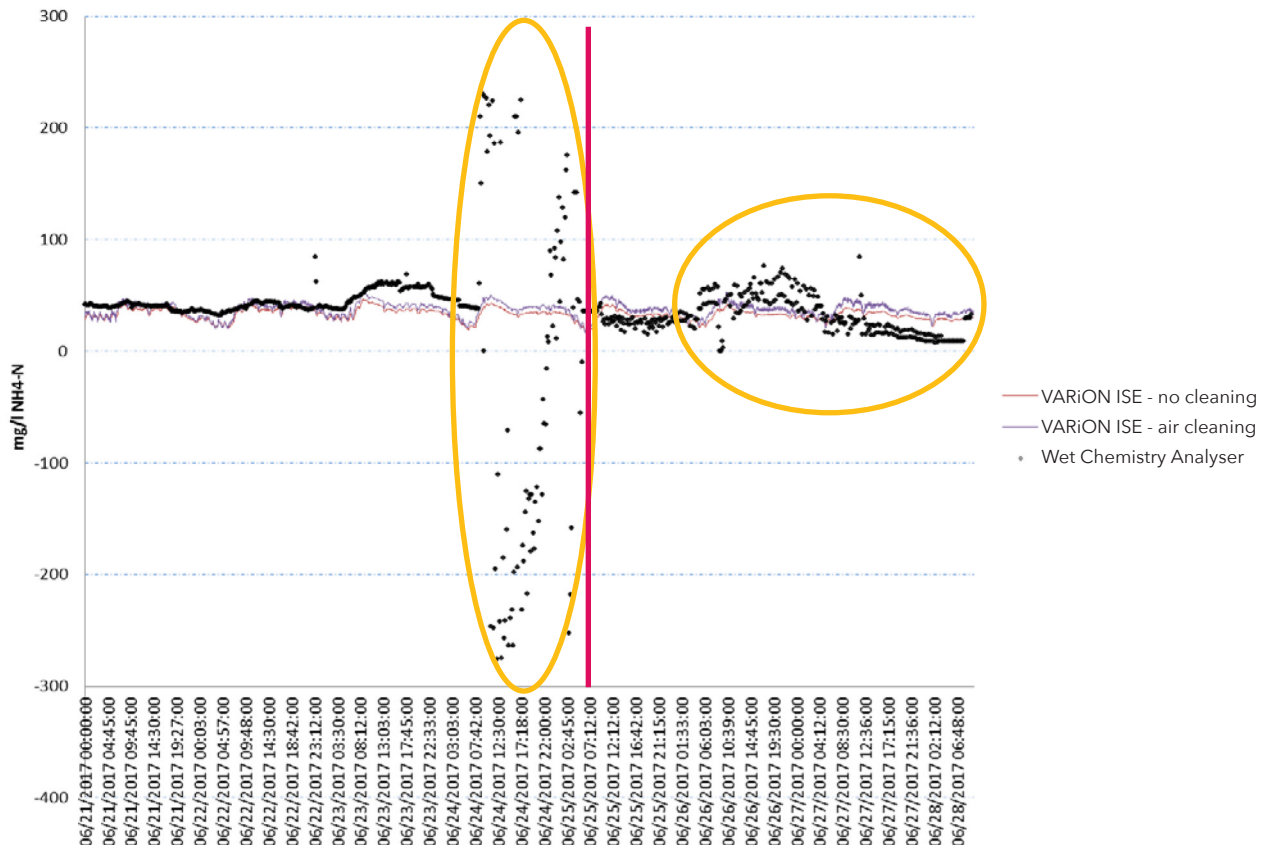


Figure 4. Week 4: WTW Trial VARiON ISE vs Competitor Wet Chemistry Analyser. Highlighted regions show unactionable analyser data (orange) and an emergency service visit (red line)

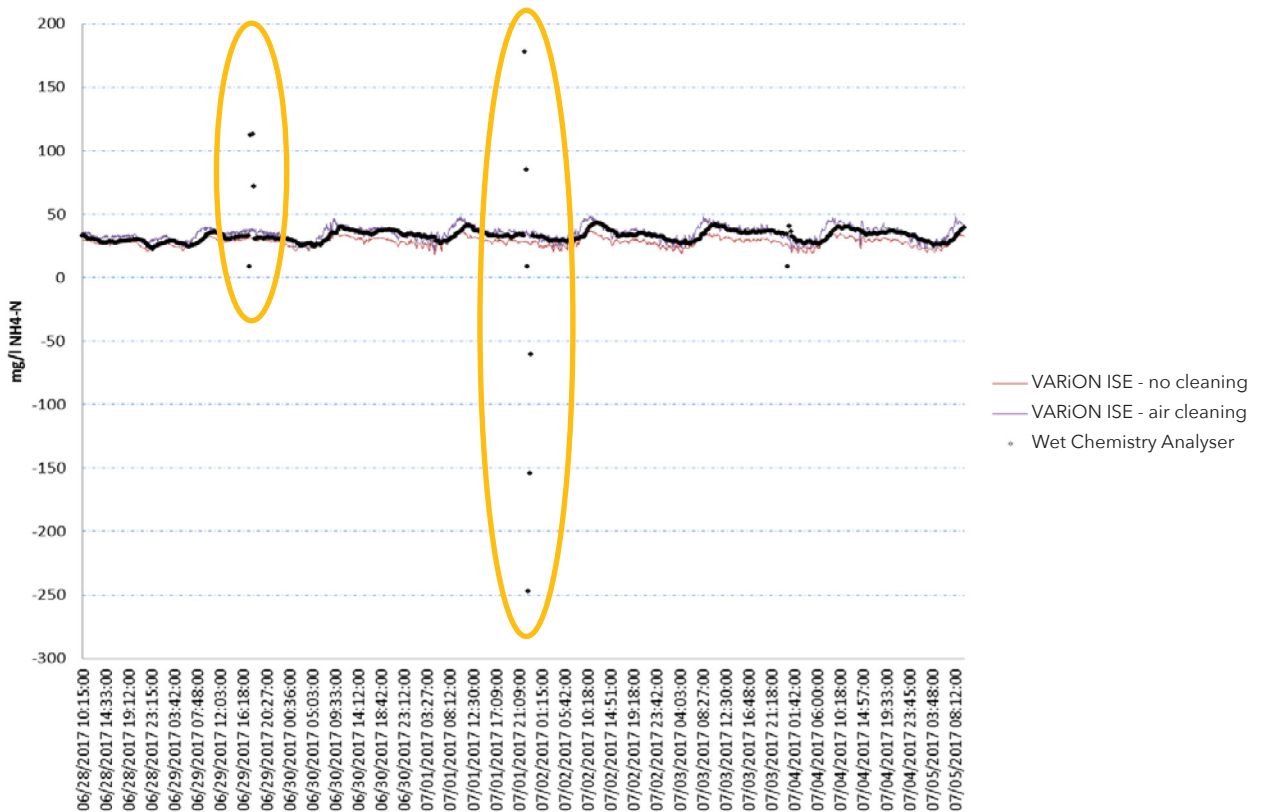


Figure 5. Week 5: WTW Trial VARiON ISE vs Competitor Wet Chemistry Analyser. Highlighted regions show unactionable analyser data (orange)

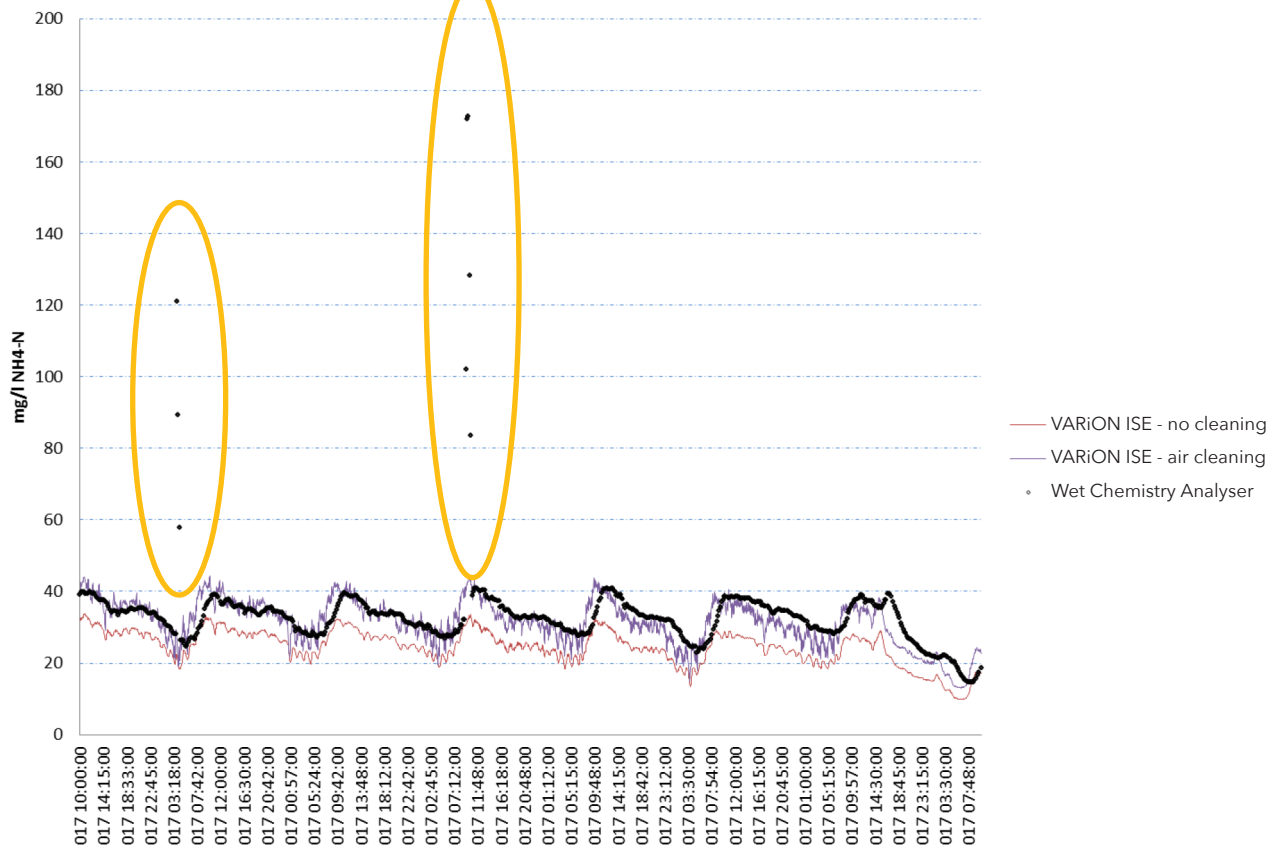


Figure 6. Week 6: WTW Trial VARIION ISE vs Competitor Wet Chemistry Analyser. Highlighted regions show unactionable analyser data (orange)

DATA ANALYSIS

As can be seen from the above data, it is the ISE sensors which have proven to be the most reliable, the difference between the two ISEs by the 6 week mark highlighting the importance of the air cleaning to the installation location. The wet chemistry analyser required two emergency service visits to correct major issues in week 2 and week 4 of the above data, and repeatedly produced unactionable data when operating in the intervening times, and during the first two weeks of the trial struggled to measure the diurnal load variation.

This data challenges the historical preference for wet chemistry analysers to assess the Ammoniacal loading of an ASP. Due the cost (both capital, installation and operational) of these instruments, a single measurement point at the inlet to the ASP has been the only commercially viable solution, with the assumption that the feed to each of the lanes in the plant will have the same hydraulic characteristics and therefore the loading will be identical. This is rarely the case and the differences between lanes can become more severe as the size of plant increases. These differences limit both the treatment efficacy achieved through control via a single measurement point and limit the efficiency savings which can be made through the availability of a larger volume of reliable and actionable data.

The improvements in ISE technology as evidenced in the data presented offer a number of key benefits. Whole life cost of ownership saving in comparison to the wet chemistry analysers is sufficient to enable the instrumentation of individual lanes for targeted feed-forward ammonia based dissolved oxygen control to become a viable commercial reality.

Utilising a combined Ammonium/Nitrate ISE sensor further enhances the offering and provides the opportunity for feed-forward led dissolved oxygen control to meet consent with a feed-back trim to save energy to be implemented with a rapid payback time for the customer. The reliability and stability of the ISE sensor coupled to stable, actionable data increases the payback by reducing plant energy usage and improves control efficiency without the requirement for costly service contracts, emergency service visits and extended periods of downtime (as seen with the analyser) where the plant must be run from recorded profiles or in hand, adversely impacting site OPEX.

“Good control is impossible without accurate and reliable data...”

ENHANCING POTENTIAL EFFICIENCY

The WTW IQ SensorNet system further enhances the potential efficiency through the networking of zones, lanes and even entire ASPs into a single instrumentation system. This is not limited to WTW sensors only but can also take in signals from flow and level sensors enabling visualization and provision of data from a single point on each lane or ASP. The reduction in cabling, both power and signal, offers further savings in both material and installation time. This is of particular benefit as plants move from analogue to digital communications systems.

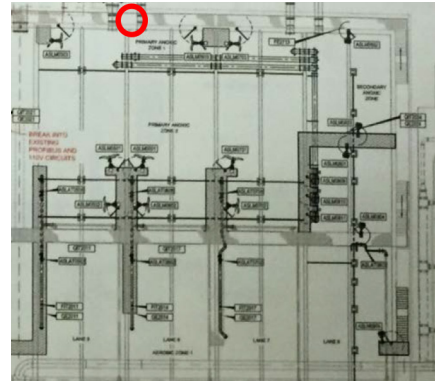


fig.7: location of single wet chemistry analyser on pre split inlet assuming identical loading across lanes.

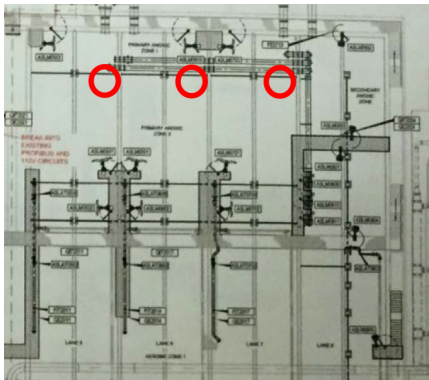


fig.8: locations of Ammonia ISEs enabling effective monitoring and feed-forward control on each lane.

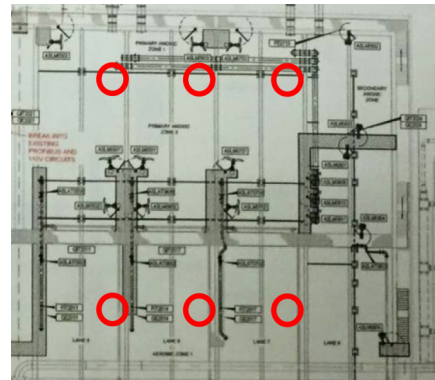


fig.9: locations of Ammonia ISEs enabling feed-forward control with feed-back trim on each lane.



IQ SensorNet 2020 3G

The IQ SensorNet 2020 3G is a modular water quality system for a complete sensor network ideal for various installation needs. The modular system can accept additional sensors easily at any time. This is a powerful system to continuously measure water quality parameters anywhere in a facility for process control.

Immediate benefits include better network visibility and management, early detection of network failures, improved compliance with regulatory targets and cost savings (energy, pump/blower maintenance, labor).

For further information, please contact:

Xylem Analytics UK Limited

2 Focal Point, Lacerta Court

Letchworth SG6 1FJ

United Kingdom

Website: www.xylemanalytics.co.uk

Email: salesuk@xyleminc.com

Telephone: +44 (0)1462 673581

Fax: +44 (0)1462 673582

Xylem Analytics UK manufactures environmental monitoring instruments and systems with a reputation for high levels of accuracy and reliability.

WTW, a Xylem brand, brings 75 years of knowledge and technical expertise in waste water instrumentation coupled to continuous innovation in performance and reduction of cost of ownership. This customer focused drive has resulted in market-leading sensors and systems for ammonium, nitrate, nitrite, turbidity, suspended solids, pH, conductivity, UVT, SAC and COD.

Xylem Analytics' experience in instrumentation, optimisation, system development and control enables them to select the best solution for your challenge, be it simple and discrete single sensor systems or a plant wide multi-parameter network. Local installation, commissioning, service support and training is also available through our dedicated engineering and projects teams.



Xylem Analytics UK | 2 Focal Point, Lacerta Court | Letchworth SG6 1FJ

Tel +(+44) 1462 673581 | salesuk@xyleminc.com

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