

Why a New Portable Turbidity Monitor is Revolutionising the Water Industry

Solving the Water Industry's challenges through innovation is vital if the water industry is to achieve OFWAT's tough targets to improve the quality of drinking water and reduce the number of customer complaints.

“*The NephNet offers a sustainable solution to meet the complex challenges currently facing the water sector.*”

As the emphasis on reducing turbidity in potable water increases and customers become less tolerant of discolouration, water professionals have become more motivated to look for new, reliable and effective methods to address water quality as a priority.

Following four years of research and development, one pioneering monitor has become the only solution available to water companies that can help achieve these targets and effectively monitor turbidity. With 95% of water companies now using the NephNet, ATi's Dr Michael Strahand looks at why this monitor has taken the industry by storm.

Customer Complaint Targets

The UK water industry has been targeted over the quality of drinking water supplied to the public, with 27 measures, including turbidity, put into place to improve water quality. OFWAT has applied high financial penalties to water companies who fail to keep complaints of discolouration to a set limit – a fine of up to £1,000 per complaint if water companies exceed their target. Based on the number of complaints water companies received last year, this could see expected fines reaching between £2-3 million if they don't meet their targets. In addition, this could also affect their share price and positions in the quality league table. Under the new rules, although fines can be applied to water companies who 'fail' to hit their target, they can also be rewarded for an improvement to the quality of the water provided.

Research & Development

For this reason, water companies are looking at how they can reduce the number of complaints from the public. The main causes of discolouration is the release of biofilm and entrapped inorganic material, such as iron and manganese being released from pipe walls, typically by changes in the flow and/or pressure in the system and air trapped in the network (see image 1). This gives a 'cloudy' appearance. Discolouration can be caused in many ways: sudden changes in pressure when the fire brigade connects to a hydrant; council staff with high pressure cleaning; valve operations when dealing with 'dead-legs' in the network; and leaks that can affect sudden changes in pressure. This alters the level of shear stress, hence releasing bio-film. Once the bio-

film reaches the consumer, a complaint is made and logged.

To help create a solution for this, ATi has spent the past four years working in close partnership with the UK Water Industry, in conjunction with internationally renowned PODDS Group at the University of Sheffield, to develop a monitor that would offer a sustainable solution to safeguarding water quality for consumers in this pioneering, pro-active area of distribution management.

The UK water industry detailed the pros and cons of the existing technology that was available at the time. It became apparent that the information generated was not sufficient or accurate enough for what was needed.

The main challenges were to produce a low powered, continuous sensor that was as accurate as the fixed system. It needed to be a safe source of power that was small enough to fit down a hydrant chamber, whilst also providing an informative GSM that could offer alarms via text and/or email for events.

ATi listened to what the water companies really needed out of a new system, and with the help of battery and telemetry experts, the NephNet was born.

NephNet – The Solution

The groundbreaking NephNet is now the only monitor available to customers that provides a complete solution for water companies (see image 2). It is the first battery powered, portable turbidity monitor that gives the same measurement performance as the more traditional fixed monitor, with no compromise on measurement.

The portable, battery powered monitor was created to assist the UK water industry with measuring continuous low level turbidity; to help to control the movement of water; provide a better understanding of the networks; improve the quality of data; and prove the effectiveness of flushing DMA in the network. The innovation behind this technology is to maintain the accuracy of the turbidity sensor, whilst reducing the demand for power. One of the main reasons that other similar systems failed was their sensors could not operate at low levels and they did not have the power needed for medium-long term deployment with regular, logging intervals.

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Figure 1



Figure 2

The NephNet offers a string of benefits to help water companies control network discolouration, including continuous remote monitoring of turbidity; better accuracy at lower levels; fast connection to water mains via hydrants; and wireless communications and alarms (see image 3).

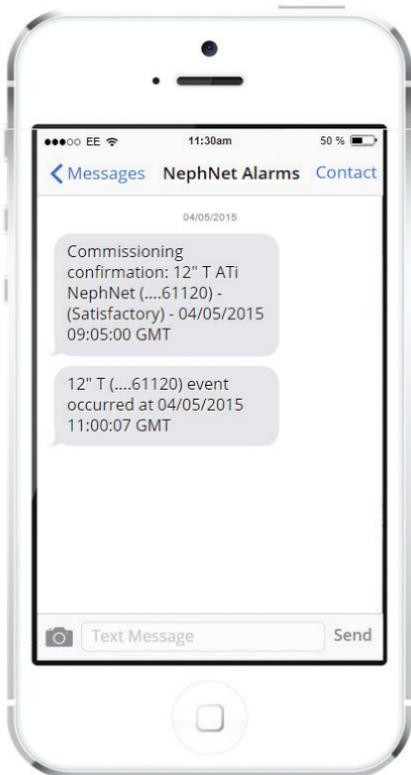


Figure 3

Network monitoring and flushing with NephNet

The benefits of continuous, accurate data has 'opened the eyes' of many water companies, who have previously struggled to understand the overall condition of their networks. In many cases, network engineers simply do not know the quality of their network. As only spot checks were available, there was a lack of information on why water quality differs so much within an area. Now that changes in water quality can be identified and tracked via the NephNet, the supply can be diverted where possible, and crucially, warnings can be sent out to customers to prevent complaints filtering through. If the NephNet is permanently deployed it can also allow water companies to track issues and identify where problems are occurring, enabling them to forewarn when any problems are likely to reach the customers.

The NephNet can also be used to control and monitor tactical responsive flushing and strategic operational maintenance. The latter can only be carried out if the measurement is continuous, accurate and reliable at low levels. Mains flushing can be costly and ultimately ineffective if there is no pre and post data to support the work. However, the NephNet can be used to prove how effective a flush has been, by continuously monitoring pre, during and post flush.

Before the NephNet, a spot test was often carried out to see how the water quality has improved after a flush. The reliability of such hand-held tests have not always been accurate, with readings being +/- 0.5 NTU (at best). With water quality usually around 0.2 NTU, such tests have often been classed as unproductive. However, the accuracy of Nephnet is the same as ATI's fixed turbidity monitors, with excellent resolution and accuracy at low levels, <0.100 NTU (see image 4).

Other benefits consist of location of dead legs; effectiveness of a valve operation; boundary box installations for complaints; locating unused water pipes; reducing the risk of injury to personnel who would previously take spot tests near busy roads/motorways; collecting risk data from proposed work and proving/disproving discolouration from other sources.

Accurate, First Class Results With Substantial Savings

The overall accuracy and reliability of the turbidity sensor used in the NephNet allows for better data acquisition. This data is being used to check the conditions of the mains pipework and allows for better forecasting. In many cases, proposed work on the network with flushing and re-lining is being reassessed,

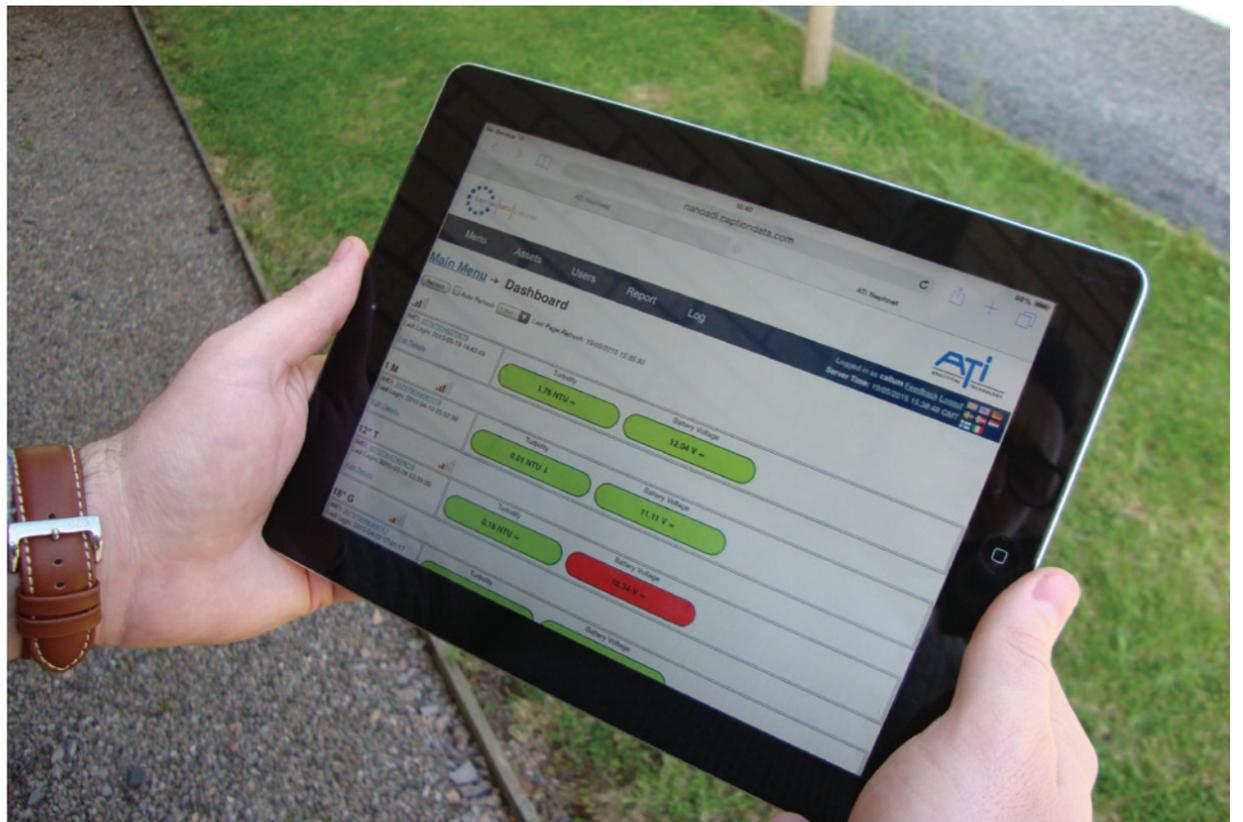


Figure 4

delayed or cancelled due to the level of accurate information. One other way in which the water companies are using this data is to prove or disprove the validity of complaints by the consumer.

Extensive field testing and evaluation has also demonstrated how the use of the NephNet allows huge savings when planning or carrying out flushing. One of the major water companies based in the south of England had identified a discolouration risk trunk main that they believed needed major refurbishment and possible relining. However the NephNet identified that this wasn't actually needed and instead the main was gradually cleaned by changing the flow, using turbidity as the control. This saved the water company a deferred cost of over £2 million and has resulted in a long term sustainable maintenance strategy. (Image 5)

Giving Customers What They Need

ATI continues to work in partnership with the water companies and the PODDS Group to tweak and adjust the NephNet where possible to make the water industry that little more slicker in operations. The demand for water quality will always have new set benchmarks. It is up to us, the manufacturers, to listen and innovate where and when necessary.

Revolutionising the Water Industry

Dr Stewart Husband, Head of the PODDS Group at the University of Sheffield, believes that innovation plays a vital part in providing solutions to the challenges faced by the Water Industry: "Advances in robust, high-precision and reliable network monitors is revolutionising water quality management in water distribution systems.

"Detecting variations in turbidity from remote locations in response to immediate changes in flow, using a portable instrument like the NephNet, has shown discolouration risk can be controlled simply and at low cost. Understanding network behaviour using these monitors, therefore allows operators to condition mains for resilience purposes, or long term maintenance to reduce customer complaints and safeguard against water quality failures."

Conclusion

The NephNet offers a sustainable solution to meet the complex challenges currently facing the water sector. It will ultimately help drive down complaints, increase water companies' credit ratings and result in pro-active network management to safeguard water quality for customer use.

The development of the NephNet has been a fantastic opportunity for ATI to work in partnership with water companies and leading researchers to develop a monitor that provides a solution for our customers for an ongoing and costly problem.

We pride ourselves on designing and manufacturing first-rate monitors and the results of the Nephnet speak for themselves, demonstrating our commitment to leading the way in innovation by being proactive, responsive and reliable in giving customers what they want and need.



Figure 5

NN nephnet

continuous battery powered turbidity
for network monitoring

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