



Fact Sheet 1 of 4 - Project 1075

Optimising Instrumentation for Better Process Performance

Module 1: Current knowledge

Background

The tightening of water quality guidelines, and utility based performance requirements in Australia is driving the need for improved data collection and process monitoring practices. Online monitoring provides significant advantages over traditional monitoring techniques in providing real-time water quality and process information to water utilities. Despite the popularity and potential benefits of online monitoring for risk reduction and improved compliance, implementation of online instrumentation remains a challenge at water utilities.

This project was developed as an industry collaboration to better understand, and begin to address, issues encountered by water utilities in using online instrumentation. It was separated into four modules focusing on key topics of interest.

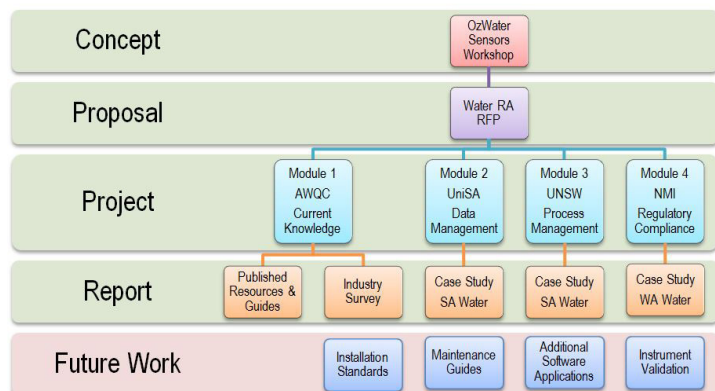
Published Resources and Guides

The literature review of online instrumentation focussed on four broad topic areas. These were

1. Identification of performance indicators and measurement issues,
2. Instrument maintenance issues,
3. Data management and
4. Regulation.

Literature was sourced in the form of existing guidance documents, journal articles and industry reports. The aim of this review is to summarise existing literature on the factors that can affect online instrumentation performance and data use, and tools that currently exist to improve optimisation of online monitoring systems. Discussion of the status of online instrument accreditation/standardisation is also provided.

Recent works on this subject area have identified the limited range of literature on these topics, as knowledge often exists in the form of industry specific experience rather than in published works. The information in this review is therefore supplemented with the findings of the Industry Based Survey completed by partner utilities at the project's commencement.



Module 1 of this project was allocated to capture a current Australian industry baseline from water utilities, instrument suppliers and research organisations across Australia with respect to online instrumentation applications. Information for this baseline was captured using two methodologies;

1. Published Resources and Guides - a standard literature review covering broad topics of interest, and
2. Industry Baseline Survey - a survey of industry representatives from water utilities, research institutions and instrument suppliers across Australia.

The key outcome of Module 1 was that knowledge gaps identified were subsequently used to shape the focus areas to develop the case studies for the project. The strategy and outcomes from this step are discussed within this module.

Knowledge gaps identified

- There is scope to develop formalised online instrument installation guidelines to improve online instrument performance and measurement accuracy.
- Due to known discrepancies between offline and online measurement of certain parameters, it may be appropriate to develop online calibration procedures for some instruments to better match operating conditions. Application of novel online parameters (e.g. COD, BOD) and online calculated parameters (e.g. C.t) may improve operational control, however case studies are required to document their success.
- There is a need for a more extensive range of data visualisation portals and tools for real-time data processing.

- Data management tools that can filter out/detect bad instrument data (created by instrument errors or environmental factors) will greatly improve data interpretation.
- Development of minimum performance criteria for online instrumentation, against which instrument manufacturers can demonstrate compliance, will make selection of fit-for-purpose online instruments much easier for utilities.

Industry Baseline Survey

The literature review found a limited body of published research related to online monitoring, but was able to provide a summary of the identified key topics of interest. It was concluded that the majority of relevant information on how online instruments are currently utilised by the industry was likely to only be available as un-published industry experience, prompting the development of the industry baseline survey.

The industry baseline survey was conducted by representatives from water utilities across Australia, including SA Water (SA), Allwater (SA) Water Corporation (WA), Seqwater (Qld), Sydney Water (NSW), Sydney Catchment Authority (NSW), Taswater (Tas) and Central Highlands Water (Vic). Additionally, industry suppliers were able to provide their perspective on current issues identified with online instrumentation (Hach, DCM Process Control).

Research module development

1. There is a need for a more extensive range of data visualisation portals and tools for real-time data processing.
2. Data management tools that can filter out/detect bad instrument data (created by instrument errors or environmental factors) will greatly improve data interpretation.
3. Although regulation of online instrumentation is not welcomed by the industry currently, there would be great benefit in developing standardised guidelines around online instrument installation and operation for optimisation of performance.

It was concluded that to produce extensive industry standards for online instrument installation and use was outside the scope/budget of this project. However further investigation into the role industry standards could play in online monitoring was further evaluated as part of the current work. The project similarly focussed on priorities 1 and 2, which also sat within the capabilities of the research team.

Key project outcomes and the way forward

The industry baseline survey indicated that although utility staff see the value of online instruments, a number of issues exist with their successful operation including:

- Being able to accurately interpret and visualise online data – existing data portals do not allow easy viewing of more complex online instrument data. Current industry data visualisation tools did not appear to meet the need for real time online data processing and management. The research team at the University of South Australia developed a customised online portal to allow the visualisation of complex data from an online UV spectrophotometer.
- Ability to detect bad instrument data in the event of instrument failure, error, or when operational conditions at the plant impact the quality of sample delivered to the instrument. There is no way to differentiate between online instrument responses that require action, and those that don't. Industry participants were particularly interested in detecting false positive/event responses in online turbidity meters, one of the most widely used online instruments at both water and wastewater plants. The University of New South Wales research team aims to conduct the development of a prototype Bayesian Belief model (BBN) to properly categorise and interpret online turbidity responses from a working treatment plant in South Australia.
- An absence of formal standards or regulation in Australia for the operation of online instruments, means utilities have limited guidance on instrument installation, selection and performance measures. The National Measurement Institute, with its extensive experience in this area, outlines how current laboratory QA/QC protocols, together with scientific and technical concepts from the international legal metrology framework, could be adapted to address industry concerns.

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