POLICY BRIEF

August 2018
The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

Drinking water quality process management & control

The Blue Drop Programme is a risk-based legislative programme for drinking water management in South Africa. While compliance to set drinking water quality standards (SANS 241) is a priority, water service authorities and institutions have to also ensure that the plant remains capable of consistently achieving regulatory performance requirements. As part of the Blue Water Audit requirements, water services authorities and institutions are required to conduct a process audit on an annual basis. This audit also informs the water safety plan. In the absence of a guideline, there are disparities in the interpretation of who can conduct a process audit, the scope of work to be undertaken and content of a process audit. A completed Water Research Commission (WRC) study considered these aspects and developed a set of guidelines on drinking water treatment process audits and plant optimisation.

Background

The provision and management of drinking water services in South Africa is guided by the Water Services Act (No. 108 of 1997). The Department of Water and Sanitation (DWS) is responsible for the regulation and monitoring of water services as stated in Section 62 of the same Act.

Four approaches are used by the Department for drinking water regulation: (1) compliance monitoring according to prescribed norms and standards); (2) punitive regulation (enforcement); (3) risk-based targeted regulation, and (4) incentive-based regulation. These approaches are applied either individually or in combination in order to facilitate improvement.

Currently, the Blue Drop Certification programme, an incentive-based regulation programme, provides the framework for drinking water quality process management and control. The programme also incorporates monitoring for compliance to drinking water quality standards (SANS 241) and is based on the water safety planning approach.

A water-supply system is awarded Blue Drop Certification according to the performance against set of Blue Water services requirements or criteria.

In one of the criteria, drinking water service authorities or institutions are required to conduct an annual process audit for each facility to ensure consistent performance against regulatory targets.

While the concept of a process audit is familiar to the South African water sector, content and format of the process audit report, as well as on who can be regarded as 'technically competent' remains problematic as this varies broadly in the sector. This creates problems when presented to the DWS for regulatory purposes as the report often falls short of the Department's requirements.

Clear guidance is therefore required on the requirement of process audits and also optimisation studies which naturally follow from this.

Compliance versus optimisation

A process audit aims to produce a compliant plant while an optimisation study aims to produce a 'smart' plant. As such a regulatory process auditor asks, "What can go wrong and what do we put in place to mitigate these risks to achieve compliance?", and during a process optimisation process, the question is, 'What can we do better than yesterday?"

However, regulatory compliance must always precede cost saving and process optimisation in general. The conventional approach would therefore be to invest in risk evaluation via the process audit route and mitigation of these issues prior to investing in optimisation.

Typical optimisation targets may include:

- Improved water quality compliance,
- Reduced operations cost as reflected in chemical and energy expenditure
- Reduced environmental impact as reflected in reduced water loss and sludge production and
- Improved production rates and income generation as

reflected in increased production rates and reduced water losses.

These are, however, not mutually exclusive exercises and, in a mature organisation, will exist side-by-side.

The Guideline framework

The guideline was compiled based on both international best practices as well as local practices and operational experiences in selected top performing water services institutions.

The resultant guideline provides a flow diagram which assists the user to understand process audits and plant optimisation in context and sequence to the municipal decision-making process.

The guideline addresses the treatment facility from the point of water abstraction to the first point of bulk distribution and makes reference to the latest version of the drinking water standard, SANS 241, where relevant.

The developed guidelines are intended to be used by skilled plant designers, senior process controllers, and decision-makers to inform decisions regarding the operation, maintenance and ongoing improvement of water treatment works.

It is expected that the process inspector has an excellent understanding and experience of water treatment processes, operation and maintenance requirements, management functions and has a good knowledge of the regulatory framework.

The guidelines offer an approach to be followed by self-assessors or process auditors who require a structured methodology to assess the performance of a plant, identify factors that detrimentally impact on the performance of the plant, and how to develop a response to those factors in such a way that plant performance is optimised.

The basic steps of the approach are as follows:

- Determine current plant performance levels against optimised/regulatory goals
- Determine if major unit process sizes are limiting performance
- Identify any aspects (other than unit size) of unit process design which limits performance
- Determine if operational practices are limiting performance
- Determine if administrative practices are limiting performance
- Determine activities to address factors that will improve performance
- Implement strategies and monitor performance to assess progress toward the identified goal.

After application of the Guideline document it is anticipated that the inspector will repeat the process on an ongoing basis to refine the risk management and optimisation approach. The system drives the continuous improvement effort at the plant.

Who can perform a process audit?

In terms of who can conduct an audit or optimisation, findings from this study indicated that some water service institutions require that a process auditor must be an engineer while others are satisfied if the inspector is a scientist or a professional process controller.

In many cases Blue Drop or Green Drop Audit training and experience is seen as an advantage. This aspect is not clearly stated in Regulation 5 of the Draft amendment regulations relating to compulsory National standards for provision of quality of drinking water.

Conclusion and recommendations

While the development of the guideline has clarified the basic approach and context for conducting process audits and plant optimisations, it has also assisted in identifying some weaknesses in the current regulatory framework for drinking water management in South Africa.

Below are recommendations on how these can be addressed:

Guidelines for conducting drinking water treatment plant process audits and optimisations as well as who can conduct audits

Regulation 5 of the Draft amendment regulations relating to compulsory National standards for provision of quality of drinking water needs to be amended as follows:

- Section 10: A WSA must ensure that water treatment processes are adequately managed to ensure the production of safe drinking water for the protection of public health, including: a) A process audit of the water works every year according to set guidelines; b) Inspection and process audit of the drinking water-supply system by a registered professional person every 5 years...".

Where, a registered professional person should be, "A person with the relevant experience on water services works and registered with ECSA or SACNASP". There should not be any ambiguity between the definition of a process controller and this professional referred to here.

If the required qualification and experience of a process auditor is not adequately defined, the risk is that this might attract open to poorly skilled persons to advise on matters that they are not adequately qualified to do. It is also necessary that a detailed and structured approach is developed, and possibly a scoring system, which can be used in the definition of competence in order to grade prospective process auditors so that water utility owners and consumers are assured that the services rendered, will be done in a professional and responsible manner.

Role of process controllers in the support of process audits

Process controllers play a critical role in the overall performance of a treatment facility and, in most cases, are the first persons to recognise a process risk or optimisation opportunity. They are also significant role players in the implementation of measures which follow from process audits and optimisation studies.

Development of benchmarks for operational and administrative functions

The current Municipal Benchmarking Initiative is inadequate for determining plant performance benchmarks. South Africa is in need of generally accepted benchmark definitions at plant level which will allow for a case-by-case assessment of the support afforded by administrative and management structures in a utility which will allow the specific plant to achieve optimum performance.

Associated project:
Guidance on drinking water treatment process audits and plant optimisation (K5/2578). For more information, contact Publications at Tel: (012) 761 9300, Email: orders@wrc.org.za or Visit: www.wrc.org.za.