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Service activities relating to drinking water supply, wastewater and stormwater systems — Guidelines for the implementation of continuous monitoring systems for drinking water quality and operational parameters in drinking water distribution networks

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 224, *Service activities relating to drinking water supply, wastewater and stormwater systems*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Cases of drinking water contamination around the world have raised awareness of water utilities' exposure to risk. Contamination can arise from many causes, including societal mishaps, errors in operation, maintenance or management by the water utility, natural disasters, vandalism, sabotage, criminality and terrorist activity. The distributed nature of drinking water systems makes them especially vulnerable to contamination and can permit the rapid dispersion of a contaminant. The velocities and volumes of water in a drinking water distribution network can result in contamination affecting significant numbers of users in a short time (e.g. tens of minutes). Recognition of these risks has raised awareness of the need to consider the use of continuous monitoring systems to rapidly detect potential contamination events.

The occurrence of an event can rarely be predicted. However, the more frequently relevant data can be collected and examined, the greater is the chance of quickly detecting an event's occurrence. This supports consideration of the adoption of continuous monitoring systems to provide the data streams that can be used in event detection.

A contamination event can make a waterworks or a drinking water distribution network unusable for a time and require implementation of contingency plans. Such plans could involve, for example, accessing an alternative source water or providing an alternative water service other than via the drinking water distribution network.

To date, very few water utilities have installed continuous monitoring systems either in part or throughout their drinking water distribution network(s). This situation can result from a rational decision based on risk assessment and, in some cases, a cost-benefit analysis. However, it should be acknowledged that circumstances can change – gradually over time or rapidly in the face of events. Water utilities wishing to explore such an option can face uncertainties and gaps in their knowledge on how to proceed. In such circumstances water utilities typically face three main challenges:

— which types of measuring devices (MDs) to install in each continuous monitoring station;

— how many continuous monitoring stations to install per drinking water system;

— where to locate the continuous monitoring stations in the drinking water distribution network in order to achieve the best results.

The installation of continuous monitoring systems could reduce the risk to public health and mitigate the impact on users and other stakeholders during a contamination event. The value of continuous monitoring systems can be determined using appropriate risk assessment and cost-benefit analysis. Such an evaluation should take into account existing controls and establish the additional risk mitigation that might be achieved and likely costs.

Advances in MD technology have recently made the adoption and deployment of continuous monitoring more practicable. MDs are not limited to the measurement of drinking water quality alone. Continuous measurement of operational parameters such as water flow and water pressure can improve the water utility's capability to interpret results from the measurement of drinking water quality.

This document provides water utilities, their contractors, consultants and regulators with guidelines for the installation of continuous monitoring systems in drinking water systems, including guidance on their appropriate selection, maintenance and optimal calibration.

These guidelines can aid a water utility's processes for risk assessment and cost-benefit analysis. Taken together these can help a water utility's top management take informed, risk-based decisions on the worthwhileness of investment in a continuous monitoring system.

The guidance provided in this document is intended to be universally applicable, regardless of the structure and size of a water utility's drinking water system. An event detection process (EDP) that relies upon grab samples and intermittent data inputs could be implemented at lower cost. However, where a water utility's assets, finances, management system and technical capability make it practicable, the ability to provide continuous data streams offers advantages for event detection.

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To gain experience, initial deployment could be limited to higher-risk areas within a wider drinking water system.

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Service activities relating to drinking water supply, wastewater and stormwater systems — Guidelines for the implementation of continuous monitoring systems for drinking water quality and operational parameters in drinking water distribution networks

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1 Scope

This document specifies guidelines for the implementation of continuous monitoring systems for drinking water quality and operational parameters in drinking water distribution networks.

It provides guidance for determining the:

— effective number of continuous monitoring stations in the drinking water distribution network;

— location of monitoring stations in the drinking water distribution network;

— types of operational and drinking water quality parameter measuring devices (MDs) that can be installed in a continuous monitoring station;

— quality control, maintenance and calibration requirements of the continuous monitoring system.

This document excludes guidance on the design, structure, number and type of MDs to be installed in a continuous monitoring system.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 24513, *Service activities relating to drinking water supply, wastewater and stormwater systems — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 24513 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
accuracy
measurement accuracy
accuracy of measurement
closeness of agreement between a measured quantity value and a true quantity value of a measurand

[SOURCE: ISO/IEC Guide 99:2007, 2.13, modified]

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