TGN9 - TREATED WATER STORAGE

Introduction

Distribution systems often include treated water storage structures in the form of Service Reservoirs (SR) and Water Towers (WT) to balance variation in demand and provide storage. These strategic points in the network are often appropriate locations for the provision of secondary chlorination, or other chemical adjustment to the water.

Weekly monitoring of SRs and WTs, when in supply, for bacteriological indicators and chlorine residual is a requirement of Water Supply (Water Quality) Regulations 2016 and their equivalents in the devolved administrations, hereinafter "the Regulations".

These structures are usually the last storage unit for potable water before it is distributed to consumers and are at additional risk as they are not pressurised and are a potential point for water quality deterioration, e.g. ingress, water age, malicious damage.

Appropriate design and operation of such structures are important factors for ensuring water quality is maintained.

Routine inspection and maintenance strategies are required to identify risks and necessary control measures to ensure that water quality does not deteriorate as it passes through these assets.

Contact tanks, clear water tanks, pump suction tanks and break pressure tanks are not classed as "service reservoirs" under the Regulations, however many of the following principles of Good Practice apply to all such treated water retaining structures and companies should ensure that appropriate operation and maintenance practices are applied.

Treated water storage tanks should be classified as restricted areas and all personnel involved in their inspection, cleaning and maintenance must hold valid a National Water Hygiene card (see Principles of Water Supply Hygiene Technical Guidance Note 1).

Good Practice

In developing their own policies, codes of practice or operating procedures for the management of treated water storage structures, companies should consider the following points:-

Security and Structural Integrity Issues

1. Structures should be designed:
    i. to prevent contamination through external ingress,
    ii. and managed to ensure that there is adequate turnover,
    iii. to allow access for cleaning,
    iv. to achieve a balance of hydraulic flow between compartments
    v. Structures must be designed, operated and maintained in accordance with the Reservoir Act 1975 and the Security and Emergency Measures (Water and Sewerage Undertakers) Direction 1998.

2. Facilities should be available to isolate the structure from service to allow continuation of supply e.g. bypass facilities, multiple compartments.

3. Overflow arrangements should be secured, designed and maintained to prevent introduction of contaminants and vermin (e.g. flap valves need to be maintained to

prevent sticking in the open position).

4. All materials used for construction, maintenance and repair (including membranes, sealants and associated apparatus which are likely to come into contact with treated potable water) must be approved under Regulation 31 of The Water Supply (Water Quality) Regulations 2016.

5. Access hatches should comply with the Water UK security specifications and be:
    i. kept to a minimum,
    ii. designed with concealed hinges,
    iii. designed to include devices to prevent contaminant ingress,
    iv. fitted with a watertight seal between the lid and supporting frame,
    v. self-venting,
    vi. installed with intruder alarms installed where necessary,
    vii. regularly inspected.

6. Vents screens should be constructed of corrosion resistant mesh designed and maintained to prevent access of insects and small mammals.

7. Redundant access hatches should be securely and permanently sealed.

8. Where secondary (booster) chlorination is considered necessary to maintain chlorine residual in the distribution system, dosing facilities should be flow proportional. Disinfection by-product risk should also be assessed.

9. Services including telemetry cables and sample pipes that may be a route for contamination should, as a minimum, be sealed with an appropriate elastomeric sealant to a depth that will prevent inadvertent raking out. Installing glanded entry plates inside reservoirs and tanks should be considered for all small bore entries such as cables and small bore pipes (e.g.:. sample lines).

10. Where structures are emptied to supply to enable inspection , care should be taken to prevent the mobilisation of any sediment entering the distribution system.

11. Prior to return to supply, arrangements must be made to ensure adequate disinfection and satisfactory water quality monitoring results are obtained.

12. On-site valves should be clearly marked with details recorded in site manuals and asset records.

Hydraulic Performance Issues

1. The retention time and hydraulic performance of treated water storage tanks can have a significant impact on water quality. Structures should be designed and operated to minimise the detrimental effects of water ageing. The following factors should be considered:
    i. Inlet and outlet pipes should be located, as far as is practicable, to minimise the creation of "dead spots" within tanks;
    ii. Common inlet/outlet pipes ("push/pull" systems) should be avoided as far as is practicable.
    iii. The operation of multiple-celled tanks should be optimised to prevent deterioration in one or more such tanks from hydraulic imbalances.

iv. Turbulent inflow improves mixing and prevents stratification leading to particle deposition.

Inspection, Maintenance and Cleaning Issues

The following Good Practice is provided in addition to any requirements that may be necessary under the Reservoirs Act 1975 and the Security and Emergency Measures (Water and Sewerage Undertakers) Direction 1998.

1. External and internal inspection of structures should be carried out at a frequency determined by individual risk assessment. Internal inspection should be carried out at a frequency not be greater than every 10 years.

2. Internal inspections should identify aspects which may impact on water quality, including a survey of internal surfaces and joints, a leakage drop test and roof integrity test. Remedial work should be carried out prior to return to supply.

3. Structures should be cleaned, disinfected and satisfactory sample results obtained prior to return to supply.

4. Sampling should routinely include analysis for bacteriological, physical and aesthetic parameters. Other parameters should be considered where additional contamination risks may have occurred during refurbishment and/or cleaning activities.

5. Where a structure is being filled or left standing during the return to service period, it must be configured such that flow out to the distribution system is prevented.

Sampling Issues

1. Sampling facilities should be installed to enable compliance with the water quality monitoring requirements of the Regulations.

2. Particular consideration should be given to achieving representative samples from multi-compartment structures and those with more than one outlet main.