

Information note on Regulation 5



Regulation 5

Regulation 5 of the Private Water Supplies (Wales) Regulations 2010 states that where disinfection forms part of the preparation or distribution of water, the relevant person must design, operate and maintain the disinfection process so as to keep disinfection byproducts as low as possible without compromising the effectiveness of the disinfection.

Disinfection byproducts (DBPs) are formed by the reaction of disinfectants with precursor substances. Natural organic matter (usually measured as total organic carbon) and inorganic matter (bromide) are the most significant disinfection byproduct precursors. All commonly used chemical disinfectants (e.g. chlorine, chlorine dioxide, chloramines and ozone) react with organic matter and/or bromide to varying degrees to form different disinfection byproducts. Other types of disinfection byproducts which may form include haloacetic acids, haloaldehydes, haloketones, chloral hydrate, haloacetonitriles, halogenated hydroxyfuranone derivatives, nitrosamines, chlorite, chlorate and bromate. The factors which influence DBP formation include:

- type and concentration of disinfectant used;
- concentrations of organic matter and other DBP precursors present in water presented for chemical disinfection;
- temperature;
- pH;
- contact time;
- length of a distribution network.

While a wide range of DBPs may be formed, the most commonly encountered DBPs are trihalomethanes. However, the levels of bromate where ozone is used and chlorite/chlorate where chlorine dioxide is used as a disinfectant will need to be closely monitored to ensure that the levels do not exceed the regulatory standards or the WHO provisional guidelines values.

Further factors that can contribute to elevated levels of DBPs include:

- a lack of, or poorly operated or maintained treatment process capable of removing organic matter (such as coagulation or filtration);
- operation of treatment processes outside their design criteria (e.g. excessive filtrations);
- accumulation of sediments in tanks/chambers or the distribution network;
- ingress into tanks/chambers or distribution network.

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Local authorities should encourage relevant persons to focus their activities to minimise the formation of DBPs on identifying and removing DBP pre-cursors and avoiding conditions that encourage the formation of DBPs (while ensuring disinfection itself is not compromised). The Regulations set a parametric value of 100µg/l for trihalomethanes (i.e. a group of four DBPs, namely chloroform, bromoform, dibromochloromethane and bromodichloromethane) and 10µg/l for bromate. In general there will be a need to control excessive dosing, and to remove or reduce chemicals which may act as precursors in the creation of DBPs. Specific actions that relevant persons can take to minimise the formation of DBPs are listed below. This list is not exhaustive and a significant body of scientific knowledge is available on the reduction of DBPs pre-cursors. Many of the activities below will also have beneficial impacts or should already be underway to ensure the safety and integrity of the water supply:

- ensure the adequacy of the treatment process to remove organic material;
- review of raw water intake management;
- optimisation of any pre-treatment stage including filtration (if present);
- optimise the disinfection process to ensure that the optimum disinfectant dose is used. However, care must be taken that the disinfection process is never compromised;
- assessment and review of disinfection chemicals used (e.g. ozone, chloramination, chlorine dioxide, UV etc);
- flushing and cleaning of distribution mains;
- implementation of a regular programme of cleaning out of any clear water tanks and/or service reservoirs.

Relevant persons must ensure at all times that actions taken to minimise DBP formation do not compromise the effectiveness of the disinfection process. Furthermore they must be able to demonstrate that the disinfection process is not only designed for the challenge present in the raw water, but also that it is operating within the design criteria of the treatment.

Regulation 5 also requires that the effectiveness of the disinfection process must be maintained and verified. This means that any disinfection process should be fit for purpose, and that the effectiveness of the process is able to be measured and evaluated. This may be through the use of online monitoring, regular sampling or other means.