



## Water In The Food Industry

### Introduction

The food processing industry uses a huge amount of water. In many foods, water is a major ingredient. In addition, water is used for cooking ingredients, such as vegetables and for cooling cooked foods. Water also plays a major role in cleaning both for preparing the appropriate dilutions of detergents, sanitizers, and disinfectants, and also for rinsing off the cleaning chemicals. Toilets and hand washing stations also need significant quantities of water. Good quality potable water is essential throughout the food and catering industries. To achieve this, there must be stringent water management throughout the food premises and this requires close monitoring. Ensuring and maintaining the quality of water and preventing its contamination at source and throughout its use are of paramount importance.

Water is a potential vehicle for the direct transmission of disease and continues to cause significant outbreaks of disease in both developed and developing countries. Water is just one route by which foods can be contaminated with pathogenic micro-organisms, foreign bodies or toxic chemicals. However, the volume of water used in the food and catering industries means that the potential risk to the consumer can be very high from poorly maintained water systems. In addition, poorly maintained water systems can be contaminated with pathogens such as *Cryptosporidium* and *Legionella*. These can pose a threat to the health and safety of the workforce and those in close proximity to the food premises.

Water companies supply good quality potable water with low levels (usually 0.2ppm) residual available chlorine). However, poorly maintained water systems can become polluted with micro-organisms, including faecal pathogens. Bacteria can multiply in water distribution systems, especially when water remains for a long time in storage tanks or pipes that are not used frequently. The problem will be even greater if the water system is not kept clean. The resulting microbiological contamination can then spread to other parts of the system and be transferred to food.

In addition to microbial contamination, water supplies can also be a source of chemical contaminants, such as heavy metals, pesticides, nitrates, and

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industrial pollutants. These chemical contaminants can be transferred from the process water into food.

Food and catering management must also be aware of the increasing cost of mains water. Good management of water usage and waste water can significantly reduce running costs. Water conservation and water recycling are closely related to water quality.

This document gives an overview of water management in the food and catering industry, including regulations and standards available to help the water consumer. It helps explain how companies can meet their obligations for ensuring water is of good quality and safe to use. In addition it briefly covers the general principles of using water efficiently. There will be further HIFs to cover specific areas of water usage in more detail.

### Regulations and Standards

The following legal instruments and associated documents provide the regulatory framework for the quality of drinking water supplies in England and Wales. Copies of all these documents are available on the Inspectorate's website.

**The Water Industry Act 1991 (the Act)** – the primary legislation which enables Regulations to be made and contains the duties of water companies and the powers used by the Drinking Water Inspectorate (DWI).

**The Water Act 2003** – primary legislation which, inter alia, designates the post of Chief Inspector of Drinking Water, gives greater autonomy to the DWI and contains amended provisions in respect of fluoridation

#### **Drinking Water Regulations applying to Wales:**

The Water Supply (Water Quality) Regulations 2010 (S.I. 2010/994 (W.99))

#### **Other legal instruments applying to Wales:**

The Water Industry (Suppliers' Information) Direction 2009 – made under the Act, specifies the format and timing of water companies provision of information to DWI.

**The Drinking Water (Undertakings) (England and Wales) Regulations 2000 (SI 2000/1297) as amended by the Water Supply (Miscellaneous Amendments)**

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**(England and Wales) Regulations 2010** [SI 2010/996] – relates to legally binding water quality improvement programmes to meet drinking water standards

**The General Food Regulations 2004** [SI 2004 / 3279 as amended] and **Council Regulation 178/2002**.

**Council Directive 98/34/EC The Technical Standards and Regulations Directive** - requires Member States to notify all new technical regulations when they are at the draft stage

**Security and Emergency Measures (Water and Sewerage Undertakers) Direction 1998**

**The Security and Emergency Measures (insert name of company) (Licensed Water Suppliers) Direction (insert year)** – this is a pro forma for a named licensee

**The Security and Emergency Measures (Water Undertakers) Direction 2006** – this updates the 1998 Direction in light of Water Act 2003 and provisions for licensees

There are a wide range of other useful documents on the science and practice of drinking water quality regulation from research reports through to industry best practice documents. All of these may be of assistance to water companies. DWI makes many of these available through its website ([www.dwi.gov.uk](http://www.dwi.gov.uk)) either directly or by links to other websites. For example:

Drinking water safety - Guidance to health and water professionals - [http://www.dwi.gov.uk/stakeholders/information-letters/2009/09\\_2009Annex.pdf](http://www.dwi.gov.uk/stakeholders/information-letters/2009/09_2009Annex.pdf)

World Health Organisation (WHO) Guidelines for drinking-water quality - [http://www.who.int/water\\_sanitation\\_health/dwq/guidelines/en/index.html](http://www.who.int/water_sanitation_health/dwq/guidelines/en/index.html)

The Government's response to the consultation on the amendment of the Water Supply (Water Quality Regulations 2000 held between 29 December 2006 and 31 March 2007. *This document updates Government's policy on drinking water quality.*



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The Private Water Supplies Regulations 2009 apply in England and came into force on 1st January 2010. These Regulations apply in relation to private supplies of water intended for human consumption; and for these purposes “water intended for human consumption” means—

- all water either in its original state or after treatment, intended for drinking, cooking, food preparation or other domestic purposes, regardless of its origin and whether it is supplied from a distribution network, from a tanker, or in bottles or containers;
- all water used in any food-production undertaking for the manufacture, processing, preservation or marketing of products or substances intended for human consumption.

**The BRC Global Standard for Food Safety Issue 5** states that “ All water used as a raw material in the manufacture of processed food, the preparation of a product, or for equipment or plant cleaning shall be supplied in sufficient quantity, be potable or pose no risk of contamination according to applicable legislation, either being drawn from the mains supply or suitably treated according to its source.’

### Water as an ingredient

Water is often a direct ingredient in food and drink. The quality of water can have significant impact on the safety, quality and taste of products. Although some operations use water treatment devices to ensure a safer and more consistent product, many use mains water and assume it has been adequately monitored, analysed and determined safe for human consumption. Mains water supplies can vary with regard to taste, odour and the presence of microbes. The food industry is global with products imported and exported daily. The global nature of the food industry further complicates control efforts since countries vary in their standards and practices. Raw water can be contaminated with pathogens, usually as a consequence of human or animal faecal material or run-off contaminated with faecal material. It can also be contaminated with a wide range of chemicals, both natural and anthropogenic, which are of concern under some circumstances depending on the concentrations present.

Contamination can arise in raw water or as a consequence of improper storage or pick-up of contaminants from distribution systems. It can also occur as a consequence of leakage from a dirty water system into a clean water system.

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In addition, the increasing pressure to optimise water use within food production facilities may result in the potential for contaminated water to reach food products.

It is, therefore, vital to minimise the risks and avoid unnecessary harm by ensuring that the necessary control measures are put in place, e.g. water safety plans and Hazard Analysis and Critical Control Point (HACCP). Water quality requirements are a function of the type of food, processing conditions and methods of final preparation in the home (cooked/uncooked). They are also dictated by the use of the water within a particular process or process. If the water is potable, then it is probably acceptable for all food contact uses. Potable may be defined as water that is wholesome or will not affect the wholesomeness of the food. This water should meet the requirements of local standards for safe drinking water or meet the requirements of the WHO Guidelines for Drinking-water Quality.

### Risks from water to food

Although the quality of the water is potable it can still contain micro-organisms which could cause subsequent problems in food. Examples of potential risks to the food industry are:-

1. The pathogens of concern may be different: Pathogens of faecal origin are generally considered to be the greatest threat to drinking water whilst other pathogens can be important in food-borne illnesses, e.g. *Bacillus cereus*, *Staphylococcus aureus*.
2. The growth of pathogens: Pathogens discharged into water sources do not normally multiply (with a few exceptions), but bacterial growth in food products can be an important factor in food-borne disease.
3. The uptake and concentration of chemicals and pathogens: Concentrations of chemical and microbial contaminants in drinking water sources are generally stable or decline with dilution, but the concentration of chemicals and some pathogens can increase in foods or on food surfaces, e.g. shellfish can concentrate chemicals or pathogens in their flesh to levels higher than the environment.
  - Some national standards for chemicals in drinking water may include allowances for exposures to the chemical that may not be relevant to food production/processing, e.g. skin absorption or inhalation from bathing or showering, although this does not apply to the WHO Guidelines.

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- Processing: Drinking water is often consumed without further processing, but water that enters the food cycle may be processed further (e.g. canning, cooking), which will reduce risk from pathogens.
- It is important that if a problem has arisen resulting in contamination and even product write off, the cause should be determined. If the water supply is responsible corrective action must be implemented. It is important to remember when establishing targets necessary to protect public health using risk analysis that risk is made up of two components: one is exposure, and the other is the severity of the hazard.

### Guidelines for safe use of water in a food processing site:

**Potable water** must meet the minimum requirements of Directive 98/83/EC. It may be drawn from the public mains supply network operated by a water company, or from a private supply, such as a borehole.

**Supply** - consider the need for adequate water supplies for food processing, cleaning and other requirements in the design and construction of premises or when buildings are rebuilt, altered or refurbished.

**Private supplies** - Where water is drawn from a private supply it may require disinfection treatment (e.g. filtration, ultra-violet light, or chlorination). Consult a water treatment specialist to help identify the most effective method.

**Capacity** - make sure that the water distribution system has sufficient capacity to meet demand at peak times (e.g. during cleaning).

**Water storage tanks** - should be made of inert material to avoid chemical contamination of water and corrosion. Keep tanks covered and secured to prevent contamination.

**Plans** - water distribution systems can be complex, especially in larger premises. Detailed plans will help to identify any redundant pipe work that could act as a reservoir of microbiological contamination and to define an area to be isolated if contamination occurs. Keep an accurate and dated plan of the potable and any non-potable system, including pipe work, point of entry of water into the premises and numbered outlets (see monitoring below). Update

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the plan if alterations are made. Plans must be submitted with applications for approval. Keep water distribution systems in good condition and maintained so that water does not become contaminated. Clean tanks regularly to prevent any build up of organic or mineral material that could act as a source of microbial growth and contamination. Even well maintained water distribution systems suffer from a build up of organic matter over time. To prevent this from affecting water quality, it is good practice to drain and clean the entire system at least annually as well as when any contamination incident occurs.

**Maintenance inspections** – carry out regular inspections of the water distribution systems for signs of damage, corrosion, leaks etc. The frequency of inspection will depend on the likelihood of a problem being found (once a month may be sufficient for well-designed premises that are kept in good order). Keep an accurate, dated report (e.g. in a maintenance notebook) of the date and result of each inspection and of any corrective action taken.

**Disinfection systems** – These can include filtration or other disinfection systems with ultra-violet light. They require maintenance e.g. filter systems need to be cleaned and/or changed regularly to maintain performance, and checks that the transmission of UV is maintained.

**Water softening** – in hard water areas water softening maybe applied to prevent the build up of scale and reduce the use of detergents. If used, keep water softeners in good condition, as micro-organisms can grow on resin beds and become sources of contamination.

**Training** – Operatives (and any contract cleaners) must be trained in good water management. This should include the use of potable water (including ice and steam if appropriate), to use only water from the correct outlets and report problems promptly. Quality personnel who take or test water samples also need to be adequately trained so that results are reliable. Supervise as appropriate and issue reminders if lapses occur. Keep accurate, dated records to show what instruction/ training individuals have received. Clearly identify potable and non-potable water systems and particularly water outlets to avoid misuse of non-potable water. See also 'Plans' above. Make sure there are no opportunities for non-potable water to enter the potable distribution system, for example, through syphoning back from a drain.

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**Ice** which comes into contact with food or which may contaminate food must be made from potable water; and handled and stored under conditions that protect it from contamination.

**Steam** used directly in contact with food is not to contain any substance that presents a hazard to health or is likely to contaminate the food. If steam is used for direct contact with food, make sure that it is generated from potable water, and does not contain potentially harmful contaminants.

**Delegation** – responsibility for applying and verifying the company's water supply procedures may be delegated to a nominated person who knows the layout of the water distribution system, to whom problems are reported, and has sufficient authority to ensure that corrective action is taken when necessary.

**Verification** – there should be regular management checks to see if company procedures are being followed regarding the supply and use of potable water; inspections and maintenance of the water distribution system, reporting of problems; and the results of microbiological testing.

**Frequency of verification** – this will depend on the likelihood of a problem being found. Once a month may be sufficient for monitoring experienced staff who are following well-known procedures and if water test results are satisfactory. More frequent checks may be needed if there are new operatives or procedures.

**Records** – keep an accurate, dated account (e.g. in a suitable notebook or on the computer) of the date and result of the periodic verification checks, test results and of any corrective action taken.

### **Mains water supply**

The water supplier is required to monitor the quality of mains water entering the premises. A copy of their test results can be obtained and should be held on file.

### **Mains water supply with intermediate storage tanks**

If mains water is stored in tanks before use and/or if the water distribution



system is complex and/or the system is old, it can become contaminated after entering the premises. Regular testing of water samples from cold or mixed hot/cold water outlets where the water could come into direct contact with food, food processing equipment, or food handlers, will indicate whether microbiological contamination is occurring on site or whether the water is potable. It is planned that the testing of water will be covered in a later HIF.

## Conclusions

Food producers and processors, and caterers need to ensure that the use of water in their premises is maintained to the highest possible standards. Water is used for many operations and all operatives and contractors must be adequately trained in appropriate water usage and the controls needed to ensure that water does not become a source of contamination. The contamination could result in the food being contaminated with pathogens, spoilage micro-organisms, chemicals such as heavy metals and tainting chemicals. There are many published guidelines which set microbial and chemical quality targets for potable water which should be referred to as indicated in this document. It is proposed to issue further HIFs covering water usage in specific applications in more detail, including testing water to ensure that it is of the highest quality.