The 6 steps to manage water quality in food industry

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Water is essential for life but in many cases is also a vehicle for human illness and even death. World Health Organization (WHO) estimated that contaminated drinking water causes 502,000 diarrhoeal deaths each year and at least 2 billion people consume and use drinking water contaminated with feces.

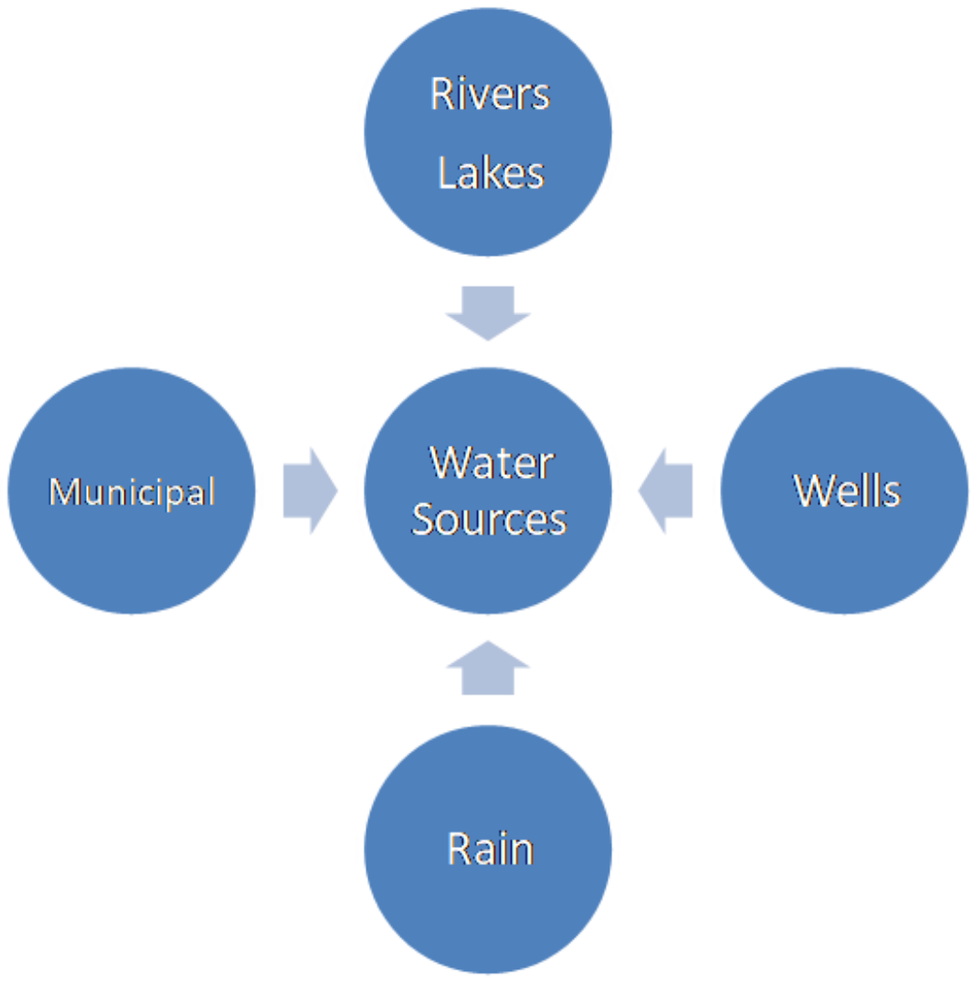
Although most prominently, it is mistaken thinking that diseases caused by water are exclusive to third world countries. This year, in the USA, two cases of Romaine Lettuce foodborne outbreaks are related E. Coli contaminated water. The first outbreak's investigation was declared final by June 28, 2018. 5 persons were reported as death cases and 96 as hospitalized cases. CDC Centers for Disease Control and Prevention is currently investigating the second crisis' source of the contamination and said, "the E.coli strain was found in an irrigation reservoir …. despite the announcement, other possible sources of the outbreak are still being investigated … As of December 13, 2018, 59 people in 15 states and Washington D.C. have been infected by the strain of E.coli."

There is no food safety system/standard or a guideline that does not include the need to manage water, from the Codex Alimentarius Code of Practices to SQF, BRC, IFS, ISO 22000, FSSC 22000. Additionally, in many countries, regional and state Water Boards enforce water quality management programs.

Here are the 6 steps you may consider when implementing a water quality control system.

1. Define sources and purposes

First things first! When planning for the development of a procedure to control water quality it is important from the start to define what are sources of water and the purpose it will be used for. In the diagram you can find some examples.



The source of the water is important to characterize “base” quality of water. When the source is municipal/city water it is often treated. In some countries you can even have access to their tests results (if so, ask for and retain those results). When the water is collected by the organization directly from rivers, wells, lakes or rain: a treatment must be in place and the organization must see itself as a water supplier operator and guarantee potable water at the point of entrance. Some of the most common options to treat water in the food industry are Chlorin, Ozon, Ultraviolet light, and Reverse Osmosis. In many cases, the food industry uses these treatments even when using a potable water supply.

Another important aspect is the intended use. Will it directly contact food products (e.g. ingredient, stem, ice) or not (e.g. cooling or heating)? In the case of steam and ice the cleaning and maintenance of the equipment that produces it shall also be planned, implemented and monitored. Water used in cleaning has also to be managed depending if it is for personnel hygiene (e. g. showers or hand washing), for cleaning non-food contact surfaces or food contact surfaces. It is also recommended to study how the water characteristics may influence the effectiveness of the cleaning agents.

2. Water system description

a) Water system diagram

The organization shall have a complete diagram of the water system.

Water system diagrams

- Site Map (regional with topography detail)
- Entry point(s)
- Treatments
- Back-flow prevention devices, filters
- Flow direction
- Distinguish lines from different sources,
- Sewage and wastewater lines
- Points of use

b) Amount of water needed (and pressure)

The organization shall assess and calculate its needs in volume of water and pressure. This is very important to guarantee that water is always available and with adequate pressure. I have witnessed situations in organizations where in some water consumption spike periods, water was not available in toilets or with very low pressure in cleaning areas. The volume of water needed is also detrimental to correctly design water treatments equipment (when used) or even sampling periodicity (see 5. b)

c) Amount of wastewater produced

The wastewater produced shall drain easily avoiding water accumulation. Therefore, the organization shall also evaluate the amount of water that is wasted daily to guarantee that is compatible with the draining capacity. In order to reduce the water consumption the organization should consider the possibility of reusing the wastewater.

d) Water pipe materials

The materials used in the pipes where potable water circulates shall be appropriate so that their components do not constitute a hazard by migration to water or introduce any kind of flavor or smell.

e) Drains and wastewater pipe materials

The organization shall guarantee that drains and wastewater pipe materials are appropriate and resistant to cleaning chemicals used during cleaning.

3. Manage documented information

a) Statutory and regulatory requirements

The organization shall search and retain all the statutory and regulatory requirements applicable according with the sources and purposes defined in point 1. Organizations shall comply with regional and country regulations and be aware of international codes or guidelines.

b) Maintenance planning

The water system shall be included in the organization maintenance plan including when appropriate:

- Pumps
- Water treatment equipment
- Water treatment consumable materials (lamps, filters, etc.)
- Back-flow prevention devices
- Hoses
- Water taps
- Water pressure equipment
- Water Quality Monitoring Devices
- Other water systems

c) Preventive and corrective maintenance records

Records from any maintenance in the water system shall be retained as evidence and to be considered in the continual improvement of the system (see 6). Examples of these situations can be repairing the chlorine injection pump or simple items such as a UV Ultraviolet lamp.

d) Water system verification (inspections)

At least annually the organization shall do a full inspection to the water system infrastructure including at least a pipe deterioration assessment, backflow prevention device operationality (consider pressure tests), water collecting infrastructure and their surroundings.

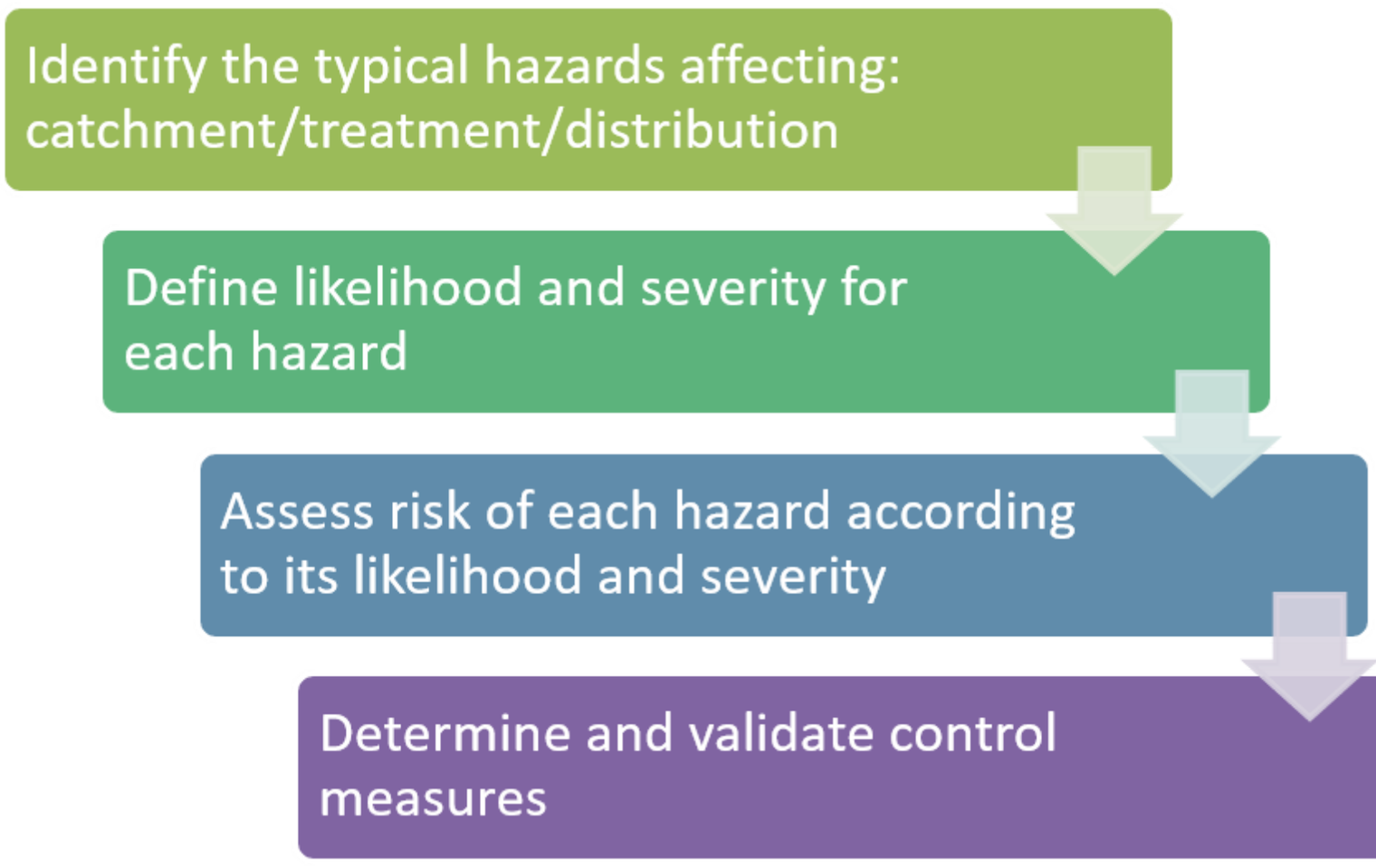
4. Risk assessment

a) Water Quality analysis (for each source)

As a starting point the quality of the water delivered or collected must be known. For that organizations must conduct/request analysis and research how the surroundings (e.g. pollution, soil contamination by agriculture/livestock practices) and soil constitution can affect water quality when collected by the organization. Organizations shall also take in consideration: variations on the water quality throughout the year’s seasons and seasonal human and animal activities (contamination, pollution).

b) Hazard analysis throughout the entire water system

To proceed to the hazard analysis of the water system the organization shall gather a multidisciplinary team to assess each and every processes step. This team may include external experts including trained personnel from the water supplier, water analysis laboratory or the water treatment equipment. EN 15975-2 provides an excellent guideline for water risk management incorporating elements from the Water Safety Plan - WHO. The approach, in essence, is very similar to the Hazard Analysis food safety professionals are used to do in HACCP.



5. Define monitoring program

(even if you are not using a 3rd party certified laboratory to test it, review their advice)

a) Define microbiological and chemical parameters and sampling (how to, frequency, where, and record keeping)

Based on statutory and regulatory requirements, code of good practices and other documentation (see 3), and expert advice the organization shall follow in respects to compliant parameters to monitor and the appropriate sampling. Installing some sampling ports should be considered as long as they do not introduce a hazard (e.g. stagnant water)

b) Establish an annual timeline monitoring form (and verification schedule)

In order to easily visualize what to do to comply with the water

quality monitor program it's advisable to develop, on an annual basis, a Timeline containing what to monitor (parameters), where to monitor (places), when to monitor (day/week), and who is responsible for sampling and analysis (take corrective actions).

c) Retain similar information (complete lab analysis reports) when using an external laboratory

When the water monitoring control plan is developed and managed by another organization (e.g. external laboratory) the organization shall nevertheless retain the information necessary for a. and b.

d) Communicate results

According to the local regulatory requirements the organization may have to share the results of the water monitoring control plan with official authorities and/or inside the organization.

6. Continuous improvement

a) Who monitors results

The responsibility for receiving and analyzing all results from the monitoring program must be defined so that any nonconformity or trend to nonconformity can be detected and reported. This person shall have appropriate competence/training and ideally be a member of the team defined in 4 b.

b) Who analyzes nonconformity

If any nonconformity is identified it must be addressed promptly and by a person that has competence to do it and defined responsibility/authority to initiate corrections and corrective actions.

c) Have in-place effective corrections in the case of nonconformity

The organization shall define actions to conduct in the case of nonconformity. When detected the organization shall be prepared to implement corrections. This means that it shall consider in advance at least:

Persons	Actions	Options
• To be notified (Internal and external) • External expertise necessary	• Segregate unsafe product	• Keep operations at work • Other sources of potable water

d) Risk assessment re-evaluation and improvement

The organization shall at least annually re-evaluate the water system risk assessment (see 4). Results for monitoring procedures, inspections to the system or laboratorial analysis and their trends shall be used to assess the efficacy of the system and to identify necessary improvements. Procedures shall be in place to regularly verify new statutory or regulatory requirements.

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