RESEARCH ON THE MONITORING ACTIVITY IMPROVEMENT OF THE WATER QUALITY FROM FOOD INDUSTRY

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Abstract

The provision of safe drinking water is one of the most important steps that can be taken to improve the health of a community by preventing the spread of water-borne disease. The maintenance of a sufficient supply of wholesome drinking water is a complex undertaking in which individuals from many disciplines have a role. Potable water supply is a target of interesting in the context of occurrence and development of new human settlements or expansion of existing ones.Central water inputs have currently achieved for entire communities or localities chains with water derived from sources localized sometimes at hundred of miles away.

The goal of the paper is increasing food safety through the improvement of the drinking water quality used in processing and distribution of food products. In this context is necessary to provide water that is safe and adequate from the perspectives of technological requirements in every stage of food processing/distribution.The public health importance of using drinking water in food industry and the implications of the sanitary conditions of the food units on the water quality will be discussed within this paper.

Keywords: monitoring, water, quality, food industry.

INTRODUCTION

Freshwater is a finite resource, essential for agriculture, industry and even human existence. Without freshwater of adequate quantity and quality sustainable development will not be possible. Discharge of toxic chemicals, over-pumping of aquifers, long-range atmospheric transport of pollutants and contamination of water bodies with substances that promote algal growth (possibly leading to eutrophication) are some of today's major causes of water quality degradation.

Water quality monitoring is the foundation on which water quality management is based. Monitoring provides the information that permits rational decisions to be made on the following: describing water resources and identifying actual and emerging problems of water pollution, formulating plans and setting priorities for water quality management, developing and implementing water quality management programmes, evaluating the effectiveness of management actions (Bartram J., Ballance R., 1996).

Concepts of total quality management and quantative risk assessment are increasingly being used to assure safe drinking water. Drinking water is often collected at springs, extracted from artificial wells in the ground, or pumped from lakes and rivers. Building more wells in

adequate places is thus a possible way to produce more water, assuming the aquifers can supply an adequate flow. Other water sources include rainwater collection. Water may require purification for human consumption. This may involve removal of undissolved substances, dissolved substances and harmful microbes. The drivers to improving water efficiency in industry can be roughly classified into three types: economic, environmental and technological (Terrell and Holmes, 1994), whereas the barriers also include elements dealing with safety, legislation, perception, collaboration and communication.

Water supplied to the factory may differ in quality according to its different routes through the environment. In most cases, the source water for the food industry is the potable supply from the water main. Depending on the quality of the water and the technical requirements for use, this water may be further adjusted to suit different needs such as removal of colour, softening or the addition of chlorine to minimise the count of potential spoilage microorganisms or the use of UV radiation, e.g., to disinfect stored water directly before use as an ingredient (Griffiths, 1998; Dawson, 1998).

The aim of the control monitoring is to produce periodical informations about the organoleptical, chemical and microbiological quality of potable water, about the efficiency of the treatment technologies, in order to determine if the values of the quality parameters of drinking water are according to the norms. In this context, the research focus on the monitoring of the quality of water used in food industry in order to achieve health and hygiene control, food security and for certification of hygienic quality of water according to the norms.

MATERIAL AND METHODS

The research was done in 2014, in two food processing factories. The monitored food units are placed in Bihor County. Following the visits made at the two food units (milk and meat processing factories) were obtained information on the monitoring activity of the quality of drinking water used in different stages of food processing.

A monitoring programme document should begin with a clear statement of the main objectives and a complete description of the area in which the monitoring is to take place (Bartram J., Ballance R., 1996).

The main objectives of the monitoring programme of the water quality in the two food units are:

- identification of water supply sources in the monitored food units;
- inventory of the main uses of water and technological study of water consumption;

● determination of the quality parameters of potable water used in the monitored food units.

RESULTS AND DISCUSSION

Water use is a part of the food-processing industry and it has become the principal target for pollution prevention, source reduction practices (unido.org). Traditionally, the food-processing industry has been a large water user. In the monitored food units from Bihor County, the water is used as an ingredient, an initial and intermediate cleaning source, an efficient transportation conveyor of raw materials, and the principal agent used in sanitizing plant machinery and areas.

The milk factory has a central source of water supply while the meat processing factory present underground source of water supply represented by drilled wells.

Table 1

Typical rates for water use for various food industries

Industry	Range of Flow gal/ton product
Fruits and Vegetables	
Green beans	12,000-17,000
Peaches and pears	3,600-4,800
Other fruits and vegetables	960-8,400
Food and Beverage	2,400-3,840
Bread	480-960
Meat packing	3,600-4,800
Milk products	2,400-4,800

In dairy industry the water is used at washing machines and products containers, preparation of syrup for sugar products and preparation of sodium chloride solutions for cheese. Washing water must be bacteriological pure, and to not contain ferruginous, lime sulfur-oxidizing or sulpho-reducing bacteria. For washing or disinfection the water is used generally after clorigene substances were previously added.

The water used in meat industry must be transparent, colorless and without taste and odour. Total hardness values must not exceed 28 german degrees and the calcium concentration must be smaller because may favor a brown color of products and irron must not exceed 0,05 mg/l. Suspended materials including organic substances and bacteria that cause degradation of this organic susbtances must be completely removed from water before utilisation. The choice of the water supply sources is a result of the studies concerning the flow, the quality of water needed by consumers and economical efficiency of the investments.

The water used in the technological processes of the food industry must correspond to features that ensure the quality of food products, must be potable and is important to present organoleptic characteristics according to the norms.

The monitoring and assessment of water quality is based, ultimately, upon the fundamental physical, chemical and biological properties of water. Water samples for complete chemical analyses should collected at least once a year and submitted to a recognized water testing laboratory. Both microbiological and chemical parameters should be tested. Chemical tests should include pH, water hardness, heavy metals, pesticides, iron and nitrates (table 2).

However, water quality monitoring and assessment is a process of analysis, interpretation and communication of those properties within the wider context of human activity and use, and the conservation of the natural environment (Bartram J., Ballance R., 1996).

Table 2

Standardized methods of determination of the potable water quality indicators

Analysed indicators	Method of analysis
Taste and odour	SR EN 1622-2000
Colour	SR 7887-2002
Turbidity	SR EN ISO 7027-2001
Nitrites	SR EN 26777/C91-2006
Nitrates	SR ISO 7890/1-1998
Total hardness	SR EN ISO 6059-2008
PH	ISO 10523-1997
Residual chlorine	SR EN ISO 7393-2/2002
Total number of microorganisms	SR EN ISO 6222-2004
Faecal streptococcus	SR EN ISO 7899/2-2002
Coliforms	SR EN ISO 9308/1-2004

The bacteriological examination of water is particularly important as it remains the most sensitive method for detecting faecal and, therefore, potentially dangerous contamination (table 3).

In Romania, the procedure for the quality of potable water monitoring is cariied out in all cities, however, the number of analysed parameters is very limited in many places because the monitoring focuses in particular on the microbiological parameters with epidemiological risk for the public health.

In addition to the quality parameters of drinking water as provided in the previous legislation, it is necessary to monitor other parameters but for this are necessary facilities with equipment and specialized personnel in order to obtain sufficient data to determine their incidence in the drinking water. Also recorded frequently in some places many breaches of important parameters with the meaning in the context of public health. Treatment plants do not have adequate technology for the water quality in the source.

Evaluation of treatment technologies in the wastewater treatment plants of our country is an objective in the making at the level of local

authorities in the framework of compliance required by the norms in force. Concrete efforts are directed towards european recognition of water laboratories.

Table 3

Standard normative utilised for the microbiologycal analysis of drinking water (www.asro.ro)

Nr. crt.	Romanian Indicative Standard	Title	Method
1	SR EN ISO 6222:2004	Water quality. Total number of microorganisms.	Water quality - Enumeration of culturable micro-organisms - Colony count by inoculation in a nutrient agar culture medium and incubation at 22-36^{0}C.
2	SR EN ISO 9308-1:2004	Water quality - Detection and enumeration of Escherichia coli and coliform bacteria - Part 1: Membrane filtration method	Membrane filtration method CMN Endo, incubation at 37^{0}C, 24 h.
3	SR EN ISO 7899-2:2002	Water quality - Detection and enumeration of intestinal enterococci - Part 2: Membrane filtration method	Membrane filtration method, CMN Azid, incubation 24-48 h, at 37^{0}C.
4	SR EN ISO 12780:2003	Water quality. Detection and enumeration of *Pseudomonas aeruginosa*.	Membrane filtration method, CMN Cetrimid, incubation 48 h, at 37^{0}C
5	SR EN ISO 6461-2/A-99:2002	Water quality. Detection and enumeration of sulphite-reducing clostridia and *Clostridium prefringens*	Membrane filtration method, CMN agar with sulfit, 48h, at 37^{0}C

CONCLUSIONS

In our country it is necessary to provide an assessment of the existing situation concerning the identification of the risk points for the drinking water quality, the establishment of technical solutions to reduce or eliminate the risk of non-compliance and the development of measures designed to bring about improvements in the technology of drinking water quality monitoring in our country.

Informations gained over time through the quality of water monitoring will provide a comprehensive image on the quality of any particular source of water eliminating any suspicion regarding its quality degradation.

ACKNOWLEDGEMENT

This paper has been financially supported within the project entitled ***"Horizon 2020 - Doctoral and Postdoctoral Studies: Promoting the National Interest through Excellence, Competitiveness and Responsibility in the Field of Romanian Fundamental and Applied Scientific Research",*** contract number POSDRU/159/1.5/S/140106. This project is co-financed by European Social Fund through Sectoral Operational Programme for Human Resources Development 2007-2013. **Investing in people!**

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