

codex alimentarius commission

FOOD AND AGRICULTURE
ORGANIZATION
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WORLD HEALTH
ORGANIZATION

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON FOOD HYGIENE

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DISCUSSION PAPER ON PROPOSED DRAFT GUIDELINES FOR THE HYGIENIC REUSE OF PROCESSING WATER IN FOOD PLANTS

(Prepared by the United States of America with the assistance of Australia, Netherlands,
India, Germany, France and the International Dairy Federation)

BACKGROUND

The need to conserve water through reuse is crucial given the finite nature of this resource and increasing demands for its use in domestic, agricultural and manufacturing activities.

The 29th (1966) Session of the Codex Committee on Food Hygiene (CCFH) noted that there are significant hygiene implications in the reuse of food processing water. The Committee noted that the practice of water reuse is increasing and that guidelines on the reuse of processing water would be helpful. The Committee requested the United States, with the assistance of Australia, Netherlands, India, Germany, France and the International Dairy Federation (IDF) to develop a Discussion Paper for review at the Committee's 30th Session.¹ The 22nd Session of the Codex Alimentarius Commission (CAC) approved the new work.²

At the 30th (1997) Session of CCFH, the United States introduced a Discussion Paper on the subject.³ The Committee agreed to circulate the paper for government comments, particularly with a view towards obtaining further information on specific water reuse practices.

A revised Discussion Paper was considered at the Committee's 31st (1998) Session.⁴ The Delegation of the United States proposed to incorporate the Guidelines into the *Recommended International Code of Practice: General Principles of Food Hygiene* (CAC/RCP 1-1969, Rev. 3) as an Annex and also indicated that the title of the document should be more general and refer to "reuse" rather than to "recycling". The Committee discussed whether to develop general guidelines or to develop sections on water reuse in specific commodity codes. It was proposed to follow these

¹ ALINORM 97/13A, paragraph 66.

² ALINORM 97/37, paragraph 130, Appendix IV.

³ ALINORM 99/13, paragraphs 93-95.

⁴ ALINORM 99/13A, paragraphs 72-76.

two approaches simultaneously and that the opinions of Codex commodity committees would be requested on this issue in view of their expertise. The Committee agreed that the discussion paper should be further developed by the Delegation of the United States with the assistance of its drafting partners and considered by the Committee at its 32nd Session.

PROPOSED APPROACH

Based on the recommendation of the Committee to simultaneously develop general guidelines for water reuse and to develop sections on water reuse for specific commodities, this Discussion Paper proposes the development of a set of general guidelines for the hygienic reuse of water in food manufacturing plants that would be incorporated into the *Recommend International Code of Practice: General Principles of Food Hygiene* as an Annex. Further, that additional commodity specific provisions for water reuse, if needed, could be incorporated into individual commodity codes of hygienic practice. Such an approach would be consistent with the manner of constructing Codex codes of hygienic practice in which hygiene provisions applicable to food in general are incorporated into the *Recommend International Code of Practice: General Principles of Food Hygiene* and provisions unique to a given food commodity are placed in individual codes of hygienic practice.

It is further proposed that the reuse of both reclaimed and recycled water be included in this document.

Attached as Annex A is a proposed set of general guidelines for the hygienic reuse of reclaimed and recycled water and appropriate definitions.

Attached as Annex B, for informational use only in order to indicate how additional product specific guidelines for water reuse might be developed, are examples of additional commodity specific guidelines. Such commodity specific guidelines would be supplemental to those in Annex A and be incorporated into specific individual Codex commodity codes of hygienic practice.

RECOMMENDATION

The Committee is invited to consider the proposed approach to the development of guidelines for the hygienic reuse of water in food manufacturing plants with a view towards developing such guidelines. The Committee is also invited to consider the appropriateness of the proposed general guidelines as given in Annex A.

ANNEX A

PROPOSED GUIDELINES FOR THE HYGIENIC REUSE OF WATER (INCLUDING RECLAIMED WATER) IN FOOD MANUFACTURING PLANTS**1. INTRODUCTION**

These guidelines describe general hygienic practices to be used when water is reused in a food manufacturing process. Reused water includes both recycled and reclaimed water. These guidelines anticipate that water reuse practices would include, but would not necessarily be limited to the washing of product, the movement of product, the cleaning of equipment and food processing facilities (including floors, walls and ceilings), and the generation of steam for multiple purposes including direct or indirect contact with product. The reuse of water may also include its subsequent re-incorporation into product.

These guidelines are to be used in conjunction with the *International Recommended Code of Practice: General Principles for Food Hygiene* (CAC/RCP 1-1969, Rev. 3). Further, additional guidelines that are commodity specific may be found in individual Codex codes of hygienic practice.

2. SCOPE

These Guidelines apply to water that is used in or obtained from a food processing operation and is subsequently reused in a food processing operation as reclaimed and/or recycled water.

3. DEFINITIONS

Reuse: The recovery of water from a processing step, including from the food component itself; its reconditioning treatment, if applicable; and its subsequent use in a food manufacturing operation.

Reconditioning: The treatment of water intended for reuse by means designed to reduce or eliminate microbiological, chemical, and physical contaminants, according to its intended use.

Recycled water: Water, other than first use or reclaimed water, that has been obtained from a food manufacturing operation and has been reconditioned when necessary such that it may be reused in a subsequent food manufacturing operation.

Reclaimed water: Water that was originally a constituent of a food, has been removed from the food by a process step, and has been subsequently reconditioned when necessary such that it may be reused in a subsequent food manufacturing operation.

Reused water: Recycled and reclaimed water.

Food manufacturing operation: Any operation intended to clean, sort, process, or package a food product or its ingredient(s) including the cleaning of equipment and facilities.

4. GUIDELINES

4.1 Prior to first use at the processing plant, water must meet the applicable requirements of the official body having jurisdiction. Some sources of water may make treatment of water necessary before first use in food processing.

- 4.2 Reuse water shall be safe for its intended use and shall not jeopardize the safety of the product through the introduction of chemical, microbiological or physical contaminants in amounts that represent a health risk to the consumer.
- 4.3 The principles of HACCP apply to water reuse. The use of HACCP principles in the identification, evaluation and control of potential hazards resulting from water reuse is a recommended method to manage the use of this important resource.
- 4.4 Reuse water should not adversely affect the quality of the product. The application of reuse water will determine its suitability for quality (flavor, color, texture) purposes.
- 4.5 Both the sources of water and/or the prior condition and the intended reuse of water dictate the degree of reconditioning and frequency of monitoring necessary. More critical applications may require greater levels of reconditioning than less critical uses.
- 4.6 Reuse water intended for incorporation into a food product shall at least meet the microbiological and, as deemed necessary, chemical specifications for potable water.
- 4.7 Reuse water shall be subjected to on-going monitoring and testing for appropriate analytes to ensure its safety and quality. The frequency of monitoring and testing are dictated by the source of the water or its prior condition and the intended reuse of the water; more critical applications normally require greater levels of reconditioning than less critical uses. The HACCP system should be used to determine the frequency and type of monitoring and testing; reconditioning to a higher level of water quality (e.g., potable) will normally require more frequent monitoring/testing.
- 4.8 Unless reconditioned to potable water quality, distribution of reuse water should be in systems separate from the distribution lines for potable water and distinguished by differently colored piping and outlets; cross contamination by backflow, back-siphonage, or cross-connections from reuse water systems shall be prevented.
- 4.9 Reuse water shall be introduced into a processing system such that it will not add to the microbiological or chemical burden of the product.
- 4.10 Water from sources that are in contact with or include human or agricultural sewage should normally not be upgraded for use in product formulations or other direct or indirect contact with final food products.
- 4.11 The water treatment system(s) chosen should be such that it will provide the level of reconditioning appropriate for the intended water reuse. For example, UV disinfection as the sole treatment is not appropriate for water that is turbid or contains particulates because the organisms in the shadow of particles or entrained within particles are protected from the lethal effects of the irradiation.
- 4.12 Proper maintenance of water reconditioning systems is critical. For example, filter systems can become sources of bacteria and their metabolites if bacteria are allowed to grow on the entrained organic materials removed from the incoming water; proper maintenance and testing is needed to ensure the absence of this situation. Proper application of HACCP will ensure proper maintenance of water reconditioning systems.
- 4.13 Extremely large volumes of reuse water may justify the use of an advanced waste water treatment system; such systems may incorporate one or more processes such as filtration, denitrification, phosphorus removal, coagulation-sedimentation, and disinfection.
- 4.14 Treatment of water must be undertaken with knowledge of the types of contaminants the water may have acquired from its previous use. For example, the use of UV irradiation on water that may have acquired protozoa and similar organisms, helminths or virus pathogens may be

ineffective for killing or inactivating them. Similarly, the use of chlorine or ozone on organically enriched water may result in the formation of hazardous organic compounds.

4.15 Reuse water storage vessels, if used, should be properly constructed of material(s) which will not contaminate the water and should allow for periodic cleaning.

ANNEX B**EXAMPLES OF POSSIBLE ADDITIONAL GUIDELINES FOR WATER REUSE IN INDIVIDUAL COMMODITY TYPES**

The following examples are for informational use only. They provide examples of additional guidelines for water reuse, supplemental to those in Annex A, that might be incorporated into specific individual Codex commodity codes of hygienic practice.

1. EXAMPLES ASSOCIATED WITH THE MEAT AND POULTRY PROCESSING**1.1 REUSE OF COOK OR CHILL WATER**

Potable water which has been used as a medium to cook or chill imperviously packaged ready-to-eat meat and poultry products may be reused providing that it has been reconditioned to be free of pathogens. It is recommended that the processor adopt performance parameters used in appropriate monitoring and testing programs to assure that the water is maintained to be free of pathogens. Appropriate performance parameters may include temperature control, microbiological tests (total plate count, total coliforms, fecal coliforms) and physical criteria (particulate levels).

1.2 RECIRCULATION OF WATER USED TO WASH RAW MEAT AND POULTRY PRODUCTS

Water used to wash raw meat and poultry may be reused in certain specific practices where the reused wash water does not raise the level of product contamination. Typical examples may include hog dehairing systems, and poultry and gilet chilling systems. It is recommended that the processor adopt appropriate performance parameters and control measures to maintain these systems. This would encompass reduction of microbiological buildup, limiting visible contaminant buildup, and the introduction of sufficient quantities of potable water. Appropriate temperature controls of the reuse water should be maintained and monitored and no sanitary nuisance created.

1.3 REUSE OF RECONDITIONED WATER

1.3.1 Non-potable water that does not contain human waste and is from a single source within the establishment may be reused for a variety of purposes provided it has been reconditioned to be free of pathogens. This would typically include water to wash beef carcasses, flume chicken paws, to move heavy solids or to flush the bottom of open evisceration troughs, to wash antemortem pens, trucks, poultry cages, picker aprons and picking floors and similar areas.

1.3.2 It is recommended that the processor adopt performance parameters used in appropriate monitoring and testing programs to assure that the water is maintained to be free of pathogens. Appropriate performance parameters may include temperature control and microbiological tests (total plate count, total coliforms, fecal coliforms, salmonella, coagulase positive staphylococci, etc.). Visible solids should be removed before reuse and no sanitary nuisance created.

2. EXAMPLES ASSOCIATED WITH FRUIT AND VEGETABLE PROCESSING**2.1 WASHING AND FLUMING**

2.1.1 For washing and fluming, washing water may be reused employing a counterflow pattern; that is, the water is reused in a pattern opposite to the flow of product. Water may be reused in earlier product preparation, either within the same operation (e.g. washing or fluming) or to another earlier step, providing that established levels of food hygiene are not compromised. The processor should determine the appropriateness for introducing fresh water to a fluming system and adopt

appropriate performance standards and monitoring procedures where applicable to control accumulation of soil, organic debris, foam, bacteria, by the addition of fresh water and appropriate sanitizers or sanitizing procedures when necessary.

Flood washing: Water can be recirculated within a unit provided fresh makeup water is continuously added to ensure acceptable water quality and debris removed periodically by drains mechanical means, skimming etc. Final washing/rinsing should be done with fresh water. Where fresh water sprays are used for the final rinse, the used water from the final spray rinse can be collected for reuse within the flood washer.

Spray washing: Final rewash water can be reused for earlier stages of spray washing provided fresh water is first added to the final rinse. Screening is recommended where necessary to remove particulate matter that might clog the nozzles.

Fluming water: Fluming water can be reused for conveying or fluming. Water may be recirculated within the flume unit itself and/or within the food processing plant; the water used in the flume may be collected and subsequently moved/pumped counter to the product flow and reused from one unit operation to a previous one. Flumes for conveying and washing unprepared raw products (e.g., beets, tomatoes, other unprepared fruits and vegetables) may not require the introduction of fresh water.

2. CONTAINER COOLING

2.1 Water used for the cooling of retorted containers may be reused for the same purpose.

2.2 Container cooling water should be sanitized (e.g. chlorine) as necessary. The level of residual sanitizer should be measured and monitored at the point of discharge of the container cooler or cooling canal. Cooling canals must be cleaned regularly and replenished with potable water to prevent accumulation of debris and organic matter buildup. It is recommended that the processor adopt appropriate performance standards and monitoring procedures to assure that recycled container cooling water is handled in a system that is designed and operated such that buildup of microorganisms, organic matter, and debris, is prevented.

3. EXAMPLES ASSOCIATED WITH THE PROCESSING OF DAIRY PRODUCTS

3.1 DAIRY SOURCES FOR RECOVERY OF WATER

The dairy processing plant generates large volumes of water, some of which may be reused. Typical examples of these sources are:

- Reclaiming of water from condensate from product evaporation.
- Reclaiming of water from permeate obtained by ultrafiltration, microfiltration or reverse osmosis.
- Recycling of water used for washing curd during manufacture of caseinates, butter and cheese.
- Recycling of steam condensate.
- Recycling of water used for cooling of product and equipment.
- Recycling of water used for rinsing of equipment (starting up, flushing out and after cleaning).
- Recycling of water used for sanitizing of equipment.

3.2 POTENTIAL REUSES OF WATER IN DAIRY PLANTS

Potential reuse of water in dairy plants includes the following.

- Direct preparation of products (dissolving ingredients, dilution of milk (e.g. in the manufacture of cheese and fermented milk), adjusting the dry matter content in end-products (e.g. processed cheese).
- Technical purposes with direct contact with the product surface (e.g. cheese brine, curd washing, cheese surface washing, dialysis water for membrane filtration).
- Production of ice, hot water and steam.
- Air-conditioning humidity control in stores.
- Starting-up, rinsing and cleaning of processing equipment.
- Cleaning and disinfection of processing facilities.
- Boiler feed water.

3.3 QUALITY OF REUSE WATER

The quality of reuse water needed depends upon its origin and its intended use.

3.3.1 *Microbiological quality:*

- The reuse water shall have been subjected to reconditioning to obtain a microbiologically safety level that, unless justified otherwise, at least meet the microbiological specifications for drinking water. For certain uses, higher quality is required.
- It is recommended that the processor adopt performance parameters to be used in appropriate monitoring and testing programs to assure that the is water reconditioned and is maintained free of pathogens. Appropriate performance parameters may include temperature control and microbiological tests. Visible solids should be removed before reuse and no sanitary nuisance created.
- For validation and verification purposes, testing for total bacterial counts, total coliforms, fecal coliforms, coagulase positive *Staphylococcus aureus*, *Listeria monocytogenes*, and *Legionella spp.* should be considered. Also testing for Chemical Oxygen Demand (COD) or similar tests may be relevant.
- During storage, there should be no microbiological carry-over of reuse water from one day to the next unless the temperature is maintained at or above 63°C (145°F) by automatic means.
- Reuse of reclaimed water by addition to dairy products may present a quality risk of cross-contamination with bacteriophages.

3.3.2 *Chemical quality:*

- The reuse water shall have been subjected to reconditioning, as necessary, to obtain a chemical quality that does not adversely affect the safety of the food.
- The intended use will determine the chemical quality required. For instance, if the water is reused for disinfection or cleaning purposes, it should not contain substances in amounts that effects the efficiency of these fluids.

					X		X	
Water used for sanitizing equipment							X	

3.4.2 Reuse water originating from any of the sources listed above may be used for general facility cleaning (floors, walls, ceilings), cleaning of the exterior of equipment provided there is no possibility for contamination of the product or product contact surfaces of processing equipment. Reuse water from any of these sources may also be used as boiler feed water, fire extinguishing, and similar purposes.