USDA Policy on Water Reuse in Meat and Poultry Plants

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Introduction

Before we can discuss present agency policy related to water use and reuse, I believe that it will be helpful to you to know what went before. The laws that authorize USDA to regulate the meat and poultry industries specify that product be produced in a wholesome manner. Although neither the Meat Inspection Act nor the Poultry Product Inspection Act requires the use of potable water, a legal decision was made (based on technology and industry practices at the time) that the production of wholesome product would require the use of "potable" water. So, the underlying policy of the Agency has been that only potable water may be used on edible product or equipment that contacts edible product. However, water uses are allowed that do not adhere to this policy. There are water uses that are permitted because the Agency recognizes that water had been used in a manner accepted as good manufacturing practice for many years before the acts were passed. Additionally, in the last 20 years, the Agency has accepted other uses of water that do not adhere to the policy based on scientific information that demonstrates the safety and efficacy of the particular uses. For example, poultry carcasses are chilled in water and red meat carcasses are scalded in water that is reused. Similarly, brine solutions used to chill scalded product may be reused under certain conditions. So, the Agency has tacitly recognized that wholesome product may be produced using water that meets a test for safety and efficacy although it might not always meet the standards for potability.

Permitted Reuses

The Agency defines potability according to the requirements of the Environmental Protection Agency's (EPA) Primary Drinking Water Regulation. EPA's standard for potability uses many criteria, but it is based on tests for coliforms, nitrate and turbidity. For the last 15 years, the Agency has been evaluating proposals to reuse plant process water using physical, chemical and microbiological criteria. During this time, many proposals for the extended use of water were accepted based on these evaluations.

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Table 1. Permitted Reuses.

Deodorizer Water
Can Cooling Water
Poultry Chill Water
Condenser Water
Ice Making Water
Hog Dehairer Water
Ice for Poultry Chilling
Brine for Chilling
Ice for Cut-up Poultry
Retort Water
Boiler Blowdown Water
Propylene Glycol
Heat Exchanger Water

Table 1 is a partial list of permitted reuses of water, propylene glycol, brine and ice. For example, by regulation, can cooling water may be reused if a chlorine concentration of 1 ppm is maintained.

Poultry chill water may be removed from the chiller, cooled and returned to the chiller without further treatment if the required overflow is maintained. Additionally, poultry chill water may be substituted for potable water in the chiller if it is removed and filtered to meet the regulatory standard before reuse. Ice that is used to chill raw poultry may be removed from the birds, cleaned and reused to chill other birds or parts if either the birds or the ice are placed in impervious bags to prevent possible cross contamination. Water for hog dehairing may be reused in the first 2/3 of the dehairer. In other cases, water for heat processing of red meat and poultry products may be reused for the same purpose. There are many other permitted reuses of water. Each reuse proposal is considered on its own merits since rarely are any two alike. Water reuse proposals must be submitted to the Agency's Water Reuse Subcommittee. This group is composed of representatives from various disciplines and segments of the Agency: Chemistry, Microbiology, Mathematics, Field Operations, Slaughter, Processing, Equipment, Facilities, Sanitation and any others that might be required on an as-needed basis.

Water Reuse Conditions

In each case, there are conditions that must be met before the water can be reused. Some of the conditions are listed in Table 2. Often, conditions are based upon microbial and chemical analyses around critical control points. For example, the parameters specified for brine reuse are supported by extensive microbial testing of brine at various concentrations, temperatures and periods of use.

Table 2. Reuse Conditions.

Equipment Construction
Equipment Maintenance
Solution Maintenance
Chlorination to 1ppm
Closed System
Sanitary Handling
Same Day Reuse
Critical Controls
Product Condition
Treatment of Solution
Brine Parameters
Raw After Cooked
Discard Exposed Product
Written Control Program

In general, the equipment must be approved, backflow prevented, and the material collected and handled in a sanitary manner. Other requirements also apply depending on the reuse situation. Let's say that you would like to reuse potable water that has been used to cool a condenser compressor. If this water has been in a totally closed system, the Agency would allow the reuse of this water as potable water. Other reuses are more limited such as for chilling product.

Various conditions might be applied depending on the proposed reuse such as chlorination, same day reuse, and other controls that are deemed critical for the maintenance of a safe process. So, a keen observer of the Agency can extrapolate from its present position to a logical extension of it.

Agency Plans for the Future

To this point, I have been discussing past Agency policy with regard to water reuse. These reuses are basically limited in scope end usually are "point source" reuses. They usually involve moderate to minimal treatment of the water before its reuse. I'd like now to spend a few minutes discussing Agency plans for the future of water reuse. It is universally recognized that good quality water is becoming a scarce and expensive commodity and that the cost of disposal of process water into the environment is increasing exponentially.

In the mid-seventies, the Environmental Protection Agency (EPA) conducted a demonstration plant at a poultry establishment in western Maryland that produced potable quality water from poultry processing water. For technical reasons, EPA decided that it would not designate this water as potable.

EPA, Food and Drug Administration (FDA), and Food Safety and Inspection Service (FSIS) representatives have now agreed that, using current technology, plant process water can be treated and returned to a condition which is safe for most plant reuse even though it does not have a potable water designation. FSIS is proceeding with this consensus to develop data from the water treatment facilities of several cooperating meat and poultry plants.

Current thinking is that water will be treated to render it free of physical, chemical and microbial hazards. Some combination of treatments such as oxidation, coagulation, clarification, filtration, and disinfection will be necessary to achieve the level of water quality desired. Quality criteria will include analyses for chlorine. If you have treated the process water adequately and verified its quality by appropriate testing, how may this water be reused? Again, this is something that will be decided after more discussion within the Agency, between FSIS, EPA and FDA, and with concerned representatives from industry and consumer groups.

Typical Slaughter Systems

Before proceeding, let's take a quick look at typical cattle, hog and poultry slaughter systems. The steps in Tables 3, 4, and 5 are meant to show the main water-using functions of a typical plant. Many steps in the process require constantly flowing water and others require some regular use of potable water, such as in a sanitizing or disinfecting unit. For example, most poultry broiler plants require from 3 to 8 gallons of potable water to process each bird.

However, if we look at the prooess steps in Tables 3, 4, and 5 that involve the use of water in a typical processing operation, it seems obvious that water that is safe (although not designated potable) could be considered as a replacement for potable water for many of these tasks. For example, water of this quality would be considered safe for truck washing and other similar uses. To reiterate, safety would be judged physically, chemically and microbiologically. There are several meat and poultry plants that have agreed to collect data to characterize the quality of the water produced by their treatment. A hog slaughter and processing plant has constructed, tested and is now operating a state-of-the-art water treatment system and has been given permission to use the treated waste water in several areas previously requiring potable water. A poultry slaughter plant has installed a system to disinfect poultry chill water using

Table 3. Cattle Processing Water Use.

	Constant Water	*Sanitizer Units*
Stun/Shackle	X	X
Stick	X	X
Skin Heads	X	X
Head Removal		X
Skin Legs		X
Udders, Etc.		X
Open Brisket		X
Drop Bung		X
Saw Brisket		X
Pull Hide		X
Eviscerate	X	X
Viscera Inspection		X
Viscera Chutes	X	
Viscera Handling	X	X
Paunch Handling	X	X
Saw Rump, Loin, Back Neck	X	X
Trim		X
Wash	X	
Cooler Spray		
Further Processing		X
Plant Cleanup		X

Table 4. Swine Processing Water Use.

	Constant Water	*Sanitizer Units*
Stun Bleed		X
Scald	X	
Dehair	X	
Singer/Polisher	X	
Shaving		X
Washer	X	
Head Drop	X	X
Head Inspection		X
Brisket Splitting		X
Opening Cut	X	X
Evisceration	X	X
Viscera Inspection		X
Retain Rail		X
Rail Inspection		X
Viscera Handling	X	
Splitting		X
Neck Trim	X	X
Bruise Trim		X
Final Inspection		X
Ham Facing		X
Leaf Lard		X
Neck & Final Wash	X	
Cooler	X	
Further Processing		X
Plant Cleanup	X	

Table 5. Poultry Processing Water Use.

	Constant Water	*Sanitizer Units*
Stun-Kill (Mist/Dip)	X	
Blood Tunnel (Trickle on Walls)	X	
Scalder (Qt Overflow/Bird)	X	
Pickers	X	
Singer/Washer	X	
Rehang	X	
Oil Gland Removal	X	
Vent Cut	X	
Opening Cut	X	
Eviscerators	X	
USDA Inspection Station	X	X
Heart/Lung/Liver Inspection	X	X
Gizzard Processing	X	X
Lung/Reproductive Organ Removal	X	X
Crop Removal	X	
Head Puller/Neck Breaker	X	
Final Inspection		X
Singer-Inside/Outside Washer	X	
Chiller (2 Qts/Bird)	X	
Pack/Ship/Further Processing		X
Plant Cleanup	X	

ozone. The treated water will be reused in the poultry chiller. This system is now operating as a full-scale pilot plant prior to final approval. The Agency anticipates that it will propose changes in the federal regulations related to water reuse.

Several questions occur from these last remarks:

1. How must the water be treated?
2. By what criteria will the water be tested?
3. How and where may treated water be reused?

The consensus of the three Agencies (EPA, FDA, and FSIS) is that:

1. Only plant process water will be treated. Human waste will not enter this system, mainly for aesthetic reasons.
2. Treatment regimes will vary but, in general, will incorporate current technologics for primary, secondary and tertiary treatment of water.
3. Water will be analyzed before and after treatment to assure its physical, chemical, and microbiological quality.
4. The data will be evaluated to determine if the water is of sufficient quality that it can be judged safe for reuse in all but the last 2 steps of processing prior to packing and shipping. That is, potable water would be required in the final wash and chiller for poultry and in the final wash and cooler for red meat to provide a rinse with potable water as a final processing step for the carcass.
5. Only potable water will be used for human drinking water and in product formulation. It is thought that reuse of treated process water in this way could reduce the use of potable water by 50% to 70%.

Current FSIS Recommendations

Obviously, it will take some time to accomplish these objectives. In the meantime, FSIS is recommending that plants place added emphasis on water conservation, treatment and reuse.

1. Survey the plant's use of water. Put meters on at various critical water-using steps in the process.
2. Make a concerted effort to conserve water in the plant using both common-sense methods and currently approved water reuses. For example, often a piece of equipment is operated using much more water than the manufacturer requires. Some plants have put restrictors onto the influent water supply pipes to these machines, allowing a flow about 10% above the manufacturer's recommendations.
3. Consider installing a system to treat plant process water. First, even minimal treatment will improve the quality of effluent water markedly and should put the plant in better standing with the local sewer authorities, and will save money if effluent charges are based on the quality of the effluent water. Secondly, all or part of the process water may be treated to the point where it is safe for reuse under present requirements and this will save money and water.

Finally, if we are able to carry our plan to a successful conclusion, being able to treat and reuse process water will be at least a competitive advantage to a company under normal condition: and, perhaps, an all-out necessity for survival should the drought conditions experienced several times in recent years return.