Fishplant Sanitation And Cleaning Procedures

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FISH PLANT SANITATION

AND

CLEANING PROCEDURES

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INTRODUCTION

The decade of the '70s has all of us racing to keep up with technological changes, but there is still no substitute for good working conditions. A clean plant, well-lighted work areas, and capable employees who know where their tasks fit into the total work picture, realize each job must be done well and understand the probability of advancement in status, rate of pay and prestige are valuable assets to any industry. No rule or regulation can take the place of a job well done.

Since May, 1969 when the Food and Drug Administration published the current "Good Food Manufacturing Practices" for the manufacturer processing, holding or packing human food there has been an increased awareness of the need for better sanitation practices in fish plants and on fishing vessels. A number of some semi-related incidents have stimulated public awareness of the need for a clean-up and the consumer is demanding a higher quality product. A more serious threat has been the implication of *Salmonella* food poisoning bacteria in a surprising array of food products. There is also a world wide awareness in the fishing industry for the need for stringent quality control standards. A recent fish inspection and quality control conference sponsored by the Canadian government and the United Nations food and agriculture organizations attracted over 90 papers and was represented by more than 45 countries. At this time, I do not believe that anyone in our industry can reasonably question the need for better quality control for our fisheries products. One of the reasons fresh and frozen fishery products has not received strict attention from regulatory agencies, is that it has not been implicated in a disease bearing capacity.

Why be concerned with sanitary operations? Fish are food; a fact that many plant personnel and fishermen tend to forget.

EMPLOYEE ATTITUDES

The attitude of the employee towards plant clean-up and sanitation is one of the biggest problems facing the fish plant manager today. Sometimes

this poor attitude is perpetrated by plant management by turning over the clean-up job to the poorest workers and turning it into a job of the lowest order, or by assigning an already exhausted crew to do what to them is pure drudgery. I believe a study of plant sanitation conditions would point to employee attitudes as one of the most important contributors to an unclean, unsanitary plant. The person charged with the responsibility of clean-up should be the plant foreman. The head of the clean-up crew should be paid on a level with the fish boss. The raise in the status of the clean-up crew will be reflected in a better job of cleaning. Remember, a poor attitude can negate the best sanitation technology.

What is meant by a clean plant? The plant is physically clean when all dirt, slime, blood, gurry, oil and grease are removed. It may still have a large number of bacteria on working surfaces, walls and floors. When these have been killed it is biologically clean. If a residue of detergent is left or sanitizing agent remains on working surfaces, it may get into the fish product, leaving an odor and bad taste. This then, would be chemically unclean. The plant sanitarian's tools are: water, cleansers or detergents, the scrub brush, sanitizers, and more water, in just about that order. Detergents help to remove the dirt. Sanitizers kill bacteria. THE FUNCTIONS OF THE TWO SHOULD NOT BE CONFUSED.

DETERGENTS

There are several types of detergents available. The best detergent for all-around use is inexpensive, approximately neutral and is biologically degradable. Purchase it in bulk. There are a number of proprietary cleaners on the market. These run the gamut from acid to alkaline. An acid cleaner will have a pH less than 7 and most generally in the neighborhood of 3, while an alkaline detergent will have a pH of over 7, generally in the neighborhood of 10.5 to 12. Look on the package for pH of your cleansing product. A neutral product in the pH range of 6 to 8 will be less corrosive to machinery. Some detergents are chlorinated, some have corrosion inhibitors included, and some are touted as bacteriacidal. The latter claim is dubious. Jellies and foams are used to hold the detergents to the surface to be cleaned. They have their special uses explained below.

Each of the basic types of detergent will handle some cleaning jobs better than others. Standard neutral detergents will hold the dirt and oil particles in suspension permitting them to be washed away. Acids attack mineral deposits, and alkalis will attack fats and proteins. Chlorinated alkaline detergents are best for removing proteins (gurry which is built up on fish carts and tables). They are not sanitizers, as the alkalinity is too high to allow the chlorine to go into solution.

SANITIZING OR STERILIZING AGENTS

The three most common sanitizing agents are chlorine, iodine and phenols. Chlorine is used more than the other two in food processing plants. It is the least expensive and is readily available in several forms. Iodine is more expensive and not as available but has some advantages. Phenolic compounds such as "Lysol", Creosol or Hexachlorophene should not be used in anv fish processing plant, because very small quantities of phenols leave a long lasting odor and bad taste in most food-stuffs. Fish is no exception. When combined with even very small quantities of chlorine, phenolic compounds produce a very strong flavor.

CHLORINE COMPOUNDS

There are two basic forms of chlorine available for plant sanitation. Gaseous chlorine is available in quantities ranging from cylinders to 30 ton tank cars. It is readily available in 150 pound cylinders, and equipment is available for feeding this directly into the plant water systems. The hypochlorite compounds are calcium hypochlorite and sodium hypochlorite. These are widely used in fish processing plants. Sodium hypochlorite is sold in liquid forms such as "Purex" or "Clorox". Thev are low in free chlorine averaging about 5% to 6%. Calcium hypochlorite is available under such brand names as "HTH", "B-K" and "Percloron" and others. The amount of available chlorine varies from 50% to 70%, depending on the sodium carbonate content. The higher the concentration of sodium carbonate, the lower the available chlorine.

It is very important to dilute the calcium hypochlorite to a maximum of 50 parts per million in order to obtain a low pH (see below). This is one place where the old adage of "if a little is good a lot is better" is all wrong.

The Germicidal Effect of Chlorine:

When chlorine in a water solution comes in contact with micro-organisms the cells will be killed if the concentration is high enough and the contact time is sufficiently long. According to the most generally accepted theories, the germicidal action of the chlorine compound is due to the hypochlorous acid produced when the compound is added to water. THE SPEED AT WHICH BACTERIA ARE KILLED IS DIRECTLY PROPORTIONAL TO THE CONCENTRATION OF HYPOCHLOROUS ACID.

The Advantages of Chlorine Gas:

Chlorine gas is considered the best source of chlorination where large volumes of water are used. This certainly would apply to most Alaskan fish plants.

The Specific Advantages are:

1. It is a pure substance and contains no other minerals.
2. It lowers the pH slightly, producing more hypochlorus acid.
3. It is easy to control and apply.
4. It is the least expensive source on the basis of pounds of available chlorine.

The main objection is the cost of the chlorination equipment. This cost, however, is balanced by the lower price of the product over a sufficient period of time.

Hypochlorites:

Hypochlorites are the second choice because:

(1) When they are added to processing water, the other chemicals such as calcium chloride and sodium chloride are produced which may have an adverse affect on the quality of the product.

(2) The amount added is difficult to control.

(3) They raise the alkalinity of the water and add to mineral deposits on equipment.

(4) They are more sensitive to organic matter in the water and lose their germicidal powers faster.

(5) They are more difficult to store and deteriorate on long standing.

(6) They are more costly. Sodium hypochlorite is too expensive for general plant use because of the relatively low amount of free chlorine. It is, however, ideal for boat use, as fishermen tend to use a too-high concentration of the other types of hypochlorites. There is a general tendency in the plants to use too high a concentration of products such as "HTH" or "Percloron". These products are highly alkaline; in other words, they have a high pH. At a concentration of 25 parts per million calcium hypochlorite, the pH is 9.35. At 100 ppm, the solution has a pH of 9.75, and at 1000 ppm yields a pH of 11.10. At these high levels, the amount of free chlorine produced is greatly reduced, and very little hypochlorus acid is available to attack the organisms. Table I shows the relative efficiency of the three chlorine compounds.

TABLE I

Relative killing power of hypochlorites and gaseous chlorine.

Chlorine Compound	Total Free Chlorine ppm	pH*	Time Required to Kill 99.9% of Cells
Chlorine gas	5 ppm	7.0	1 minute
Calcium hypochlorite	5 ppm	7.4	2 minutes
Sodium hypochlorite	5 ppm	7.6	2.5 minutes
*pH of untreated water was	7.2		

Concentrations of 5 ppm available free chlorine should be present in processing waters. This concentration will not produce an off-flavor in fish products. For sanitizing equipment and surfaces after cleansing, the concentration should be increased to 25 to 50 ppm with a residual of free chlorine content not under 25 ppm at the washing end of the water line. This concentration is high enough to kill exposed bacteria in a very short time. Do not use a sanitizing agent in place of cleansers. Remember, exposed bacteria would be killed. If deposits of slime and gurry are left on machinery or working surfaces, the chlorine will react with the protein producing chloramines, which have very little germicidal effect. As a result very little chlorine will be available to kill spoilage bacteria.

INSTRUCTIONS TO CLEAN-UP CREWS

A word is necessary about water use. It is a good idea to conserve water. Shovel up the gurry, etc. before wash down. Cleansers are more effective when used with warm water, 120° to 140° F is ideal. The one drawback to using warm water is that it will raise the temperature of the surface on which the bacteria live, increasing their growth rate astronomically. Use steam sparingly, if at all. It may be necessary in limited areas to use steam to remove fats and oils. Steam is sometimes necessary to remove the thick oil and fat deposits left by salmon egg processing.

Rinsing and sanitizing should be done with cold water to cool the contact surface heated by the warm water wash. Thus, remaining bacteria will have less chance to grow and multiply.

SUGGESTED PERIODIC CLEANING SCHEDULE

I. Before the season starts:
   (1) Require thorough cleaning of all machinery, tanks, tables, floor, walls and ceilings to remove dirt and bacteria-bearing dust.
   (2) Sanitize all working surfaces with 25 ppm chlorine solution.

II. Continuous cleaning:
   (1) Tables, floors and other working surfaces should be sloped to effect continuous draining to prevent standing water which builds up bacteria populations.
   (2) Rinse each cart or tub each time it is emptied.

III. Morning clean-up:
   (1) Before operations start for the day, rinse all working surfaces with cold water containing approximately 5 — 10 ppm residual free chlorine, as a precaution to remove any cleanser and sanitizing agent left from the previous clean-up.

IV. Each coffee or rest break:
   (1) As practical, run all fish that have come on to the line through processing steps.
   (2) Remove all static material from working surfaces; in other words, bits of fish, gurry, etc.
   (3) To remove all slime and blood, flush and rinse all working surfaces with water containing 5 ppm residual free chlorine.
   (4) Shovel all waste from the floor.

V. Lunch break:

(1) Clear line of all fish.

(2) Remove all gurry from the working surfaces.

(3) Shovel all waste from floor.

(4) Drain all washing tanks.

(5) Rinse all working surfaces, wash tanks, tubs, carts, and floor with high-pressure hose, using 25 ppm free chlorine solution to cut slime and lower bacterial count.

(6) At end of lunch break, flush all surfaces with 5 ppm free chlorine solution to clean away all excess chlorine.

VI. End of day clean-up:

Repeat items 1 through 4 above.

(5) Rinse all working surfaces with cold water containing 25 ppm chlorine.

(6) Remove cowlings to expose all machinery that comes in contact with the fish.

(7) Scrub all working areas with cleanser and scrub brush, or a high pressure detergent dispenser.

(8) Scrub all cutting boards and place in a tank containing 100 ppm chlorine solution (to kill all bacteria in the wood grain it is almost necessary to place cutting boards in a retort and give them a cook).

(9) Rinse all areas with stronger chlorine solution of 30 to 50 ppm. Allow 10 minutes contact time.

(10) Scrub down floors and walls. A large floor broom with stiff bristles is effective for this.

(11) Rinse all surfaces with clean water or 5 ppm chlorine solution. This low level of chlorine will prevent corrosion of metal surfaces.

VII. End of week:

In certain areas and on equipment fish carts and chutes, a hard dried deposit tends to build up. This is the place where jelly or foam additives

in harsh detergents may be useful. This is difficult to remove by using ordinary detergents and a scrub brush. By using the techniques outlined above, this dried-on material should be held to a minimum. If the problem does arise, strong detergents mixed with a jelly or foam suspension will help considerably. The jell or foam will hold the detergent to the surface. Remember, alkali detergents attack oil and proteins.

Procedures on use:

(1) Rinse away all loose material, mix chemicals in the tank following manufacturer's recommendations.

(2) Spray all hard-to-clean areas and other surfaces which have a heavy deposit of static material.

(3) Let stand 30 minutes to an hour, then rinse thoroughly. Strong alkali detergents will corrode metal surfaces.

(4) It may be necessary to use an acid detergent once a month or several times during a season. Acid detergents will remove the mineral deposits. Do not use acid detergents on concrete floors, as acid will pit the concrete.

PERSONAL HYGIENE

This is perhaps the area of the greatest contamination. Some of the basic steps which you might post on the bulletin board in your plant are:

(1) All long hair should be confined by hair nets.

(2) Men should wear caps.

(3) Wash hands before going to place on fish line. Use a bacteriacidal soap in the washroom ").

(4) Have a dip pan with a sanitizing agent outside washroom door. All personnel should dip their hands in the solution after each trip to the washroom or after each break. In this case, an iodine solution is best, as it will change color on becoming inactive.

(5) Have pans with iodine solution available for all workers wearing gloves. Gloves should be washed in clean water at the beginning of

each break, and placed in the sanitizing solution during break. This solution will need to be changed after each break. I would recommend the use of knit polypropylene gloves as polypropylene is easy to clean and will not support bacterial growth.

It would be well for the foreman to come in and do the initial morning spraydown. This should assure a good job and give him a chance to pick up any trouble spots in the clean-up. Crews should be staggered so that one or two people clean-up during the break rather than an inefficient job done by the whole crew.

The above outlined procedures will cost in equipment and labor but can result in an overall economy of operation. Manpower is the most expensive element involved. A small crew trained to do the job will be much more economically efficient than the present system of everyone "pitching in" and giving a hand. You will also have a cleaner plant, improved product and better working climate for all concerned.

Suggested Additional Reading

Fish Handling and Processing
1967 ed. G.H.O. Burgess, C.C. Cutting, J.A. Lovern, and J.J. Waterman, Chemical Publishing Co., Inc. New York, N.Y. pp. 66-69.

Food Processing Operations
1963 by Maynard A. Joslyn and J.L. Heid. The AVI Publishing Co., Inc. Westport Conn. Vol. 1 Chapter 10.

Fundamentals of Quality Control for the Food Industry
2nd ed., 1966 by Amihud Kramer and Bernard A. Twigg The AVI Publishing Co., Inc. Westport Conn. Chapter 11.

Laboratory Manual for Food Canners and Processors
1968 by National Canners Association, The AVI Publishing Co., Inc. Westport Conn. Vol 2, Chapters 16, 17, 18.