MEAT TECHNOLOGY – INFORMATION SHEET

Cutting edge technology for the meat processing industry

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Cleaning of a Rendering Plant

The operation of a rendering department should be separated into two distinct areas, irrespective of the type of process used. The distinction is simply on the basis of wet and dry areas.

The same segregation applies to the cleaning program for the plant, with two distinctly different cleaning operations required:

1. Raw material processing
   This includes areas for raw material collection and all associated equipment including the exterior of the cooker but excluding all meal handling equipment areas. If raw material operations are in the same area as dry meal operations, then handling equipment for the dry meal must be protected to prevent water from entering.
2. Dry meal processing
   This includes areas past the last heat treatment in the process: all cake and meal handling, processing and storage equipment.

Equipment must be protected to prevent water from entering, if water is required in the interface area between the raw material processing area and the dry meal processing area. Water must be completely excluded at all points beyond and including the mill. Equipment in the dry processing areas must be cleaned by dry techniques – i.e. scraping, brushing, etc.

Raw Material Processing

An effective cleaning and sanitation program involves the interplay of several factors:

1. **Mechanical action:** Mechanical action is supplied through water pressure, physical scrubbing and abrasion. When using high-pressure water, operators should take care around equipment because damage to electrical and electronic equipment and physical seals can occur.

2. **Temperature:** Soil removal and cleaning is most effective at the temperature at which the soil was deposited. In many instances, soil removal is accelerated at higher temperatures. Because protein is coagulated at temperatures above 65°C, protein soils can become cooked onto the surface to be cleaned if water temperatures are above 65°C. Also, because fats found in rendering plants generally melt at temperatures above 45°C, temperatures between 50°C and 60°C are recommended. Water at this temperature is also generally safe to use, and burning of skin should not occur at this temperature during normal cleaning procedures.

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3. **Time:** The residence time of the cleaning chemical in contact with the soil influences the ease of removal. Generally, the longer the exposure time, the easier the cleaning. In practice, a balance must be achieved between maximising the contact time and effective utilisation of the time available.

4. **Chemical:** Although the chemical is an important component in the cleaning process, it can only be effective if applied under conditions appropriate for the soils to be removed. The chemicals are designed to penetrate and soften the soils for removal and suspension in rinse water.

5. **Equipment design:** Equipment design is frequently overlooked as part of the cleaning process. However, if equipment is poorly designed, access for cleaning can be very restricted and much heavier soiling of the environment can occur.

6. **Management programs:** Strong effective management is required to implement maintenance and cleaning programs throughout the plant. Cleaning does not just happen. Like other production activities, cleaning must be planned.

The Raw Material Handling Area

Equipment design is an important part of the cleaning equation in the raw material process area. Unfortunately, equipment is frequently designed for optimum transport with little regard for contamination of the surrounding environment with soils and micro-organisms. For example, raw material receiving and charge bins often receive amounts of splash with the force of discharge. These raw material charges also create tremendous aerosol problems. If the bins are not enclosed, then splash and aerosols are widely distributed throughout the environment.

If located adjacent to dry handling areas, the bins should be enclosed with controlled venting for pressure release. If located away from the dry handling area, the bins should be sufficiently enclosed to prevent splash onto walls and adjacent structures.

Storage bins should be watertight, or the area around them should be well drained and contained. Effective drainage at all loading, washing and storage points reduces trafficking of raw material through the plant and, because cleaning is easier, the appearance of the plant is improved.

The soil in the raw material handling area is a combination of proteinaceous and fatty soils which are difficult to remove when dried onto surfaces. Where possible, surfaces should be regularly flushed with water several times per day to prevent build-up and drying of the soils onto surface. Conveyor housings and lines should be thoroughly washed on a daily basis at shutdown to prevent the gross build-up and spoilage of the raw material which attracts insects and vermin.

An essential preliminary step in the cleaning program is the removal of gross soils, preferably with hot water, to melt the fats for removal. Water temperature should be 50-60°C, which is sufficient to solubilize the fat but not hot enough to set the protein.

A heavy duty alkaline cleaner, which incorporates chlorine, is required for removal of protein soils in the raw material handling areas. Some compounds require the further addition of chlorine for extra protein soil removal power.

The cleaning technique used with these products is foam application. This involves mixing the product with compressed air and water to form a stable foam and spraying it onto the soiled surfaces. Foaming allows the chemical to contact the soils for long periods. After foam application, cold water can be used to rinse away the foam containing the soils.

These products are strong alkalis with significant chlorine contents and are corrosive on mild steel. An alternative option is to use a neutral enzymatic foamer which will not lead to wear on the plant.

It must be recognised, however, that the cleaning of the plant will be a compromise between efficacy and corrosion because of the heavy duty soiling.

Following cleaning, sanitation can be achieved using a quaternary ammonium compound sanitiser (QAS). Sanitising is particularly important over weekend breaks and any other extended breaks where gross spoilage of any residual soils can occur.

Chlorinated alkaline powders are recommended for floors. The powder should be sprinkled across the floor, wetted with hot water and scrubbed in with a broom. The area should then be hosed down. Products with the added chlorine effectively remove soils and bleach the floor, which greatly improves the floor's appearance.

Because the chemicals used in cleaning heavy rendering soils are necessarily strong, care must be taken in handling them. The manufacturers' safety instructions should be read before cleaning commences and workers should wear the appropriate safety equipment.

If raw material handling equipment is in the same area as dry processing, the equipment should be bunded with a nib wall to prevent accidental splash into dry handling equipment or pooling of water which may gain access to bucket elevators, etc. Although plants might be congested, this activity can be handled provided the dry processing areas are protected from wash water by adequate bunding and drainage, and overlapping covers are on conveyors.

The Dry Meal Handling Area

The **critical** factor in cleaning all equipment beyond the cooker and presses (if present) is the **complete** exclusion of water from the equipment. Any water introduced into the system will moisten residual cake or meal and create an environment for *Salmonella* growth.

Dry cleaning practices involving scraping and brushing are recommended for certain equipment. Some washing of the external environment can be permitted in the areas surrounding presses and cookers in a dry rendering plant, where tallow on the floor is a safety problem. However, equipment must be protected from accidental splash and water access.

Hose outlets should not be present in the dry processing area beyond the mill. Contamination in this area is limited to dust and should be cleaned by appropriate sweeping or vacuuming techniques.

Many rendering plants hose out the presses and the conveying systems from the percolators to the presses. This is not a good practice because all cracklings from the conveyors cannot be cleared and all the water from the conveyor cannot be drained. Water can become trapped in the screw casing, and any cake or meal present ends up as a soup, which is an ideal focus medium for the growth of *Salmonella.*

The cracklings and tallow, if left dry, will not spoil since the insufficient moisture in the material cannot support bacterial growth. Although it may not be the most pleasing aesthetically, the presence of material and fat in these conveyors is preferable to having a moist source of contamination beyond the cooker.

For the conveyors, covers must be opened at shutdown to allow rapid cooling and free circulation of air to dry off any condensation. Any deposits of meal that build up above the travel of the screw and on the covers should be scraped off the housings on a regular basis. This material can be screwed, or barrowed, to a collection point for reprocessing.

No sophisticated equipment is required for dry cleaning. All that is needed is some thin stainless or mild steel plate which can be used to scrape accumulated material off the conveyors, elevator buckets etc.

A regular inspection program is a must since failure to monitor equipment for moist meal build-up will invariably lead to *Salmonella* infection and costly decontamination procedures.

Salmonella Decontamination

Salmonella decontamination has traditionally been attempted by fumigation with formaldehyde gas and the screwing of meal soaked with formalin through the processing system. This is of limited efficacy because the formaldehyde has only minimal penetration capacity. Fumigation is also difficult to handle since the system cannot be enclosed to completely entrap the gas.

More importantly, most fumigation has been undertaken without removing the base cause of the problem. The moist meal in the system which is still present, even if sterilised by the fumigant, and is susceptible for recontamination.

Several commercial products of much lower handling toxicity and reported greater efficacy and penetration have been recently introduced. These products are all based on combinations of propionic acid, formic acid or combinations or their salts.

Propionic acid and formic acid can be used as the organic acids themselves, but they are highly corrosive and tend to damage plants. The salts of these acids are more user friendly and the commercial products utilise this in their design.

The propionic-based material can be sprayed into equipment and screwed through the plant in a carrier. This system is recommended on an end-of-week basis to decontaminate equipment surfaces.

The advantage of this type of material is that it also has a residual action in the meal and on the surfaces, lasting up to several days on surfaces and reportedly several months in meal. Carriers that have proven successful are unmilled cake, corn husks, crushed bark or wood chips. Care must be taken to recover the carrier and discard it.

These products should be used only as part of Good Manufacturing Practice and not as a rescue mission following poor hygiene practices. If they are used as a rescue mission following poor hygiene practices, the extend of *Salmonella* contamination will quickly outweigh the protective effects of the decontaminant.