

Waste Reduction in Food Processing - A People Management Issue

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The traditional approach to waste management in the food processing industry has been fend-of-pipe. With more stringent environmental regulations, ever increasing waste treatment and disposal costs, and more intense public scrutiny, food processors have been forced to examine other management avenues.

The first step to any management program is to quantify the problem. In food processing, wastes are broken into two basic categories: direct and indirect. Direct wastes that are found in dumpsters and inedible containers can be further broken into intentional and unintentional wastes.

Unintentional wastes and indirect wastes (sludge) are those wastes that can be reduced with proper operation, maintenance and cleanup practices. These wastes, however, are often not considered wastes by plant employees. Therefore "proper" operation and cleanup practices may have different definitions to the management and the plant worker.

Through employee training programs and an active "people management" or involvement program, these wastes can be significantly reduced. Examples and results will be presented to prove the effectiveness of the people management approach to waste reduction.

The food processing industry is extremely diverse. The diversity of the industry is not only apparent by its vast array of final products but also by the waste it generates (3). Food processing waste is not considered to be a health hazard. However the quantities generated can be formidable. Even the smallest seasonal food processing plant can have waste loads equivalent to a population of 15,000 to 25,000 people (3). Sludge generation from process wastewater treatment coupled with solid waste generation occurring during product handling and

processing can result in wastes that are difficult and expensive to handle.

TYPES OF WASTE

An understanding of what is and how and where it originates is required before an effective waste reduction plan can be implemented. In the food processing industry, there are direct and indirect wastes.

Direct

Direct wastes are wastes that can be accounted for in the dumpsters or inedible bins. These wastes occur as raw materials are stored, transferred or processed and can be classified as intentional or unintentional. Intentional wastes are expected wastes such as peelings and pits from vegetable processing, blood and bones from meat processing, bread and dough bakeries and process wash-down water from all processes

Unintentional wastes are those wastes resulting from poor inventory control, improper employee management and improper maintenance. Some examples include losses due to: spoilage while in storage, improper handling/transfer, improperly maintained production equipment and improperly supervised cleanup activities. Direct waste, whether intentional or unintentional, is comprised of lost raw ingredients and semi-processed or fully processed product.

Indirect

Direct waste lost down the process drains results in the creation of the indirect waste, sludge. Sludge is the solid waste produced from the treatment of process wastewater.

Sludge generation is dependent on the type of food being processed, type of wastewater treatment employed and

amount of food lost into the drains. Sludge generation from the seasonal plant referenced in the introduction could range from 1,200 to 5,200 pounds/day (5).

Food products lost to the drains can be directly related to elevated levels of biochemical oxygen demand (BOD) total suspended solids (TSS) and fats, oils and grease (FOG). For example one pound of BOD is equivalent to 0.89 pounds of fat, 1.03 pounds of protein and 0.65

APPROACHES TO REDUCTION OPPORTUNITIES

Inaccurate record keeping or lack of disposal problems may have lulled management into thinking waste loads are within acceptable limits. If management realized that most efficiently run wet food processing plants only lose 2 to 5 percent of input material, they may have a concept of the losses they are incurring.

Lack of corporate commitment is the one most formidable obstacles to waste reduction. Establishment of a clear, concise corporate policy regarding waste reduction is therefore imperative (4). Employees can sense the true level of corporate commitment and will rise or fall to the level that is expected or allowed.

The next step toward waste reduction taken by many industries is a waste audit. This approach can be lengthy but results in detailed information being compiled on each waste stream and on available, economical waste reduction solutions. The solutions may include process modification, chemical ingredient substitution, on-site or off-site recovery, reuse and recycle systems to name a few.

The food industry is unique in that the simple, low approaches of employee involvement and training about dry cleanup activities can have a dramatic effect on waste production. The basic concept of dry cleanup is to teach employees to treat their work area as they would their own kitchen.

Observation and Inquiry

The basic approach begins with observing work activities

and asking questions. During the observation phase, it is often useful to video activities of each shift and each job. Video tapes can serve two purposes. The first is to help identify wasteful activities. Current accepted processes or cleanup activities may not appear as acceptable when viewed away from the process line. The second purpose is as an initial training tool for employees and later as a tool by which to judge progress.

It is best if each shift can be observed on more than one occasion. This will help to distinguish daily practices from infrequent or occasional practices. It will also provide an opportunity to question employees about the rationale behind wasteful activities.

Training

Training and employee involvement are interactive and cannot be separated. Employees are usually willing participants in a waste reduction plan once they realize what waste is and how their work practices can directly affect the environment, the plant profitability and ultimately their job security. Training is multifaceted and should be job specific. First, begin an education program. This should include an explanation of what waste is (food as waste) on the public's perception of the plant and its product, the environment and plant profitability.

The second area involves "retraining" employees to correct wasteful methods. This may take close attention if the "Susie teaches Sallie" initial employee training method was used. The practice of only allowing line people to train new employees may have resulted in wasteful practices being taught to the new employee.

During the retraining segment, employees should be introduced to dry cleanup methodologies that are found in Table 1. Training should not damage the employees' self-respect. Emphasis should be placed on new, better approaches to processing and cleaning for management and line personnel alike. Training should emphasize keeping food ingredients out of the drain.

Table 1. Dry Cleanup Activities

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- Keep food ingredients/products off floors and out of drains.
 - Use brooms/vacuums to remove dry spills from floors/equipment.
 - Use brushes to clean equipment and collect "brushed off waste."
 - Use squeegees, shovels or vacuums to remove liquid or semi-liquid ingredients/product from Roars and equipment.
 - Provide inedible bins/containers for all dry and liquid wastes.
 - Squeegee out all vats and mixers prior to introducing water.
 - Assure all lines/pumps are completely empty prior to cleaning.
 - Never use hoses as brooms.
 - Equip all hoses with high-pressure, low-volume, automatic shutoff nozzles and place flow restrictors on faucets.
 - Use minimum allowable amounts of detergents/disinfectants.
 - Keep brooms, vacuums, shovels, squeegees and bins accessible.

Related Activities

- Provide collection pans for drips/leak until repairs are made.
 - Provide screens for all floor drains.
 - Never overfill vats or mixers.
 - Never dump off-spec or excess product down the drain.
 - Keep liquid and solid waste separate.
 - Examine handling/transport procedures that result in spillage.
 - Examine inventory control to assure spoilage is not occurring.
 - Never leave faucets/hoses running.
 - Evaluate all disinfectants/cleaners for BOD loading.
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Corporate commitment to a reduction programs should be apparent at training sessions. This can be accomplished by having representatives of top management at all

training sessions. Management's responsibilities are listed in Table 2.

Table 2. Management Responsibilities

Listen to employees

- Establish a routine, preventative maintenance program.
 - Assure prompt corrective action when waste is reported.
 - Work with employees to design dry cleanup equipment as needed.
 - Regularly tour the plant and talk with employees about waste.
 - Provide recognition programs and follow-up training.
 - Establish markets for process 'wastes.'
 - Examine all reuse/recycle options.
 - Schedule production to reduce required cleanup.
 - Display/present progress reports to employees.
 - Work toward non-process/office waste reduction.
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The final area of training should include how to recognize waste streams and wasteful activities. Once identified, there should be a structure for taking actions to eliminate the waste.

At this point, the program can move ahead in a positive manner or fail. Lack of a follow-through structure will send a clear signal to employees that corporate commitment is limited.

INVOLVEMENT

The structure that keeps employees involved by allowing reporting of wastes and observing actions taken to stop that waste is critical. Many food processing firms have discovered that the best follow-up to employee training is an employee suggestion/awards program. Such programs keep enthusiasm high, generate pride, cost little and offer large payback to the company.

One such program, People Against Waste (PAW), was created by Maola Milk and Ice Cream Co. in New Bern, N.C. This program is designed to involve employees in search for waste sources.

The success of his program hinges on the prompt, detailed response sent to each employee submitting a waste reduction suggestion. No suggestion is considered too small for a response. This personal response is coupled with a visible award, a PAW lollipop, and the employee being recognized in a newsletter.

At the end of the month, top ideas reach additional recognition and awards, such as a percentage of the cost savings from the waste reduction, gift certificates for steak dinners or PAW caps. This program has been in effect approximately 18 months and has only cost \$3,000. Savings resulting from PAW suggestions have more than the program and are included in saving shown below in the dairy products example.

EXAMPLES

Employee training coupled with the dry cleanup approach appears simplistic—merely the use of good common sense. But, as the old cliché states, “the proof is in the pudding.”

Breaded Meat

The Equity Group in Reidsville, NC, manufactures 2.5 million chicken nuggets each day. Deboned chicken meat is mended, formed, battered, breaded, fried and frozen. Due to a combination of poor maintenance and cleanup procedures, an average of 55 pounds of meat, three pounds of tempura and 15 pounds of dry batter per line was lost to the sewer each shift (6). Additionally, over 4,000 pounds of waste per shift was landfilled.

In 1988 by improving maintenance, training employees and establishing markets for waste, 30 tons per week of solids (scrap, inedible product) that was going to the landfill, along with another 20 tons per week lost into the drains, is now being used as animal feed or being shipped to renderers (6). Additionally, BOD levels in wastewater were reduced 2,200 pounds/day. This translates to a sludge reduction of 120,000 to 402,000 pounds of sludge per year (5,6).

These activities, though impressive, did not lower effluent characteristics enough to generate compliance with permit limits. And upgrade of the existing pretreatment

facility did not help either, it was determined that additional employee training and involvement would be required.

In October 1989, each employee went through additional training. Each shift was divided in half. These smaller, more manageable groups reported to an in-plant conference room where they received training as to what waste was, where it came from, how it affected the environment and how its cost affected job stability. Most employees had not, until that time, thought of product or food as waste. They were further trained in cleanup procedures and water efficient work activities.

Training was conducted using language and terminologies consistent with the workers' educational level. Additionally, a slide presentation was made depicting actual scenes from the work floor. This proved effective as employees were amazed at the waste that they saw.

This training was presented to all employees with slight modifications being made for maintenance and cleanup. This training resulted in an enthusiastic, cooperative work force. Supervisors and management were also trained and this training emphasized those points covered in Table 2.

The training resulted in an enthusiastic, cooperative work force. Waste loads showed marked reductions with TSS and BOD levels being reduced from the 2,500 mg/l range to the 300 mg/l range. This translates into a savings of more than \$10,000/month in sewer surcharges.

The program, which continues as the Waste Awareness Program, was implemented in January 1990. This program keeps waste in the forefront of daily operations as well as implementing programs with specific purposes such as a water reduction program.

This is an on-going example program. Like any similar programs (example-safety)—it will ebb and flow, but, with proper involvement and emphasis, it will always be a positive presence.

Dairy Products

Maola Milk & Ice Cream of New Bern, N.C., simultaneously implemented several waste reduction programs ranging from a milk loss prevention programs training/record keeping/improved maintenance) to process modifications. Reductions attributed to employee training and improved record keeping total 5,000 gallons/day of milk for a total annual BOD savings of 130,000 pounds (2). This could easily translate to a reduction in wastewater treatment sludge production of 19,500 to 65,000 pounds (5). This was equivalent to \$210,000 net annual savings in sewer surcharges and product savings.

Additional BOD reduction due to process modification totalled 190,000 pounds/year for a potential sludge reduction of 28,500 to 95,000 pounds/year (2,5). Annual associated cost savings for process modifications were \$92,050.

PAW has been enthusiastically received by Maola employees. Established in April 1988 for the home office/plant, it has recently been expanded to all the branches.

Awards given include PAW of the Month, Outstanding PAW, PAW Stars, PAW Plus, Most Considerate PAW and Persistent PAW. All suggestions receive a written response and often involve the employee in formulating the corrective action.

Some examples of PAW suggestions include:

- 1 A chiller water line that drained into a floor drain without chilling anything.
 - 1 Branches not properly rotating product, resulting in losses.
 - 1 A change in milk case hands that resulted in difficulty in handling and additional case warping which resulted in case lam-ups.
- Ice cream cup samples used in the laboratory were being put down the drain instead of inedible bins.
- 1 Wasteful activities regarding computer printouts.

The PAW program with its PAW punch and cake ceremonies is just another &r of the many unique and fun

programs that Maola use to address a problem. Previous programs included Coli Busters to deal with bacteria problems and Pig Palace to deal with excessive product returns. All these "people management" programs have been successful because the in employees, were visible, and were not allowed to stagnate.

Snack Food.

Bahlsen of America in Cary, N.C., produced over 5.5 million pounds of snack food during the first three week August 1988. This corresponded to implementation of dry cleanup and recovery /reuse operations. During this period, 66,000 pounds of crackers were reworked in dough with and additional 209,000 pounds used in peanut butter. Another 132,000 pounds of second line products were recovered for sale in outlet stores. Recovered inedible waste totalled 803,000 pounds and was sold as animal feed for 2 to 4 cents/pound. Recovered products, both edible and inedible, had previously been landfilled. Due to the infancy of the program, effects on wastewater have not yet been calculated.

CONCLUSION

Waste reduction for food processors can be as simple as dry cleanup. Establishing markets for waste can result in new profit sources with wastes being reclassified as byproducts. This simple approach begins with employee training; therefore, waste reduction in food processing is first and foremost a people management issue.

REFERENCES CITED

- (1) Carawam, RE.; Chambers, J.V.; Zall, RR Core Manual on Water and Wastewater in Food Processing, Raleigh, NC :North Carolina Agricultural Extension Service , 1979.
- (2) Carawan, RE.; Rushing, J.E. Detailed Plans far the Reduction in Waste load from a Dairy and Ice Cream Plant. Raleigh, NC North Carolina Agriculture Extension Service, 1987.
- (3) Laughlin, R.G.W.; Forestall, B; McKim, M. "Food

Processing Industry. Technical Manual - Waste Abatement, Reuse, Recycle, and Reduction Opportunities in Industry. Toronto, Canada: Environment Canada, 1984.

(4) Pojaski, R.B. 'Waste Minimization: Planning, Auditing and Implementation "Processing Waste.'

(5) Miorin, A.F. (Chairman). "Wastewater Treatment Design." Water Pollution Control Federation Lancaster PA: Lancaster Press, Press, 1977.

(6) Waynick, J.B.; Carawan,R.E.; Tower, F.R. "A Breaded Foods Processor Does It Too!" Proceedings of the Conference "Waste Reduction-Pollution Prevention: Progress and Respects within North Carolina. Raleigh, NC :Water Resource Research Institute, 1988.