

Stock Rotation Plan

FIRST IN, first out (FIFO) is a critical step in food safety. Food loss and foodborne illness is decreased when storage areas are inventoried using a stock rotation plan. Have you ever organized the food in the cabinets, shelves, and refrigerators at home or at school? All food storage plans should follow a stock rotation plan to use the oldest food first. This involves checking expiration dates and physically moving food. The food with the earliest expiration date should be placed in the front of the latest expiration dates.



Objective:



Rotate stock while following food code storage requirements.

Key Terms:



best if used by (or before)
bin cards
closed or code date
FIFO

HACCP
infestations
open dating
perishable foods
pests

sell-by date
stock rotation
two-bin stock rotation
use-by date

Understanding Stock Rotation Plans

Stock rotation is an inventory strategy to move older perishable products to the front of refrigerated, frozen, and dry storage areas. A person must control the temperature and humidity to properly store foods. All dry and cold stock areas must be cleaned and checked frequently. Stock rotation ensures the use of products with an earlier use-by or sell-by date first by moving products with a later use-by or sell-by date to the back. Similar food items are placed in bins, on shelves, or in cabinets with older items in front and newer items in back. Advantages of stock rotation are:

- ◆ Prevention of food contamination
- ◆ Prevention of food spoilage (waste)

- ◆ Prevention of foodborne illness
- ◆ Food cost control

FIRST IN, FIRST OUT

First in, first out or **FIFO** is the stock rotation method of dating and arranging new stock behind (or below) older stock. The FIFO system ensures that food is used in the order in which it is delivered. For example, when stocking shelves or pantries, the oldest foodstuff is pulled to the front, and the newest product is placed in the back. At delivery, items already on the shelf are physically moved forward, with the newest items placed behind. Items that are not rotated (e.g., stuck at the back of a shelf for extended periods of time) may pass their expiration dates or suffer other forms of decay and end up in the garbage.

FIFO in Foodservices and Supermarkets

FIFO is a common practice in food establishments. The same type and variety of canned goods (e.g., cut green beans) are shelved in rows. As canned goods are purchased, green bean cans with later expiration dates are placed behind other cans on the shelf. At home, the same practice applies. When purchasing canned tomatoes, the cans with the latest expiration dates go to the back of the pantry or cabinet.

Front of the Case

In a self-service food retail facility, the items with the dates closest to expiration are displayed at the front of the case. The management makes it convenient for customers to purchase the “oldest” items first. Grocery store refrigerated units place milk with the oldest expiration date in the front of the display. Airports and other transportation hubs sell pre-made sandwiches in self-serve display cases with the oldest product closest to the customers. New items are placed at the back of the row or on a bottom shelf.

Consumer Use of Stock Rotation

Savvy consumers know to check the expiration dates at retail venues. Also, many customers avoid selecting the items closest to the front of the display. At home, inventorying the cereal boxes and placing them in a stock rotation method might not work. Individuals select specific types of cereal to eat regardless of the use-by date or best if used by date. (Stock rotation only applies when two or more boxes of the same exact cereal are available.)



FIGURE 1. Like foods are placed in rows for customer purchase. Expiration dates are placed in a FIFO system. Notice that like foods—such as various brands and types of canned corn—are located together in adjacent rows. How does placing like items close to each other help the customer?

FOOD COST CONTROL

Stock rotation is a marketing technique used by management to sell the older products first, especially perishable food items. FIFO rotation of stock controls costs and ensures guests receive the freshest products.

Two-Bin Stock Rotation

Two-bin stock rotation is a technique that makes one bin available for the customer while the other is ready for replacement when the supply is needed. Some managers use two-bin stock rotation to ensure the older products are the first available for customer purchase.

Reduced for Quick Sale

A “reduced for quick sale” item has a close (imminent) expiration date. Sometimes a consumer selects this type of item to save money if he or she can use the item immediately or shortly before the expiration date. Freezing fresh meat or dry foods before the use-by date extends the expiration date.

Expiration Dates

The federal government does not require food items to display an expiration date; expiration dates are a voluntary practice by manufacturers. However, the federal government does require infant formula to display an expiration date. The USDA identifies the following codes for **open dating** (using the calendar year), which is a system used by manufacturers to help consumers identify types of expiration dates:

- ◆ **Sell-by date** is a date that indicates how long the store may sell the product. It is best to purchase the product before the sell-by date.
- ◆ **Best if used by (or before)** is a date recommended for best flavor or quality.
- ◆ **Use-by date** is a date recommended for best flavor and peak quality. The manufacturer determines this date.

A **closed or code date** is packing numbers used by manufacturers. It is important not to confuse closed or code dates with open dating codes.



FIGURE 2. The cans show an example of open dating and closed or code dates.

PREVENTING FOODBORNE ILLNESS IN STORAGE AREAS

Every step a food product travels must follow food safety rules to prevent foodborne illness. This includes the storage techniques, including keeping and holding, used in a food establishment and at home and the handling techniques.

- ◆ Proper hygiene, especially good hand washing, is essential. Foodhandlers are often implicated in Staphylococcus, tuberculosis, and other foodborne illness outbreaks.
- ◆ Prevent cross-contamination in storage areas by thoroughly washing hands, counters, and utensils after touching raw meat.
- ◆ Avoid storing raw meat above ready-to-eat food. Leakage or drips from raw food landing on ready-to-eat foods can cause foodborne illnesses regardless of stock rotation protocols.
- ◆ Store cooked food in a wide, shallow container. Refrigerate it as soon as possible. Divide leftovers into shallow containers to promote rapid and even cooling in refrigerated storage units.
- ◆ Use precooked or ready-to-eat food as soon as possible. Do not store in refrigeration units beyond the use-by date.
- ◆ Avoid handling, preparing, and storing food if you have a nose or eye infection.
- ◆ Prevent the spread of hepatitis A with a vaccination.
- ◆ Keep refrigerators, dishcloths, and mops clean and dry.
- ◆ To prevent mold, clean refrigerated units every month with a solution mixed at a ratio of 1 tablespoon of baking soda to 1 quart of water.
- ◆ Clean black mold on refrigerated unit gaskets and casings with a solution mixed at a ratio of 1 tablespoon of bleach to 1 quart of water.
- ◆ Clean all spills inside refrigerated units with hot water and liquid soap. Then rinse and sanitize.

Bacterial Foodborne Illnesses That May Affect Food During Storage

Salmonellosis, E. coli, Staphylococcus aureus and listeria or listeriosis are some bacterial foodborne illnesses that may impact food during storage if proper steps are not followed.

Salmonellosis

Salmonellosis is an infection with bacteria called *Salmonella*. Most people infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. According to the Centers for Disease Control (CDC), the illness usually lasts for up to one week, and most people recover without treatment. Foods typically associated with Salmonellosis infection are the consumption of raw meat (especially poultry), unpasteurized milk, and raw eggs. In addition, cutting raw and cooked foods on the same cutting board with the same knife or tool can result in this infection.

E. coli

E. coli (*Escherichia coli*) is bacteria found in the environment, food, and intestines (feces) of people and animals. Some kinds of *E. coli* infection can cause diarrhea, while others cause urinary tract infections, respiratory illness and pneumonia, and other illnesses. Foods typically associated with *E. coli* are meats, especially undercooked or raw ground meats (e.g., hamburgers or sausages); water that has not been disinfected; unpasteurized raw milk and apple cider; and soft cheeses made from raw milk.

Staphylococcus Aureus

Staphylococcus aureus is a common bacterium found on the skin and in the noses of up to 25 percent of healthy people and animals. According to the CDC, *Staphylococcus aureus* has the ability to make seven toxins frequently responsible for food poisoning. *Staphylococcus aureus* bacteria cause Staphylococcal food poisoning, which is a gastrointestinal illness. These bacteria usually develop when food is left at room temperature “for too long.” *Staphylococcus aureus* is typically found in human ears, noses, throats, mouths, and hair. Contamination could come from anyone who handled the food from manufacturing, to delivery, to storage, to preparation and service. Rotation of cold storage items must be done quickly to prevent the food from being at room temperature for a long period of time. Contaminated milk and cheeses are good mediums for staph (typically contaminated by foodhandlers). Sliced meats, puddings, pastries, and sandwiches are good mediums for staph as well.

Listeria

Listeria (Listeriosis) is a foodborne infection caused by consuming the bacterium *Listeria monocytogenes* (microorganisms found in soil, water, and vegetation). Listeriosis can present in different ways. In older adults and people with immunocompromising conditions, septicemia and meningitis are the most common clinical presentations. Listeriosis can present as blood poisoning, encephalitis, and abscesses. Contamination could occur from exposure to soil, water, or vegetation during stock rotation. Some foods associated with Listeriosis infection are raw fruits and vegetables (especially melons and cucumbers) and raw food from animal sources (especially beef, pork, and poultry).

Viral Foodborne Illnesses That May Affect Food During Storage

Hepatovirus, or hepatitis A, is a viral foodborne illness most commonly found in the human intestinal tract. Fresh fruits and vegetables grown in unsanitary conditions may become contaminated. Hepatitis A also occurs when human feces is used in water for plants. Produce should never be stored where it can cross-contaminate other ready-to-eat foods during stock rotation.

Norovirus, formally known as the Norwalk-like virus, is commonly found in the human intestinal tract. To prevent norovirus, produce should be washed before use, and it should never be stored where it can cross-contaminate other foods during stock rotation.



EXPLORING OUR WORLD...

SCIENCE CONNECTION: When to Use and When to Discard

Research the USDA Food Safety and Inspection Service Web site at <http://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/safe-food-handling/molds-on-food-are-they-dangerous/>.

Find the information on “How Should You Handle Food with Mold on It?” The chart identifies foods, explains how to handle the moldy food, and explains the reason. Then check your refrigerator at home for any foods that need to be discarded.

Is the mold on this Italian dry salami harmful to humans? No: Italian salami makers apply a specific mold to the outside of the salami shortly after it has fermented. Because the *Penicillium* molds colonize rapidly, the colony prevents other contaminating molds from growing and spoiling the salami.



Fungal Foodborne Illnesses That May Affect Food During Storage

- ◆ Mold is a fungus present on plants and animals.
- ◆ Mold can be airborne.
- ◆ Mold grows in any temperature, including refrigerator temperature.
- ◆ Mold present on cold or dry products that are moved during stock rotation increases the spread of mold spores. Remove all moldy foods from cold and dry storage areas.
- ◆ Moisture or high humidity can cause dried grains to mold.

PEST INFESTATION PREVENTION

Pests are disease-, bacteria-, or virus-carrying organisms—usually insects or rodents—that harm, infect, poison, or destroy foodstuffs. Rodents and



FIGURE 3. This image is a microscopic look at mold. Spores give mold its color. Are all molds bad for food? What are spores?

insects must be controlled in food storage areas. **Infestations** are large numbers of unwanted pests in locations where they do not belong. Pests bring potential disease with them, and/or they spread disease via excrement, mites, fleas, and vomit. As most pests breed in filth, it is carried on their feet and in their intestines. As a result, the filth is deposited on food. When deposited on food, these bacteria grow and multiply. Pests that typically invade a foodservice or home pantry include:



FIGURE 4. This rice has an infestation and is also molding. Why? The stock was not rotated and/or was not stored properly.

- ◆ Rodents (mice and rats)
- ◆ Cockroaches
- ◆ Flies

Preventing Pest Infestations

Grains stored more than six weeks may develop an insect infestation. The most common insects that hatch in grain products are weevils, moths, and borers. To prevent this, grains that must be stored more than six weeks can be frozen. To prevent infestations:

- ◆ Keep everything clean.
 - Cover and remove all garbage and recycling from entrances and exits.
 - Close wall cracks and openings (e.g., screens, cement, and metal).
- ◆ Starve pests.
 - Use tight-fitting garbage lids.
 - Keep floors clean in all food storage and preparation areas. (Pests subsist on very small amounts of food.)
 - Cover all food with tight-fitting lids.
 - Store all food a minimum of 12 inches off the floor.
- ◆ Trap and destroy pests, especially rodents. Search for and remove pest nests. (This task may include the services of an exterminator or pest control operator.)
 - Make all doors self-closing.
 - Inspect deliveries for roaches and for pest nests (e.g., especially in fresh fruits and produce).

Odors

Odors can develop in cold storage areas from improperly covered foods. For instance, cut onions should be double wrapped to prevent the onion smell from permeating other foods. Also, damp mops and other cleaning supplies should never be stored in dry food areas. Aside from the odor problem, food codes do not allow the storage of chemicals and cleaning supplies with food because of the potential for leakage and accidental spills. High humidity can cause a damp sour odor in dry storage areas.

SAFE FOOD CODE STORAGE REQUIREMENTS

Food codes must be considered to determine how the food may be stored. Food codes also describe requirements for shelving and containers. Packaged and unpackaged foods must be stored separately. Also, chemicals must never be stored with foods. Dry food storage, refrigerator storage, and freezer storage all have specific code requirements.

General Food Storage Requirements

General food storage requirements, according to Federal Food Code 3-305.12, states that food may not be stored:

- ◆ In locker rooms, toilet rooms, dressing rooms, garbage rooms, or mechanical rooms
- ◆ In an open stairwell or under plumbing or water pipes
- ◆ Where it may become exposed to splash, dust, or other contaminants

Food Storage Shelving Requirements and Recommendations

- ◆ Use slotted shelving or open wire construction in dry and cold food storage. The open wire or slotted construction encourages airflow.
- ◆ Store all dry foods a minimum of six inches (15 cm) off the floor. Contact with concrete floors can leech chemicals into the foods and can rust metal.
- ◆ The labeling of standard food locations on shelves is recommended.
- ◆ Store boxes on shelves a minimum of 18 inches from the ceiling as a fire precaution.



FIGURE 5. Commercial and residential refrigeration units—including walk-in refrigerators and freezers—have open wire or slotted shelving to permit airflow. Why is airflow important to safe food storage?

Food Storage Container Requirements and Recommendations

Store leftover foods in shallow containers. A recommended food depth is 2 inches or less to allow food to cool quickly and to limit the amount of time in the temperature danger zone. Also, cover all stored food to prevent contamination from air, dust, chemicals, and/or spills.

Separation of Packaged and Unpackaged Foods

A summary of the Federal Food Code 3-302.11 states that food must be protected from cross-contamination during storage, preparation, holding, and display. In addition, frozen processed and packaged raw meat cannot be stored with or above frozen commercially processed or ready-to-eat frozen foods. Also, separate different raw meat (e.g., beef, fish, lamb, pork, and poultry) during storage.

Dry Food Storage Requirements and Recommendations

- ◆ Chemicals are separated from food storage. Recommendation: Store no chemicals or toxins in dry storage (unless stored in a separate locked metal cabinet in the room).

Dry food should be stored:

- ◆ Under low humidity conditions to prevent mold growth and the deterioration of packaging
- ◆ Between 40° and 70°F
- ◆ Away from direct sunlight that can deteriorate the packaging and quality of the food
- ◆ Off concrete floors that may leech chemicals into food and can rust metal

Cold Food Storage Requirements and Recommendations

Cold storage—refrigerators, walk-in coolers, under-counter units, and freezers—is used for perishable foods. **Perishable foods** are edible items that readily decay, particularly in warm environments and eventually under refrigeration. Perishables include all meat, poultry, eggs, seafood, produce, and dairy products.

Temperature Guidelines

Recommended refrigerator and freezer temperatures:

- ◆ Reach-in refrigerators 35° to 38°F
- ◆ Walk-in refrigerators 35° to 38°F
- ◆ Reach-in freezers 0° to –10°F
- ◆ Walk-in freezers 0° to –10°F
- ◆ Ice cream freezers –10° to –20°F

FIFO

FIFO is used in cold storage units. Newly purchased refrigerated and frozen items are dated and placed in the back of the unit. Some food facilities use pass-through refrigerators with doors in the front and back. In all cases, but especially in this case, dating is essential to ensure the product used first has the “oldest” date.

- ◆ Refrigerated foods require 60 to 70 percent humidity to ensure prolonged freshness. Too little humidity dries out items, but too much encourages mold growth.
- ◆ Sheet pans are used to catch any blood drips from meat. Raw meat is placed on the bottom shelf and is never placed above ready-to-eat foods.
- ◆ Food is never stored in open cans.



FIGURE 6. Proper storage is needed for refrigerated foods—at home and at work. What mistake did she make when storing that pot of food?

Frozen Food Storage Requirements and Recommendations

- ◆ Use open wire or slotted metal shelves in freezers to promote airflow.
- ◆ Keep the freezer temperature at or just below 0°F.
- ◆ Use FIFO with frozen foods. All frozen food storage rotations follow FIFO, whether at home or in a foodservice establishment.

STOCK ROTATION PLANS AND TECHNIQUES

For the best results, use stock rotation plans and techniques.

FIFO Receiving Techniques

Follow first in, first out (FIFO) when new food is received. While stocking, foods are inventoried for expiration dates and for any recalled foods. While stocking, delivered foods are checked for compliance with food codes for dry, refrigerated, and frozen food storage requirements. Signs of food spoilage are:

- ◆ Strange food color
- ◆ Food odor
- ◆ Dented or bulging cans



DIGGING DEEPER...

UNCOVERING ADDITIONAL FACTS: Compare United Kingdom and U.S. Information Sheets

The United Kingdom offers information on “Shelf Life and Stock Rotation—Fact Sheet and Hygiene Rating Improver No. 9” at <http://www.chiltern.gov.uk/CHttpHandler.ashx?id=2763&p=0>. Compare this to “Shelf-Stable Food Safety by the FSIS (Food Safety and Inspection Service)” at <http://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/safe-food-handling/shelf-stable-food-safety>.

Another source is the legal written FDA codes, titled CFR—Code of Federal Regulations Title 21, (Subpart L) at <http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPart=820&showFR=1&subpartNode=21:8.0.1.1.12.12>. What information do consumers, employers, and employees need to know about food stock rotation?

- ◆ Freezer burn
- ◆ Melted products
- ◆ Products frozen together that should be frozen individually (IQF)

Date Stamp Techniques

Receiving clerks and home cooks should mark the date of delivery on all items with a bold permanent marker. Bulk items, such as flour, may be stored in rolling bins with a date sticker attached.

- ◆ Mark prepared and open foods with a calendar date stamp before storing them.
- ◆ Use the date the food is opened as day one.
- ◆ Indicate the last date the food can be consumed or sold.
- ◆ Indicate the days of the week using color-coded markings (e.g., Monday is green).
- ◆ The common name of the food product should be listed on the date stamp.

Ongoing Unit-Count Processes and Techniques

Inventory or stock ledger sheets (often in spreadsheet format) are a common form of unit-count.

Bin cards are documents that record the status and number of goods held in a stock area. They document the receipt and the issue of materials or the quantity of materials stored in the bin or section. Bin cards are a common crosscheck on the stock ledger or inventory list. They avoid overstocking and under-stocking. The receiving clerk uses Damage/Shortage/Excess report tools to document goods to be returned. These reports include the number and date of the receipt voucher for returned goods.



FURTHER EXPLORATION...

ONLINE CONNECTION:

How the Government Responds to Food Outbreaks

Research the Food Safety Web site at <http://www.foodsafety.gov/poisoning/responds/index.html> to find out how food can become contaminated during production, processing, distribution, and preparation. Note the agencies that respond to foodborne illness outbreaks, and see the latest food recalls.

Stock Rotation Template

Templates may indicate the month, week, or days of the week to check stock rotation (normally twice a week), the storage area to be checked, and the name of the employee evaluating the food storage and rotation of stock. Templates are customized for each foodservice facility and typically include the following task checks:

- ◆ Proper storage based on regulations and procedures
- ◆ Removal of out-of-date and recalled foods
- ◆ Physical removal using the FIFO procedure

HACCP Plans and Techniques for Storing Foods

Hazard Analysis Critical Control Point or **HACCP** is a systematic approach to the identification, evaluation, and control of food safety hazards. HACCP plans are written documents based on HACCP principles that delineate the procedures to be followed. According to the USDA, critical control point is a step at which controls are applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level. HACCP directs workers in the proper handling of food, the monitoring of food safety, and the keeping of accurate records. Procedures for developing an HACCP plan are found at “Conducting a Hazard Analysis and Developing an HACCP Plan” at <http://www.fda.gov/downloads/Food/GuidanceRegulation/UCM252380.pdf>.

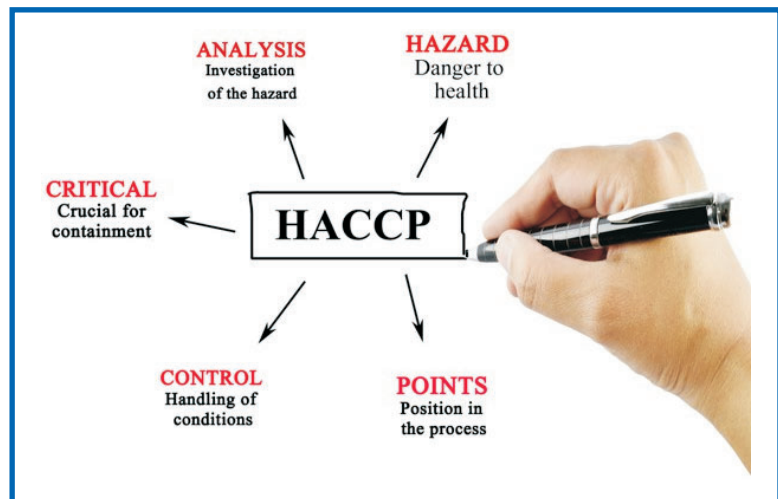


FIGURE 7. The HACCP procedure can be used to develop a stock rotation plan.

Summary:



Stock rotation is a critical step in food safety. Using FIFO techniques to rotate stock decreases food costs and food waste for the home and the food establishment. During the process of inventorying food during stock rotation, the employee also checks the procedures used in storing food. There are important requirements for the ways in which dry food, cold food, and frozen food are stored. Foodservice managers create a scheduled plan for stock rotation using a template or design one using HACCP principles. Stock rotation is an important skill for successful and financially profitable food establishments and homes.

Checking Your Knowledge:



1. What is FIFO? Explain two techniques.
2. Why is stock rotation important?
3. How is mold controlled in food storage areas?
4. Why is a date stamp used in storing food? What information is on the date stamp?
5. How do you evaluate a stock rotation template?

Expanding Your Knowledge:



The FIFO and Stock Control questions are used in training retail employees to reorganize stock. They also emphasize the importance of identifying stock to be discarded and when to mark down selected stock. Training sessions are outlined on FIFO and Occupational Health and Safety (OHS) Web sites. See the Commonwealth of Australia's [FIFO and Stock Control] questions and training plans in the Web Links section. Do a self-test of the questions. How well did you score? Determine if you need more training to work in a retail position responsible for FIFO and stock rotation.

Web Links:



Current Recalls and Alerts

<http://www.fsis.usda.gov/wps/portal/fsis/topics/recalls-and-public-health-alerts/current-recalls-and-alerts>

FIFO

<http://www.leanmanufacture.net/operations/fifo.aspx>

FIFO and Stock Control (Australia)

https://nationalvetcontent.edu.au/alfresco/d/d/workspace/SpacesStore/e56ed9ad-ad46-4c16-a46a-686ab37f7db2/ims/toolbox12_06/scenarios/first_in/03_on_floor/docs/fifo_checklist.doc