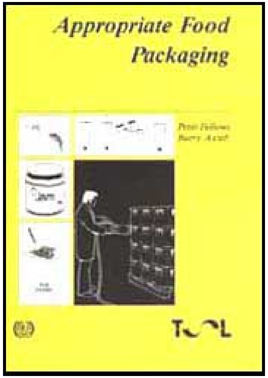


Appropriate Food Packaging (Tool)

6 Implications of introducing packaging

6.1 Introduction

Improvements to the packaging methods used by small-scale food processors, or the introduction of a packaging stage into a process that previously did not pack the products, is likely to require significant changes to the layout of the equipment, the process and work organization. In this section the types of change needed are described in more detail for a representative range of foods.

In previous chapters, the types of spoilage that foods may undergo were first described and then the use of packaging to preserve foods (as well as to promote

the foods to customers) was shown. Details of the properties of different materials, their applications and methods of use were given in Chapter 3. The methods of filling foods into packs and labelling them were described in Chapter 4 and reusable packages or those that can be made on site were described in the previous chapter.

In this chapter some of the general implications of using these methods of packaging for the first time or for improving existing methods are examined. In particular it should be noted that changes that result from introducing new packaging are not simply the extra costs of equipment and materials but may also involve changes to the production process and the introduction of new quality control and storage systems. In each case however, the benefits of new packaging in terms of increased market size, better product quality and increased sales should outweigh the extra costs involved.

A summary of the requirements for introducing different packages for selected foods is shown in Table 6-1 (following pages). To use the table first look up the type of food that is to be packed and then look down the column to see the types of packaging that could be used. When a pack is selected note the numbers in the box and look these up on the key below the table. This will give a summary of the factors that are important when using this type of package for the particular food that is selected.

Activity and important factors

1 *Storage of packaging materials*
2 *Cleaning and filling*
3 *Sealing*
4 *Collation for transport/distribution*

Short — Baked — Snac — Dairy pr — Dried

Long shelf-life — Fermented pro — Acid pre — Pre — Fermented bev — Bev — Confect — Syrups — Pasteuri — Cook — Es — Dairy pr — Baked — Frozen — Smoked

5 *Storage of packaged product*

		goods	k food	oducts	foods	serves	serves	serves	erages	erages	ionary	honey	urees	ing oil	ences	oducts	goods	foods	foods
Glass Bottles				■					■	■				■					
1	stacked upside down on pallets/shelves			●					●	●				●					
1	with mouth of containers covered			●					●	●				●					
2	careful cleaning and sterilisation of pack			●															
2	thorough cleaning with hot water or steam								●	●				●					
2	remove moisture by drying before filling													●					
2	pack suitable for hot filling								●										
2	pack and product heat processed after filling								●										
3	hermetic seal								●	●									
3	close fitting lid			●										●					
4	into boxes or shrinkwrapped trays			●					●	●				●					
5	in a clean container or glass fronted case								●	●				●					
5	off the ground, away from heat and light			●															
Glass Jars				■	■	■	■	■			■	■	■			■	■		
1	stacked upside down on pallets/shelves			●	●	●	●	●			●	●	●			●	●		
1	with mouth of containers covered			●	●	●	●	●			●	●	●			●	●		
2	careful cleaning and sterilisation of pack			●												●			
2	thorough cleaning with hot water or steam					●	●	●			●	●							
2	remove moisture by drying before filling				●						●	●					●		
2	pack suitable for hot filling					●	●	●				●	●						
2	pack and product heat processed after filling						●	●											
2	rinse with water to clean before filling				●												●		
3	hermetic seal					●	●	●					●						
3	close fitting lid			●	●						●	●				●			
4	into boxes or shrinkwrapped trays			●	●	●	●	●			●	●	●			●	●		
5	in a clean container or glass fronted case				●	●	●	●			●	●	●			●	●		
5	off the ground, away from heat and light			●															
Pottery				■	■	■	■	■			■	■	■	■		■			
1	stacked upside down on pallets/shelves			●	●	●	●	●			●	●	●	●		●			
1	with mouth of containers covered			●	●	●	●	●			●	●	●	●		●			

2	careful cleaning and sterilisation of pack															●			
2	thorough cleaning with hot water or steam			●		●	●	●			●	●	●	●					
2	remove moisture by drying before filling			●							●	●		●					
2	rinse with water to clean before filling				●														
3	simple cover			●															

Figure

Activity and important factors

1 Storage of packaging materials
2 Cleaning and filling
3 Sealing
4 Collation for transport/distribution
5 Storage of packaged product

Short / *Long shelf-life*

		Baked Goods	Snack food	Dairy products	Dried foods	Preserves	Acid preserves	Fermented preserves	Beverages	Fermented beverages	Confectionary	Syrups/honey	Pastes/purees	Cooking oil	Essences	Dairy products	Baked goods	Frozen foods	Smoked foods
5	off the ground, away from heat and light	●	●																
Wooden Barrels					■		■	■	■				■				■		
1	stacked upside down on pallets/shelves				●		●	●	●				●				●		
1	with mouth of containers covered				●		●	●	●				●				●		
2	thorough cleaning with hot water or steam						●	●	●				●						
2	pack suitable for hot filling						●						●						
2	brush clean before filling				●												●		
3	close fitting lid				●		●	●	●				●				●		
4	into boxes or shrinkwrapped trays				●		●	●	●				●				●		
4	on pallets				●		●	●	●				●				●		
6	in a clean container or glass fronted case				●		●	●	●				●				●		
Wooden Chests					■												■		
1	stacked upside down on pallets/shelves				●												●		
1	with mouth of containers covered				●												●		
2	brush clean before filling				●												●		
3	close fitting lid				●												●		
4	into boxes or shrinkwrapped trays				●												●		
4	on pallets				●												●		
5	in a clean container or glass fronted case				●												●		

		Baked Goods	Snack food	Dairy products	Dried foods	Preserves	Acid preserves	Fermented preserves	Beverages	Fermented beverages	Confectionary	Syrups/honey	Pastes/purees	Cooking oil	Essences	Dairy products	Baked goods	Frozen foods	Smoked foods
Wooden Boxes					■												■		
1	keep flat in a dry store				●												●		
2	remove moisture by drying before filling				●												●		
3	glue/tape				●												●		
4	into boxes or shrinkwrapped trays				●												●		
4	stacked and tied together				●												●		
4	on pallets				●												●		
5	in a clean container or glass fronted case				●												●		
Paperboard Cartons		■	■	■							■						■	■	
1	keep flat in a dry store	●	●	●							●						●	●	
2	not normally cleaned before filling	●	●	●							●						●	●	
3	simple cover	●	●																
3	glue/tape			●							●						●	●	
4	into boxes or shrinkwrapped trays	●	●	●							●						●	●	
4	stacked and tied together	●	●	●							●						●	●	
5	in a clean container or glass fronted case										●						●	●	

Figure

Activity and important factors

1. *Storage of packaging materials*
2. *Cleaning and filling*
3. *Sealing*
4. *Collation for transport/distribution*
5. *Storage of packaged product*

		Short				*Long shelf-life*													
		Baked Goods	Snack food	Dairy products	Dried foods	Preserves	Acid preserves	Fermented preserves	Beverages	Fermented beverages	Confectionary	Syrups/honey	Pastes/purees	Cooking oil	Essences	Dairy products	Baked goods	Frozen foods	Smoked foods
Foil Sheets / Trays			■		■						■					■	■	■	
1	stacked upside down on pallets/shelves		●		●						●					●	●	●	
1	with mouth of containers covered		●		●						●					●	●	●	
1	keep rolls upright in dry store				●						●					●	●	●	
2	not normally cleaned before filling		●		●						●					●	●	●	
3	simple cover		●																
3	close fitting lid				●						●					●	●		
4	into boxes or shrinkwrapped trays		●		●						●					●	●	●	

4	on pallets		●		●						●					●	●	●	
5	in a clean container or glass fronted case				●						●					●	●	●	
5	off the ground, away from heat and light		●																
Plastic Jars/Bottles					■	■	■	■	■	■	■	■							
1	stacked upside down on pallets/shelves				●	●	●	●	●	●	●	●							
1	with mouth of containers covered				●	●	●	●	●	●	●	●							
2	rinse with water to clean before filling					●	●	●	●	●	●	●							
2	not normally cleaned before filling				●	●	●	●	●	●	●	●							
3	close fitting lid				●	●	●	●	●	●	●	●							
4	into boxes or shrinkwrapped trays				●	●	●	●	●	●	●	●							
5	in a clean container or glass fronted case				●	●	●	●	●	●	●	●							
Plastic Pots				■	■	■	■	■			■	■	■			■		■	
1	stacked upside down on pallets/shelves			●	●	●	●	●			●	●	●			●		●	
1	with mouth of containers covered			●	●	●	●	●			●	●	●			●		●	
2	rinse with water to clean before filling			●															
2	not normally cleaned before filling				●	●	●	●			●	●	●			●		●	
3	close fitting lid				●		●	●			●	●	●			●		●	
3	heat seal			●		●	●	●				●	●						
4	into boxes or shrinkwrapped trays			●	●	●	●	●			●	●	●			●		●	
5	in a clean container or glass fronted case				●	●	●	●			●	●	●			●		●	
5	off the ground, away from heat and light			●															
Plastic Trays		■	■																
1	stacked upside down on pallets/shelves	●	●																
1	with mouth of containers covered	●	●																
2	not normally cleaned before filling	●	●																
3	simple cover	●	●																
4	into boxes or shrinkwrapped trays	●	●																

Figure

Activity and important factors *Short* *Long shelf-life*

Ferment *Ferment*

1 Storage of packaging materials
2 Cleaning and filling

3 Sealing
4 Collation for transport/distribution
5 Storage of packaged product

		Baked Goods	Snack food	Dairy products	Dried foods	Preserves	cid preserves	ted preserves	Beverages	od beverages	Confectionary	Syrups/honey	Pastes/purees	Cooking oil	Essences	Dairy products	Baked goods	Frozen foods	Smoked foods
3	close fitting lid				●	●	●	●			●	●	●	●		●			
4	stacked and tied together			●	●	●	●	●			●	●	●	●		●			
5	in a clean container or glass fronted case				●	●	●				●	●	●	●		●			
5	off the ground, away from heat and light			●															
Metal Cans						■			■	■		■	■						
1	stacked upside down on pallets/shelves					●			●	●		●	●						
1	with mouth of containers covered					●			●	●		●	●						
2	thorough cleaning with hot water or steam					●			●	●		●	●						
2	remove moisture by drying before filling											●							
2	pack suitable for hot filling					●			●			●	●						
2	pack and product heat processed after filling					●			●										
3	hermetic seal					●			●	●		●	●						
4	into boxes or shrinkwrapped trays					●			●	●		●	●						
5	in a clean container or glass fronted case					●			●	●		●	●						
Metal Tins					■						■	■	■	■	■	■	■		
1	stacked upside down on pallets/shelves				●						●	●	●	●	●	●	●		
1	with mouth of containers covered				●						●	●	●	●	●	●			
2	careful cleaning and sterilisation of pack															●			
2	thorough cleaning with hot water or steam										●	●	●	●	●				
2	remove moisture by drying before filling				●						●	●		●	●				
2	pack suitable for hot filling											●	●						
2	rinse with water to clean before filling				●														
2	brush clean before filling																●		
3	close fitting lid				●						●	●	●	●	●	●	●		
4	into boxes or shrinkwrapped trays				●						●	●	●	●	●	●	●		
5	in a clean container or glass fronted case				●						●	●	●	●	●	●	●		
Metal Drums							■	■						■					
1	stacked upside down on pallets/shelves						●	●						●					
1	with mouth of containers covered						●	●						●					

1	with mouth of containers covered						●	●						●					
2	thorough cleaning with hot water or steam						●	●						●					
2	remove moisture by drying before filling													●					
3	close fitting lid						●	●						●					
4	Into boxes or shrinkwrapped trays						●	●						●					
5	in a clean container or glass fronted case						●	●						●					

Figure

Activity and important factors

1. *Storage of packaging materials*
2. *Cleaning and filling*
3. *Sealing*
4. *Collation for transport/distribution*
5. *Storage of packaged product*

		Short			Long shelf-life														
		Baked Goods	Snack food	Dairy products	Dried foods	preserves	Acid preserves	Fermented preserves	Beverages	Fermented beverages	Confectionary	Syrups/honey	Pastes/purees	Cooking oil	Essences	Dairy products	Baked goods	Frozen foods	Smoked foods
5	off the ground, away from heat and light	●	●	●															
Fibreboard Boxes					■													■	
1	stacked upside down on pallets/shelves				●													●	
1	with mouth of containers covered				●													●	
2	brush clean before filling				●													●	
3	glue/tape				●													●	
4	stacked and tied together				●													●	
4	on pallets				●													●	
5	in a clean container or glass fronted case				●													●	
Fibreboard Drums					■						■						■		
1	stacked upside down on pallets/shelves				●						●						●		
1	with mouth of containers covered				●						●						●		
2	not normally cleaned before filling										●						●		
2	brush clean before filling				●														
3	close fitting lid				●						●						●		
4	Into boxes or shrinkwrapped trays				●						●								

4	stacked and tied together																●		
4	on pallets				●						●						●		
5	in a clean container or glass fronted case				●						●						●		
Paper Bags		■	■		■						■					■	■		
1	keep flat in a dry store	●	●		●						●					●	●		
2	not normally cleaned before filling	●	●		●						●					●	●		
3	wrap/tie	●	●		●						●					●	●		
4	into boxes or shrinkwrapped trays	●	●		●						●					●	●		
4	stacked and tied together	●	●		●						●					●	●		
5	In a clean container or glass fronted case				●						●					●	●		
5	off the ground, away from heat and light	●	●																
Paper Wraps		■	■		■						■					■	■		
1	keep flat in a dry store	●	●		●						●					●	●		
2	not normally cleaned before filling	●	●		●						●					●	●		
3	wrap/tie	●	●		●						●					●			
3	heat seal																●		
4	Into boxes or shrinkwrapped trays	●	●		●						●					●	●		
4	stacked and tied together	●	●		●						●					●			
4	on pallets																●		

Figure

Activity and Important factors

1 Storage of packaging materials
2 Cleaning and filling
3 Sealing
4 Collation for transport/distribution
5 Storage of packaged product

		Short			*Long shelf-life*														
		Baked Goods	Snack food	Dairy products	Dried foods	Preserves	Acid preserves	Fermented preserves	Beverages	Fermented beverages	Confectionary	Syrups/honey	Pastes/purees	Cooking oil	Essences	Dairy products	Baked goods	Frozen foods	Smoked foods
5	in a clean container or glass fronted case				●						●					●	●		
5	off the ground, away from heat and light	●	●																
Polythene Film		■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	
1	keep rolls upright in dry store	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	

2	not normally cleaned before filling	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	
3	simple cover	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	
3	wrap/tie	●	●	●	●	●	●	●											
3	heat seal	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	
4	into boxes or shrinkwrapped trays	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	
4	on pallets	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	
5	in a clean container or glass fronted case				●	●	●	●			●	●	●	●	●	●	●	●	
5	off the ground, away from heat and light	●	●	●															
Cellulose Film		■	■								■						■		
1	keep rolls upright in dry store	●	●								●						●		
2	not normally cleaned before filling	●	●								●						●		
3	simple cover										●						●		
3	wrap/tie	●	●																
3	heat seal	●	●																
4	into boxes or shrinkwrapped trays	●	●								●						●		
4	on pallets	●	●								●						●		
5	in a clean container or glass fronted case										●						●		
5	off the ground, away from heat and light	●	●																
Polypropylene Film		■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	
1	keep rolls upright in dry store	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	
2	not normally cleaned before filling	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	
3	simple cover				●	●	●	●			●	●	●	●	●	●	●	●	
3	wrap/tie	●	●	●															
3	heat seal	●	●	●															
4	into boxes or shrinkwrapped trays	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	
4	on pallets	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	
5	in a clean container or glass fronted case	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	
Cotton Bags					■											■			■
1	keep flat in a dry store				●											●			●
2	careful cleaning and sterilisation of pack															●			●
2	brush clean before filling				●														

Figure

Activity and important factors

1 Storage of packaging materials
2 Cleaning and filling
3 Sealing
4 Collation for transport/distribution
5 Storage of packaged product

Short *Long shelf-life*

		Baked Goods	Snack food	Dairy products	Dried foods	Preserves	Acid preserves	Fermented preserves	Beverages	Fermented beverages	Confectionary	Syrups/honey	Pastes/purees	Cooking oil	Essences	Dairy products	Baked goods	Frozen foods	Smoked foods
3	wrap/tie				●														●
4	stacked and tied together				●												●		●
4	on pallets				●												●		●
5	in a clean container or glass fronted case				●												●		●
Jute Sacks		■																	
1	keep flat in a dry store	●																	
2	brush clean before filling	●																	
3	wrap/tie	●																	
4	stacked and tied together	●																	
4	on pallets	●																	
5	in a clean container or glass fronted case	●																	

Figure

6.2 Pre-packaging changes

6.2.1 Process room layout

In all food production there should be a flow of materials around the production room to prevent cross-contamination between raw food and the processed product and provide smoother working (Figure 6-1). The introduction of a packaging stage should be done so that this flow is maintained. Typically the introduction of packaging will require a store for the packaging materials, a packaging area, a quality control area for finished products and a store to hold the finished products before they are sent out for distribution to customers. Some types of packaging materials will also require an area for making them into containers (for example cardboard boxes), for cleaning and/or sterilizing the packaging before filling (for example glass jars or bottles) and a place for inspecting the packaging materials before filling.

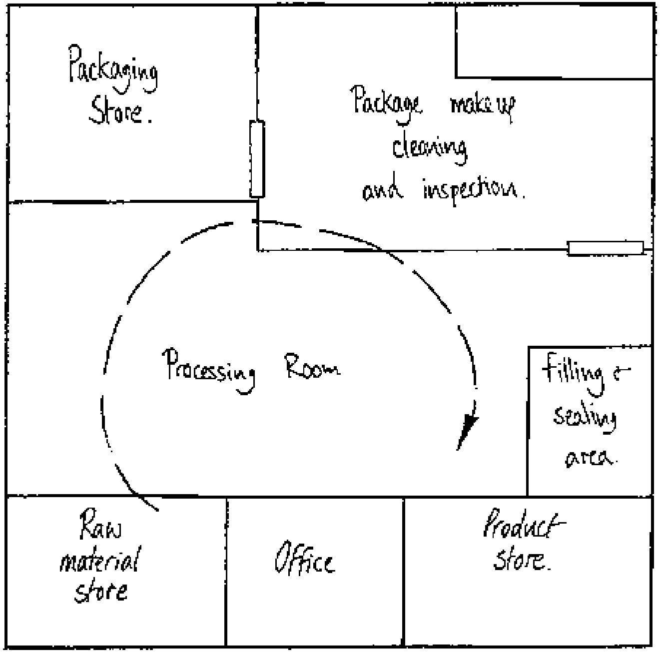


Figure 6–1: Floor plan of a food processing unit

Figure

6.3 Packaging store

All packaging materials should be stored in a mom that is not used for processing and is protected from rats, birds and insects. It is a common fault to concentrate on hygiene in the production area and ignore storerooms. However faeces from

animals, insects or birds that contaminate packaging has a high chance of also contaminating the final product.

Rodents may also destroy packaging by eating it or making it into nesting which is a direct economic loss to the processor. Rooms should therefore be screened at doors and windows to prevent birds and insects, all drains and wall-roof joints should be made rodentproof, and the fabric of the storeroom (the roof, walls and floor) should be intact without holes that animals and insects could enter (Figure 6-2).

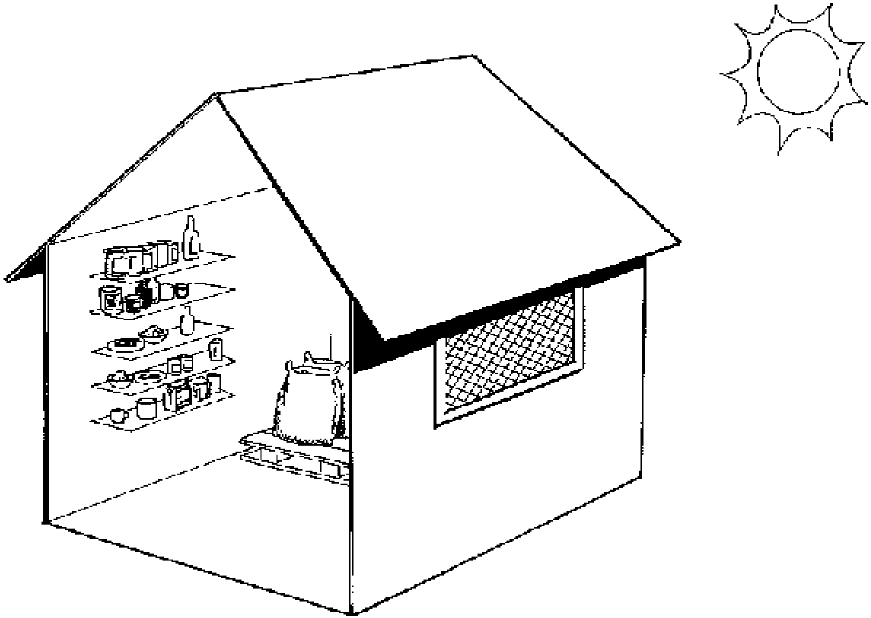


Figure 6–2: Suitable storage room

Figure

The storeroom should not be used for processing to minimize the entry of dust, dirt and food particles which would contaminate the packaging and in turn contaminate the product.

Packaging materials should be stored off the ground on shelves or pallets. This is especially true for papers, cardboard and films which are damaged by dampness

(see also Sections 3.1.6, 3.2.1 and 3.2.2).

6.3.1 Preparation of packaging materials

Some materials are bought flat and must be made up into containers before filling. Examples include paper for bags, cardboard for boxes and film for packs. These preparation procedures are often dusty and may produce small pieces of material which could contaminate the product. Package make-up should therefore be done away from the filling and processing area and ideally in a room away from the processing room.

Other types of packaging such as pre-prepared glass, metal and plastic containers, require rinsing with clean water as a minimum before filling. Many will also require sterilization if there is a risk of contaminating the product or if the product is not to be further processed after filling and sealing.

The washing and preparation of re-used bottles and jars is most important. A good product packed in a dirty container will soon deteriorate. As a minimum all used jars and bottles should be thoroughly washed in detergent and then rinsed in clean water (chlorinated if necessary). An inspection at this stage is necessary to detect any trace smell of kerosene, petrol or other liquids that may have been stored in the container. If operators suspect that a container has been used to store insecticides, herbicides or other chemicals it should be discarded as it is not possible to clean the container properly.

Most glass containers also require sterilization by either steam or boiling water for at least ten minutes. This is important even if the product is to be filled hot into

the jar or bottle because the heating will show up any weakness in the container and it will break before it is filled. The producer will therefore save any wasted product. This is discussed in more detail in Section 3.1.1.

All packaging should be routinely inspected for the common faults that are likely to occur with the particular material. An outline of these inspection procedures is given below and details are given in the individual sections for each packaging material.

6.3.2 Filling and sealing

The introduction of a packaging stage to a process will require a filling and sealing area to be set aside. This is a critical stage in the production of most packaged food, but particularly for those foods that are not processed further after filling and sealing. This is because at the filling stage it is often the last opportunity for the staff to properly inspect the food for contaminants, correct quality, etc.

It is also the stage at which the correct weight of food is filled into the container and it is the last stage that a package can be inspected by staff for foreign bodies or gross contamination before it is filled.

Great care should therefore be taken to ensure that the filling area and equipment are kept clean, free of waste food and away from open doors or windows. The lithting (either artificial or preferably natural light) should be good in the filling area to allow operators to inspect the product and packages as filling and sealing takes place.

Automatic or semi-automatic fillers are normally too expensive for small-scale producers, and their high capital cost cannot be justified in terms of the income generated at small production levels. Appropriate small-scale fillers are in general difficult to buy from suppliers and examples of locally made equipment are therefore described in Chapter 4. Sealing equipment for bottles, cans, jars, bags and boxes are described in detail under each section in Chapter 3.

6.4 Quality control

In this section the general inspection procedures that are needed for packaging materials are described. Specific checks on the quality of individual packaging materials are described in detail in Chapter 3 following the description of each material. It should be noted that the analysis and quality control of the final product itself is not covered in this publication and the reader is recommended to read one of the many texts available for specific foods.

It should be noted that for very small-scale enterprises no formal quality control schemes or quality control staff are normally employed. The quality of both packaging and products is checked informally by the owner and/or the operators. This is satisfactory provided the people involved know what to check for but as the size of a business increases it is necessary to adopt more formal procedures. This publications is intended for small to medium-scale producers and it therefore includes basic quality control procedures for packaging materials. Larger-scale industries, particularly those that export foods may have to consider more sophisticated quality control systems than those described here and it is recommended that they employ a specialist to advise on their specific requirements.

6.4.1 Incoming packaging

Quality control should be seen as a method of saving money and not as an unnecessary expense. The time and effort put into quality control should therefore be related to the nature and importance of the likely fault that is being checked for. For example splinters of glass in a bottle or jar (Section 3.1.1) is a hazard that is very important to both customers and manufacturers because of the risk of injury. On the other hand if a design on a label (Chapter 4) is a few millimetres out of alignment this is not so important and not worth spending a lot of money to check for.

These differences in importance give rise to a general classification of faults (or defects) into the following categories:

- critical fault
- major fault
- minor fault

Critical faults are those that may injure an operator in the plant or a customer, or alternatively they may be so serious that they may cause the food to become unsafe. The example of glass splinters above is one example of a critical fault and another is faulty can seam dimensions (Section 3.1.3), which could allow food poisoning micro-organisms to enter a can and contaminate the food.

Major faults are those that make a package unsuitable for use in the process or result in a serious loss of money for a business (for example through wasted product, legal action etc). For example if glass containers are not vertical (Section

3.1.1) they may break in a filling machine, if layers of plastic Film on a roll are stuck together (Section 3.2.2) it cannot be unwound and used or if foil has too many pinholes (Section 3.2.3) its barrier properties are affected and it will not protect the food as required.

Minor faults are the majority of faults that occur in packaging materials. For example a printing ink may be slightly the wrong color, the dimensions of a glass bottle or jar may vary a little or a plastic film may have marks or ink smudges which make it less attractive.

It should be noted however that each producer should carefully consider the market in which the package is to compete. An acceptable package with a few minor faults in one market may be totally unacceptable for a different market situation.

When quality control procedures are being set up or reviewed it is important to record the types of faults that have occurred in the past as well as those that could occur. The manager of the food plant then decides which of these faults is so important that they are critical to the success of the business or health of the operators and customers. It is possible that in some processes them are no critical faults, but if they are likely to occur (especially with glass containers) they must be included. Next the manager decides which faults will lose the business money if they occur. These major faults may result from a problem that the packaging supplier has or they may be connected with preparation of the packaging materials in the food plant.

These critical and major faults are the ones that a quality control scheme will be

designed to check for. It is not ususally worthwhile checking for minor faults on a routine basis, unless they result in customer complaints.

6.4.2 Requirements for routine inspection of packaging materials

To monitor the quality of packaging materials successfully, each incoming batch should be examined. Routine inspection requires the following:

- trained staff,
- an established procedure,
- space,
- some equipment and facilities.

The most important of these is properly trained staff and it is desirable that all staff involved in a process are trained to look out for faults in packaging materials as they are being used (as well as other faults in the product or process). In addition it is desirable to have one member of the production staff who routinely examines the packaging material as it is purchased for a set of likely faults that are important (critical or major) and who knows from experience are likely to occur. The operators who fill the packs with product should also be trained to look out for packaging faults. The training should make sure that the operators draw the manager's attention to the faults and do not simply let the faulty pack go out with the others. In some cases a bonus system in which operators are paid for identifying faulty products or packages can be beneficial provided safeguards are in place to prevent fraud.

It is not usually necessary to spend time and money examining every package that

is bought (an exception to this is the examination of glass jars or bottles, particularly if they are to be re-used and may have been used by customers to store non-food materials such as kerosene. Here every container must be checked and this is often most conveniently done by the operators who wash the jars/bottles).

More often an established procedure is set up in which a sample of containers is checked for the expected critical or major faults. Deciding on the number of samples to check is not an easy decision. The number will depend on how many packages there are in a load and the number of faults that have been found previously (the reliability of the supplier) among other factors. There are published statistical tables that can be used to decide on the number of packages to inspect. They are based on different risks that a processor will accept faulty packages if not enough are inspected. However these are only useful if they are agreed with the packaging supplier so that any faulty packs can be returned and the money refunded. In practice small-scale processors in developing countries rarely have such an arrangement with a packaging supplier and the cost of any faulty packs is carried by the processor. The reason for checking the packages in these situations is therefore to prevent harm to customers and to removeseriously faulty packages before they are filled and so save the business money and protect its reputation.

Space should be set aside in the packaging store room or in the processing area to check routinely both the quality of the packaging materials and the weight of filled packs. This does not need to be elaborate, and a table, a checkweighing scale and a few simple items of equipment are usually adequate.

6.4.3 Checking filled packs

The main checks that should be done on packaged foods are as follows:

- net weight,
- appearance of pack and product,
- integrity of seal,
- presence and position of label,
- presence of faults in the pack.

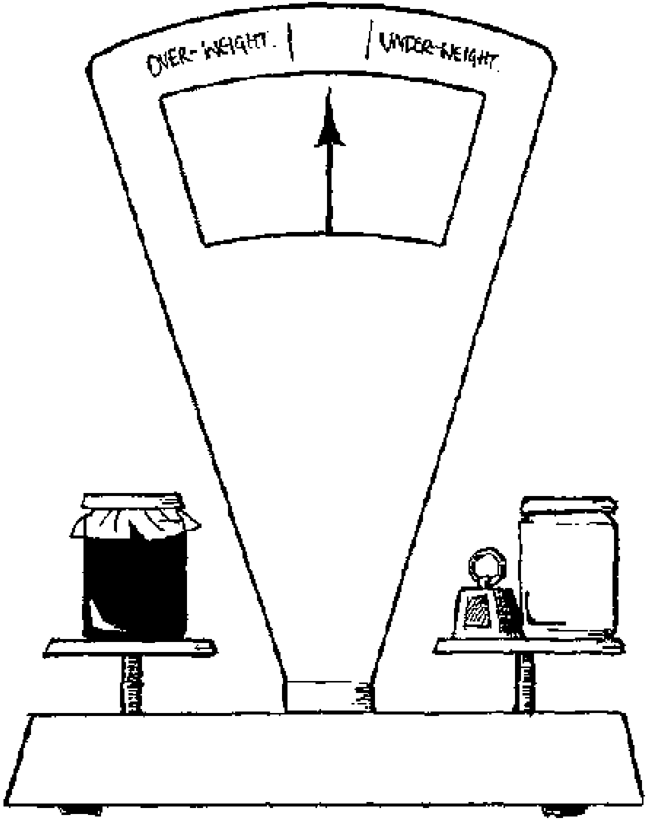
Fill weight

It is a legal requirement in most countries that a package has the weight of the food written on the label and that the net weight of food inside the pack is not less that this. To be sure that the correct amount of food is being filled it is necessary to check the weight of a sample of filled containers (except for very low production rates it is usually not possible nor worthwhile to check every container).

To do this a scale is needed which has a package plus a known weight on one side (Figure 6-3). In the case of glass the heaviest container from a batch should be used. Samples taken during the day's production are placed on the other side of the scale. All should be equal to, or greater than, the test weight. If an automatic filler is used in the process a record of the average weight of five samples can be kept which is then written on a chart (Figure 6-4). This shows the trends in fill weight over a period of time and lets the operators know when the machine needs to be adjusted If filling is done by hand it is still necessary to check the fill weights

but the chart is less valuable. Instead operators who fill the containers should be told routinely of the results of the checks so that they can make the necessary adjustments to their filling.

Figure 6-3: Scale



Figure

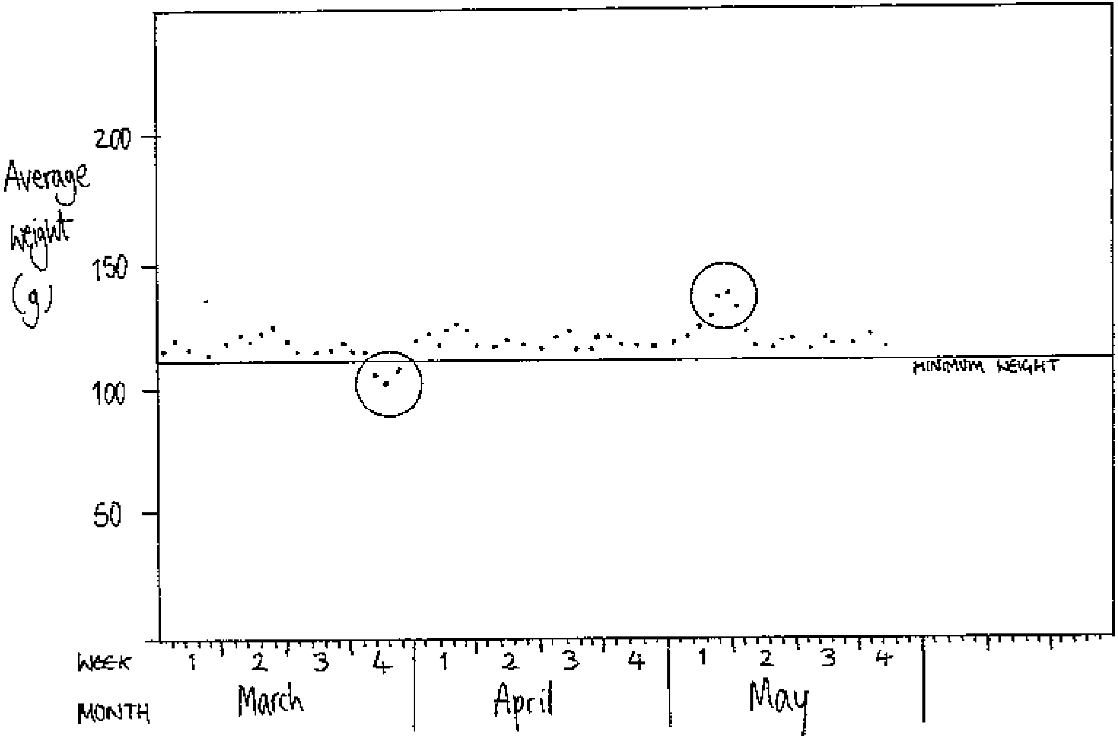


Figure 6-4: Record of the average weight

Figure

The number of samples that should be taken to check fill weight depends in part on the amount of food that is produced and the method of filling (hand filled

containers usually need more frequent checking). As a rough guide one in every twenty packages could be checked, but the proper number of samples will vary according to the production. The check does not damage the packages and if their weight is satisfactory, they can be returned for sale.

The method of checking fill-weights described above is known as the Minimum Weight system and it is intended to make sure that every package of food contains at least the net weight that is shown on the label. This is the simplest system for small scale producers to operate. In Europe another system has been introduced to take account of the highly mechanized, automatic filling and packaging that is used by most producers. This is known as the Average Weight system and relies on a statistical probability that a known proportion of packages will be above the weight written on the label. This system is unnecessarily complex for small-scale producers and is intended to operate when producers use automatic filling and checkweighing machines. However, if small-scale producers are intending to export foods to Europe they should be aware of this system and the implications for both labelling and import restrictions. It is recommended that further advice is obtained from local Export Development Boards or their equivalents.

6.4.4 Labelling

This is described in detail in Chapter 4. For routine quality control it is often sufficient to check that the correct label has been placed on a container in the correct position when the fill weight is being checked. In addition the general appearance of the pack and product (including any food smeared on the outside) and the integrity of the seal can be checked at this time.

6.4.5 Batch coding

It is important to be able to identify when a batch of food was produced so that proper stock control can be achieved. In this way packaged foods are sold in the sequence that they are produced and there is no risk of packages being left in the store room until they spoil. At its simplest a batch code is a single number which is stamped onto the label of all packages that contain food from that batch. The number is then increased by one for each subsequent batch. A written record is kept by the processor to show which numbers correspond to the date of production. This can also be a useful double check on the shelf-life of the food when the batch code is taken together with the sell-by date (see also Chapter 4).

6.5 Post-packaging operations

The introduction of new packaging techniques requires changes to the production routines that do not end when the product is packaged. The packages themselves most often require labelling, coding and collation into larger loads that are suitable for handling and transport to customers. In addition the packaged product should be checked to make sure that it conforms to national legislation or, for export, that it conforms to the legislation of the importing country. Finally the packaged food may require storage until enough is produced to make a full load for transporting to customers.

6.5.1 Collation and preparation of shipping containers

Once packages have been filled, sealed and labelled they are grouped together into larger packs to make handling and transport easier. The most common shipping

containers used in developing countries are fibreboard (more commonly known as 'cardboard') boxes which are described in detail in Section 3.1.6. Newer shipping containers include shrinkwrapped and stretchwrapped film around packs contained on cardboard trays (Section 3.2.2). Some products may require the greater protection of wooden crates or boxes and these are described in Section (3.1.5). A summary of the common combinations of package and shipping container is shown in Table 6-2.

Consumer packs	*Paperboard cartons*	*Cardboard boxes*	*Shrinkwrap/ stretchwrap*
Glass			
- bottles		■	■
- jars		■	■
Ceramic pots		■	
Metal			
- cans		■	■
- tins			■
- drums			■
- trays	■	■	■
- foil wraps	■	■	
Plastic			

- bottles		■	■
- pots	■	■	■
- trays	■	■	■
Paper / Fibre board			
- cartons		■	■
- tubes	■	■	■
- bags	■	■	
- wraps	■	■	
Sealed plastic films	■	■	■
Cotton bags		■	■

Table 6–2: Types of shipping container

Figure

In general a filled shipping container should weigh between 10 and 15 kg. If it is heavier it is likely to be dragged rather than carried, if it is lighter it is likely to be thrown rather than carried. Both would result in damage to the package and possibly to the product inside.

Detailed descriptions of metal, wood, shrink/stretch film and fibreboard materials used for shipping containers are given in Chapter 3. In this section the methods used to seal the boxes and drums made from these materials are described.

Boxes

Wooden boxes, chests and crates are nailed or stapled together, often using metal reinforcement to protect the corners. Fibreboard boxes can be glued, stapled, banded with metal or plastic tape, or tied with rope/twine. Equipment used to seal fibreboard boxes is shown in Figures 3-40 and 3-41.

Drums and barrels

The lids of drums can be pressed into place, held by a retaining band or by a screw thread. Metal drums are found with each of these types of lids whereas it is more common for fibreboard drums to hays banded lids and plastic drums to have screw-threaded lids. Wooden barrels are normally fitted with a removeable wooden plug that is hammered in for transport.

Sacks

Jute and cotton sacks can be tied with wire or rope, stapled or stitched. An example of an electrical sack stitcher is shown in Figure 3-42. Polythene or polypropylene sacks are usually heat sealed.

6.5.2 Storage and handling of shipping containers

Shipping containers should be stacked in storerooms or on pallets in a neat way so

that there is no danger of the stack falling over and that the best use is made of the available space. All packages should be stored off the ground in rows. Space should be allowed for operators to walk between the rows to inspect the food and to collect packages for delivery to retailers or consumers. A typical stacking design for boxes on a pallet is shown in Figure 6-6.

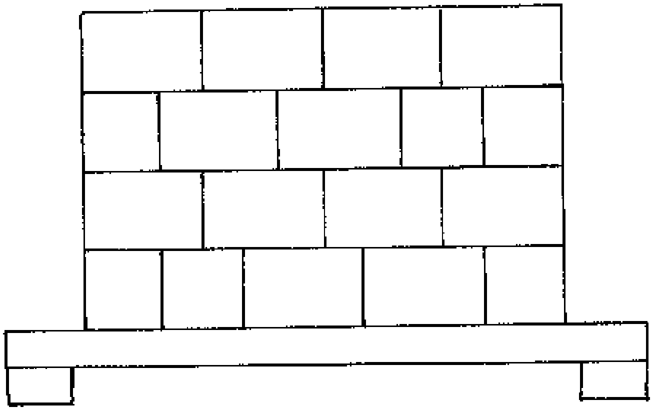
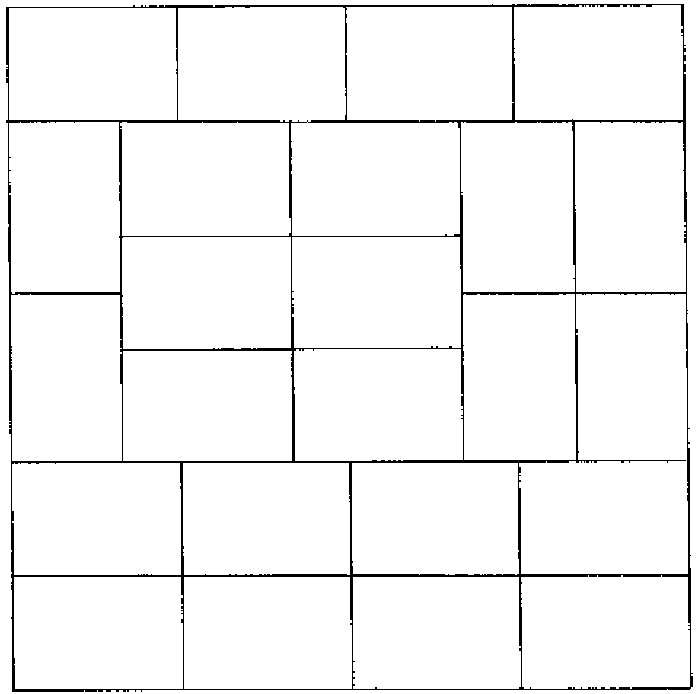


Figure 6–6: Stacking design for boxes



Figure

Packaged products are the most valuable materials on site and represent the future income to the business. Every care should therefore be taken to protect them and avoid any deterioration before they are transported to retailers and consumers. Storerooms should be kept as clean as the processing mom and protected against rats, insects, birds and other animals using wire mesh screens and fully sealed doors and ceilings.

A system should be introduced to monitor the amount and types of packaged food that are held in the storeroom. This can be a simple board on which the batches are written as the packages are taken into the store (Figure 6-7). The first packs in are then removed from the store first. This ensures that the processor knows how much food is in the store at any time, the age of the oldest stock and it helps to ensure that stock is used in the correct order.

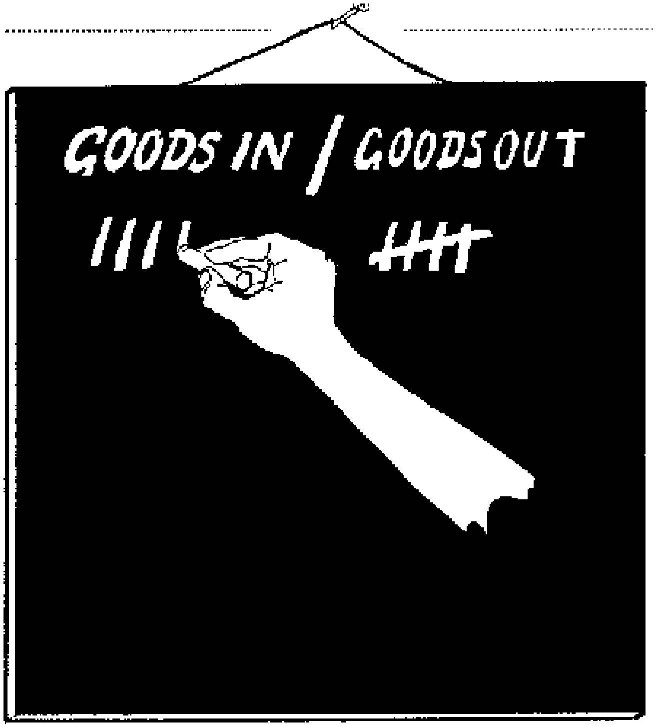


Figure 6–7: Board for batch numbers

Figure

Although processing and packaging are able to stabilize foods against spoilage it should not be assumed that foods are impervious to climatic conditions during distribution and storage. In general a longer shelf-life for processed foods will be

achieved if they are kept in cool dry conditions away from direct sunlight and temperature fluctuations. These conditions are also ideal for maintaining the condition of the packaging materials and the colors used in printing.

The types of deterioration of foods are described in detail in Chapter 2. Processing slows or halts this deterioration provided that the storage conditions and/or package integrity are maintained. If these are not adequate the processed food will spoil in a similar way to the fresh food.

Packaging materials may also deteriorate under incorrect storage conditions. In general most packaging materials will keep their properties and appearance if they are stored in cool, dry and dark conditions. However some types of packaging are more susceptible to deterioration than others.

Glass packs are the most stable and little change in the glass itself is expected under most conditions. However the caps or lids are less stable and in damp, humid and hot conditions metal caps can corrode and the Lining material can separate away (Section 3.1.1.) Metal cans will corrode at weak spots in the tin coating in hot humid conditions (Section 3.1.3).

Plastic caps, jars or bottles are in general fairly stable under most storage conditions, but higher temperatures increase the rate of plasticizer movement into foods from some plastics and soften the plastic which may affect the seal strength. Direct sunlight affects the structure of plastics such as polythene and also makes some printing inks fade more quickly (Sections 3.1.4 and 3.2.2).

Cellulose film has barrier properties that vary with changes in the humidity and

temperature of the storage environment which can affect the shelf-life of foods that are stored in this packaging. The barrier properties of other flexible films also change to a small extent with changes in storage temperature but if these changes are not extreme this will not substantially affect the shelflife of the foods being stored (Section 3.2.2).

Papers and fibreboard are very susceptible to changes in the humidity of storage. In high humidity they lose their rigidity and strength thus making puncturing and tearing more likely. In damp conditions the adhesive that is used to form bags, corrugated fibreboard or cartons may also lose its strength and the container will fall apart (Section 3.2.1).

Papers, fibreboard and cloth/fibre containers are all susceptible to mould growth in humid or damp conditions. Even if the mould growth is not visible, it can produce a musty odour which will taint foods that have a delicate flavour or odour.

6.5.3 Transport and distribution

One of the main functions of shipping containers is to protect the food against physical damage and pilfering during transport and distribution. Different containers are designed to have different strengths and these should be matched to the requirements of the food. Table 6-3 shows the effectiveness of different shipping containers in protecting foods against physical damage during transport.

Type of pack	*Crushing*	*Puncturing*	*Vibration*	*Impacts*	*Pilfering*
Metal drum	■■■	■■■	■	■■■	■■
Plastic barrel	■■■	■■■	■	■■	■■
Wood barrel	■■■	■■■	■	■■■	■■
Wood chest	■■■	■■■	■■	■■■	■■
Fibreboard box	■■	■■	■■■	■■■	■■
Fibreboard drum	■■	■■	■■■	■■	■■
Cotton sack	■	■	■	■	■
Jute sack	■	■	■	■	■
Plastic sack	■	■	■	■	■■

Key
■■■ very good
■■ moderate
■ poor

Table 6–3: Effectiveness of shipping containers

Figure