



FOOD SAFETY & SHELF LIFE EXTENSION

Western Australian Government,
Department of Primary Industries and Regional Development
WA Food and Beverage Packaging Forum
Perth, Western Australia
30 October 2019

FOOD SAFETY & SHELF LIFE EXTENSION

Packaging and food are inextricable. Packaging has a number of functions aside from being a vehicle of containment and a medium for product information etc. In the extension of shelf life it provides a range of opportunities from basic containment to the role of processing vessel.

First step is a safe food. Made and controlled at all steps.

The extension of shelf life can be considered under the following headings:

1. The slowing down of microbial activity and/or biochemical processes using refrigeration, modification of the immediate environment through vacuum, gas or modified atmosphere packaging.
2. The elimination of viable micro-organisms and the inactivation of enzymes by heat e.g. pasteurisation, sterilisation.
3. The reduction of water activity e.g. concentration, dehydration.

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In order to achieve these objectives, particularly from the packaging aspect, we need to understand those characteristics of the product which are vulnerable and how these might be afforded protection.

Product spoilage is dependent on microbiological, chemical and physical factors which are influenced by the composition and initial quality of the product, processing, packaging and finally storage.

Food Safety / Shelf Life Extension / Packaging / Storage Conditions are closely linked and today we are going to discuss the many links between them.

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Functions of Packaging

➤ **Containment**

➤ **Protection**

➤ **Convenient**

➤ **Communication**





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FOOD SAFETY AGENDA

- **Good Manufacturing Practices (GMP)**
- **Contamination and Foreign Objects (including microbiological contamination)**
- **Illness and Accident Reporting** **HACCP, CCP, QCP, RCP**
- **Allergens** **Cleaning, Sanitation, and Chemicals**
- **Pest Control** **Waste management**
- **Glass, Brittle Plastic, and Ceramics**
- **Calibration** **Product Labeling and Coding**
- **Food Hygiene**

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Packaging has the potential to
address food safety issues.

Packaging must handle the
intense rigors of the food supply
chain journey.

Consumers will pay a premium
for safe food.

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Spot the Food Packaging Safety Hazards



Study this food packaging manufacturer with poor hygiene controls and try to identify the hazards that could be a risk to food packaging safety.

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Glass, Brittle Plastic, and Ceramics

Potential contamination of product with glass, brittle plastics, or ceramics presents an unacceptable risk for consumers and for the business.

A register of glass, ceramics and brittle plastics is maintained and an annual audit undertaken to ensure the register is accurate, adding any new items if they are identified.

A risk assessment of the whole site is undertaken to determine and document the potential for product contamination if breakage occurs of these contaminants occurs.

Control measures are documented and if High or Medium risk glass items are identified they must be replaced with a lower-risk option, a non-glass alternative or be contained. Controls must also be in place for low risk items.



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Product Labelling

The Food Standards Code requires that we comply with the following:

Nutritional

Country of Origin

Directions for use

Food recall info

Allergen sufferers

Food additives

Ingredient List

%age





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Product Coding



Best Before Date: Shelf Life < 2 years

Use By Date: Don't consume after





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Food Safety

Establishing Shelf Life

How can packaging extend Shelf Life Safely?

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Food safety management for manufacturing food packaging

Safe Materials

- Compositionally fit for use:
 - Food type
 - Use Conditions

Suitable purity

- RM supplier GMP
- Internal storage/handling

Safely made

- Good manufacturing practice (gmp)

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Shelf Life

the stated shelf life is the period of time, established under intended conditions of distribution, storage, retail and use, that the food would remain safe and suitable.

This means that the food:

- must remain safe to consume, i.e. should not cause food-poisoning because of the growth of pathogenic bacteria, or the production of toxins (bacterial and fungal) in the food during storage;

- has not deteriorated in quality or spoiled in any way that the consumer would find unacceptable;

- has not lost significant amounts of any nutrients listed on the label. *From MPI*

How to Determine the Shelf Life of Food July 2016

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Packaging and Food are inextricably linked

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PACKAGING AND THE EXTENSION OF SHELF LIFE

REFRIGERATION

MODIFIED ATMOSPHERE PACKAGING

ASEPTIC PACKAGING

HIGH PRESSURE PROCESSING

ACTIVE & INTELLIGENT or SMART PACKAGING

TAMPER EVIDENT PACKAGING

The other side

DEFECT DETECTION

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REFRIGERATION

Refrigeration plays an integral part in the extension of the shelf life of foods.

In the normal handling of products ex-farm some form of refrigeration is necessary, fruits and vegetables prior to packaging need to be kept at an appropriate temperature.

Chilling is essential if the raw product is to be displayed for sale.

In the case of highly perishable products such as meat and fish then refrigeration temperatures are a crucial requirement.

Temperatures in refrigerated display cabinets need to be appropriate to the products displayed.



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REFRIGERATION



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REFRIGERATION PACKAGING

Frozen foods rely on the inability of microorganisms to grow at low temperatures and also the slowing of the rate at which biochemical changes take place.

Enzymic degradation does not cease entirely and this can cause deterioration over a long period.

In terms of packaging the range of materials is extensive. PE bags are popular and if packed tightly around the food can minimise some the aforementioned problems.

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REFRIGERATION PACKAGING - VACUUM



FOOD SAFETY & SHELF LIFE EXTENSION

REFRIGERATION PACKAGING - VACUUM



2019 SAVE FOOD PACKAGING DESIGN SPECIAL AWARD



- ✓ Easy to Open
- ✓ Portion Control
- ✓ Freezer Ready
- ✓ Extension of Shelf Life
- ✓ Increase of shelf life by 25%
- ✓ Tear Tab & Peelable Top Film



- ✓ Design to Protect
- ✓ Design to Preserve
- ✓ No product dehydration
- ✓ Moved from MAP to vacuum skin
- ✓ Serving size optimised for 2x
- ✓ Design for Consumer Convenience



Company Name: Hazeldene's Chicken Farm & Sealed Air
Product: Cryovac Darfresh on Tray vacuum skin technology
Country: Australia



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REFRIGERATION PACKAGING

The vacuum bag prevents contact with the air, so moisture cannot evaporate and therefore a very useful barrier.

Shelf life is extended – 3 to 5 times – depending on the food item being protected.

Vacuum packs using high barrier (gas and moisture) films such as EVOH and PVDC or metallised films or Polyester/ PVdC/ LDPE provide a higher degree of protection but are more expensive.

New designs even have easy-open features.

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MODIFIED ATMOSPHERE PACKAGING

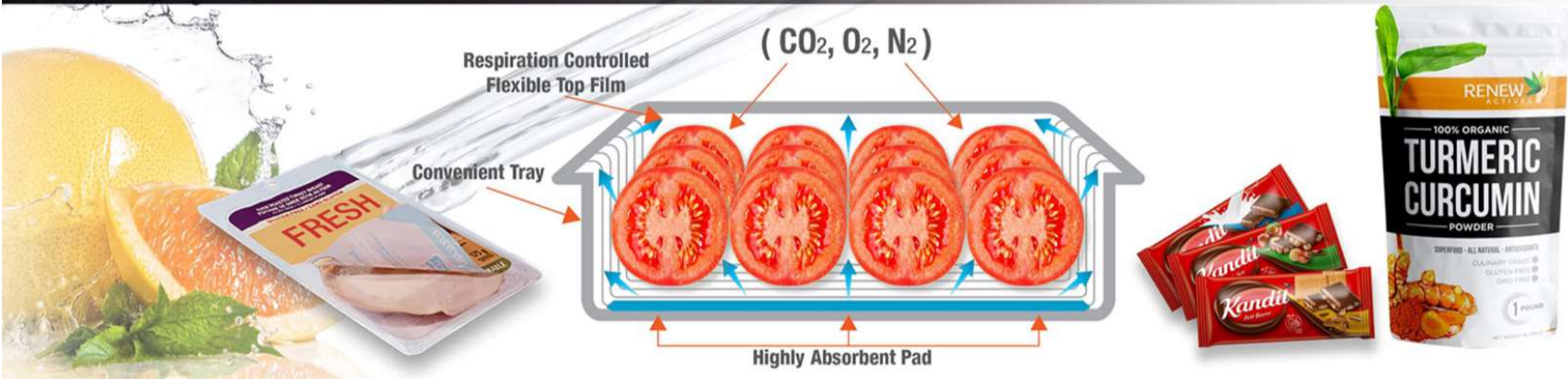
Modified Atmosphere Packaging as we know it today is the replacement of the atmosphere in a pack with a tailored mixture of gases i.e. modified atmosphere, to provide the best protection and optimal shelf life for the product.

The range of gases used includes not only nitrogen, oxygen and carbon dioxide but also argon, nitrous oxide, helium which are approved for use in the Europe.

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MODIFIED ATMOSPHERE PACKAGING

Modified Atmosphere Packaging



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MODIFIED ATMOSPHERE PACKAGING

MAP –packaging materials

The materials used in MAP range from semi rigid trays to pillow packs to bulk packs the latter with a rigid outer and an inner MAP bag.

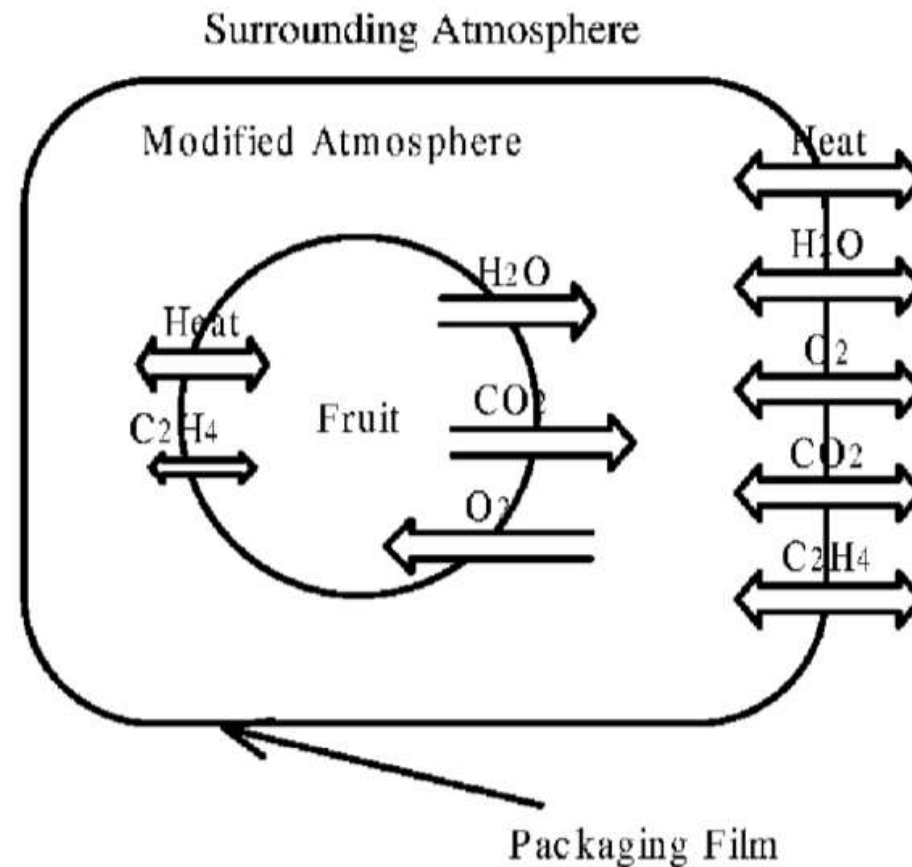
In the same way as we ‘tailor’ the gases used so the films are structured to meet specific requirements.

Films are normally multilayered and based on nylon, PET, PVDC, EVOH. The structures can range from laminates through co-extrusions or coatings.

The key factors in terms of performance are seal integrity, transparency and anti-fogging

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MODIFIED ATMOSPHERE PACKAGING



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MODIFIED ATMOSPHERE PACKAGING

Material properties

LDPE Low-density polyethylene

Good barrier to water vapour but poor barrier to oxygen and carbon dioxide. Seals at a lower temperature and over a wider range. Good hot tack. Cost low.

LLDPE Linear low-density polyethylene

It has high impact strength, tensile strength, puncture resistance, and elongation compared to LDPE. Poor barrier to oxygen and carbon dioxide

HDPE High-density polyethylene

Stiffer than LDPE but still flexible. Gas and water vapour barrier is better but permeability to oxygen and carbon dioxide is still too high.

PP Polypropylene

Water vapour resistance is high and its high point makes it suitable where thermal resistance is required. Biaxially oriented PP is explicitly used in Modified Atmosphere packaging of foods.

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ASEPTIC PACKAGING

Typical examples of Aseptic Packaging are the Tetra Pak / Comibloc format.

Key elements are the food or beverage is processed through sterile equipment (short time – high temperature) then brought to sterile packaging in a sterile environment.

Key values are minimal deterioration in the product, no preservatives, long shelf life under ambient conditions.

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ASEPTIC PACKAGING

Aseptic Food Safety Packaging

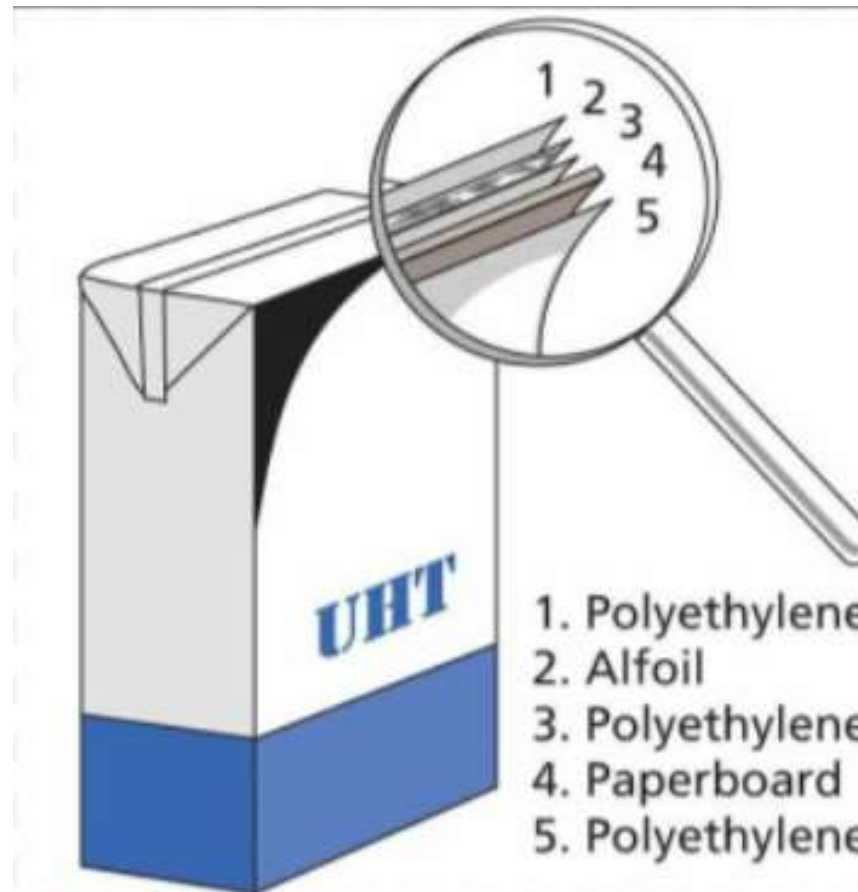
Tetra Pak's main concern is to keep food safe. For food safety they are more conscious about aseptic packaging, adulteration and food safety packaging effectively.

Tetra Pak's vision is to make food safe and available everywhere for every person, through their aseptic processing and effective packaging technology which continues food safe, right as much as intake. Tetra Pak, as a responsible food processing and packaging industry, are proud to launch the Right to Keep Food Safe campaign and the Nutrition Quotient online programme.



With the help of this programme mothers can become more conscious and aware about food safety. So that they make safer & healthier choices for their families.

Know More About Tetra Pak's Food Safety Packaging, Aseptic Packaging & Adulteration

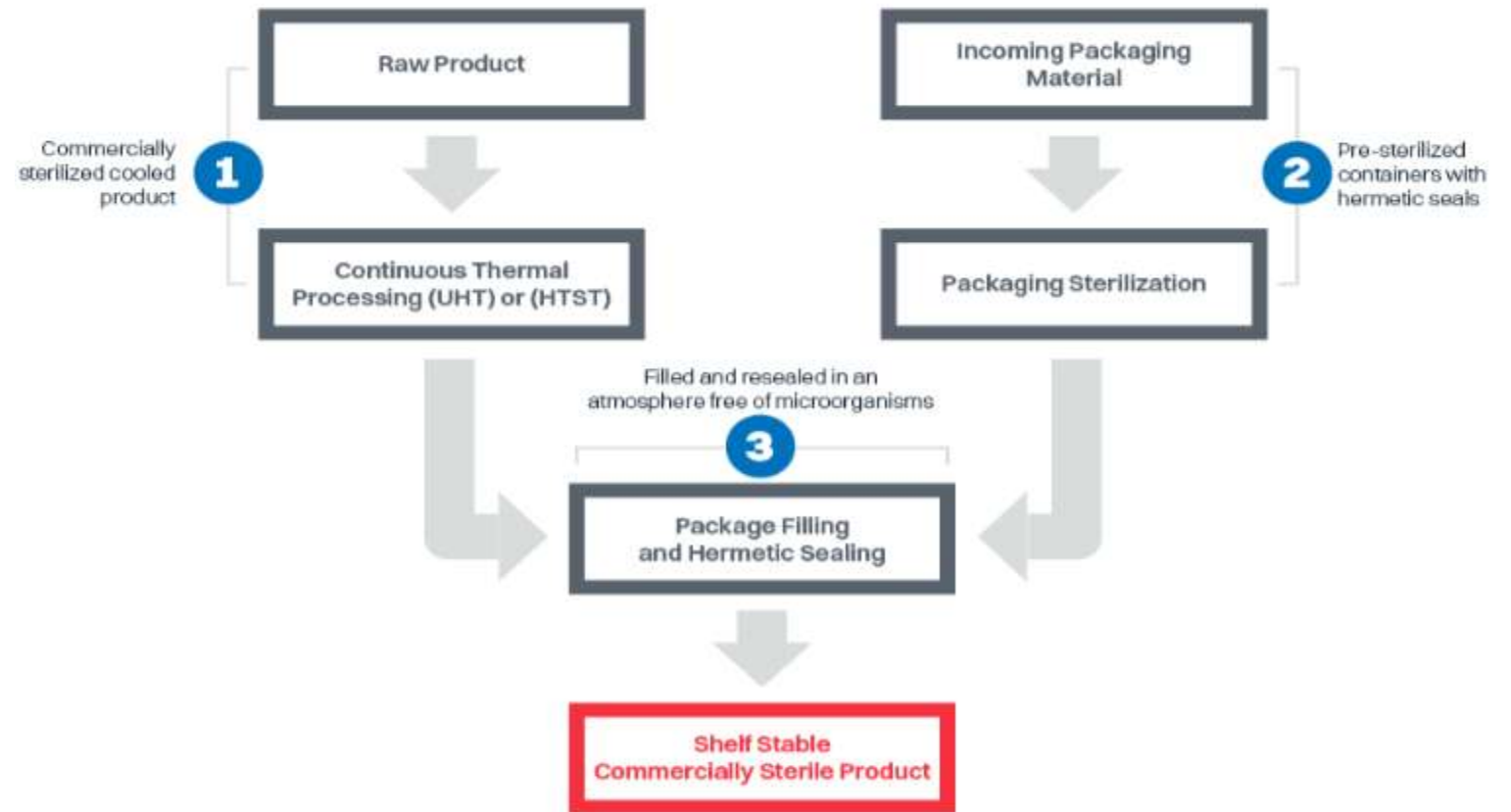


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Aseptic Filling Process for Bag-In-Box

ASEPTIC PACKAGING



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HIGH PRESSURE PROCESSING PACKAGING

Commercial application a range of products:

Japan-fruit, jams and juices, sake, ham, fish and rice products

USA- oysters and fruit juices

Mexico- fruit juices

Spain-ham and other meat products

High Pressure Processing involves subjecting foods to pressures of 100 to 800 MPA* with exposure times between a millisecond pulse to over twenty minutes.

A primary objective of HPP is death of micro-organisms and specifically those which are pathogenic or have a deleterious effect, in this case, on foods. The focus is primarily on spores as distinct the vegetative forms of bacteria which are more easily inactivated by HPP.

Australian packaging examples are Preshafruit Juice.

Key focus is seal integrity.



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HIGH PRESSURE PROCESSING PACKAGING



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ACTIVE & INTELLIGENT or SMART PACKAGING

Active Packaging: has been defined as ‘a system which actively changes the condition of the packed food to extend shelf life or to improve food safety or sensory properties while maintaining the quality of the food’.

Intelligent Packaging*: has been defined as one that ‘monitors the condition of the packed foods to give information about the quality of the packaged food during transport and storage’.

Recently this has been updated to include intelligent functions (sensing, detecting, recording, tracing, communicating, and applying scientific logic) in order to extend shelf life ,enhance safety ,improve quality, provide information and warn about possible problems.

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ACTIVE & INTELLIGENT or SMART PACKAGING



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ACTIVE & INTELLIGENT or SMART PACKAGING



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ACTIVE & INTELLIGENT or SMART PACKAGING

Track and trace

Processors and their suppliers are developing a variety of packaging technologies to keep food safe from such interference and to provide fast, thorough product tracking and tracing in the event of a recall.

Covert and overt packaging techniques are developing more and more and becoming substantially more sophisticated. Covert techniques require a scanner or other device for detection. Marking packages with invisible, ultraviolet-luminescent ink is an example of covert security. Overt refers to something visible on the package, such as a batch code or tamper-evident bands.

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ACTIVE & INTELLIGENT or SMART PACKAGING

Label Application Accuracy – Dot matrix coding



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ACTIVE & INTELLIGENT or SMART PACKAGING

Serialisation – Two-Dimensional coding

Serialization is the unique identification of individual packs (cartons or bottles) of medications. As each batch of finished **product** is packaged, a globally unique code is assigned and physically marked on the packaging in the form of a two-dimensional code known as a datamatrix.

Example: Use of GS1 Standards for the identification of products using a GS1 DataMatrix



GTIN: (01) 07046261398572
Expiry: (17) 130331
Batch / lot: (10) TEST5632
S/N: (21) 19067811811

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TAMPER EVIDENT PACKAGING

Definition of tamper-evident packaging

Packaging having an indicator or barrier to entry which, if breached or missing, can reasonably be expected to provide visible or audible evidence to consumers that tampering has occurred.



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TAMPER EVIDENT PACKAGING

Packaging security is critical to food, for keeping food fresh as well as safe to eat. Packaging security can protect against everything from consumer tampering to bioterrorism to product counterfeiting.

Solutions may involve all phases of product production, distribution, logistics, sale, and use.

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TAMPER EVIDENT PACKAGING



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TAMPER EVIDENT PACKAGING



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DEFECT DETECTION IN PACKAGING

Packaging is a critical component in the overall food safety process.

Build a defence against packaging failures.

1. Review the packaging and manufacturing process.
2. Address the human error factor.
3. Review the supply chain and ensure that raw materials and value-added products that contribute to your food product are meeting international standards.
4. Steps for your business to take – reduce risk

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DEFECT DETECTION IN PACKAGING

1. Review the packaging and manufacturing process.
 - a. The hygiene of the environment in which food packaging is manufactured plays a part in the food safety process
 - b. incorrect labelling (a missing detail on the list of ingredients)
 - c. jar lacking a proper seal.
 - d. The inks used for printing must not contain dangerous substances that may migrate through the packaging and into the food.
 - e. hazard analysis and critical control points (HACCP) models for packaging materials in the categories of cartons, rigid plastics, cut and stack labels and composite cans.

BRC Global Standard for Packaging and Packaging Materials.

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DEFECT DETECTION IN PACKAGING



Migration of
Residual
Chemicals

SLOWLY BUT STEADILY, IT'S
MOVING, AND EVENTUALLY
GONNA CHANGE WHATEVER
INSIDE

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DEFECT DETECTION IN PACKAGING

2. Address the human error factor

- a. First, organizations must make sure that anyone that interacts with food and/or its packaging is well-equipped with knowledge of personal hygiene, washing and the sanitization of equipment, utensils and surfaces and an understanding of the consequences of malpractice.
- b. Training program that is tailored to the individual company's culture and employees.
- c. Take into account the unique risk context of the food preparation and packaging protocols.
- d. Regular microbiological tests.
- e. Clear sickness policies must also underpin an approach to vigilance on education, as diseases can easily be transferred onto food packaging through physical contact.

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DEFECT DETECTION IN PACKAGING

3. Review the supply chain and ensure that raw materials and value-added products that contribute to your food product are meeting international standards.
 - a. risk-assessing the packaging supplier in relation to its products, processes and customer base, a manufacturer can ascertain the level of food safety risks associated with a particular supply chain and packaging material.
 - b. Global Standards - Global Food Safety Initiative (GFSI) Guidance Document, 6th Edition, which includes Good Manufacturing Practices associated with packaging materials intended for food use. These standards include, for example, British Retail Consortium (BRC), FSSC22000 and the Safe Quality Food (SQF) program.
 - c. Food Standards Australia and New Zealand (FSANZ) – Standard 3.2.2

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DEFECT DETECTION IN PACKAGING

Steps for your business to take – reduce risk

Choose the right packaging:

- only use clean, undamaged, food-safe packaging
- buy from a reputable source
- know the composition of your food and check the packaging is suitable (ask the supplier or manufacturer for assurance or certification that the material is food-safe)
- check manufacturer's instructions or symbols to confirm the packaging can take the conditions it will be exposed to, such as freezing, microwaving, or use in dishwashers

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DEFECT DETECTION IN PACKAGING

Steps for your business to take – reduce risk

Use packaging correctly:

- handle with good hygienic practices
- store in a secure and clean place
- consider how long and where food will be stored in the packaging and check it will stay safe under those conditions
- use appropriate cleaning and sanitising methods
- only reuse packaging or other materials if safe for food (e.g. don't repeatedly use packaging designed for single use)

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DEFECT DETECTION IN PACKAGING

Need more information?

[Safe Food Australia](#) is a guide to the food safety standards in Chapter 3 of the Food Standards Code. Food packaging is under Standard 3.2.2 clause 9.

Copies of the guide, some translated fact sheets and other information is available at www.foodstandards.gov.au

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Plastics in Food Packaging

“All plastics are bad for you” – Catch Cry by a vocal few.

Plastic as such isn't a problem. The polymer molecules from which it's made are far too big to move from the packaging material into the food.

PVC is questionable in Food Packaging due to the extra plasticisers used to soften it. These plasticisers are Phthalates and Epoxidised Soybean Oil (ESBO).

Please refer to Food Standards Code, Food Standards Australia New Zealand (FSANZ), our food regulator, maintains that BPA and phthalates pose no significant health risks at the low levels found in food.

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Plastics in Food Packaging



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Plastics in Food Packaging

| | | |
|------|--|---|
| PET | Drink Bottles, Jars for Peanut butter, Oils, Vinegars, Juices | No known health hazards |
| HDPE | Bottles for Milk and Cream, Yogurt, Cereal bags | No known health hazards |
| PVC | Shrink and cling films, Clear clam shells, Some soft drinks, some caskets on jar seals | Alert on Plasticisers, Questionable future through the recycle loop |
| LDPE | Take Away Containers, Water proof coating on milk containers, bread bags, cling wrap | No known health hazards |

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Plastics in Food Packaging

| | | |
|----------------|--|---|
| PP | Bottle caps, yogurt and margarine containers, food storage boxes | No known health hazards |
| PS | Plastic cutlery, drinking cups, yogurt, coffee cups, light weight trays for supermarket vegetables | Some research but low risk. APCO alert on recyclability |
| Other Plastics | Bottles for sauces and condiments, Reusable water bottles | Polycarbonate can release BPA into food |
| | | |

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Plastics in Food Packaging

From AFGC – Sustainability – 25 October 2019

EFSA - daily alerts for Scientific Output (European Food Safety Authority)

Sharpak Bridgewater /Ferrarelle/ PETman/ Reco-Kavala/ Pinaform / Marcato / V&T Trade , based on Starlinger Decon technology

These processes given green light by EFSA for recycling of PET for long term food storage

Message – keep up to date



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THANK YOU