Vacuum Packaging of Fish and Fish Products

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Vacuum packaging involves the removal of air from the package, then the application of a hermetic seal. Vacuum packaging can considerably extend the viable shelf life of cooked food products. It should be stressed that vacuum packaging must be used under strict conditions of hygiene and control, and not as means to forgo proper sanitation. This could be applied to cook-chill food systems to increase food quality and microbiological assurance.

The use of vacuum packaging, in gas impermeable and heat stable materials, has many advantages, which include;

- No or low risks of post pasteurisation contamination.
- Ease of handling.
- Inhibition of growth of aerobic spoilage organisms.
- Inhibition or slowing of deleterious oxidative reactions in the food during storage due to oxygen barrier properties of the packaging material.

There are number of criteria required for the films used for vacuum packaging in large scale production methods, especially those which require in-pack pasteurisation (i.e. the pasteurisation of the food after it has been packaged). These requirements include:

- High durability, ie. ability to withstand considerable mechanical stresses during packaging, handling and transport.
- Retention of flexibility even at low temperatures (-2 to 4°C) to enable satisfactory handling in the packaging and refrigeration rooms.
- Ability to withstand heating to at least 150°C without structural damage, leaching of potentially toxic plastics or plasticisers
- Impermeability to liquids, including oils and fats and macromolecules
- Impermeability to gases, in particular oxygen, so that oxidative deterioration of the packaged food stuffs is limited or inhibited,
- Manufactured from non-toxic, food acceptable, odourless materials.
- Must be able to create airtight durable heat seals to close packs.

Many of these criteria have been met by a range of materials mostly multilaminated plastics. A wide range of materials are now manufactured throughout the world which are suitable or even specifically designed for use in large scale vacuum packaging/cook-chill operations. The extreme perishability of fish renders it susceptible to losses at every stage from harvest to consumption. These losses appear to be enormous in India. Incorrect handling techniques, inadequate packaging materials and poor processing accelerate spoilage which results in quality deterioration of fresh fish at the consumption level. The use of ice can significantly increase the shelf life of fish both at sea and on shore provided adequate fish to ice ratio is maintained. It is important to use insulated container for storage and transportation to prevent melting of ice.

Why vacuum packaging?

Foods maintain their freshness and flavor 3-5 times longer than with conventional storage methods, because they don't come in contact with oxygen.

Foods maintain their texture and appearance, because microorganisms such as bacteria mold and yeast cannot grow in a vacuum.

Freezer burn is eliminated, because foods no longer become dehydrated from contact with cold, dry air.

Moist foods won't dry out, because there's no air to absorb the moisture from the food.

Dry, solid foods, such as brown sugar, won't become hard, because they don't come in contact with air and, therefore, can't absorb moisture from the air.

Foods that are high in fats and oils won't become rancid, because there's no oxygen coming in contact with the fats, which causes the rancid taste and smell.

Insect infestation is eliminated, because insects require oxygen to survive and hatch.

Meat and fish will marinade in minutes when vacuum packaged in canisters, because as air is being removed from the canister, the pores of the mat or fish open up and allow the marinade to penetrate.

Food bills are reduced because food lasts longer (so less spoiled food will need to be thrown away), and because food can be purchased in lower-priced bulk quantities and re-packaged at home into smaller portions.

And non-food items are protected from corrosion and moisture-damage. Like your antique silverware, which won't tarnish when vacuum packaged or wool sweaters, to keep bugs away, and to shrink them for minimal storage space.

Types of home vacuum packaging systems

Manually operated vacuum pumps

These systems consist of a small manually-operated pump which can be used to extract air from canisters and bottles only. They do not usually indicate when a vacuum has been achieved.

Although they do not completely remove the air from the container, they do help food last longer. Glass or glazed ceramic containers work best.

Bag sealers with a fan

These systems utilize small rotary fans to extract some air out of plastic bags before they are sealed. Some systems include polyethylene bags. Others provide sheets of plastic from which bags of different lengths can be made by "welding" the seams with a heated wire bag-sealing mechanism.

The fans don't have enough suction to create a vacuum. The amount of air removed is comparable to using a straw to suck air out of the bag. The plastic will shape itself loosely to the contours of the food in the bag, but it will be obvious that air remains in the bag. The type of bag material (polyethylene is best) and the strength of the seal will determine whether oxygen is able to re-enter the bag.

Less-air is better than out-in-the-air. Remember, however, that plastic does breathe, so storage life will be limited.

Electric pump systems

These are the only storage systems that eliminate exposure to oxygen. They are also the most expensive, of course.

They utilize electric-powered piston pumps to extract air from the container, and seal with container to prevent air from re-entering. And, ideally, they indicate when a vacuum has been achieved.

When food is vacuum packed in bags, the effect of the pump is highly visible, because the bags will shape themselves tightly around the food. Not so when vacuum packed in a jar, which is when a vacuum gauge is most helpful and will keep the jar from imploding.

In order to maintain the vacuum, containers are constructed of special materials which provide an oxygen barrier.

Vacuum packaging is not a substitute for canning or dehydration

Vacuum packaged food will taste fresher and last longer than food stored in conventional containers.

But because the food is not devoid of moisture or potentially lurking pathogens, it is important to remember that vacuum packaging is not an alternative to refrigeration.

Of course you don't need to refrigerate vacuum packaged cereal. But you do have to refrigerate meat, dairy and other products that require it.

Shelf life of vacuum packaged foods

Food	Store	Normal Shelf Life	Vacuum Shelf Life
Large cuts of meat: beef, poultry, lamb and pork	Freezer	6 months	2-3 years
Ground meat: beef, poultry, lamb and pork	Freezer	4 months	1 year
Fish	Freezer	6 months	2 years
Coffee beans	Room temperature	4 weeks	16 months
Coffee beans	Freezer	6-9 months	2-3 years
Berries: strawberries, raspberries, blackberries	Refrigerator	1-3 days	1 week
Berries: cranberries, huckleberries, blueberries	Refrigerator	3-6 days	2 weeks
Cheese	Refrigerator	1-2 weeks	4-8 months
Cookies, crackers	Room temperature	1-2 weeks	3-6 weeks
Flour, sugar, rice	Room temperature	6 months	1-2 years
Lettuce	Refrigerator	3-6 days	2 weeks
Nuts	Room temperature	6 months	2 years
Oils with no preservatives, like safflower, canola, corn oil	Room temperature	5-6 months	1-1.5 years
Wine	Refrigerator	1-3 weeks	2-4 months