

Shrink Packaging

P. Ravindranathan Nair

Packaging is known to have brought out a revolution in the marketing and distribution of commodities in the world. As an efficient method of modern packaging for fish, shrink packaging has come up as an important method. Shrink wrapping is the term used to describe the method of shrinking film around an article or a group of articles to give a skin tight wrap. Shrink wrapping involves the use of thermo plastic films that have been stretched or oriented during manufacturing and have the property of shrinking with the application of heat. Shrinkable films are produced in such a manner that when the articles are wrapped in them and subsequently heated, shrinkage occurs and the film clings on to the article. This method of packaging provides sufficient protection to the content and makes the package attractive in appearance. In technologically advanced countries, the concept of shrink wrapping started gaining popularity from the mid 60's and today it is one of the most accepted methods for utilizing small consumer goods or any industrial palletized loads. Even though, this method is not very common in our fish processing factories at present the method can be adopted and practiced in the near future. Shrink packaging using a shrink packaging machine followed by quick freezing at -40°C and further frozen storage at -20°C form the different steps involved in this method of fish preservation. Salient feature of "Shrink Packaging" are given below:

Shrink wrapping or shrink packaging

Articles with irregular shape were the first to be shrink wrapped. The earliest film used was polyvinylidene chloride, and the

close wrapping of food items such as hams and poultry was carried out by evacuating the air from a bag and shrinking by immersion in hot water. The use of tougher, cheaper films with high softening points, such as low density polythene, had to wait for the development of hot air shrink tunnels with reasonable control of temperature. The development of shrinkable low density polythene film led directly to applications such as the collation of cans, jars, bottles or cartons and put shrink wrapping into direct competition with the fibre board case. For cans and bottles, it is necessary to use collating trays made from fibre board or thermoformed plastics such as PVC or expanded polystyrene. Shrink wrapping is usually cheaper than a fibre board case. It is this additional advantage of shrink wrapping which usually leads to its adoption.

One advantage at retail store level is the fact that the total amount of packaging to be disposed of is smaller and this is an important positive point from the environmental protection view point. A further advantage is the fact that shrink-wrapped goods takes up progressively less storage space as the cans and bottles are removed whereas a fibre board case takes up the full amount of space until the last of the contents have gone.

A later development in the use of shrink wrapping is the over wrapping of complete pallet loads, displacing the use of paper or board coverings held in place by metal or plastic strapping. Shrinking of large areas of films can be carried out in heated cabinets or tunnels, or by the application of hot air from hot air 'guns', similar to large

hair dryers. Shrink wrapped pallet loads are more stable than strapped loads (particularly when the objects being palletized are irregularly shaped) and the film wraps confer extra protection against ambient conditions.

Some advantages of shrink wrapping method

Among the various advantages this system offer includes simplicity in operation, ability to wrap any shape and size of one or a group of articles, the transparency which enables easy identification of the packed product, pilfer proof packaging and above all protection against moisture and any other hazardous chemicals and gases to which the package may be subjected to during transit. Because of these advantages, it has successfully replaced a wide range of conventional packaging materials such as kraft papers, Bituminised laminates, corrugated fibre board materials etc. The shrink wrapped packs are clear and exhibit sparkling sheet and enhances mechanizing and display characteristics. Shrink wrapping gives a clear tidy pilfer proof package. It enhances shelf life and provides environmental protection. Comparatively simpler and cheaper machines are required for shrink packaging. Disposal of waste generated out of the shrink film becomes easier at the retailer's end. Yet another advantage of shrink wrapping is that this method eliminates the use of expensive and bulky materials like corrugated boards, brown papers, nests partitions etc.

Packaging materials used for shrink wrapping

1. Earliest film used was poly vinylidene chloride (PVC).
2. Later, low density polythene used for hot air shrink tunnels with reasonable control of temperature. Shrink film normally polyethylene, which has been

biaxially oriented and the pack is passed through a heated tunnel which softens the film, causing it to shrink and tightly envelop the contents. A cooling section normally follows the heated tunnel so that the packs may be handled immediately.

Heat shrinkable films can be made from a large number of polymeric materials viz. Low density polythene, PVC, PP, Ethylene Vinyl acetate co-polymer and polystyrene.

Various shrink films used:

- (a) Polyethylene: This film is extensively used in shrink wrapping which is the cheapest of all. The only major drawback of this film is its haziness and lack of sparkle, but it offers reasonable clarity. This film is freely available in India.
- (b) PVC & Poly Propylene: These films are much expensive and except the transparency and sparkle, do not provide any special quality to the pack. PVC is very popular in western countries for the clarity and display properties.

These films can be blown to much thinner gauges, which to some extent compensate for the high cost.

Method of manufacture

Shrinkable polythene films are generally made within the thickness of 37-150 microns depending on the type of the product and also the unit load of the package. In order to produce a film of high shrinkage value with balanced shrink properties, control of the following processing parameters is important:

- Blown up ratio
- Freeze line height
- Type and design cooling ring
- Out put rate
- Die radial opening

By proper adjustments of all the above parameters, it is possible to produce film having reasonably well balanced shrink properties.

Shrink wrapping process

There are two types of shrink wraps normally used in packaging field, namely sleeve wrap and full over wrap. In the case of sleeve wrapping, the product is normally surrounded with a loose sleeve or an open ended tube shape of a shrinkage film. By heat shrinkage of the film, the ends contracts over the product edges.

In the case of full over wrap also the article is over wrapped with the sleeve but the ends are closed by means of hot plates or linear sealing. The package has full protection against humidity and dust.

Although products of any shape and size may be shrink wrapped trays are used for items like cans, jars, bottles etc. for providing stability to the package. The trays are usually made of cartons board or corrugated board.

Some equipment required for shrink packaging

In order to provide adequate shrinkage around the wrapped article it is usually necessary to heat the polyethylene film to a temperature between 110°C and 120°C. This can be conveniently achieved either in a hot air tunnel or by the help of a shrink gun/hot air blower.

Hot air tunnel

The hot air tunnel in general consists of an air blower, an electrically powered heat exchanger and a tunnel shaped cavity located over a conveyor belt. The temperature requirement in the tunnel should be between 170°C and 220°C.

Hot air blower

Portable hot air blowers or guns can be used satisfactorily in place of hot air tunnels

for shrinking operations. This method is particularly suitable for large palletized loads if the labour costs and production rates are low. Such type of hand blowers are now indigenously available.

Wrapping and sealing units

Various kinds of wrapping and sealing units have been developed for use with shrinkable plastic films, employing the conventional heat sealing techniques.

Applications of shrink wrapping

A wide range of products can be successfully wrapped in shrinkable polythene films as given below:

- Cans, jars, bottles, tools, toys
- Fresh fruits and vegetables
- Fresh meat (in tray) for sale from chilled storage cabinets
- Paper goods, stationery items, toilet rolls etc.
- Clothings, woolen blankets
- Poultury products etc.
- Industrial products on pallets, tea packaging bags of various raw materials etc.

Shrink packaging of some quality fishes

Shrink wrapping or shrink packaging of fish (in fresh condition) can be carried out in the laboratory using a shrink packaging machine made for shrink packaging purpose. The fish can be shrink packed using a shrink film specially made from LDPE specially made for this purpose. The whole fish after gutting or without gutting can be used for shrink packing after proper washing and draining. The temperature of the shrink packaging machine should attain around 150°C for shrink wrapping. The speed of the conveyor belt of the machine can be properly adjusted. The whole fish is properly wrapped using the shrink film and

allowed to pass through the conveyor belt from one end to the other end with proper speed so that the shrink film softens and on cooling hardened properly. With this operation shrink wrapped fish will be properly sealed and packed intact.

Immediately after shrink packing, the whole fish are placed in a tray and quick frozen at -40°C so that the freezing can be completed within 3 to 4 hours. The quick frozen shrink packed fish samples are properly packed in a master carton in a thorough manner and stored at -20°C .

Depending upon the size of the fish the speed of the moving conveyor belt as well as the temperature inside the tunnel can be adjusted. Shrink packaging machine used for shrink packaging studies are available through local suppliers (M/s. Sevana Industries, Kizhakkambalam). Experiments on shrink packaging using pearl spot and white pomfret were carried out in Central Institute of Fisheries Technology. The studies indicated that the shrink packed pearl spot had better storage life compared to the ordinary packed fish at -20°C .