Guide to Wrapping Consumer Product: Processes and Materials

People use shrink wrap all the time without understanding that you can put film around a product in many different ways and that different wrapping materials have different properties. These differences apply to films, paper, cellophane, waxed paper and composite materials that are used to wrap.

So let's discuss what those different ways are, the material choices and the pros and cons of each.

Wrapping Processes

- Overwrap
- Shrink wrap
- Flow wrap
- Diefold wrap

Overwrapping

It is also called diamond-fold wrapping, tuck-and-fold wrapping, gift wrapping, cigarette wrapping and bundle wrapping. Overwrapping is a process in which a box-shaped carton, tray, bundle, etc. is wrapped and sealed. The only requirement for the package shape is that it have flat sides to be sealed. Tear tape is often used as an easy-open feature.

The end result looks like a "gift wrap," with one long seam located either on the bottom or side of the package and each end of the package neatly "tucked, folded and sealed." The first tuck-and-fold machines were designed in the 1920s by the original Package Machinery Company.

You can use a variety of relatively stiff, single- or multi-ply web materials including clear, printed and/or metallized polypropylene (BOPP or biaxially oriented polypropylene), cellulose-based films including cellophane, paper, glassine, waxed paper, aluminum foil or metallized paper. You cannot overwrap with polyethylene or PLA films. Such films are too flexible and have too much "give" to be used in overwrapping.

While you need heat to seal the film or set the glue (with paper), your heat needs are limited to the spots needing sealing.

Overwrapping machines are built in elevator, in-line, turret or rotary styles.

Overwrap can be done on trays, boxes or bundles. Examples of overwrapped products include cigarettes, candy trays and boxes, tea boxes, CDs/DVDs, frozen food cartons, reams of paper, perfumes and personal care items. Some times “naked” food such as bread, fruitcake or brownies are overwrapped.

Shrink wrapping

This process that uses relatively soft polyolefin film in which a loose sheath of film is created around the product, sometimes sealed on two or three side sides. The loosely sheathed product passes through a heat source, which shrinks the film to the dimensions of the product. The result is a very tight wrap, conforming to the product shape, often with a ridge of plastic at the seam where the film meets, sometimes with gaps in film on either end. Shrink wraps are typically stronger than overwraps and the machines are inherently very flexible. The downside is that shrink wrap can be significantly less attractive than overwrap.

Shrink is a great solution when the product is oddly shaped or you are doing a low volume of any one size package or when you

want to use a tray to hold bottles rather than a box and need something to keep the bottles together. Per unit package operational costs are usually higher because of film waste and energy consumption in the shrinking process. Products must have some heat tolerance due to the required heat tunnel to make the film fit the package. You usually cannot use printed film, as the film often distorts as it shrinks.

Note: "stretch" and "shrink" obviously don't mean the same thing. Stretch wrappers, a popular choice for wrapping pallet loads of products, achieve tight wraps by expanding the stretch film-rubber-band-like-before enveloping the product and letting the film return to its original size.

Flow Wrap

Other terms for flow wrap include fin-seal wrapping, crimp-seal wrapping, horizontal bagging and pillow-pouch wrapping. Flow wrapping is a horizontal-motion process in which product of any shape is wrapped in clear or printed polypropylene film. The end result is a flexible package with a non-lap type seal on the bottom and crimped end seals.

Good flow-wrappers get the film tightly around the product to minimize product shift within the package and minimize the "tails" on the product as they make case-packing more difficult. On larger packages, you can put in gussets that tighten the wrap against the package.

While the process in flow wrapping is quite different from overwrapping, flow wrap uses BOPP films (like Overwrap) but ones that need only to seal to one side of the film. (Overwrap films need to seal to both sides of the film.) There are zillions of products that are flow-wrapped. Think wipes, tissues, vending machine candy bars, etc.

DieFold Wrap

This process is not widely used anymore. It achieves an overwrap on a soft, non-box shaped product by enveloping it (often placed on a card or U-board) in film and sealing the bottom. The film forms either a box or circular shape around the product via a "die-box" in the machine's elevator section. Limited application of heat (only to the bottom seal) gives the product a tuck-and-fold appearance that doesn't need side sealers and won't be crushed by the machine or melted by its heat.

Flow-wrap has largely replaced diefold on less expensive products.

Reese's Peanut Butter Cups once were diefold-wrapped with two cups seated on a chocolate-colored U-board in cohesive film (which requires no heat for sealing). The process is still used for some Reese's Peanut Butter Cup SKUs. Candy bars with two parts (foil and paper) wraps are done as diefold. Also, "homemade" cookies whose manufacturers are going for the "baked-like-grandma's" look still use the diefold wrapping process.

Wrapping Materials

Now that we have discussed wrapping processes, let’s discuss wrapping materials.

- Film
- Paper

Film Types

Often when people talk about plastic films—which technically are defined as plastic sold in thicknesses of up to 10 mils—they treat them as one type of material, grouping all flexible plastic

packaging into a single category. What they do not realize is that plastic films compose a broad category of materials that can be relatively simple or complex depending on the demands of a particular product or package. They can be sourced from petroleum or from plants including wood. They can be biodegradable or home compostable or be reused for energy.

Like plastic bottles and containers, film can be made with different resins, each of which has a unique combination of properties that makes it ideal for certain applications. For example, low density polyethylene (LDPE) film acts as a gas barrier, which is necessary for packaging such things as chicken, which would quickly spoil if exposed to oxygen. Polyvinyl chloride (PVC) film, on the other hand, is gas permeable and necessary for packaging such things as red meat that require a small amount of oxygen inside the package in order to keep it fresh.

Plastic film also can be clear or colored, printed or plain, single- or multilayered and combined with other materials such as aluminum and paper. It can come in a variety of thicknesses and degrees of opacity. Thus, the only thing that all plastic film really has in common is that it is flexible in nature, as used in grocery bags, as opposed to rigid, as used in soft drink bottles and butter tubs.

Consumers have different expectations based on the contents, the perceived quality and the overall appearance of the product. For a food manufacturer, the principal requirement is the safety and protection of the contents. For a cosmetic or perfume buyer, the quality of the wrap is critical: perfect corners, perfect seals, high quality film, perhaps a biodegradable film. Sometimes the role of the film is to contain the product, such as a stack of cards or paper or a bundle of boxes.

Wrapping film needs to be able to handle production requirements as well. This means that the film needs to seal in time with the speed of the line. It is important to make the calculation of a films sealing time and temp in order to get the seal needed in the time permitted.

Properties of Plastics

Plastics have different properties. Here is an explanation of some of the different sources from which film for wrapping is made, a description of their properties and some of the applications in which they are commonly used.

Petroleum-based Films

Petroleum based films are the most common and usually the most inexpensive films used for wrapping today. Most of these films require stabilizers in order to prevent them degrading prematurely. Discussion about how to use stabilizers to permit degrading is ongoing at this point.

Low Density Polyethylene LDPE/LLDPE

These two polyethylene resins often are talked about as if they are one because they have similar properties—both have good clarity, are good moisture barriers and fair gas barriers, can be heat sealed and are strong and highly flexible. They both are also used in similar applications, including but not limited to stretch wrap and shrink wrap.

High Density Polyethylene HDPE

Because it is part of the polyethylene family, HDPE film is found in many of the same applications as LDPE and LLDPE. In recent years, it has made inroads into the film market mostly because of its ability to allow manufacturers to use less material (i.e., source reduction) to make a package that can deliver an equal

amount of product. HDPE also tends to be stiffer than other polyethylene films, which is an important characteristic for packages that need to maintain their shape. In addition, HDPE is strong and puncture resistant, has good moisture barrier properties and is resistant to grease and oils.

Polypropylene PP

PP film comes from a resin that has a high melting point, which makes it desirable in packages that require sterilization at high temperatures. PP film commonly is used to package such things as cigarettes, candy, snack foods, bakery products, cheese and sanitary goods. Because PP has only average gas barrier properties, it often is used in combination with such things as a PVC coating or acrylic, which provide additional barrier properties.

BOPP film (Biaxially Oriented Polypropylene) film in has become one of the most popular films. BOPP film is available in a wide range of film variations targeting the packaging, pressure sensitive tape, label, stationery, metallizing and decorative markets.

PolyVinylChloride PVC

PVC film can be found in stretch wrap for industrial and pallet wrap (although in very small amounts), shrink wrap (again in very small amounts), some bags and liners, adhesive tape, labels, blood bags and I.V. bags. It also is used exclusively to package fresh red meats. That is because it is semi-permeable, which means that just enough oxygen can pass through in much smaller quantities that impart special properties to a package.

Bio-based Films

These films come from a variety and growing list of sources. A

non-exhaustive list follows. It is important to keep in mind that the source does not dictate the molecular structure. A bio-based film is not necessarily biodegradable, although it may come from a renewable source. Similarly a petroleum-based film can be biodegradable but does not come from a currently renewable source. Here we discuss corn and wood based plastics. New bio-plastics from sugar and other materials are coming to market.

Polylactic Acid Film (PLA)

This film is currently made from corn. It is an effective substitute for polyethylene but has performance problems at higher temperatures (over 100° F). That makes it very suitable for rigid container for refrigerated liquids such as milk or juice, or films that will be kept cool such as frozen pizza.

Cellulose

These films are customarily made from wood. Think of them as clear paper. Cellophane is the original cellulose based film. They make an excellent substitute for polypropylene film. If properly treated, moisture should not be an issue and the biodegradability can be preserved.

Paper and Glue

Paper comes as treated or plain as well as waxed.

On treated paper, a small layer of adhesive is pre-applied to the paper during the conversion process. During the wrap process, heaters activate and begin to set the adhesive. Compression belts are used to hold the flaps in place until sealed.

Other makers choose to use standard gift paper which requires that hot or cold melt glue systems be integrated into the wrapping equipment. It is important to consider the clean-ability of the wrapping machine since glue application ahs become

more precise but is not perfect yet. Viscosity is critical in cold glue application; temperature, in hot glue application.

Waxed paper used on frozen vegetable applications is usually a high speed application where extended heaters and compression belts are used to complete the sealing process without compromising the integrity of the products.

Conclusion

When evaluating wrapping equipment, a buyer needs to consider the qualities that are required for the film wrap. While Package Machinery's wrapping equipment can handle a wide gauge (thickness) of films and compositions, a prospective buyer still needs to think about what is important for the wrap quality expected by the consumer.

What is your need? At Package Machinery, we know many well.

For further information, videos of our machines, brochures or case studies, please check our web site:
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