3 AND 4-SIDED POUCHES

FRAIN INDUSTRIES, INC.
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A Frain Industries Packaging Equipment Whitepaper

Pouches, sometimes called sachets, are generally formed from roll fed film stock.

They can also be formed offline at a converter or elsewhere then filled and closed on a separate machine. When preformed pouches are used, the filling and sealing process is similar except that the pouches will be fed from a magazine rather than a roll.

Films can be any sealable material such as plastic, aluminum, paper or combinations. Generally, film requirements will be similar to those of VFFS and HFFS machines discussed in a previous white paper. This paper will focus on machinery that forms, fills and seals the pouches on a single machine.

Three-Side Seal Pouches

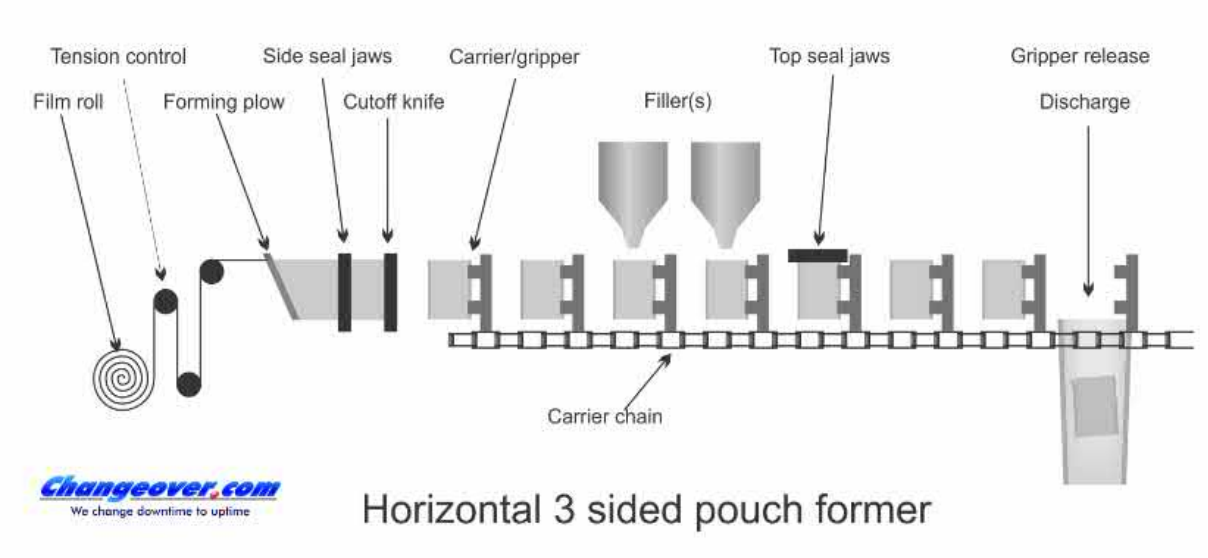
Three-side seal pouches are formed from a single sheet of film, folded and sealed on 3 sides. They generally feature a horizontal film flow with vertical filling of liquid or solid product. Pouch sizes can range from very small, such as salt packets to very large such as multi-pound packages of chicken parts. Speeds range from a few dozen pouches per minute to several hundred per minute on high speed rotary machines.

Pouches are frequently square or rectangular designed to be torn open, with or without a resealable zipper. Contoured shapes and special dispensing or re-closable fitments are also available.

Standard rectangular pouch

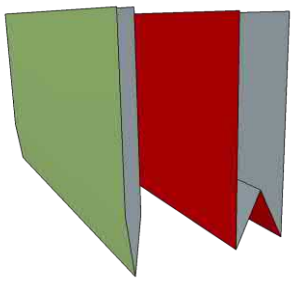
Diecut pouch with dispenser

The film roll is loaded in the machine and unwound through a series of dancer rolls. As with all film machines, tension control is critical to good performance. If the film is unprinted or continuous print, it will be unwound and cut to length. If pattern printed, it will need a registration detection system to cut precisely between graphic patterns.



If a zipper strip is desired, it can be added at this point, the zipper strip material, with both male and female halves joined, is supplied on a continuous roll. The zipper is unwound and fed between the two sides of the pouch. Sealing jaws seal it to the film. As the vertical edges of the film are sealed and cut, the zipper is sealed between them and cut flush to the film edge.

The film passes over a V block where it is folded in half to form a V. If a standup pouch is to be formed, a second, inverted, V block pushes the bottom of the film up, forming it into a W. A pair of rollers or horizontal jaws may be used to pinch the bottom of the pouch to form a sharp a sharp crease or the fold(s) may be left uncreased.



Standard and Standup pouch forms

The next step is a vertical sealing jaw. This makes a double seal on each pouch sealing the trailing edge of the leading pouch and the leading edge of the next pouch. Normally

this jaw is straight, making a square or rectangular pouch. In some instances, a shaped or contoured pouch may be desired. A specially shaped sealing jaw with a die cutting blade may be used to cut the pouches. One drawback to a shaped vs. square/rectangular pouch is that it is material inefficient, creating scrap. This scrap must be removed from the machine which also adds complexity.

A secondary set of jaws may be used to cool the seal. If stress is placed on the seal before it has had a chance to set, it may fail in subsequent handing or loading operations.

The pouch is now closed on 3 sides and open on the top. It is captured by grippers then cut free from the web and passed to the filling station. A pair of suction cups, front and back, may be used to pull the pouch open to facilitate filling. Some products may need multiple filling stations. A chicken noodle soup mix might need 3 (Soup powder, noodles and chicken bits) It is critical during filling not to contaminate the top seal area as this will prevent good seals. If needed nitrogen or other gas may be injected at this point.

If the pouch is to have a fitment, such as a re-closeable spout, it will be inserted into the bag and held in place after filling. Specially formed sealing jaws will seal the top edge of the pouch to and around the fitment as well as the rest of the top seal. If there is no fitment, a simple straight jaw provides the top seal.

When tear notches or hanging holes are required, they are generally cut into the film at this point. Hanging holes are generally not punched completely. Leaving the chad attached to the package simplifies the machine by eliminating the need to dispose of the loose chads.

For simplicity, the above described an inline intermittent motion pouching machine. If higher speeds are required, continuous motion, rotary machines are available. The principle of operation is similar: Form the film into a V or W, seal the vertical edges, fill the product and seal the top.

High speed, continuous motion, 3 side pouching machine

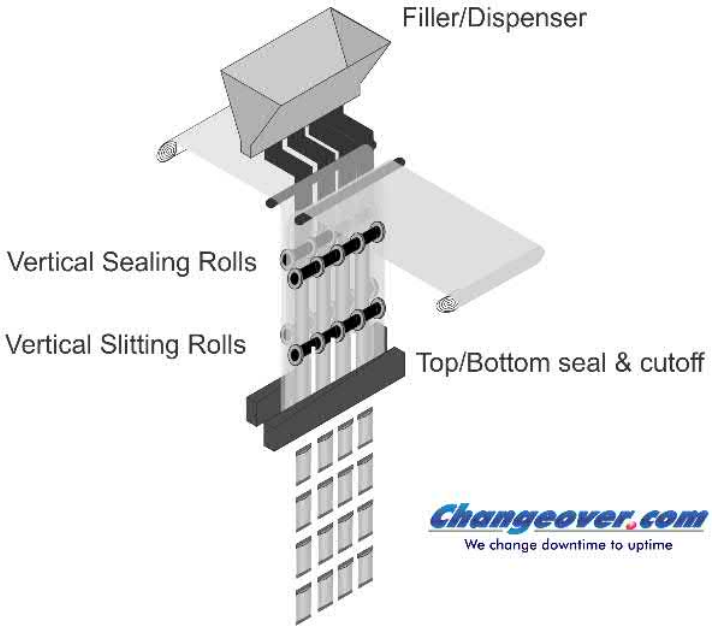
Four-Side Seal

Vertical and horizontal FFS machines as well as the 3-sided pouching machines discussed above use a single film. 4-sided seal pouching machines can use a single film for the front and back or can use different films. Some sterilizable medical devices use a clear film on one side for product visibility and a permeable Tyvek® film on the other to allow sterilization. Films can be registered or unregistered. They can also be registered on one side e.g.; front and unregistered on the other.

4-sided pouches get their name because they consist of 2-flat layers of film with no folds, sealed on all 4 sides of the product. This eliminates folds and particularly creases in the film which can potentially create a weak spot. Pouch sizes can range from ½" square or smaller to 6" X 12" or larger. Machines may be vertical for liquids, tablets, candies and so on. They may be horizontal for products like towelettes or medical kits that need more precise orientation in the pouch.

4-Sided pouch
Note: 2 individual pouches separated by perforation

One advantage of these machines is that they can produce multiple, sometimes as many as 10-12, pouches across the film. This allows high production rates at relatively low cycle speeds. A machine running 10 up (10 pouches across) at 60 cycles per minute has an output of 600 individual packages per minute.



Schematic of continuous motion, 4 side pouch machine

In operation, the film is fed via tension control rollers to the front and the back of the machine. If different films are used, they will be supplied on two rolls. If the same film is used front and back, it is common to supply a single, wide, roll of film and slit it in half as it comes off the roll. The 2 halves of the film are guided to the front and back of the machine. The advantage to using a single, slit, roll is that it eliminates the issue of multiple stoppages if separate front and back rolls do not run out at precisely the same time. Using a single roll also simplifies stock keeping by eliminating a separate raw material part number. The double width roll, especially on a wide format machine, does have the disadvantage of being heavy and cumbersome to handle. Specialized roll handling and transport carts can minimize this issue and are highly recommended.

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Special handling carts are recommended generally for use with all film packaging machines. They not only provide ease of handling, they also protect the film, particularly the edges, from damage during transport and loading. Even a small nick in the edge can propagate as the film is pulled through the machine leading to tears, with lost time re-threading the machine or jams.

The films are brought together in the machine and pass between a pair of rollers that form the longitudinal, lengthwise, seal between the pouches. This step usually includes trimming a small amount of material on the joined film's outer edges to compensate for any slight misalignments. A second sealing roll below forms the cross seal, sealing the

bottom of the current pouch and the top of the preceding pouch. These rolls are generally designed with cavities, rather than a flat surface, to conform to the shape of the product or to allow space for the product.

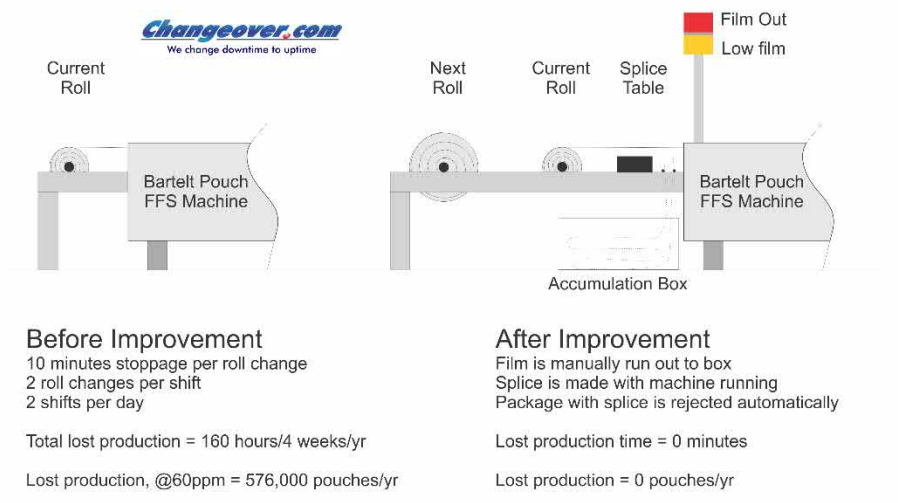
At this point the pouch is formed on 3 sides and the product can be introduced. Various types of feeders (solid product) or filling pumps (liquids) as appropriate can be used to dispense the product between the films and into the pouch. If required, nitrogen or other gas can be injected at this point. Care must be taken not to get powder or liquid on the seal area as this will interfere with proper sealing.

As the pouches continue through the machine, they are slit longitudinally into strips. A cross cutter then cuts the strips into individual pouches which are discharged to the next packaging step.

This description of the typical pouching machine assumes that each pouch is to be individualized which is not always the case. The final discharged product may consist of multiple pouches with or without perforations in strips or sheets. The major difference in the process will be the design of the slitting and cutoff blades.

The description above is of a multi-row, continuous motion machine. Intermittent motion and single row machine designs are also available when capacity requirements are lower.

As with VFFS and HFFS machines, roll replacement can cause significant downtime. Just 10 minutes of daily downtime from roll changes will cost 1 week of annual production. Simple things like amber warning lights when approaching the end of the roll, splicing tables and accumulation boxes can provide simple, inexpensive ways to reduce downtime from roll changes to close to zero.



Fully automatic splicing systems will splice on the fly with zero downtime. They may seem expensive but they can significantly improve annual output. This allows them to pay for themselves pretty quickly.

Flexible packaging has many advantages over other methods in cost, inventory shipping and volume. Vertical and horizontal form-fill-seal as well as 3 and 4 side pouch machines are the most common methods. Which of them to choose will depend largely upon product requirements and desired final appearance.

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