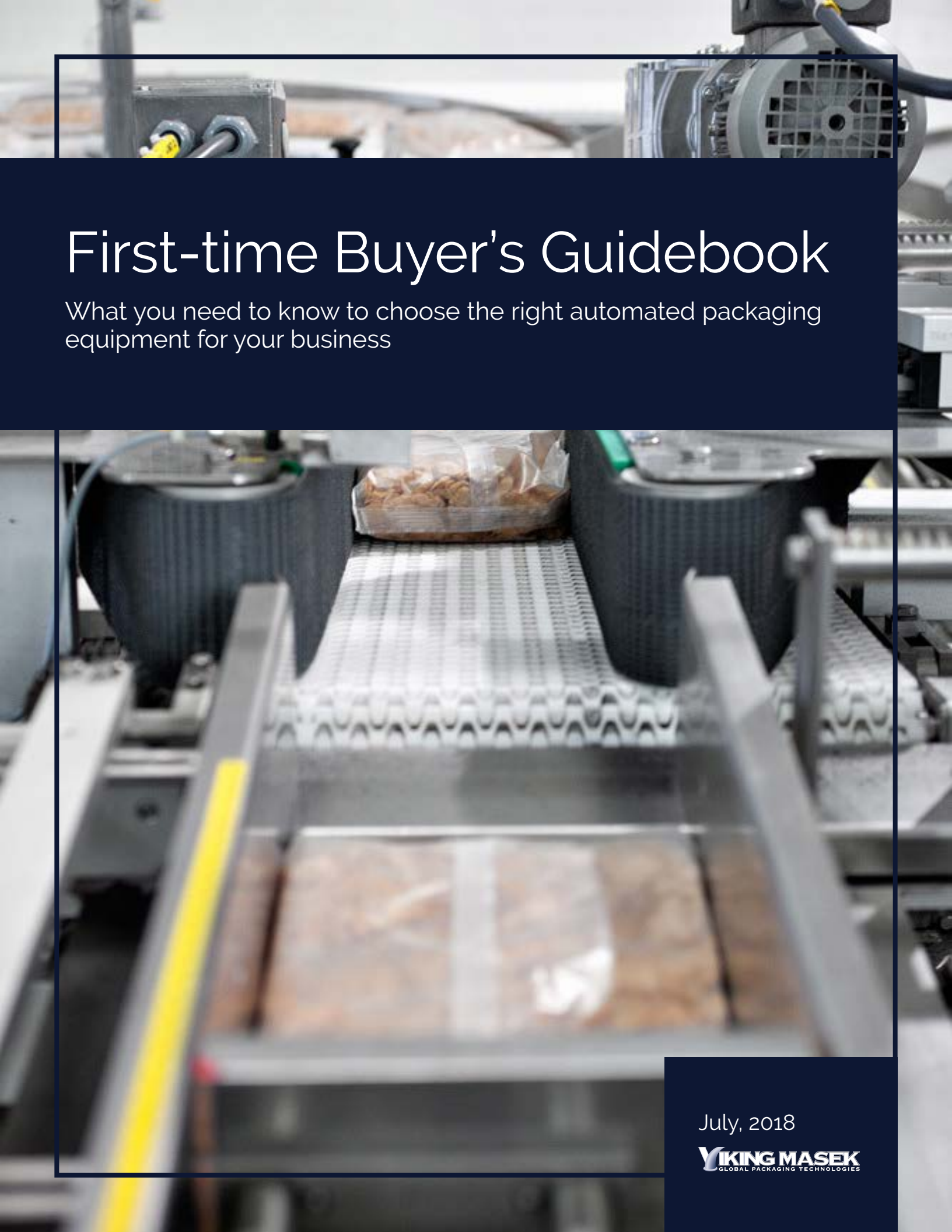


First-time Buyer's Guidebook

What you need to know to choose the right automated packaging equipment for your business

July, 2018

VIKING MASEK
GLOBAL PACKAGING TECHNOLOGIES

Contents

Congratulations!

You're considering purchasing your first automated packaging machine. The purchase of an automated packaging machine can improve your margins while increasing production to support your growing business. The options probably seem overwhelming, and you want to make the right decision. Understanding the types of machines available and knowing what questions to ask equipment manufacturers will help you make the best possible choice for your company.

We're here to make the process easy. Let's get started!

Is Packaging Automation Right For You?

Packaging equipment is a big investment that has the potential to transform your business. If you're wondering if the time is right to invest in packaging equipment, asking yourself these 5 questions can help you understand the advantages packaging automation can bring to your business.

1. What is your package type?

Automation works best for standardized products and processes. If your packaging is irregular, highly customized, enormous, or unpredictable, automating the packaging process can either be very expensive or very impossible. Viking Masek machines are capable of making or working with a variety of bag styles, including the unique standcap pouch. If your packaging is highly specialized, you might be able to implement automation by standardizing your packaging formats to one of these styles. Standardized packaging can be as beautiful as a highly customized package, while being easier to work with and still grabbing the customers' attention at the shelf.

2. How many bags per minute are required?

Production rates on flexible packaging machinery vary depending on the number of lanes available, the product to be packaged and the process to be used. Keep in mind your rates will vary depending on your product and process.

Type of Machine	General Production Rates
Vertical Form Fill Seal Machines (VFFS)	30-300 bags per minute
Automatic pouch filling and sealing machines	30-200 bags per minute
Multilane stick pack or sachet machines	40-80 bags per minute per lane

If your throughput estimates are way above standard speeds, don't worry, production increases can be achieved with the use of multiple systems or additional lanes.

If your needs drop far below those minimums or you plan to use the machine only intermittently, semi-automatic or manual solutions may be the answer for you.

> **A packaging equipment specialist** can look at isolating standard parts of the process for automation and help you weigh all your options.

3. Is your packaging process customized?

Like in almost every industry, customization equals higher cost. Research & development, engineering, and the one-off nature of a custom packaging system means more resources are required, which drives up costs significantly. Not to mention custom system development means a longer lead time.

That's not to say custom systems aren't worth it; they most definitely can be. But the additional costs must be carefully weighed against potential future gains. Often a custom system can eliminate manual labor but will require advanced (read: higher dollar) technical labor for maintenance and operations.

There's also the question of whether the custom system can be used over time for more than one application.

Sometimes, after running the numbers, it just isn't worth it to try to automate a very complex and ever-changing packaging process. At that point, a packaging equipment specialist can look at isolating standard parts of the process for automation and help you weigh all your options.

4. Will you be able to reduce costs?

Ask yourself, "If I am able to run my packaging line faster, can I reduce labor costs?" You might not need as many people to package your product, because one machine operator and an automated packaging machine might be able to replace several workers. However, if you are regularly pulling employees away from their "real" jobs to help with packaging product or have not been able to implement projects or programs because your employees are so busy manually packaging product, your labor savings might not be all that large.

Consider the other ways automated packaging can improve your bottom line. You might experience less waste. You'll be able to ship more product and accommodate larger orders. You might be able to reduce storage space by packaging and shipping product quickly.

5. Are you prepared for the upfront investment?

Let's face it: Packaging automation is not cheap. And it shouldn't be; you truly get what you pay for in this industry.

The initial investment for high-quality packaging machines can run anywhere from high five-figures up to millions of dollars. And while it is easy to fixate on the initial price tag, take a few moments to consider total cost of ownership.

Do some forecasting and calculate how much you will spend if you maintain the status quo versus your estimated future spend if you automate. You may be pleasantly surprised at how little time it could take to recoup your initial packaging equipment investment. We're talking months or years, not necessarily decades. Visit our website to download our free Packaging Equipment Return on Investment Calculator

Introduction to Flexible Packaging Machines

If you're new to the world of packaging automation, it may feel like there is a lot to learn. Never fear, we are here to help! Let's start with a high-level overview of the flexible packaging machine industry.

Introduction to flexible packaging

According to the Flexible Packaging Association, flexible packaging is any package or any part of a package whose shape can be readily changed. Examples include pouches and bags. Its opposite is rigid packaging, which includes things like bottles, cans, and jars.

Many top companies are adding flexible packaging to their lineup, for reasons including following:

- Low cost per package
- More surface area for graphics and messaging
- Less risk of breakage and injury if dropped
- Low storage and shipping costs
- Small carbon footprint
- Increased consumer demand for portable, flexible, lightweight packages

Flexible packaging materials

Flexible packaging equipment processes a layered (usually plastic) material called film to produce filled bags, pouches, sticks, and other flexible package types. This material usually contains a sealant layer that bonds together with heat to create a sealed package.

Some flexible packaging machines use a large roll of film wound around a hollow core, called **rollstock**, to form bag shapes.

Other packaging machines use already-formed bags, usually called **premade pouches**.

In either case, rollstock and premade bags are purchased from a film supplier, which is a company that creates or converts packaging materials. Sometimes these materials can be purchased directly through an equipment manufacturer, and other times the film supplier is a separate entity. Your packaging machine manufacturer will be able to provide you with recommendations for film suppliers.

Types of automatic flexible packaging machines

FORM FILL SEAL

Form fill seal machines are the most widely-used automatic flexible packaging equipment type. This equipment does exactly what its name suggests: Forms bags, fills them with product, and seals the bags closed.

Some machines perform these processes vertically (vertical form fill seal or VFFS) and some do it horizontally (horizontal form fill seal or HFFS). VFFS machines have the advantage of occupying limited floor space and are more economical in cost, which makes them a top choice in many industries when square footage and budget are limited.

Multilane stick pack and sachet machines are very popular in industries that package small packets of powder or liquid products like condiments and drink mixes. These machines work similarly to form fill seal machines but create multiple packages at once.

FILL AND SEAL

Premade pouch **fill and seal machines** are a quickly growing flexible packaging machine type. This equipment fills premade pouches with product and seals them shut. Some pouch filling and sealing machines perform their operations in a rotary fashion and others in a straight line. Rotary machines have the advantage of occupying less floor space and have more favorable ergonomics for operators.

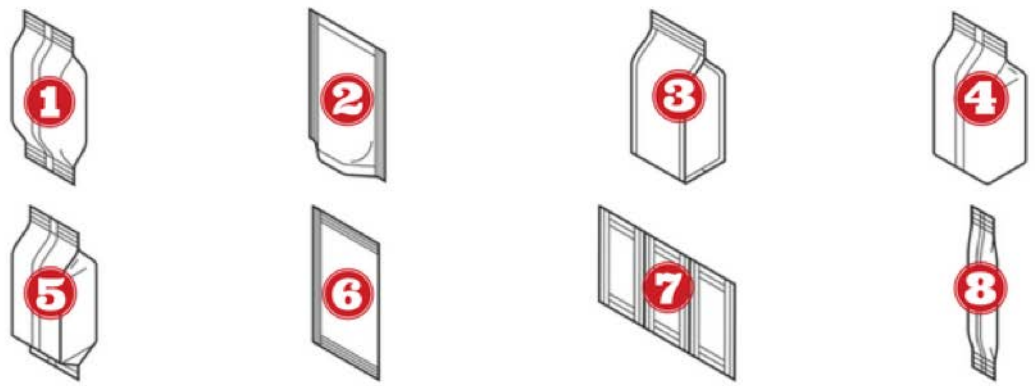
Filling equipment

For maximum accuracy, a flexible packaging machine can be integrated with a filler or doser to accurately measure the weight or volume of product before it is dropped into each bag. Depending on your product properties, different filling equipment will be recommended:

- An **auger filler** is used for powder products. This equipment uses a long screw-like mechanism to measure discrete quantities of product into bags.
- A **multi-head scale** is often used for solid products. This equipment uses a number of buckets to accurately weigh products before dropping them into bags.
- For liquids, a **liquid pump**, usually with a piston mechanism, will measure specific volumes of product into bags.

Bag types

Flexible packaging machines can accommodate many different bag types. Examples of common bag styles are below:



1. **PILLOW BAGS** are the most widely-used and economical packaging format, comprised of two flat panels sealed together on the top and bottom with a vertical seal down the back. This bag type is popular for value-brands, chips, single-serving snacks, and fractional packs of coffee.
2. **DOYPACKS** are stand-up pouches with an oval-shaped base. This bag type is growing in popularity for premium products in many industries, including snacks, coffee, and powder supplements.
3. **QUAD SEAL BAGS** have a rectangular bottom and can stand unassisted. This bag type has two side gussets and two panels joined together with four vertical seals, providing a more structured bag and modular look. This bag type is popular for premium coffee brands.

4. **FLAT BOTTOM BAGS** are similar to quad seal bags, featuring two gussets, but only have a single vertical seal. This bag type is popular for coffee and pet food.
5. **GUSSETED BAGS** are similar to pillow bags but have side gussets, offering more internal space.
6. **THREE SIDE SEAL BAGS** are flat pouches sealed on three sides.
7. **SACHETS** are small, flat 4-side sealed packets, often used for single-serving condiments and spices.
8. **STICK PACKS** are very narrow pillow bags, used for single-serving powders and liquids.

Flexible packaging machine specifications

SPEED

Packaging equipment is often rated by speed or throughput, which is how many finished bags can be completed by the machine in a certain timeframe. This is usually represented as **bags per minute (bpm)**, which is how many finished bags can be produced by the machine per minute. Often a machine will be rated for a maximum number of bags per minute, while actual production speeds will vary based on many factors.

BAG PARAMETERS

Packaging equipment will also have bag size parameters, usually represented by width, length, and/or depth in millimeters (mm). This means a finished bag must fall within certain size constraints. Some packaging machines can accommodate very large bags, and others work best creating much smaller packages. Your packaging machine manufacturer will use your bag parameters to decide which machine to recommend.

Packaging machines can also have bag weight parameters, meaning the machine can only support bags up to a certain weight. If a bag is very large and heavy, load-bearing support shelves can be added.

BAG TYPES

Another parameter will be the bag types a packaging machine can produce. Certain models can only create simple flat bag types while others can create more complex bags, like stand-up pouches.

ELECTRICAL & AIR REQUIREMENTS

Packaging machines need adequate power and air supply to operate. Specifications for these components will also be listed on most spec sheets.

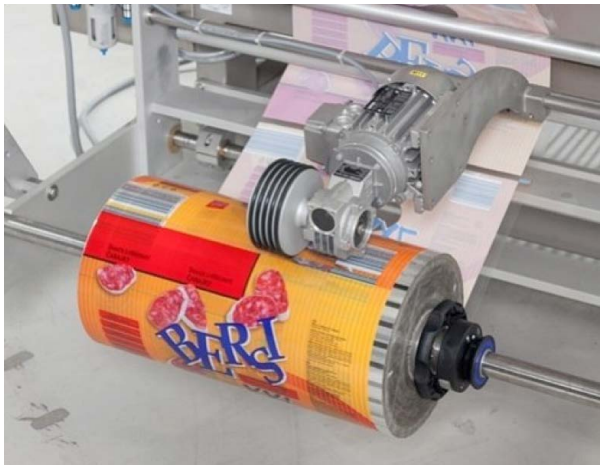
All About Vertical Form Fill Seal (VFFS) Machines

Vertical form fill seal (VFFS) packaging machines are used in almost every industry today for good reason: they are fast, economical packaging solutions that conserve valuable plant floor space. If you're new to packaging automation, chances are you're curious as to how they work. Let's walk through how a vertical form fill seal machine turns a roll of packaging film into a shelf-ready finished bag.

Simplified, vertical form fill seal (VFFS) machines start with a large roll of film, form it into a bag shape, fill the bag with product, and seal it, all in a vertical fashion, at speeds of up to 300 bags per minute. But there's a lot more to it than that.

Step 1: Film Transport and Unwind

Vertical packaging machines use a single sheet of film material rolled around a core, usually referred to as rollstock. The material used for rollstock can vary from polyethylene, cellophane laminates, foil laminates and paper laminates. The roll of film is placed on a spindle assembly at the rear of the machine.



When the VFFS machine is operating, the film is usually pulled off the roll by film transport belts, which are positioned to the side of the forming tube which is

located at the front of the machine. This method of transport is the most widely used. On some models, the sealing jaws themselves grip the film and draw it downward, transporting it through the machine without the use of belts.

An optional motor-driven surface unwind wheel (power unwind) may be installed to drive the film roll as an assist to the driving of the two film transport belts. This option improves the unwinding process, especially when the film rolls are heavy.

Step 2: Film Tension

During unwinding, the film is unwound from the roll and passes over a dancer arm which is a weighted pivot arm located at the rear of the VFFS machine. The arm incorporates a series of rollers. As the film transports, the arm moves up and down to keep the film under tension. This ensures that the film will not wander from side to side as it is moving.

Step 3: Optional Printing

After the dancer, the film travels through the printing unit, if one is installed. Printers can be thermal or ink-jet type. The printer places desired dates/codes on the film, or may be used to place registration marks, graphics, or logos on the film.

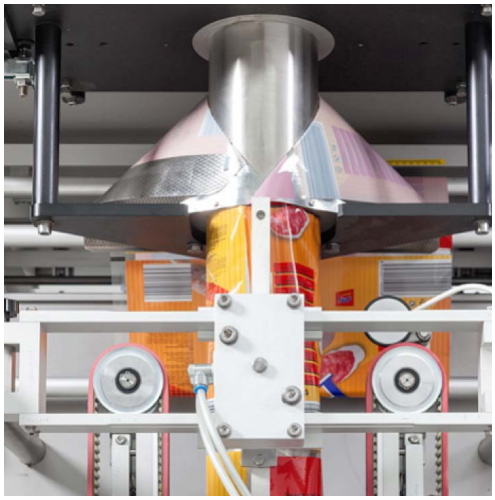
Step 4: Film Tracking and Positioning

Once the film has passed under the printer, it travels past the registration photo-eye. The registration photo eye detects the registration mark on printed film and in turn, controls the pull-down belts in contact with the film at the forming tube. The registration photo eye keeps the film positioned correctly so the film will be cut in the appropriate spot.

Next, the film travels past the film tracking sensors. The complete transport carriage assembly is shifted side to side to guide the web. Sensors detect the edge of the film. If the edge of the film shifts out of position, a signal is generated to move the actuator and cause the carriage to shift to one side or the other as needed to bring the edge of the film back to the correct position.

Step 5: Bag Forming

After passing the registration photo eye, the film enters a forming tube. As it crests the shoulder (collar) on the forming tube, it is folded around the tube to create tube of film with the two outer edges of the film overlapping each other.



The forming tube can be set up to make a lap seal or fin seal. A lap seal overlaps the two outer edges of the film to create a flat seal, while a fin seal marries the insides of the two outer edge of film to create a seal that sticks out, like a fin. A lap seal is generally considered more aesthetically pleasing and uses less material than a fin seal.

A rotary encoder is placed near the shoulder (collar) of the forming tube. The moving film in contact with the encoder wheel drives it. A pulse is generated for every length of movement, and this is transferred to the PLC (programmable logic controller). The bag length setting is set on the HMI (human machine interface) screen as a number and once this setting is reached the film transport stops (On intermittent motion machines only, continuous motion machines do not stop.)

The film is drawn down by two gear motors which drive the friction pull-down belts located on either side of the forming tube. Pull down belts that utilize vacuum suction to grip the packaging film can be substituted for friction belts if desired.

Step 6: Bag Filling and Sealing

Once the film stops moving (on intermittent models), the vertical sealer bar, which is hot, moves forward and makes contact with the vertical overlap on the film, bonding the layers of film together. The vertical seal bar presses itself against the forming tube and makes the vertical seam. On continuous motion VFFS models, the vertical sealing mechanism remains in contact with the film continuously so the film does not need to stop to receive its vertical seam.

Next, a set of heated horizontal sealing jaws come together to make the top seal of one bag and the bottom seal of the next bag. For intermittent VFFS machines, the film comes to a stop to receive its horizontal seal from jaws that move in an open-close motion. For continuous motion machines, the jaws themselves move in up-down and open-close motions to seal the film as it is moving. Some continuous motion machines even have two sets of sealing jaws for added speed.

If your product is heat sensitive or messy, an ultrasonics "cold sealing" system can be used to seal the bag. Ultrasonic sealing uses vibrations to induce friction at a molecular level that generates heat only in the area between film layers.

While the sealing jaws are closed, the product that is being packaged is dropped down the forming tube and filled into the bag. A filling apparatus such as a multi-head scale or auger filler is responsible for the correct measurement and release of discrete quantities of product to be dropped into each bag.

Step 7: Bag Discharge

After the product has been released into the bag, a knife moves forward and cuts the bag. The jaw opens and the packaged bag drops. This is the end of one cycle on a vertical packaging machine. Depending upon the machine and bag type, VFFS equipment can complete between 30 and 300 of these cycles per minute.

The finished bag can be discharged into a receptacle or onto a conveyor and transported to downline equipment like check weighers, x-ray machines, case packing, or carton packing equipment.

VFFS machines are an ideal choice for companies that need to package a high volume of packages quickly. Their speed, output, and ability to generate ROI are unparalleled. To understand if a VFFS machine is the right choice for your business and understand the options available, contact a packaging machinery expert at Viking Masek.

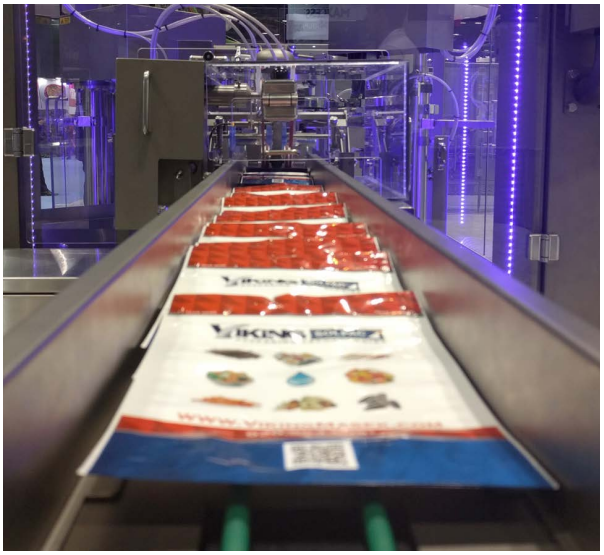
All About Premade Pouch Machines

Automatic pouch filling and sealing machines are becoming increasingly popular today for their simplicity, ease-of-use, and the superior aesthetics of their finished product.

Introduction to automatic pouch filling and sealing machines

Bag filling and sealing machines can be designed with an inline or rotary layout. For the purpose of this article, we are diving deeper into the rotary layout. This design conserves plant floor space and is constructed with ergonomics top-of-mind, and thus is seeing more popularity than inline models.

Rotary automatic pouch packing machines grip a preformed pouch, fill it with product, and seal it at speeds of up to 200 bags per minute. This process involves moving the bag in an intermittent rotary fashion to different 'stations' positioned in a circular layout. Each station performs a different packaging task. There are usually between 6 and 10 stations, with 8 being the most popular configuration. Automatic pouch filling machines can also be designed with a single lane, two lanes, or four lanes. Here is how the pouch packaging process works:



Step 1: Bag Loading

Preformed pouches are loaded manually by an operator into the bag magazine in the front of the automatic pouch filling/sealing machine. The bags are conveyed to the machine by a bag feeding roller.

In 2018, Viking developed a proprietary robotic bag infeed that eliminates much of the labor involved in properly loading and shingling premade pouches in the bag magazine. This robotic arm uses vacuum suction to grasp individual bags and load them into the bag gripping area.

Step 2: Bag Gripping

When a bag is detected by a proximity sensor, a vacuum bag loader picks up the pouch and transfers it to a set of grippers, which will hold the bag as it travels around the rotary unit to different 'stations.'
These grippers can continually support up to 10 kg on the best bag filling and sealing machine models.

Step 3: Optional Printing/Embossing

If printing or embossing is desired, that equipment will be placed at this station. Pouch fill and seal machines can utilize both thermal and inkjet printers. The printer can place desired date/lot codes on the pouches. The embossing option places raised date/lot codes into the bag seal.

Step 4: Zipper or Bag Opening and Detection

If the bag has a zipper reclosure, a vacuum suction pad opens the lower part of the preformed pouch and opening jaws catch the top side of the bag. The opening jaws separate outward to open the top of the bag and the premade pouch is inflated by an air blower. If the bag does not have a zipper, the vacuum suction pads still open the bottom part of the pouch but only the air blower is engaged.

Two sensors are present at the bottom of the bag to detect its presence. If a bag is not detected, the filling and sealing stations will not engage. If a bag is present but not placed correctly, it will not be filled and sealed and instead stay on the rotary apparatus until the next cycle.

Step 5: Bag Filling

Product is dropped down a bag funnel into the bag, usually by a multi-head scale. For powder products, an auger filler is used. In the case of liquid pouch filling machines, product is pumped into the bag by a liquid filler with a nozzle. The filling apparatus is responsible for the correct measurement and release of discrete quantities of product to be dropped into each premade pouch.

Options at the filling station include:

- Gas flush. This Modified Atmosphere Packaging (MAP) process displaces oxygen within the bag by using a blast of gas, usually nitrogen. This is done immediately prior to filling the bag with product to ensure maximum displacement.
- Dust collection. For dusty or messy products, a dust hood is placed above the filling station that collects airborne particles.

Step 6: Product Settling or Other Options

Sometimes loose contents need to settle to the bottom of the bag before sealing. This station gently shakes the premade pouch to achieve that.

Other options at this station include:

- Second liquid seal. For liquid/water pouch filling machine configurations, this station can be used for a second liquid seal to ensure maximum seal integrity.
- Second filling station. For products that include both solid and liquid components, a second filling station can be added.
- Load shelf. For heavy fills, a shelf can be added after filling to bear the load of the extra weight and take the stress off the gripping arms.

> Premade pouch machines are ideal for businesses that desire equipment that **does not require a high level of technical training to operate,** or those who have a strong brand identity tied to a premade pouch that is already in use.

Step 7: Bag Sealing and Deflation

Remaining air is squeezed out of the bag by two deflator components before sealing occurs.

A hot seal bar closes on the upper part of the pouch. Using heat and pressure, the sealant layers of the premade pouch are bonded together to make a strong seam.

Step 8: Cooling & Discharge

A cooling bar passes over the seal to strengthen and flatten it. The finished bag is then discharged into a receptacle or onto a conveyor and can be transported to downline equipment like check weighers, x-ray machines, case packing, or carton packing equipment.

Premade pouch machines are ideal for businesses that desire equipment that does not require a high level of technical training to operate, or those who have a strong brand identity tied to a premade pouch that is already in use.

All About Stick Pack Machines

Multilane stick pack machines are used in many industries today for powder and liquid packaging. The stick pack format is popular for single-serve products which modern consumers love for their portability, convenience, and ease of use. Manufacturers and co-packers love stick pack machines because they achieve high throughput and conserve valuable plant floor space.

The operation of stick pack machines is very similar to that of single lane vertical form fill seal packaging machines: a roll of film is cut and formed into multiple stick packs, the bags are filled with product and then sealed, all in a vertical fashion, at speeds of up to 80 bags per minute per lane. With machines that can accommodate up to 20 lanes, a single stick pack machine can produce up to 1,600 stick packs per minute. That's over 26 sticks per second!

Stick packs are produced using a 7-step process.

Step 1: Film Transport and Unwind

Stick pack machines use a single sheet of film material rolled around a core, usually referred to as rollstock. The film is unwound from the film reel, positioned at the rear part of the machine. The film unwinding process is done by means of movement of the cross seal jaws, located at the front of the stick pack machine.

Step 2: Optional Printing

If the machine is equipped with a date-stamping device, the film is fed around a registration roller. This helps to register the position of the date stamp on the package in relation to the horizontal seal. The film is threaded over a sensor that reads eye marks and controls the position of the horizontal seal in relation to the printing on the film.

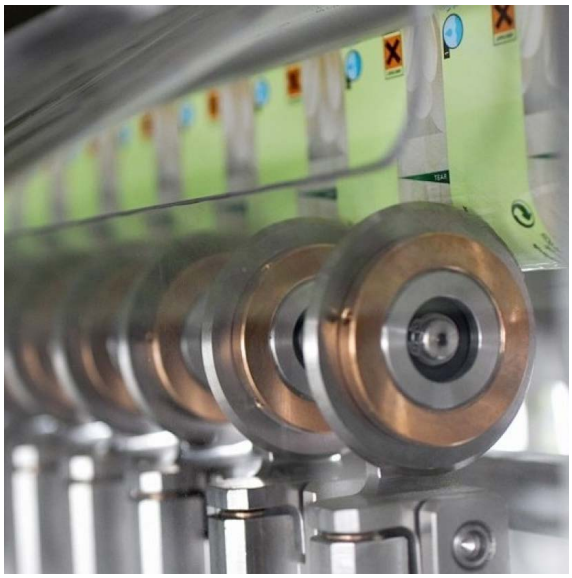
Step 3: Film Tension

Next, the film is fed through a set of nip rollers. The nip rollers keep even pressure on the film to help to keep it at a constant tension, thus keeping the dancer arm in the proper operating position.

During unwinding, the film is unwound from the roll and passes over a weighted pivot arm located at the rear of the machine known as a dancer arm. The arm incorporates a series of rollers. As the film transports, the arm moves up and down to keep the film under tension while also ensuring the film will not wander from side to side as it is moving.

Step 4: Film Cutting

From the nip rollers, the film goes into the cutting section. During this step in the process, the large roll of packaging film is cut into strips based on how many lanes the stick pack machine has. These strips form the basis for the individual stick packs.



The cutting disk knives that complete this step are not motorized. The film, still kept under tension, is passed through the knives which are in contact with a specially designed roller. The film is cut into individual stick packs as it is pulled through this assembly.

Step 5: Stick Pack Forming

From here, the cut film passes over multiple forming tubes (one per lane). As the cut film crests the shoulder (collar) on each forming tube, it is folded around the tube so that a 'stick pack' shape is created with the two outer edges of the film overlapping each other.

The forming tubes can be set up to make a lap seal or fin seal. A lap seal overlaps the two outer edges of the film to create a flat

seal, while a fin seal marries the insides of the two outer edges of the film to create a seal that sticks out, like a fin. A lap seal is generally considered more aesthetically pleasing and uses less material than a fin seal.

Step 6: Stick Pack Filling and Sealing

Once the film stops moving, multiple vertical sealer bars (one per lane) move forward and make contact with the vertical overlap on the film. The heated vertical seal bar presses itself against the forming tube and makes the vertical seal.

Then a single horizontal sealing jaw comes together to make the top seal of one stick pack and the bottom seal of the next one. While the sealing jaws are closed, the product that is being packaged is dropped down the center of the forming tubes and fills each individual bag. A filling apparatus like a volumetric filler, liquid pump, or auger filler is responsible for the correct measurement and release of discrete quantities of product to be dropped into each stick.

Step 7: Stick Pack Discharge

After the product has been released into each stick pack, the knife moves forward and cuts the bag or the horizontal seal is "notched" just under the horizontal seal jaw.

Finished stick packs drop into the outfeed chute which has a flap that opens and closes at predetermined intervals, dropping the bags either onto an outfeed conveyor or directly into a receptacle. For a more controlled and oriented discharge of stick packs, individual outfeed chutes can be optioned.

The completed bags can be fed into downline equipment like check weighers, x-ray machines, case packing, or carton packing equipment.

All About Sachet Packaging Machines

Multilane sachet machines are used in a multitude of industries for powder and liquid products. Sealed on all four sides, these small packets are often filled with condiments and spices like salt, sugar, mayonnaise, or ketchup. Manufacturers and contract packagers love sachet packing machines because they can achieve high throughput while occupying limited floor space.

The operation of sachet packaging machines is similar to multilane stick pack machines, but with a few notable differences. Basically, a large roll of film is sliced in half, formed into multiple sachet packets, filled with product, and then sealed, all in a vertical fashion, at rates of up to 80 cycles per minute per lane. With the capacity for up to 10 lanes, this means a single sachet machine can produce up to 800 packets per minute, or about 13 per second! Here's how they do it:

Step 1: Film transport and Unwind

Sachet machines use a single sheet of film material would around a core, usually referred to as rollstock. The film is unwound by motor driven rollers from a reel that is located at the rear of the machine.

Step 2: Optional Printing

If the sachet packaging machine is equipped with a date stamping device (printer), the film is fed over a sliding roller that registers the position of the date stamp on the package in relation to the horizontal seal. The film is threaded over a sensor that reads eye marks and controls the position of the horizontal seal in relation to the printing on the film.

Step 3: Film Tension and Centering

Next, the film is fed through a set of braking rollers to keep even pressure on the film, keeping it in constant tension. This is necessary so the film does not travel from one side of the sachet packing machine to the other. The film edge is tracked by optical sensors located in the upper part of the machine. These sensors detect when the film is wandering off-center and automatically re-centers it.

It is vitally important for the film to be perfectly centered and at the proper tension so when it comes times to seal and cut the sachets into individual packets, it is done with accuracy and precision as related to the film and its graphics.

Step 4: Film Cutting & Folding

Immediately after the film is centered, it is divided with a disc knife into two halves (front and back). The rear half of the film runs under the sensor that reads the marks on the film and controls the position of the cross seal with regard to the film print. The front and back halves of the film are then folded to meet again with the print facing outward.

Step 5: Sachet Forming

Next, the film is pulled over shaping strips to form the sachets. These strips are fitted with smoothing brushes to better shape the packets.

Step 6: Sachet Filling and Sealing

The liquid or powder product is then dispensed into each sachet by round tubes or flat nozzles. A special bag straightener can be employed at this step to make sure the packets are perfectly straight prior to cutting.

Next, sealing of the sachet packets takes place. Both sets of sealing jaws are heated to bond the front and back sheets of film to one another to create sealed packets. The longitudinal (vertical) vertical seal jaws first close in the space between the filling nozzles or

tubes. Then, the cross (horizontal) seal jaws close to form the bottom seal of one packet and the top of the next. This creates the distinct 4-side-seal look of the sachet packages.

Step 7: Sachet Cutting and Discharge

A group of pneumatically-driven disc knives can then cut the film vertically if individual sachets are desired. Alternately, perforation knives with an intermittent edge can be used for creating pairs or triplets of packets divided by perforation. A horizontal cutting station then separates the filled, sealed, and longitudinally cut packets into individual sachets.

Finished sachets drop into an outfeed chute that deposits the bags either onto an outfeed conveyor or directly into a receptacle. Alternatively, and Pick & Place device can be used at this point. This device uses vacuum suction to lift individual sachets, turns them by 90 degrees, and places them onto a special outfeed conveyor. This conveyor has individual lanes that guide each sachet downline. Often sachet packing machines are also integrated with case or carton packing equipment that places individual packets into outer cardboard cartons, and those cartons into larger boxes.

Understanding the Differences Between Packaging Machine Manufacturers

The purchase of a packaging machine is an important decision. We believe you deserve a partner that will work to understand your business and make the best recommendation for your situation.

To evaluate possible packaging machine manufacturers, ask yourself the following six questions:

1. How thorough is the discovery process?

This guide provided background into four different types of packaging machines. However, packaging equipment is not 'one-size-fits-all'. While there are standard machine types and models, packaging equipment must be tailored to your unique specifications and goals. Hence, a packaging machine manufacturer worth their salt should initially ask you a ton of questions. This is done to make sure their recommendations and pricing most accurately match your unique needs.

Be sure your packaging machine manufacturer has taken the time to thoroughly discover your business' needs so you purchase the right configuration machine for your current and future needs. If you end up with an improperly specified machine because the packaging machine manufacturer was more interested in making a quick sale than properly scoping your project, you can end up losing money via change orders, machine failures, inefficiency, and lost production time.

2. What materials are used to construct the machine?

The best packaging machines feature welded stainless steel frames and contact parts. Stainless steel construction provides many advantages. It has a high strength-to-weight advantage, making it uniquely resistant to corrosion, chemicals, and high heat at a reduced thickness as compared to other materials.

Stainless steel packaging machines are suitable for nearly any industry and facility. Other construction materials such as iron or specialty alloys simply cannot match the corrosion resistance of stainless steel. Iron, for example, will rust in reaction to oxygen and water, making it more brittle over time. Stainless steel's resilient properties allow it to endure almost any conditions, from dusty shop environments to highly sensitive applications that demand frequent cleanings with harsh chemicals. This high-quality material makes it the best long-term investment for your facility.

3. How durable are key machine components?

It's what's on the inside of the packaging machine that counts. Inferior construction can lead to increased costs via constant parts replacement, unexpected downtime, and costly upgrades or rebuilds. Here are a few key components to pay extra close attention to:

- **Sealing jaws:** This component uses heat and pressure to seal packages shut. If the sealing jaws are of inferior construction, your packages will end up with inferior seals that lead to leaks and contamination. To prevent this, choose equipment with seal jaws that are forged from a single piece of material. This will ensure constant, even heat conduction and pressure.
- **Pull belts:** Pull belts help transport the packaging film through the machine, and as such, they need to be constructed of strong, durable materials. Watch for plastic pieces; this can be a red flag for inferior construction that will lead to parts wearing quickly, which means extra cost for you as well as increased risk of unexpected failure.

4. How complex are the machines?

When it comes to packaging machinery, less is more and simpler is better. Adding unnecessary complexity adds barriers to efficient production.

> High-quality packaging machines are designed for ease-of-use, featuring an accessible open design concept and a modular configuration.

A digital control system, preferably with a touch screen human machine interface (HMI), can store multiple product formulas. This makes it easier for operators to enter packaging configurations and parameters into the system all at once.

5. What is the changeover process?

Packaging machines should have the ability to change over to different bag styles or sizes seamlessly, without any tools required.

The resulting decrease in changeover time and subsequent cost savings helps companies optimize productivity, production, and profitability for their business. It also facilitates a shorter learning curve for packaging line operators and maintenance employees.

All it should take to change over a premade pouch machine is the push of a button on the HMI, and loading the new bags into the machine. Changing over a VFFS machine should also be easily accomplished by changing out modular components like forming tubes, jaw assemblies, and the film roll.

6. Will the OEM make a good long-term partner?

A packaging machine purchase is not solely transactional; instead it should signify each side committing to a long-term partnership. The lifespan of a packaging machine can span decades, and you should be confident that the OEM makes your success a top priority. Here are some signs that an OEM will be a great partner:

- Offering non-proprietary parts that can be fabricated locally to you
- Keeping key machine parts in-stock at the OEM facility that can be shipped quickly in emergencies
- Offering comprehensive preventive maintenance plans and programs
- Directly hiring support personnel, not outsourcing service and maintenance to a third party
- Offering education and training either at the OEM facility or at the customer's site
- Stocking popular machine models at their facility for quick delivery

What you need to know before requesting a proposal

Fair warning: Getting pricing for a packaging machine is not as quick and simple as picking a model and referencing a price list. It's nearly impossible to buy a machine off-the-shelf with no customizations. The machine model itself may be standard, but it must be tailored to your unique specifications.

As a result, expect a bunch of questions from the packaging machine manufacturer before they provide you with a proposal.

This isn't done to make you crazy, we promise. Every question asked has a singular goal: Making sure the equipment manufacturer fully understands the scope of your needs so they can provide accurate recommendations and pricing.

Here are the top 25 questions you can expect when contacting a packaging machine manufacturer for a proposal:

GENERAL INFORMATION

1. When do you need to be up and running with new packaging equipment?
2. Do you have automated packaging equipment in your facility right now?
3. Do you have a budget in mind?
4. Is your project approved and funded?

PRODUCT INFORMATION

5. What is the description of the product(s) you looking to package?
6. SOLID PRODUCTS: What is the average piece size?
   POWDER PRODUCTS: What is the bulk density?
   LIQUID PRODUCTS: What is the fill temp and viscosity, and does it have a solid component?
7. Is your product dusty?
8. Is your product fresh or frozen?

PACKAGE INFORMATION

9. Do you use premade bags or do you need to create your bags from scratch?
10 What are your bag styles?
11. What are your package weights/volumes?
12. How much output do you require (finished bags per minute, shift, day, year, etc)?
13. Does your package have easy-open features? (i.e. tear notch, perforations)
14. Does your package have recloseable features? (i.e. zipper, label, or tin tie)
15. Do you require a degassing valve applicator (for coffee applications)?
16. Can you send pictures of film, finished bags, and product?
17. Even better, can you send samples of film, finished bags, and product?

FACILITY INFORMATION

18. How many shifts are in production at your facility?
19. Is your plant environment wet or dry?
20 What is the electrical availability in your plant?
21. What is your plant ceiling height?

EQUIPMENT INFORMATION

22. How do you wash down your equipment?
23. Do you need equipment to feed and/or dose your product into the packaging machine?
24. Do you need the packaging system to print date/lot codes on your packages?
25. Do you require metal detection, X-Ray or checkweigh in your packaging system?

Want to streamline the packaging machine proposal process? Don't miss a single detail; organize your answers to the questions above (and more) in a single document. Download our free project planning spreadsheet to get ahead of the game.

Calculating ROI – How Long Will it Take for Your Investment to Pay Off?

People who are buying their first automated packaging machine always ask how long it will take for their investment to pay off. Understanding your ROI is an important part of your decision. There are five steps to calculating your ROI.

1. Calculate the total cost of new packaging equipment

When purchasing automated packaging equipment, you must take into consideration more than just the price tag on the machine. Your ROI calculations will be most accurate if your equipment cost represents the total cost of ownership including factors like:

- Equipment purchase price
- Freight costs
- Commissioning and installation costs
- Training costs
- Cost of financing
- Annual maintenance and parts expenses

These costs will vary widely and are hard to estimate, so we recommend requesting information about machine costs specific to your application and business needs.

2. Calculate labor with and without packaging automation

First, determine the current fully loaded wage per hour for your packaging staff. This includes not only rate of pay, but the cost of benefits like insurance, paid time off, and other employee perks.

Next, determine how your labor costs would change with packaging automation. Your fully loaded wages per hour will likely not differ, but the number of employees required after implementing automation will change. Often this means the number of employees required to run a packaging line will decrease, sometimes by half or more.

3. Calculate efficiency factors with and without packaging automation

Packaging efficiency calculations begin with knowing how many packages are currently produced annually and what your profit per package is in dollars (or your local currency).

Then, using the specifications provided by packaging equipment manufacturers (check out their website or give them a call), you can input how many packages you could expect to produce after implementing automation. Throughput specifications are often represented as bpm (bags per minute) or cpm (cycles per minute). Multiplying this number by the hours spent packaging per day, the number of days per week, and operational weeks per year will give you an annual estimation.

4. Factor in miscellaneous expenses unique to your business

Be sure to include costs before and after automation for factors like scrap and rework, engineering or R&D of a custom packaging system, or commissions you may pay third-party integrators. Your expenses could also include the value of plant square footage gained when consolidating multiple manual packaging areas into the smaller footprint of a machine.

5. Perform return on investment calculations

Calculate the Simple Return on Investment (ROI) formula

A standard definition of ROI is the ratio of a benefit or loss made in a fiscal year expressed in terms of an investment and shown as a percentage. In packaging equipment terms, the ROI formula is as follows:

(Net benefit or loss generated by new equipment / Total new equipment cost) x 100

As an example, if you are considering purchasing a packaging system for $200,000 and predict a net annual benefit of $150,000 (via labor savings and profit from increased throughput), your return on investment will be:

($150,000 / $200,000) x 100 = 75%

Calculate the Payback period (PBP) formula

The payback period calculates how much time it will take to recoup the initial investment. In packaging equipment terms, the payback period formula is as follows:

Total new equipment cost / Total periodic benefit realized from new equipment

Using the same example above of $200,000 equipment cost and $150,000 net annual benefit, the payback period will be:

$200,000 / $150,000 = 1.3 years

Understanding the potential return on your investment in packaging equipment will give you confidence in your decision and the ability to plan the right course of action for not just this purchase, but also for the upcoming years as you work to capitalize on your investment.

Put away your calculator, we took care of the math for you: Visit our website to download our free Return on Investment Calculator.

Glossary of Common Flexible Packaging Machine Terms

Automatic Film Tracking

Automatic Film Tracking is performed by sensors that detect the edge of the film. If the edge of the film shifts out of position, a signal is generated to cause the carriage to shift to one side or the other as needed to bring the edge of the film back to the correct position.

Bag Deflator

Usually consisting of two components that gently squeeze the bag after filling but prior to receiving its final seal, bag deflators remove excess air from inside the bag.

Changeover

Changeover is the process by which a packaging machine is adjusted to accommodate different bags or products. Because changeover means the machine is not producing, it should be minimized. Depending upon the machine, changeover can take from minutes to hours.

Continuous Motion Machines

On continuous motion VFFS machines, the film is transported continuously and does not stop. This machine type offers higher output but usually requires a higher investment than a standard Intermittent Motion machine.

Controls System

The Controls System governs the starting, stopping, direction of motion, acceleration, speed, and function of the machine. Allen Bradley and Siemens are the most popular brands of controls in the United States.

Cutting Knife

On VFFS machines, the cutting knife is in between the sealing jaws and moves forward once per cycle to cut the bag above its top seam. This releases the finished bag from the machine.

Dancer arm

Mounted on torsion springs and located at the back of a VFFS machine, the dancer arm moves from front to back to keep the web of film under constant, even tension.

Fill and Seal Machines

Fill and seal machines are loaded with premade pouches which are then filled with product and sealed shut. Also known as premade pouch machines or automatic pouch filling and sealing machines.

Film web

The film web refers to a continuous length of packaging film. This material is unwound from a roll (see Rollstock) and fed through a form fill seal packaging machine.

Forming Tube Assembly

Usually fabricated from metal materials, the forming tube assembly is responsible for forming flat rollstock film into a bag shape. The curved forming shoulder is connected to a hollow forming tube. The flat web of film is pulled over the forming shoulder, which brings the edges of the film together to form a tube shape. After the vertical and bottom seal is created on the bag, product drops down the hollow interior of the forming tube and lands inside the bag.

The size and shape of the forming tube assembly is dictated by the finished bag dimensions and bag style required. Each size and style of bag requires a different assembly.

Gas / Nitrogen Flush

Gas flush pumps gas, usually nitrogen, into the package right before filling. The nitrogen displaces oxygen that may decrease a product's shelf life. Also see: Modified Atmosphere Packaging.

Heat Sealing jaws / bars

Sealing jaws use heat, pressure, and time to bond the sealant layers of packaging material together to create a package seal. Usually in pairs, these hot bars come together over the sealing area of a package to create a seam.

Human Machine Interface (HMI)

Similar to a computer monitor, the Human Machine Interface (HMI) is the primary operator station through which a human controls the packaging machine. Often a flat, 10 – 12 inch touch screen panel, this interface provides feedback, error reporting, status updates, and other information.

The HMI is usually located at the front of the packaging machine and can be attached directly to the equipment, located at the end of a movable arm, or on its own stand or pedestal next to the machine.

Intermittent Motion Machines

Considered standard in the flexible packaging industry, intermittent packaging machines must stop once per cycle to create the bag's vertical seam. Intermittent machines generally cannot meet the high speeds of continuous models but are more affordable.

Ingress Protection (IP) Rating

An IP Rating, usually composed of a 2-digit number, represents how protected an enclosure is against the ingress of solid objects and liquids. The first digit represents the level of protection against ingress of solids and the second digit represents the level of protection from liquid ingress. The recommended IP Rating for your packaging machine enclosures depends upon your product, plant environment, and cleaning protocols.

Modified Atmosphere Packaging (MAP)

Any type of packaging material or process that seeks to modify, create, or maintain a certain atmosphere inside of a package. MAP is usually used to reduce the onset of oxidation, thereby extending the shelf life of a product.

Premade / Preformed Pouches

Premade pouches are bags that are preformed into their end shape. They arrive at the production facility premade. These pouches are loaded into a fill and seal machine for further processing.

Product Settler

A machine component that gently shakes a filled bag to encourage the product to settle toward the bottom of the bag.

Programmable Logic Controller (PLC)

Similar to a computer hard drive, the programmable logic controller (PLC) is the 'brain' of the packaging machine, containing all the logic, parameters, recipes, and set points needed for the packaging machine to function.

Pull belts/Film transport belts

Pull belts, or film transport belts, are small conveying mechanisms that transport the web of film through the packaging machine. There are two main types: Friction and vacuum belts. Friction belts use friction between the film and the belt to move the film web. Vacuum belts use vacuum suction

to suck the film against the belts. Vacuum belts, while more expensive, are often the preferred option because of better performance and longevity, especially if the product is dusty or messy, which can cause issues with friction belts. Friction belts can last weeks, while vacuum belts can last years.

Registration Photo-Eye

Registered film has markings that can be detected by a Registration Photo-Eye on the packaging machine. These markings, when detected by the photo-eye, keep the film positioned correctly so the film will be cut in the appropriate spot.

Rollstock film

Rollstock film is a flat sheet of packaging material wound around a hollow cardboard core into a large roll. Rollstock film is the basis of the form fill seal packaging process. This large roll is loaded into form fill seal or stick/sachet machines and processed to form the bags shapes and sizes required.

Servo Drives

Servo drives control the motion of certain machine components. Servo drives provide closed loop feedback, constantly monitoring signals and adjusting for deviations in behavior. Considered a superior option to standard mechanical drives, servo drives provide higher accuracy, precision, and flexibility, and have a longer lifespan.

Ultrasonic Sealing

As an alternative to heat seal bars (which are always hot), ultrasonic sealing only generates heat inside of the sealing layer of the film and only for a matter of milliseconds. This is done by way of converting vibrations at a molecular level to friction heat. The parts of the ultrasonic sealing component that come in contact with the package remain cold for the entire sealing process.

Vertical Form Fill Seal Machines

A vertical form fill seal (VFFS) machine uses rollstock film which is unwound and shaped while travelling upwards vertically over a forming collar and down the filling and sealing area. In short, VFFS machines form bags, fill them with product, and seal them closed.

Washdown Construction

Washdown construction means the packaging machine will be able to withstand harsher cleaning procedures. This design may include angled frames, silicone seals, covers for exposed moving parts, drip pans, and electrical/pneumatic enclosures IP rated for your facility and cleaning specifications.

About Viking Masek

Viking Packaging Technologies manufactures, sells, and services flexible packaging machinery for food and non-food markets worldwide. With over two decades of industry experience, we offer a broad range of intermittent and continuous motion VFFS packaging machines – each with completely customizable features – to ensure every customer receives a solution that matches their unique needs. Our baggers integrate seamlessly with weighers and fillers, infeed and outfeed equipment, metal detectors and X-ray systems, cartoners and casepackers, and other automated packaging equipment. Viking Masek has flexible packaging covered from Tote to Pallet™.

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