

OPPORTUNITIES VERSUS CHALLENGES

AUTOMATIC CASE PACKING OF FOOD FLEXIBLE PACKAGING



*Performance
through
Understanding*

 **Sidel**

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EDITORIAL

Flexible packaging: great for marketing and logistics, but challenging for the industry...



Today, flexible plastic and paper bags or sachets are light, adaptable to many formats and types of use, and are relatively easy to mass-produce.

While this guide focuses solely on food applications, don't forget that they are used in a wide range of sectors, from body and home care to cosmetics and drinks.

Flexible packaging is growing in popularity, linked to three factors:

- Companies are looking for packaging that sets them apart,
- More individual portions are needed in emerging countries,
- Consumer and companies are paying more attention to environment and carbon footprint.

Flexible packaging has paved the way for a variety of new uses, from portable items to ready-to-eat snacks, and food companies are waking up to the possibilities. They can multiply the number of products/formats they offer by adapting the size, the recipe or the cap - an interesting way to increase their product offer and beat price-comparison sites and apps!

Sidel is looking to provide support and advice to the food industry, using flexible packaging through its automatic packing process expertise.

We hope to convince the reader that, while the lightness and deformability of flexible packaging may be a major constraint when mechanizing the packing process, there are relevant solutions. However, being well informed and aware first, is key to move forward with a clear mind.

With extensive experience in a range of emerging new types of flexible packaging (Doypack®/stand-up pouches, chain bags and refill bags), Sidel can also help companies choose the right kind of secondary packaging and maximize their position in the case. This will depend on the company's priorities: do you want to optimize their logistics or make it easier to shelve your products? Sidel is a key player in the global mechanizing of the process, from the product collation to the corrugated case sealing, including quality control and mass balancing of the products.

With this guide, we can help food manufacturers make the right choices for their overall packing solution. To do this, we have illustrated the various primary and secondary packaging configurations available, laid them out according to user priorities and provided an inventory of the primary industrial resources available. Lastly, there are four case studies to give you a real-world view of what we are talking about.

Now let's begin!

Etienne Henry

Packing Business Development Director

SIDEL AND GEPIA

Geppia is a group of process and packaging equipment manufacturers, uniting more than 80 manufacturers in the field of processing, transformation and packaging. Sidel has been an active member of Geppia since 2005, working with a variety of other companies aiming to meet the needs and expectations of the international markets and distribution channels of the future.

1 FLEXIBLE PACKAGING: A FAST-GROWING PRIMARY PACKAGING SOLUTION








Changing consumer lifestyles and increasing global demand for commodity products are driving the growth of flexible packaging.

According to the latest Smithers Pira report, "The Future of Flexible Packaging to 2022", the global demand for flexible packaging should grow at an annual rate of 4.1% from 2017 to 2022, growing from 27.4 to 33.5 million tons⁽¹⁾.

⁽¹⁾ Magazine de l'Emballage et du Packaging - March 2017



WHICH FLEXIBLE PACKAGING FOR WHICH PURPOSE?

	SHAPES	FEATURES	USES	MARKETS
PILLOW BAG	Sealed on 3 sides 	Single-dose	From portion pack to large container	Candy, childhood nutrition, pastry, snacking
		Gusset bag	Premium image ; adapted to thick food products	Dry food
		Chain bags, folded and sometimes overwrapped in a flow-wrap	Single-dose chain bags	Street vending in Asia and Latin America ; personal and home care
STAND UP POUCHES	Sealed on 4 sides 	Pouches offering a certain rigidity	Low gram-weight powders	Prepared and dehydrated dishes
	Upright bag 	Can be closed after use and offering a large printable surface	Life after opening ; use as required ; Closing by clips, adhesive or zip	Pasta food & biscuits (cookies, ...), coffee, so mainly dry food
	Doypack® 	Can be closed after use and offering a large printable surface Premium image	Reclosable pouch well adapted to beverages and fresh food - Very used in refill	Lump sugar, olives, ready-to-cook preparations, sauces. Home care (dishwasher tablets)
	Doypack® with add 	Stopper, straw...	Mobility	Gourd of compote ; liquids

FLEXIBLE PACKAGING UNDER 6 ANGLES

1 ECONOMIC ANGLE

A reduced quantity of material is used to create flexible packaging while keeping resistance and capacity.

2 LOGISTIC ANGLE

Less material means a lighter weight, a boon for storage and transport.

For liquid or viscous products, the ability of the primary packaging to mould to the shape of its contents gives it more stability during the logistics process.

3 CONSUMER ANGLE

The success of flexible packaging can be explained primarily by the fact they are fully adapted to modern uses and habits. Mobility (on-the-go single-serve pouches), the need to split up the contents, the use of refills (refill bags), the use of individual doses (chain bags) and the simplicity of ready-to-use products (*stand-up* products) are all needs which are perfectly met by flexible packaging.

Flexible packaging also comes with several advantageous technical characteristics, as they are waterproof (for better product preservation), flexible (making it easier to extract viscous/thick products) and can be transparent (reassuring consumers by showing them what they are buying).

4 MARKETING ANGLE

Flexible packing is a primary packaging solution which can be adapted to a variety of different presentations. For example, they can come with or without a base, likewise for a cap. They can be linked in a chain or sold separately; they have a large four-color printable surface (frequently on both sides) opening-up lots of opportunities for Marketing/Product managers.

5 INDUSTRIAL ANGLE

With a packing line for flexible packaging, the industrial process requires relatively fewer steps, less equipment and generally economically advantageous. A line will generally include:

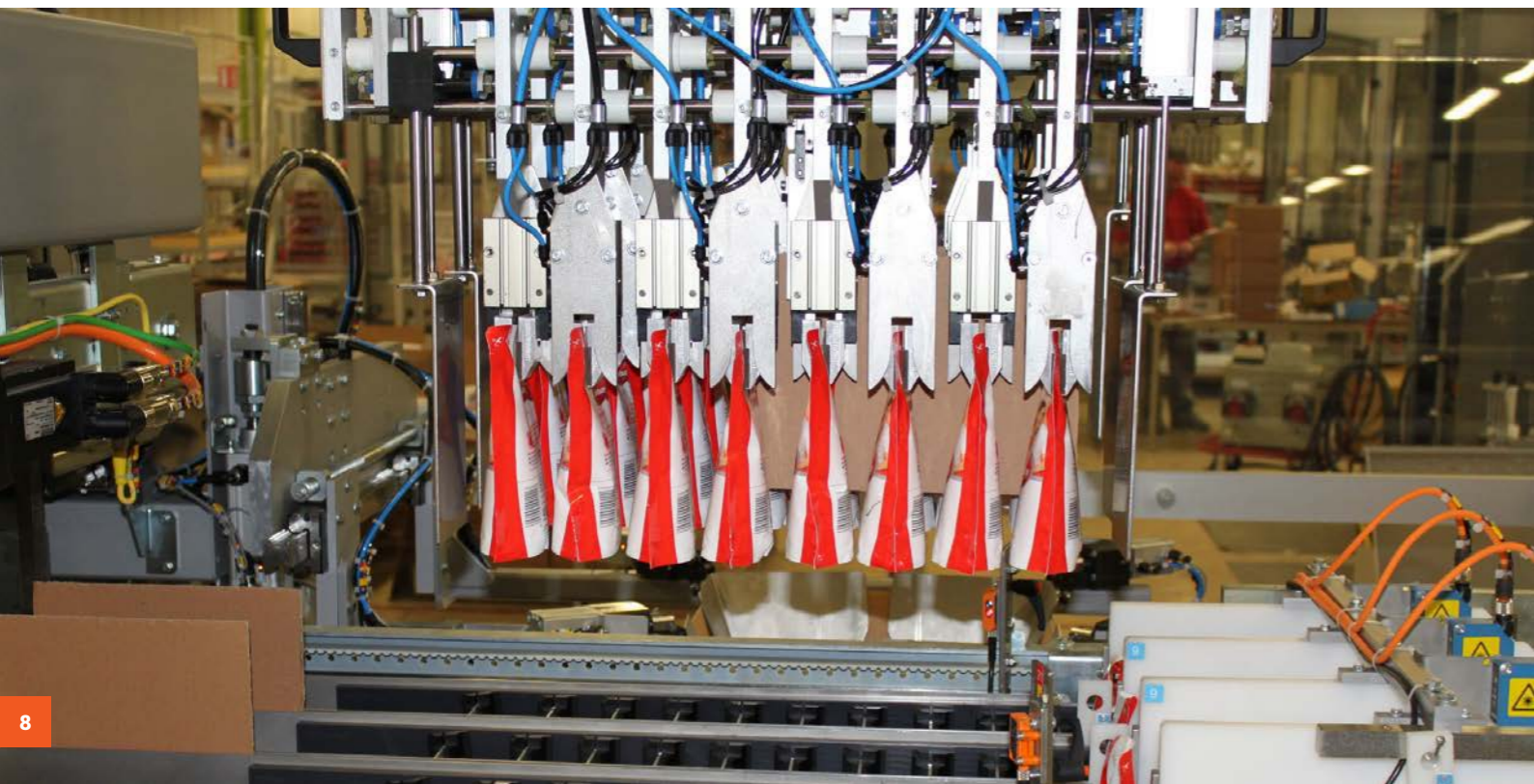
- a Form Fill Seal machine, which forms the flexible primary packaging from a printed reel, seals it,
- a transfer by step-by-step conveyor belt,
- a case erecting, packing and sealing solution for the secondary packaging,
- Some quality control and traceability systems (weighing, metal detection, labelling, etc.),
- a palletizing cell,

With a body already printed, the flexible packaging does not need a label to be glued on, nor consequently a labelling machine.

6 ENVIRONMENTAL ANGLE

By massively optimizing the quantity of materials used, this has a very positive effect on the company's carbon footprint - both in terms of the lightness of the packaging and the quantity of waste produced. Additionally, the reels of flat film from which flexible packaging is produced are themselves easy to manufacture; they are also compact when transported between the manufacturer and the production site.

And while flexible food packaging is generally made from carbon-based materials, the use of sustainable packaging made from biodegradable polymers and materials bio-derived from recycled plastics is growing, and will allow companies to reduce their carbon footprint even further.



3 GROWING TYPES OF FLEXIBLE PACKAGING

Flexible packaging is gaining ground with food companies around the world, from small businesses serving local communities to multinationals, because of its ability to create new uses and consequently boost rapidly sales of their products. In this way, three categories of flexible packaging in particular have seen particularly strong growth in the food sector:



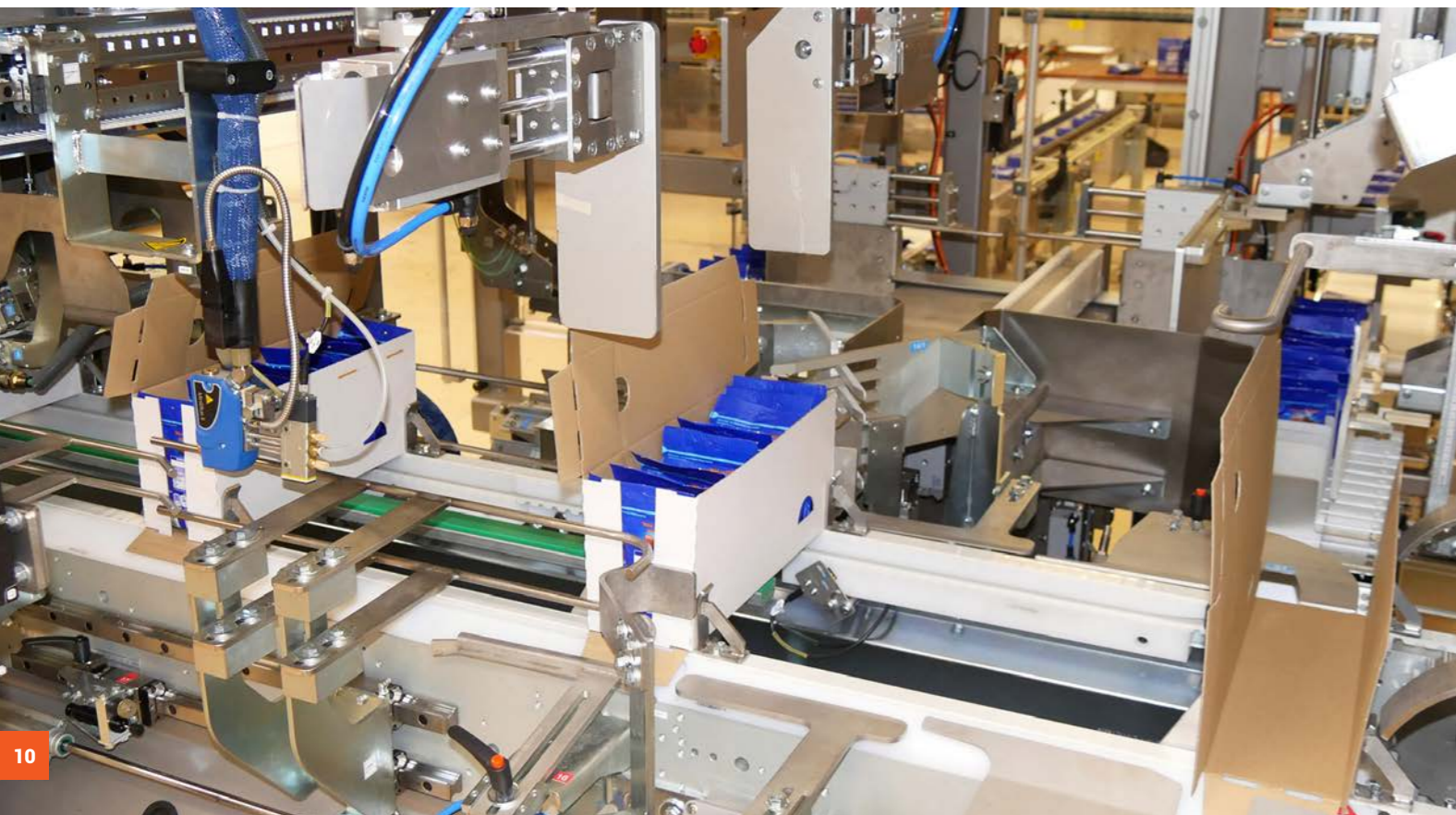
■ Stand-up pouches or Doypacks®



■ Chain bags



■ Refill bags



STAND-UP POUCHES, FOR A PREMIUM-LOOKING PRODUCT

A REAL NEED FOR INNOVATION

Food brands need to frequently renew their products in order to remain fresh and popular with their client base.

They need to provide innovative products and recipes, and enhance their associated services to create new uses such as mobile consumption. They also need to meet new needs, such as ready-to-eat or ready-to-cook products.

The flexibility of stand-up pouches is not only due to their nature, but also to the sheer variety of formats and presentations available. This explains why stand-up type bags are showing the strongest growth out of all types of flexible packaging⁽¹⁾.

These packaging innovations are coming alongside innovations from filler machine manufacturers, too. Each new generation of machines increases production speed, increases flexibility and improves sealing quality.

(1) Smithers Pira report

STAND-UP POUCHES: A SOURCE OF DISTINCTION FOR YOUR BRAND

A REAL NEED

Stand-up pouches were invented in 1962 (see text box), giving companies a flexible packaging solution which stood upright and which provided a large, printable surface.

Stand-up pouches offer a real **premium image** for the product. A transparent stand-up pouch on the table or a fruit purée pouch in a child's backpack was suddenly a very normal thing in households across Europe and America.

In addition, stand-up pouches **allowed product developers to become more creative and provide a whole host of additional services**. These included level graduation on the pouch, an easy-pouring cap or even a recipe printed directly onto its body.

THE DOYPACK® CREATION

Stand up pouches were first developed in 1962 by Louis Doyen, who at the time was the director of the Thimonnier Company (doypack = doyen packaging). The Doypack® combined the quality of rigid containers (stability, ease of use, facing) with the advantages of flexible packaging (cheaper, more compact before and after use, easy to produce). Thanks to the premium image and the diversity of use it offered manufacturers (such as their opening and closing mechanisms, or their capacity), they were an instant success.

CHAIN BAGS FOR “GOOD-VALUE” APPEAL IN EMERGING COUNTRIES

A GROWING APPETITE FOR CONSUMPTION IN EMERGING COUNTRIES

Consumer habits around the world are growing more homogeneous as cultures become increasingly globalized. However, certain populations are running into problems as their purchasing power lags behind their desire to consume. If they are to adapt, food companies must find solutions that are compatible with their consumers' capabilities, their distribution networks and the ways in which their products are consumed.

By releasing single-servings of products, which are produced and packaged based on an affordable business model approach, brands can respond to these issues.

A PORTIONED RESPONSE

By packing food products in individual bags strung into chains of 10 or 12 units, companies are in a good position to meet emerging market conditions. With a low production cost and properly adapted product logistics, chain bags give brand sufficient visibility at point-of-sales and allow retailers to sell as a chain or as individual units.

In more mature markets, chain bags are also a way to provide a variety of flavors, test innovations by providing samples and allow consumers to maintain product freshness by opening the portions as needed. Chain bags also allow producers to change the size of the sales unit, moving from 1 product to 3, allowing them to increase sales or temporarily discount a product.



REFILL BAGS: A 2-STEP APPROACH

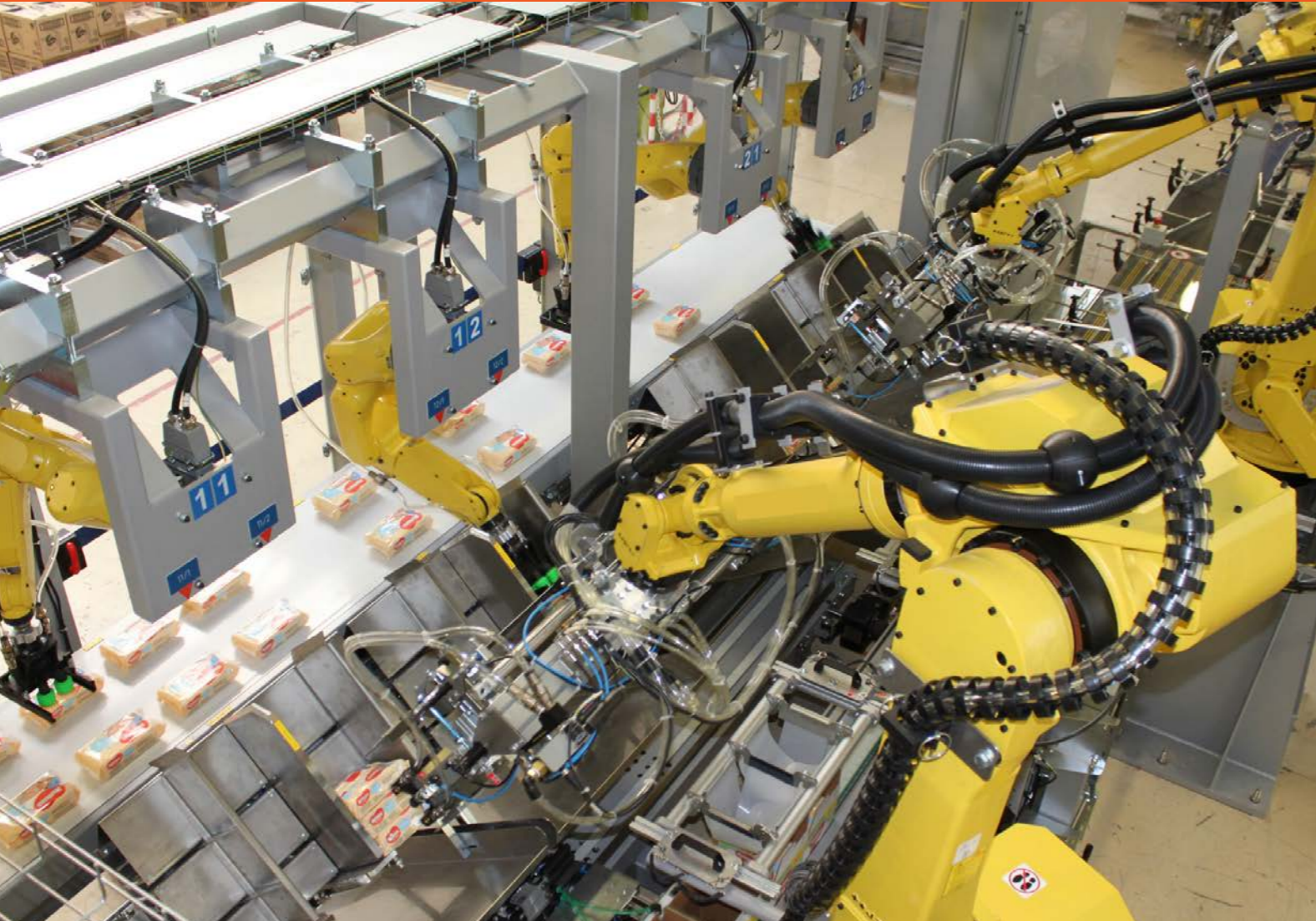
AN INITIAL PREMIUM PURCHASE FOLLOWED BY REFILL BAGS

While durable packaging requires rigidity, **flexible packaging is adapted to refills**. Refill bags are used widely in the food industry, with several brands using them to their advantage in their marketing strategies.

Refill bags can be cut or torn open at one end and then emptied into a specially adapted container. With fewer preservation issues, no pouring spout and a perfect seal for the product, refill bags are lightweight (from 50-70% less packaging^[1]). This makes them more compact and convenient for the consumer, taking up less space in the shopping bag and less space in the bin - this packaging can easily be rolled or folded to reduce space.

[1] <http://www.casuffilegachis.fr>

2 THE AUTOMATION CHALLENGE OF FLEXIBLE PACKAGING



AUTOMATIC PACKING: A DEMANDING PROCESS

Whether manual or automated, packing is a core part of the industrial process. It is designed to transfer a product, which is already packed in its primary packaging, into a secondary cardboard packaging ("Packing" notion). Secondary packaging provides essential protection while the products are stored and transported, and also makes them easier and faster to handle. This packaging can also be a marketing support, as with "Shelf-Ready Packaging. (CTA page 16).

Whatever type of primary packaging is used, **automatic packing consists of using an automated system with one or several machines (mechanical and/or robotic) which form and glue the secondary packaging. Simultaneously, the primary packaging is conveyed, oriented and collected before being picked and placed and/or transferred (side or bottom loading) into the case.**

Packing systems are flexible. An automatic packing system can be used to process several primary packaging formats and, for each format, also different grouping arrangements according to the product's final destination (transport and shelving).

AUTOMATIC PACKING CAN BE CONDUCTED:

- **On a product-by-product** basis using a variety of mechanical or robotic modules,
- **In batches:** the batches are then t using various mechanical or robotic resources, selected according to the criteria discussed in the following chapter. (CTA page 15).

The primary packaging batches **are placed in the secondary packaging according to a pre-defined plan** (upright, horizontal, staggered/nested), chosen to optimize case filling, with the mass in the case well-balanced because it maximizes product protection or it makes shelving quicker and easier.

Whichever arrangement is selected, **flexible packaging (by its very nature) could bring many challenges for manufacturers when making the packing process automatic.**

THREE CORE AREAS OF EXPERTISE

Three key areas of expertise are required to ensure effective automatic packing for food products in flexible packaging:

- An understanding of the constraints inherent to the primary packaging, in particular during conveying and handling.
- Selection and control of the secondary packaging: it must be properly adapted to the product and the distribution channels.
- Expertise in mechanization and automation.

A global approach taking into account all three fields is essential, and will lead to the best possible automatic solution and the best possible return on investment.

EACH FLEXIBLE PACKAGING TYPE COMES WITH ITS OWN MECHANIZATION CHALLENGES

FLEXIBLE PACKAGING: WHEN YOU CANNOT CONTROL THE GEOMETRY

THE CHALLENGE FOR FLEXIBLE PACKAGING

Unlike other types of primary packaging (such as cans, tins or cartons), flexible packaging does **not offer the advantage of a stable geometry**.

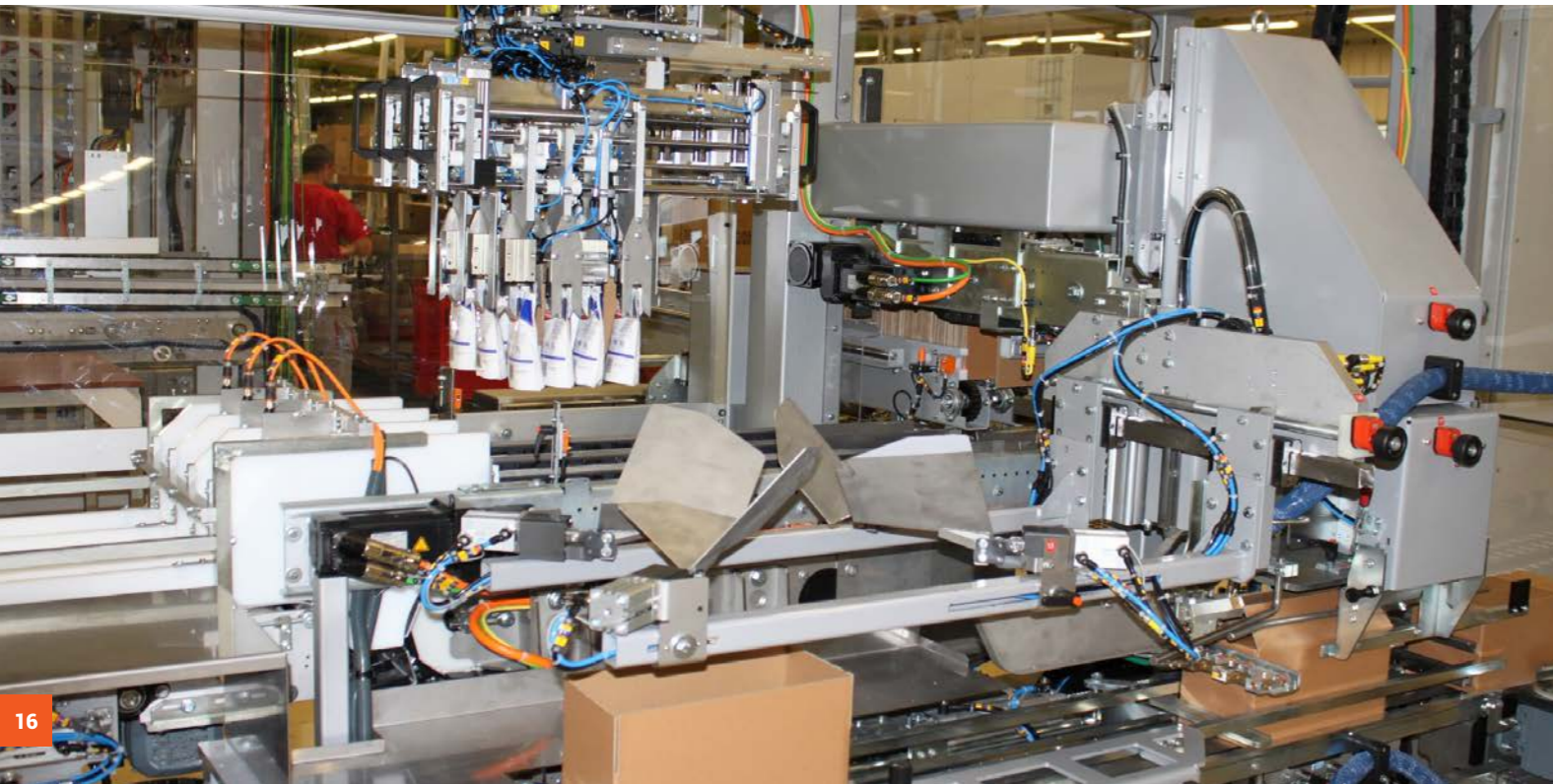
Their inability to hold their shape has five major consequences for the packing process, and requires particular care and attention during automation:

- they cannot be accumulated: in automatic packing systems, accumulation allows companies to both simplify how the batches are formed and regulate the product flow in the event of a machine stop. For flexible packaging, batch collation and flow regulation require sophisticated technical solutions, generally managing flows on a continuous basis.
- **there is no way of applying counter-pressure to seal packaging** (RSC and wrap-around cases), which must be compensated for by a technical solution. A poor seal will have repercussions on product protection and pallet stability during transport.
- **they provide little or no resistance to vertical compression strength of the secondary packaging on the pallet** (for wrap-around packaging in particular). Good resistance to vertical compression strength is crucial for well-constituted pallets which offer sufficient rigidity for storage (pallet stacking) and transport. By optimizing the solution, you can even

increase the number of layers per pallet; however, for flexible packaging, vertical compression strength is provided solely by the cardboard cases themselves. Increasing the thickness of the cardboard is one solution (but this would incur additional packaging costs). Another is choosing a different pallet pattern (columnar or cross-layers, with or without interlayers).

- flexible packaging is thin and lightweight, providing limited protection to its contents and making them vulnerable to impact damage. In order to keep them intact during conveying, handling, transfer and packing, **specific precautions are required to prevent any tearing, piercing or other damage** by an automated process.
- **there is a risk that the contents may not be distributed equally in the sachet:** filling technology (either vertical or horizontal) **cannot systematically ensure that the product is evenly distributed within the packaging** (due to variations in form and size). For powders or grains in particular, product distribution is more difficult and may even cause problems during picking and packing, and issues when you have optimized the size of your secondary packaging to the bare minimum.

There are, however, pre-packing and/or product nesting (head to toe) techniques which can offer a solution to these issues.



CHALLENGES FOR STAND-UP POUCHES

Doypack® pouches are attractive for product display, standing-up right on the shelf or counter. There are however three key issues to take into consideration when mass-producing and packing them.

1. **You need good weight and product distribution.** Filled upright, Doypack® packaging is conveyed either flat (base first) or upright on their base. In either case, the product generally ends up compacted down into the base of the pouch. Before it can be packed, you may need to uniformly (re)distribute the contents or adapt the handling system to make product transfer easier, optimize the case filling as well as ensuring its future stability in the supply chain.
2. **Their relative fragility.** Fitted with pouring systems at the top or on the side, printed extremely precisely (especially when used as measuring device), stand-up pouches require unusually precise, flexible and fluid handling solutions to provide sufficient protection.
3. **Their position in the case.** Doypack® packaging is packed vertically in Shelf-Ready Packaging, or laid down flat in staggered (head to toe) rows when packed in RSC cases or Wrap-Around blanks. Their position and orientation must be fully identified and controlled for the batch to be properly constituted and/or ensure complete safety and security during the packing operation. This information can be obtained via identification solutions, using in particular vision technology. The solution used must be particularly precise, due to the films used for stand-up pouches, which are often reflective or transparent.

To overcome these constraints, the quality and performance of the gripping tools and the precision and flexibility of the product manipulator itself are crucial.

CHALLENGES FOR CHAIN BAGS PACKAGING

Packing solution for chain bags frequently **means folding them before the packing process**. The diversity of chain shapes and bag numbers per chain only serves to increase the difficulty.

The second major difficulty is stacking the chains to create a homogeneous batch before transferring it in the case. This is required in order to optimize the case filling and to stabilise the loaded case during storage and transport.

There are three steps involved when mechanizing the chain bags packing process:

1. Folding and keeping the chain bags folded
2. Grouping the folded chain bags and stacking them to get the desired batch
3. Transferring and packing the batch while maintaining its integrity and structure

CHALLENGES FOR REFILL BAGS

The reduced film thickness of refill bags are making them attractive from an economical and environmental point of view. Consequently, this also causes them to **deform more easily and makes them even less robust and more flexible** from a packing stand point of view. When mechanizing the packing process, there must be a compromise between providing enough protection from tearing and keeping costs down, thereby **retaining the economic benefits of using these refill bags in the first place**.

Automatic packing lines of refill bags often need to be able to handle both **the flexible refill format and the premium format, which are often rigid boxes or cartons**. And with the need to handle both, there are of course technical and economical hurdles to overcome. The right answer to this challenge is key to respect the refill bag business model.

CHOOSING THE RIGHT SECONDARY PACKAGING



Choosing the right secondary packaging solution is essential for any flexible packaging mechanization project.

- Firstly, because flexible packaging has a unique geometry, you must choose secondary packaging that can compensate for its fragility and its lack of resistance and rigidity.
- Next, your marketing or logistics imperatives will dictate the type of secondary packaging you need. There are three families of cases to choose from: RSC cases, wrap-around blanks (including trays) or shelf-ready packaging.
- And lastly, you want an optimized secondary packaging solution, in terms of both surface area and cost, but which can be mechanized on a secured automatic packing system to deliver the expected efficiency.

As such, **there is no “one fits all” solution to meet every possible need.**

Each project must be studied individually and in detail, in order to identify the best possible solution or compromise in line with your own marketing, technical and logistic specifications.

During the selection process, you must not overlook the fact that this choice will have ramifications on the type of mechanization solution you need. In general, the same configuration cannot be used for 2 different families like RSC cases and Wrap-Around blanks.



RSC CASES

DEFINITION

A RSC case is a folded and pre-configured corrugated cardboard box. It can have **micro/single/double flutes, providing excellent content protection on all sides. RSC cases has a good vertical compression strength, regardless of the type of contents.** This is due to the vertical flutes, which act as a series of pillars over all of the vertical sides of the case, and because the internal and external flaps effectively double up the thickness of the two horizontal sides.

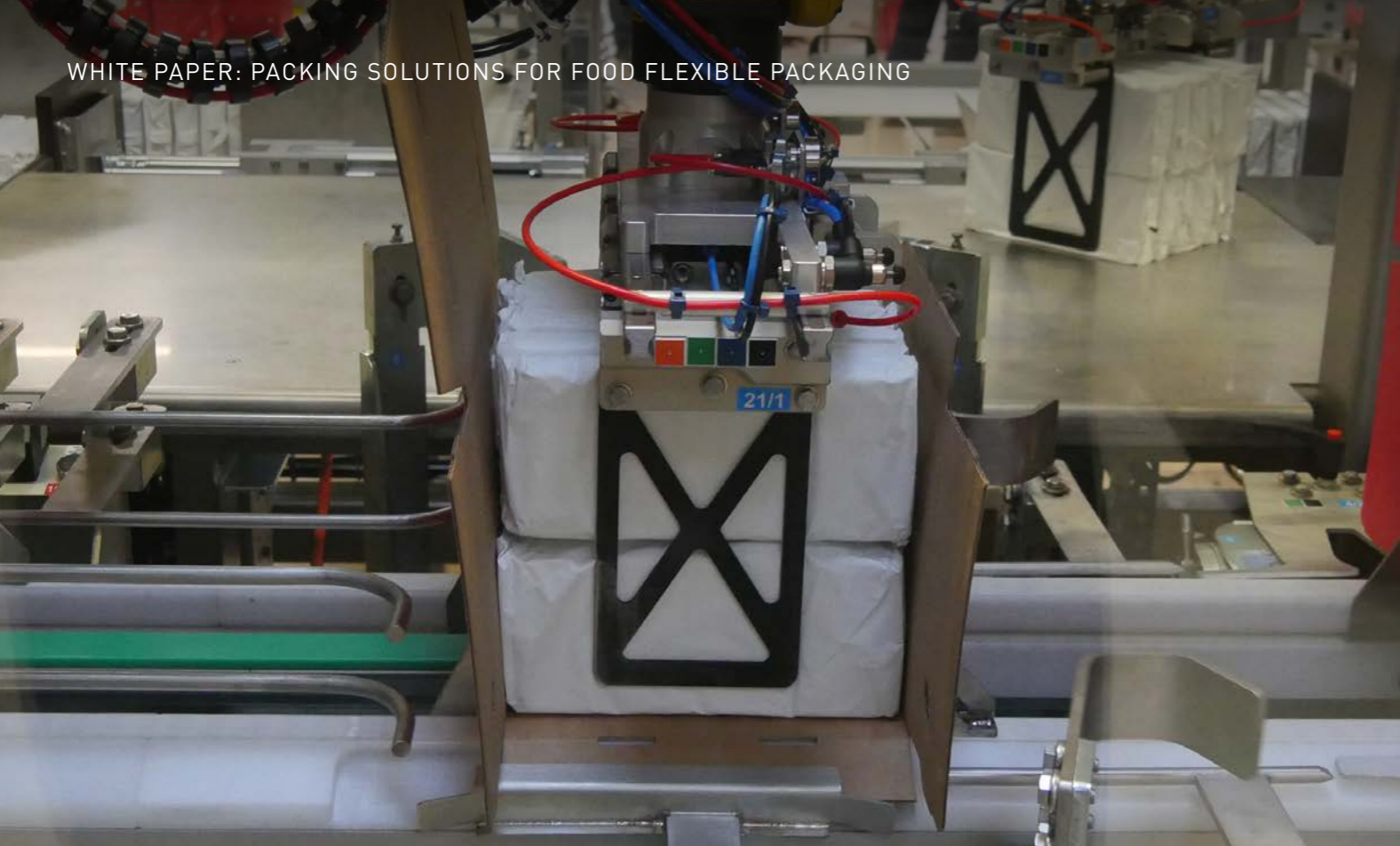
BENEFITS

RSC cases are generally the best solution when you need to focus more on the logistics side, with high-strength cases that will provide good protection for its contents. This secondary packaging is generally used with heavy products or when transport and storage are the priorities. In stores, RSC cases are generally opened and the products are unpacked and placed on the shelf. **The core concern is cost control** (packaging and transport), usually delivered by organizing the products in the best way within the case and optimizing the number of boxes on the pallet as well as the pallets in the truck. And, despite the quantity of cardboard needed to make these boxes, they are often the most economical solution due to their simplicity and the massive production capacities of cardboard manufacturers in almost every region.

You can also transform an RSC case into a shelf-ready packaging by using die-cuts into the cardboard. This could however considerably increase the production costs. However (and except for certain specific cases), the thickness of the RSC case makes it unwieldy for use as a shelf-ready platform: it's most-likely difficult to pull out the cut-away part, and it uses too much material for potentially a relatively small packaging item.

WATCH OUT

- You can optimise the case loading according to the type of flexible packaging used. Reduce the empty space by intelligently distributing the bags and stacking them efficiently (head-to-toe, horizontal or staggered), thereby saving space and preventing them from moving inside the case.
- Pallet loading can be optimised too, thanks to the good ratio between the size of the case and the size of the pallet (in general, RSC cases are 400 x 300mm, and are stacked on 1200 x 800mm pallets). This helps maximise the pallet filling ratio and prevent the products moving during transport.
- You can also optimise the pallet pattern to ensure that the whole stack is as stable as possible: cases can be stacked in cross layers, or in columns with dividers.



WRAP-AROUND BLANKS

DEFINITION

Wrap-Around blanks are produced using a die system to obtain a flat cardboard panel (no folding or pre-assembly). As a result, it gives companies freedom to create different shapes and perforated die-cuts. Wrap-Around blanks can have short or long flaps which can either conceal or reveal the batch of products within; these are on the sides of the finished case, and not at the top and bottom as with RSC cases. As a result, product protection can be adapted according to the product, but vertical compression strength can be compromised: as the flutes are not all pointing in different directions, they only play a structural support role on half the sides. This means that the vertical compression strength of Wrap-Around blank is frequently less than a RSC cases. Wrap-Around blanks are usually formed by **folding them around the batch of primary packaging during the packing phase.**

BENEFITS

Compared with RSC cases, Wrap-Around blanks can save in **two ways**:

- In terms of **material**: Much less material is needed to produce a wrap-around blank than for an equivalent RSC case. Environmental savings and good for carbon footprint.
- In terms of **space**: For an identical speed, Wrap-Around blank packers can be much more compact.

The cutting process when manufacturing the blanks is more precise. It will then allow the accurate insertion of pre die-cuts that will make the case opening easier, or turn the blank into a shelf-ready packaging.

WATCH OUT

- Depending on the production resources of the cardboard manufacturers in a given geographic area, RSC cases may or may not be slightly more advantageous than Wrap Around solutions. And although **RSC cases are often less expensive due to the volumes produced and their popularity**, there are many examples in which the material saved by a Wrap-Around blank makes it both economically and environmentally interesting.
- As there is no counter-pressure provided by flexible packaging, automatic Wrap-Around packing raises particular **issues in terms of case closing and gluing** - these can, for example, be resolved by arms equipped with suction cups at the gluing station.

SHELF-READY PACKAGING (SRP)

DEFINITION

A great multi-function solution, **Shelf-Ready Packaging (SRP) or Retail Ready Packaging (RRP) provide an all-in-one transport, storage and shelving solution for your products.** The shelving side is of course where it brings its best value. By eliminating the upper part of the case, the products can immediately be placed on the shelves without having to handle the products individually. Pre-cuts help to crack open the case when the secondary packaging is a RSC case or a Wrap-Around blank. Removing the lid, when the secondary packaging is made of 2 elements "tray + hood" joined for transport elements is a second option.

SRP are particularly useful for high-rotation products and offer good visibility on the shelf with a large printed surface (on both the products and the remaining bottom of the packaging). And, once the products are sold, they can just be discarded as usual.

As such, the core issue with Shelf-Ready Packaging is providing total product protection during transport and handling, while making it easy to open and place on the shelf and promoting your brand.

This is not all: companies are looking to **make the most of the cardboard surface they use**, in order to lower costs and stay in line with their sustainable development strategies. Packaging costs can also be optimized with shelf-ready solutions, as **only the part of the packaging remaining on the shelf needs to be printed for marketing purposes.**

As such, the top part (only used for protection during transport) does not need to be printed. This can lead to significant savings on the production costs for this secondary packaging.

BENEFITS

Shelf Ready Packaging offers 5 key advantages:

- They are easy to identify, both on the shelf and in the stock room,
- They are easy to open,
- They are easy to handle, place on the shelf and fold up when empty,
- They are easy to dispose of, recycle, reprocess or even reuse,
- They are easy for the consumer to identify and purchase from. (only used for protection during transport) does not need to be printed. This can lead to significant savings on the production costs for this secondary packaging.

A DIVERSE FAMILY OF PRODUCTS

- RSC cases with pre-cut-perforations
- ½ RSC case + hood
- Patricia case : 2 half-RSC cases glued together
- Wrap-around with short flaps and/or pre-cut perforations
- Tray with upper ledges
- Tray (high, low, with asymmetrical sides) + hood (U-shaped, cross-shaped, internal or external, glued or inserted)



CHOOSING THE RIGHT POSITION AND ORIENTATION IN THE CASE.



WHICH FILLING TECHNOLOGY SHOULD YOU CHOOSE?

When mechanizing the packing process, the way in which the flexible packaging exits the filling stage must be taken into account when designing the secondary packing line.

There are three key aspects to take into consideration:

- **Presentation when it comes out:**
 - Stand-up pouches will either come out horizontal (flat) or vertical (standing-up). If horizontal, they will generally come out bottom first.
 - Chain bags come out flat, inline.
 - Refill bags generally come out laying down. If they are stand-up pouches, however, they may come out upright.
- **The temperature of products at the outfeed** (which may be hot), may affect conveying, handling and positioning.
- **The number of outfeed.** A packing machine can, potentially, handle products arriving in one or two lanes. This means that they can either handle flows from two filling machines or receive the flow from a single filling machine with the flow broken into two lanes at the filler outfeed.

STAND-UP POUCH POSITIONING VERTICAL OR LAYING DOWN?

How the doypacks® are positioned in the secondary packaging (flat or standing-up) will depend on three factors:

- **Space optimization:** stand-up pouches are packed horizontally, flat or on their edge, and overlapping (meaning that the base of a doypack® will cover the top of another doypack® next to it, in a series of staggered layers).
- **Protection** (preventing perforation and friction between the pouches, which can damage their facing): depending on the materials, the pouch shape, the transport and storage conditions, it may be better to pack the doypacks® upright, whether in RSC cases or in Wrap-Around blanks. This must be decided on a case-by-case basis.
- **Final presentation:** Shelf-Ready Packaging requires upright presentation on the shelf, with each stand-up pouch facing forward. This can either be in 1 row (mono-facing), or in 2 rows (double facing) for better exposure on the shelf. For larger capacities, the case is generally filled on a product by product basis, by placing the stand-up pouches upright and properly oriented in the case.

Certain technical configurations allow you to pack stand-up pouches laterally in a case. They are placed on their edges, but will be upright once the case is put the right way up and presented on the shelf (pouch in Wrap Around turned to trays thanks to pre-cuts, for example).



CHAIN BAG POSITIONING

Chain bags are first folded, then **stacked and packed in flat piles or placed on their edges** to optimize the space and prevent the products from being crushed.



REFILL POUCH POSITIONING

Refill pouches are packed either **on their edge, flat or staggered**, in order to optimize the number of products per case.

CHOOSING THE RIGHT MECHANIZATION SOLUTION

APPROACHING THE ISSUE IN PROJECT MODE

The type of secondary packaging, the type of flexible packaging and their position in the cases can all vary as well as other elements coming from the production site itself. The right approach is to conduct a **proper study on the packaging context and investigate on the best packing solution.**

YOU NEED TO CONSIDER 12 FACTORS WHEN DESIGNING AN AUTOMATIC PACKING LINE

HOW THE LOGISTICS CHAIN IS CONFIGURED?

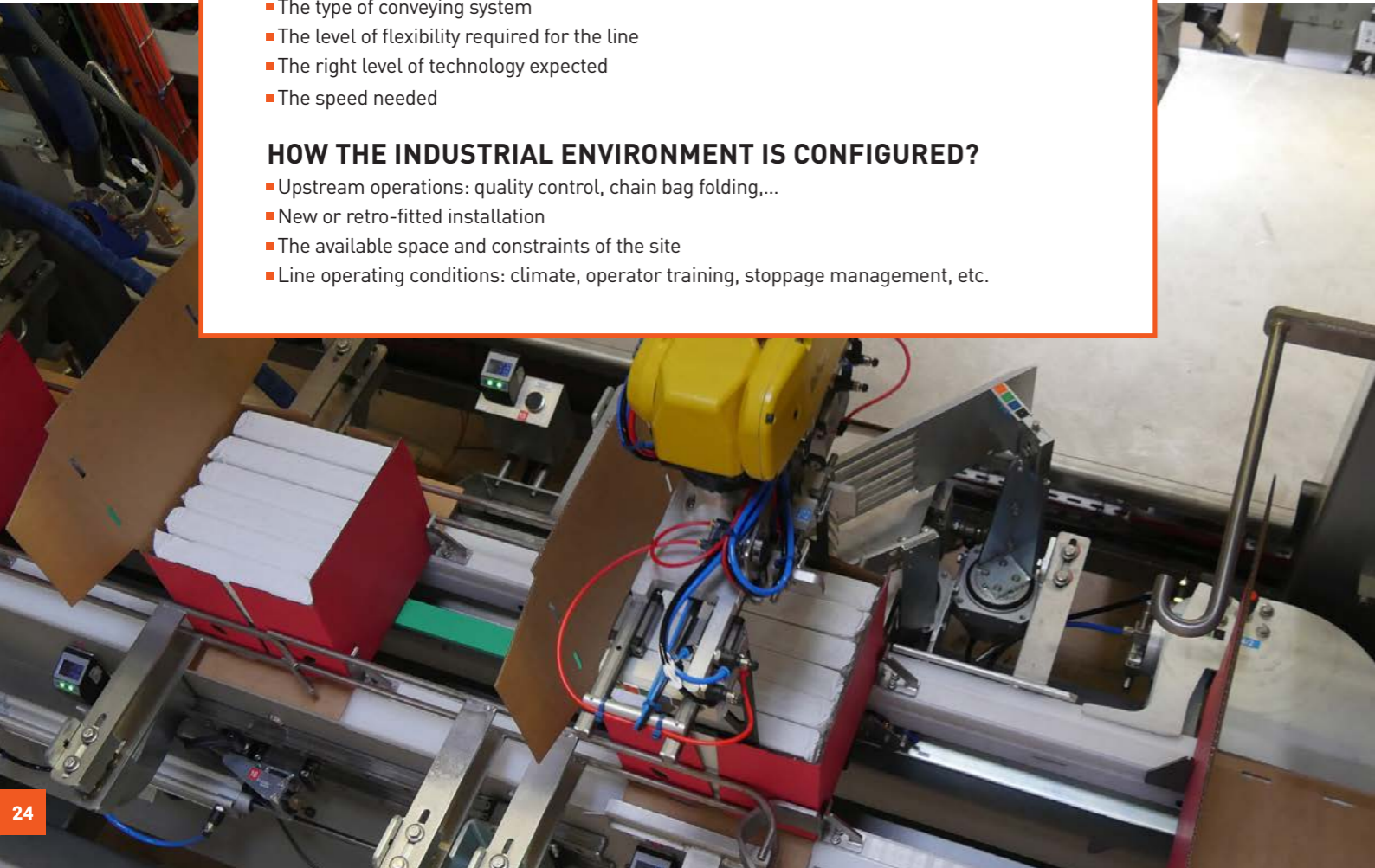
- The type of flexible packaging
- The type of secondary packaging
- The presentation and orientation of the products in the cases
- The logistics process: storage, transport and shelving

HOW THE MECHANIZATION PROCESS IS CONFIGURED?

- The type of conveying system
- The level of flexibility required for the line
- The right level of technology expected
- The speed needed

HOW THE INDUSTRIAL ENVIRONMENT IS CONFIGURED?

- Upstream operations: quality control, chain bag folding,...
- New or retro-fitted installation
- The available space and constraints of the site
- Line operating conditions: climate, operator training, stoppage management, etc.



CONCERNS TO RESOLVE UPSTREAM PACKING OPERATION

COMPLIANCE MANAGEMENT



ISSUES

Traceability and quality control are crucial operations on a food production line. Automation at the end of the line may or may not include control and inspection operations:

- checking the integrity and compliance of the primary packaging,
- detecting any metal intrusion,
- seal and/or facing checks,
- expiration date checks,
- weight checks

SOLUTIONS

Automatic inspection systems use a **series of sensors**, adapted to the types of anomalies being searched: optical barcode scans, metal detection, camera recognition (2D or 3D vision), check weighing, etc.

In any case, a **rejection circuit for non-compliant products** must be included in the installation.

FOLDING CHAIN BAGS



PRODUCT REPARTITION WITHIN THE PRIMARY PACKAGING



ISSUES

When flexible packaging are filled, it can lead to the **products being compacted in certain areas.** In order to optimize gripping, packing and/or guarantee optimal product presentation, it may be useful to include (especially for powder products) a density harmonization solution.

SOLUTIONS

There are various processes available:

- **Gravity-powered distribution:** the entrance into the packing machine is often lower than the exit of the filler. Simply putting an inclined conveyor belt may be enough to properly (re)distribute the contents inside the primary packaging.
- For issues that are more complex, a **vibrating belt** or a **distribution system** (using vibrating strips or rollers) are effective solutions.

A specific module is installed before the packing machine on the chain bag line and is used to fold the chain bags via an automated process. **The chain bag folding can be done in two ways:** either an accordion folding for big bags or a wallet-fold for smaller bags.

Folded bags can then be placed in sleeves or flowpacks, or just packed directly into the case.

Courtesy of Apollo Engineering.

A WIDE VARIETY OF AUTOMATIC PACKING SOLUTIONS

The sheer diversity of industrial configurations and the need for line flexibility means that there can be no universal packing solution. There is a wide range of solutions on offer to food manufacturers, allowing them to automate their packing lines.

1. WHICH TYPE OF PACKING EQUIPMENT?

Your equipment choice will of course depend on the **type of secondary packaging** you are working with. There are two main categories:

- Packing in RSC case,
- Packing in blanks, Wrap-Around or trays.

For Shelf-Ready Packaging, depending on whether it is based from a RSC case or a blank, the mechanization process will be the same as for one of the two examples above.

However, there are certain machines (rarely used for flexible-packed food items) that can be used to process both:

- Trays and wrap-around blanks,
- Trays and trays + hoods,
- RSC cases and wrap-around blanks (rarely used and available).

2. WHICH MECHANISATION TECHNOLOGY DO YOU NEED?

MULTI- OR MONO-FUNCTION TECHNOLOGY

Automatic packing systems may involve a **single, multi-function machine**, such as a tray-packing/lid fitting machine for Shelf-Ready Packaging, **or several mono-function machines** in a line, for example a tray erector, a vertical packer and a lid fitter. The choice will largely depend on the available space on the site, the packing speed required and/or the position of the pouches in the secondary packing.

ALTERNATIVE OR CONTINUOUS PACKING

Whether you choose alternative packing (stop & go) or a continuous solution is generally determined by the packing rate you need. However, continuous packing solutions are still uncommon for flexible-packed items.



3. WHICH TECHNOLOGY DO YOU NEED FOR PRODUCT COLLATION?

There is no single right answer. Your choice of product collation system will depend on how the bags are fed and conveyed (including line stoppage management), how many formats must be handled, how often you change formats, how much space you have available on the site and/or what are your budget constraints.

Here are a few examples of some of the most commonly used modules:

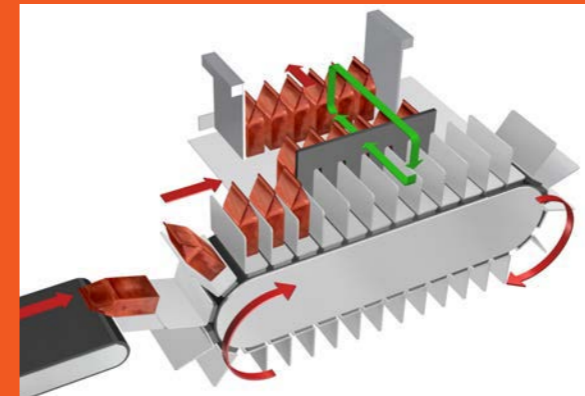
A LOWERING STACKER:



A simple and economic solution

- Products are fed using a motorised conveyor belt;
- Successive rows of products are transferred onto a supporting plate which retracts to position the products on the previous layer;
- Full batch is completed layer by layer via a step by step servo-driven descent
- Elevation of the support plate with complete batch and transfer into the case.

RACETRACK COLLATOR:



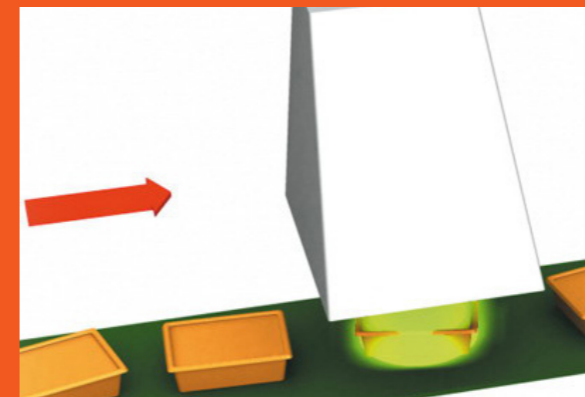
Ideal solution for products that cannot be accumulated. Great product protection as well.

- Products are fed using a motorised conveyor belt;
- Selection and spacing of products obtained by a second motorized conveyor;
- The products are continually inserted into the buckets of the mono-axial collator, which works on a step-by-step basis.

There are 2 options for product removal:

- Vertically using a pick & place manipulator
- Laterally to collect a batch/layer, or a direct transfer into the secondary packaging using a lateral pusher

CONVEYOR BELT WITH ASSOCIATED VISION SYSTEM:



Recommended for specific speed requirements or for circumstances in which the position/direction of the bag cannot be guaranteed.

- Detection real-time "on-the-fly" of the position and orientation of the product on the conveyor by 2D or 3D camera, according to requirements;
- The coordinates [x, y and rotation] are transferred to the packing robot;
- Rate: 120 products per minute.

4. WHICH PACKING TECHNOLOGY SHOULD YOU CHOOSE?

There is a very wide range of packing technology available on the market. Your choice of equipment will depend on the technical and/or economic constraints listed in the technical specifications.



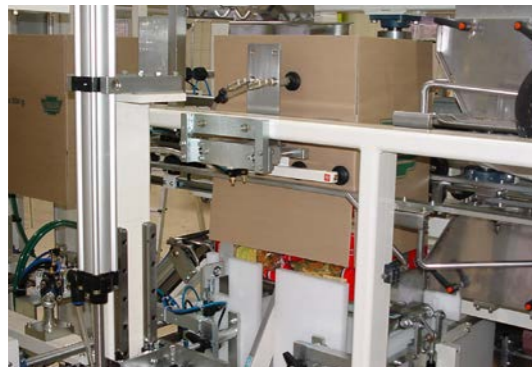
DROP PACKING:

This is a simple, robust and economical solution. The products are spaced, and then brought in on a conveyor belt. The end of the belt gradually retracts above the loading flaps, in order to position the products with or without overlaps. Products are then dropped in the case located underneath the rotating flaps. With this solution, products can only be laid flat.



SIDE LOADING PACKING:

An intermediary solution (from a technical and economical point of view). Products are grouped beforehand, then transferred laterally by a mechanical or servo-motorised pusher into a case laid on its side. The filled case is then glued or taped before being tipped vertical.



BOTTOM LOADING PACKING:

Ideal for products which cannot be tipped or picked up vertically, this solution is however used only for large stand-up pouches or bags (the product must be freestanding in its base to allow greater efficiency).



VERTICAL OR PICK & PLACE PACKING:

These Pick & Place manipulators are a great solution for higher product flexibility and integrity. They can be integrated into either a mono- or a multi-function system, and there are several types of pickers to pack the products vertically. They pick up and place the products using:

- a gantry with numerical axes;
- a poly-articulated 4 or 6 axis packing robot;
- a delta robot.

ROBOTIC PACKING

Robotic packing is the perfect solution for **premium products**, when the process requires a significant level of **precision** (in particular concerning how the products are packed into the case), and if the equipment must be flexible and able to handle high packing speeds.

In general, robotic packing is most useful for resolving **complex issues**:

- Orienting the products,
- Determine product thickness and its infeed angle when coupled with a vision system to adapt the picking accordingly),
- Laying down or putting upright the stand-up depending on configuration requested
- Simplifying a complex mechanical collation using a system which will pick up the products on-the-fly,
- Handling several infeed lanes from an unbalanced and unsynchronized filling machine.

For factories with lower packing speeds and cost-driven, where robotic packing may not make economic sense, it may be better to choose a simpler **cobot** type of manipulator.

For a multi-robot installation, a **real-time flow management solution** is required to optimize robot picking distribution, and to resolve quickly and efficiently any problem coming from the production flow.

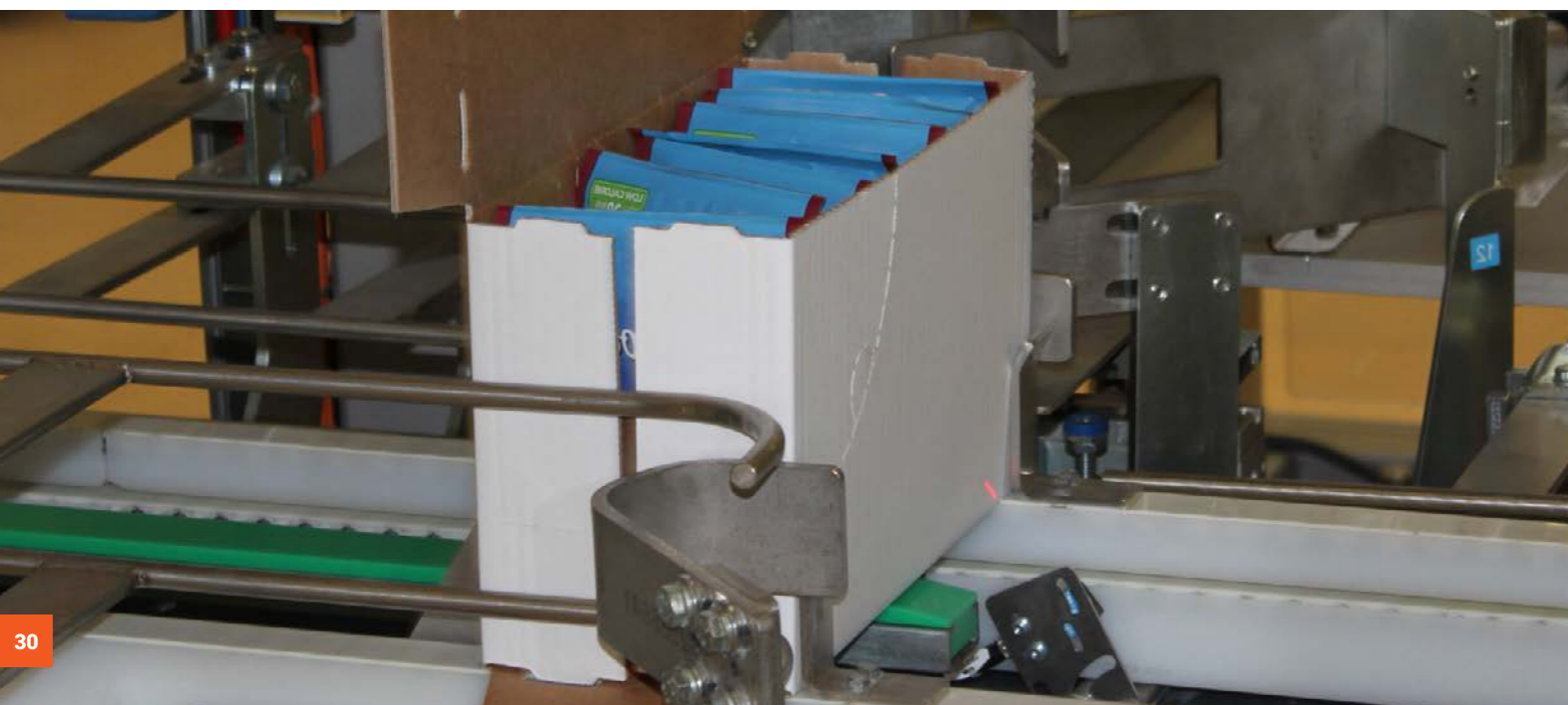


3 CASE STUDIES

CASE STUDY N°1

UPRIGHT PACKING FOR STAND-UP POUCHES OF COFFEE

- ? THE REQUIREMENT**
Packing doypacks® vertically and front-facing into RSC cases with pre-cut-perforations, designed to become a “shelf-ready - easy-shelving” packaging
- + THE ISSUES**
Continuous packing, managing flow of upright doypacks®, “on-the-fly” packing and handling several different formats.
- 💡 THE SOLUTION**
A series of 3 independent machines to pack the upright stand-up pouches of coffee, but which could potentially be packed. Flat in the case in the future.
- ⚙️ THE STEPS OF THE PROCESS**
 - Erecting the cases using a Cermex F3 case erector,
 - The products arrive upright,
 - They are packed using a Cermex ER50 packing unit, with 2 robots associated with Cermex FlowDesigner® flow managing software, to continuously manage the flow of products.
 - The upper flaps are glued using a Cermex C6 case gluer, Rate: 110 products/minute

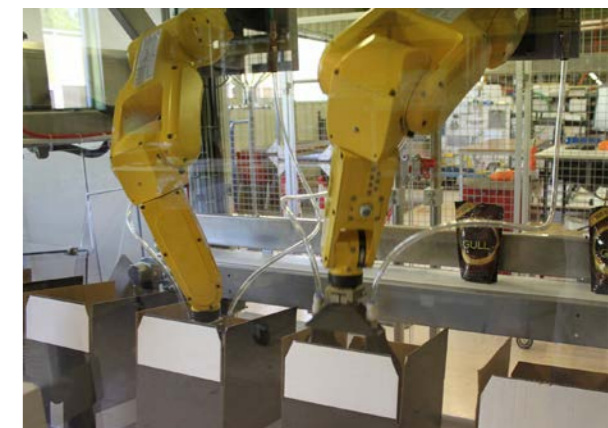


- ❄️ WHY THIS SOLUTION?**
 - The choice of secondary packaging: RSC cases for effective vertical compression strength on the pallet, and with pre-cut-perforations so they become a shelf-ready solutions.
 - The choice of the batch position within the case: product upright, for perfect shelf displaying
 - The choice of the mechanization process:
 - No possible accumulation, hence the continuous flow management;
 - Simplified product infeed composed of a single conveyor belt (versus a racetrack collator), combined with a product detection cell;
 - Easy to change formats (less mechanics and mainly the gripping head of the robot to potentially change);
 - The option to switch easily between horizontal and vertical Doypack® positioning in the case thanks to robotic arm flexibility.

- 👍 THE ADVANTAGES OF THIS EQUIPMENT**
 - A streamlined solution (collation and packing):
 - Very few mechanical elements;
 - Quicker and simpler format changes;
 - Increased accessibility;
 - Reduced maintenance requirements.
 - The robot sizes are optimized:
 - Reduced tool weight with a 3D-printed light weighted gripping head, allowing to integrate a smaller robot;
 - Reduced energy consumption (compared to traditional steel tooling);
 - Continuous picking, while offering maximum protection to the Doypacks®.

BONUS FROM THE EXPERT

- The internal flap scoring (creasing line) has been done offset compared to the external ones, to create (while folding and pressing the flaps) a natural counter-pressure to ensure that the hot-melt gluing works effectively.
 - The case is slightly tilted during packing to manage the inherent instability of the pouches by keeping the 1st row of products leaned against the internal folded flaps.
 - Additional vision checks: correct sealing of the stand up pouches and expiration dates.



CASE STUDY N°2

PACKING OF STAND-UP POUCHES WITH A CAP, FLAT IN THE CASE



THE REQUIREMENT

Packing of Doypacks® laid down flat in wrap-around blanks.



THE ISSUE

Optimizing case filling and/or reducing its size.



THE SOLUTION

A multi-function Wrap Around packer is packing rows of stand-up pouches, slightly nested. Each row of product is alternatively placed head to toe in the Wrap Around blank using a 180° rotating mechanism



THE STEPS OF THE PROCESS

- The products arrive in one lane, flat, base leading.
- They are turned 90° by a conveyor belt to position the Doypacks® crosswise as they enter the collating system.
- A racetrack collator spaces and groups the products.
- A Cermex WB46 Wrap Around packer integrating a Pick & Place robot is then packing the products 4 by 4.
- A wrap-around case with 6 nested layers of products.
- Speed: 90 products per minute; 22.5 cycles per minute



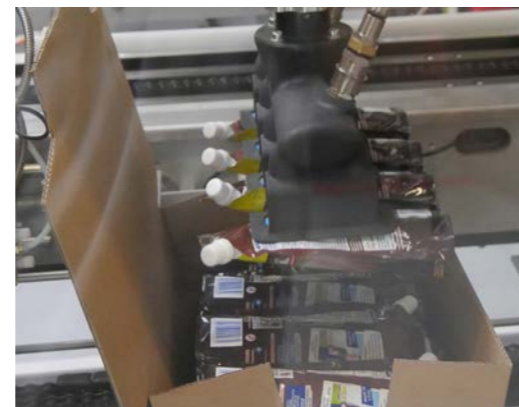
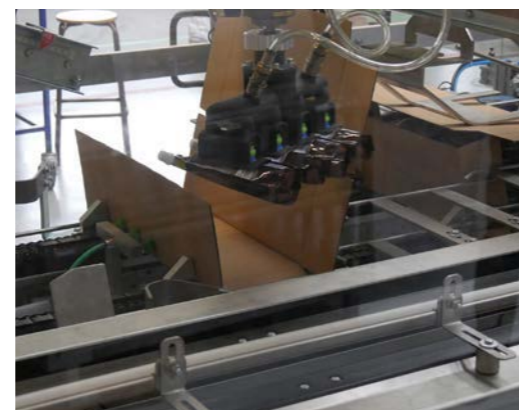
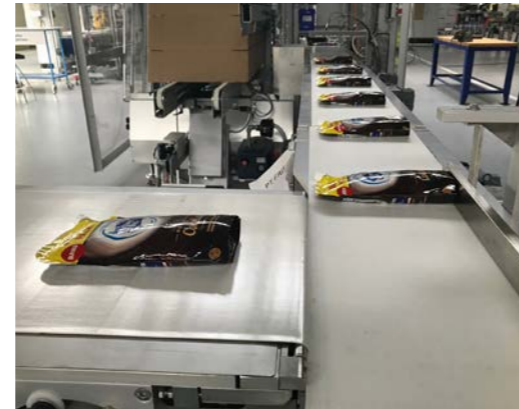
WHY THIS SOLUTION?

- Choice of secondary packaging: Wrap Around blank in order to optimize the packing speed.
- Choice of batch position inside the case: nested horizontal "head to toe" layers in order to optimize filling and mass distribution within the secondary packaging.
- Choice of mechanization solution: a compact multi-function machine



THE ADVANTAGES OF THIS EQUIPMENT

Compact footprint: a single, multi-function machine handles all of the operations (collation, erecting, packing and gluing) in a very small space.



BONUS FROM THE EXPERT

- An additional suction system at the pressing station (attached to pressing plates) to compensate for the lack of counter-pressure when the case is being squared off and glued.
- It is possible to reconfigure the lateral flaps adding a system based on tenon/mortise principle to ensure effective hot-melt gluing without counter-pressure.

CASE STUDY N°3

PACKING OF CHAIN BAGS



THE REQUIREMENT

Packing of chain bags in Wrap Around blanks.



THE ISSUES

Finding the right chain bag folding solution so they can be placed into flowpacks. Then orienting the flowpacks and keeping the batches firmly grouped at each step of the process.



THE SOLUTION

The equipment combines a chain bag folding system with a packer that collect the products in 2 layers into a Wrap Around blank, transferred done by a gantry packing arm with numerical axis or a poly-articulated robot.



THE STEPS OF THE PROCESS

- Chain bag folding solution: wallet or accordion folding.
 - Flowpacker
 - Picking flowpacks of 10- or 12-pouch chain bags.
 - The chain bags arrive lengthwise, laid flat.
 - Placed on their edge by the racetrack collator for optimized case filling.
 - A lowering stacking solution, grouping the products into 2 layers.
- All of this is done on a Cermex WB46 double infeed Wrap Around packer with a robotic arm pushing laterally the batch inside the blank.
- Speed: from 300 to 400 bags per minute; 30 or 40 chain bags per minute and per lane



WHY THIS SOLUTION?

- Choice of secondary packaging: Wrap Around blank
- For RSC cases, if you want the product to remain flat during transportation, it is avoiding the use of a Pick & Place solution (more difficult and risky during transfer into the case when)
- Could lead to savings in terms of the cardboard used (thickness and consequently weight).
- Possible choice of product position in the batch (flat or on the edge), according to the pouch and case dimensions, to secure the case filling. Optimization (more product per case, more counter-pressure when closing the case and more stability during transportation)
- Choice of mechanization process: a complete, fully automatic solution which replaces all previous manual operations.



THE ADVANTAGES OF THIS EQUIPMENT

The packer handles the arrival of the products on 2 lanes coming from 2 independent and unbalanced flowpacking machines.

BONUS FROM THE EXPERT

- The same packer can handle single bags and chain bags, depending on the distribution channel requirements.
- The pressing system also compensates for the lack of counter-pressure to form the wrap-around cases.
- The robotics system handles the different positions and orientations of the products in the case.



CASE STUDY N°4

PACKING OF REFILLS

THE REQUIREMENT

Packing of refill pouches into RSC cases.

THE ISSUES

Optimizing costs by guaranteeing the reliability and security of the process.

THE SOLUTION

A side loading case packer with a racetrack collator and lowering stacker handles the triple-sealed refill bags into RSC cases.

THE STEPS OF THE PROCESS

- The products arrive lengthwise, laid flat.
- The bags for the premium format are firstly put in carton via a cartoning machine while the refill bags are sent directly to the packer via a by-pass circuit.
- At packer infeed, the racetrack collator spaces them and collects them, placing them on their edges.
- The layers are transferred, then grouped by a lowering stacker.
- They are then packed laterally by a compact and affordable Cermex SB27.

Speed: around 120 products/minute

WHY THIS SOLUTION?

- Choice of secondary packaging: RSC cases mainly for protection and transport.
- Choice of the batch position within the case: on the edge (80%) or flat (20%).
- Choice of mechanization process: simple and economical.

THE ADVANTAGES OF THIS EQUIPMENT

It can regroup the flow from 2 bagging machines on 1 lane, also allowing to re-orient the bags with the long side leading before entering the collating system.



SOME EXPERT ADVANTAGES

- The same machine can handle both flexible refill bags and the premium (or first-purchase) format, which is often packed in carton.
- A cardboard divider can be inserted between the layers to make the secondary packaging even more rigid while increasing the case's vertical compression strength thus improving the palletising and the supply chain.

3 THE EXPERTISE YOU NEED TO SET UP AN AUTOMATIC PACKING SOLUTION FOR FLEXIBLE PACKAGING

EXPERTISE N°1

IDENTIFYING AND UNDERSTANDING THE CONSTRAINTS INHERENT TO FLEXIBLE PACKAGING.

EXPERTISE N°2

THE ABILITY TO IDENTIFY THE BEST-ADAPTED SECONDARY PACKAGING FOR YOUR LOGISTICS AND MARKETING PRIORITIES.

EXPERTISE N°3

A DEEP UNDERSTANDING OF THE FULL FLEXIBLE PACKAGING MECHANIZATION CHAIN, INCLUDING PRODUCT COLLATION, HANDLING AND PICKING AS WELL AS THE ERECTING AND GLUING OF THE SECONDARY PACKAGING.

Each factory has its own configuration and its own challenges. Any automatic packing solution for food flexible packaging products must meet your specific needs and be precisely adapted to your circumstances. Make sure you choose a partner who can support and advise you through each step of your project!



Sidel is a leading provider of equipment and services solutions for packaging beverage, food, home and personal care products in PET, can, glass and other materials.

With over 40,000 machines installed in more than 190 countries, we have nearly 170 years of proven experience, with a strong focus on the factory of tomorrow with advanced systems, line engineering and innovation. Our 5,500+ employees worldwide are passionate about providing solutions that fulfil customer needs and boost the **performance** of their lines, products and businesses.

Delivering this level of performance requires that we stay flexible. We continuously ensure we **understand** our customers' changing challenges and commit to meeting their unique performance and sustainability goals. We do this through dialogue and by understanding the needs of their markets, production and value chains. In turn, we apply our solid technical knowledge and smart data analytics to ensure lifetime productivity reaches its full potential.

We call it **Performance through Understanding**.

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