

# COMPLETE PACKAGING LINES FOR PLANT-BASED MEATS

Everything you need to know about processing and packaging plant-based meats in all kinds of packaging and packaging materials on the proper packaging lines.

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# FOREWORD

This e-book has been prepared to provide insight into the processing and packaging of meat substitutes. To compile this book, the experiences of customers and suppliers have been combined. All advice in this e-book is intended as a guideline and not as a definitive solution. To find the right solution for your product, we recommend that you contact one of our experienced consultants at JASA Packaging Solutions.

(No rights can be derived from any advice described in this e-book.)

# 1. Plant-based meats



Plant-based meats are extremely popular. Especially in the Netherlands, meat substitutes are on the rise; the Dutch consume the most plant-based meats compared to all Europeans and spend the most money on vegetable meat substitutes [1]. Also, in the rest of Europe, the consumption of plant-based meats is growing at a record pace.

A few facts:

- | The total value of the European vega market is about €3.6 billion
- | In the US, the market for plant-based meats has grown to a value of \$1.4 billion
- | Meatless meat is expected to have a 20% market share within 25 years
- | Of all Europeans, the Dutch eat the most plant-based meats and spend the most money on them
- | The largest market for vegetable substitutes in Europe is Germany



Before all these plant-based meats are hygienically packaged and delivered to the consumer, the restaurant, or other target groups, the product already traveled through machines, weighers, and robots. When it comes to packaging meat replacers, hygiene is crucial. Plant-based meats require an appropriate packaging process and suitable packaging. The packaging of plant-based meats plays a significant role in:

- | Extending the shelf life
- | Guaranteeing quality
- | Presenting the product with an attractive appearance to the consumer

JASA Packaging Solutions is a genuine expert in complete packaging lines for plant-based meats. This e-book explains the packaging process for these products and how to select the right packaging line.

# 1.1 High-quality packaging lines and trends

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Meat substitutes are products that need to be packaged in a hygienic environment to ensure food safety for consumers. This requires the proper packaging, proper packaging line, and the proper packaging process. It is essential to keep up with any trends in styling, packaging formats, and materials in the meat substitute industry. In recent years, the demand for sustainable packaging has increased, for example, by packaging with less packaging material and recyclable materials.

In addition, there is a clear trend in retail for luxury plant-based meats to be packaged in a tray with a top seal and a stylish cardboard sleeve wrapped around it. The industry also continues to innovate, continuously looking at new packaging solutions for plant-based meats.

In addition to respecting the consumer's wishes, a packaging line must be configured to meet the producer's demands in terms of quality, speed, and versatility. JASA is faced with an increasing demand for automation and robotization. Allowing plant-based meats to be packaged fully automated, without the need for human hands to come into contact with the product during the entire packaging process. This saves labor hours and contributes to the hygiene of the overall packaging process.



## 1.2 The packaging as a marketing tool

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Considering the high competition in the plant-based meat market, the packaging can be used as a marketing tool to appeal to the consumer. The cardboard sleeves of the JASA Sleever are an excellent fit for this purpose. The sleeve can be used to create a suitable packaging design, making the sleeves perfect for providing clear branding for your products and, as such, creating a recognizable product on the shelf. Sleeves offer space for product information, the barcode, and nice extras such as preparation methods, recipes, or quality certificates.

The sleeves offer great printing possibilities, higher resolutions are attainable, and sleeves offer lots of flexibility. Even the inside can be printed all to ensure that your product stands out on the shelf.



Image 1. Meat substitutes with sleeve packaging.

Vertical packaging can also facilitate branding, for instance, by choosing a full-color printed bag. This can be done in different packaging styles, such as a pillow bag, doypack, or a bag with a side gusset.



Doypack



Pillowbag



Zij-invouw



Quatro pack



Block-bodem

Image 2. Packaging styles.



## 2. The packaging process



The choice of a packaging line has a significant impact on a production company. Your company will save time and labor hours with the right packaging line. The ROI on a packaging line is easy to calculate, and with today's speeds, it soon becomes interesting. By selecting a flexible packaging line that can easily be changed in terms of packaging size and material, the company will be prepared for the future.

A complete weighing and packaging line includes the products' infeed to the weighing, the filling, and sealing of the packaging, robotized or otherwise. For plant-based meats, upstream and downstream systems can be integrated into existing packaging lines. The packaging lines can be fully automated, JASA offers various modularly proven solutions for plant-based meats.

Plant-based meat products require a high-quality packaging line that offers flexibility, hygiene, and speed in the packaging process. Both horizontal and vertical packaging solutions are possible for plant-based meats. For example, filling trays with wok cubes and sleeving packs with spinach-cheese rondos are handled on a horizontal packaging line, while frozen vegetarian nuggets are best packaged on a vertical packaging line.

At JASA, we build customized packaging lines while keeping the service in-house to ensure the best product and services. JASA offers systems that can be integrated into existing installations and synchronized to upstream and downstream systems.



## 2.1 Components of a packaging line.

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Plant-based meats are refrigerated when transported to the packaging line; the line may consist of various components required for the product. Depending on the product, volume, packaging, and customer requirements, the following features of a packaging line for plant-based meats are available.



Image 3. Meat substitutes types.

### **De-nesters**

In the case of tray packaging, a de-nester is added to the packaging line denesting the trays at high speed and advancing them to the filling station. It is essential that the tray is designed for de-nestability. This is one of the reasons to involve a specialist well in time.

### **Weighing**

For plant-based meats, carousel weighers and linear multi-head weighers can be used.

A multi-head weigher sets a target weight based on several partial weights. For example, 14 heads are available, from which the 4 closest in terms of target weight are selected. The minimum weight is, of course, always secured.

Generally, the weight chosen for a package of plant-based meats is between 80 and 1500 grams. When choosing the weight, it is crucial to consider the future. While 250 grams are typically packed at the moment, this might become 1500 grams in the future. The packaging line can be adjusted to this so that even in the future, the same line can package a different weight. In all cases, the portion is weighed very accurately, with minimal deviation.

The choice of weigher depends on the weight to be produced and the desired capacity. Different products may also require different weighers. It is essential to consider the weigher's requirements and choose a version that ensures that the product is processed hygienically throughout the entire system.

### **Top sealing or thermoforming**

In the case of tray packaging, the typical contemporary choice is to seal the package with a top seal film. This film can be resealable or feature a peel-off window. It is also possible to opt for skin packs, which mold themselves completely to the product's shape and then finish the packaging with a stylish sleeve around it.



Image 4. Top seal package.



## Vertical packaging machine

A vertical packaging machine, also called a vertical forming, filling, and sealing machine, automatically bags frozen products. The bag shape is made from a flat film that comes off a reel. This film can be either printed or not. When the product is released from the weigher into the bag, the bag is already formed and then closed by sealing.

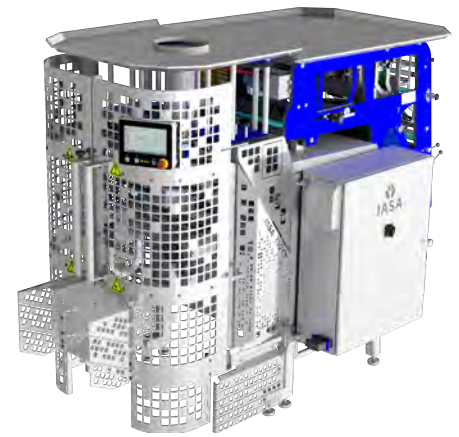


Image 5. JASA vertical packaging machine.

## JASA Sleever

With the cardboard sleeve of the JASA Sleever, the plant-based meats remain clearly visible. Yet, there is plenty of room for marketing productions on the packaging, logos, recipes, or a strong claim about environmental awareness can easily be printed on the sleeve. The sleeves themselves are highly environmentally friendly: they are 100% recyclable.



Image 6. JASA Sleever.

With the JASA Sleever, you bring in true innovation. The Sleever is designed according to the requirements and wishes of the user: the machine processes up to 100 trays per minute, has a very short change-over time of less than 5 minutes, has a hygienic design, and is very easy to operate.

In addition, the Sleever is a compact plug-and-play machine making it applicable to almost every packaging line, whether it is a semi-automatic line or a fully automatic line for weighing, filling, closing, and sealing trays bowls, and other food packaging.

Furthermore, not only are the sleeves environmentally friendly, the Sleever itself is exceptionally energy-efficient, compact, and pays for itself within a year by saving costs with automation. The Sleever can be used with different trays, square, oval, and round.

## **Metal detection, x-ray & check-weigher**

Metal detection equipment is used to detect the smallest metal particles; x-ray systems can detect metal, glass, broken products, plastic, a broken knife, and many other materials; and a check-weigher checks the weight of all products.

Often a combination of these systems is chosen, for example, metal detection and a check-weigher or an x-ray and a check-weigher.

## **Outfeed conveyor**

The JASA outfeed conveyor complements our machines and can easily be connected to all JASA machines. The outfeed belt is available in 3 different belt widths. The belt is also adjustable in height, which minimizes the drop height of the product. Other features of this outfeed conveyor are:

- | Low noise level
- | Hygienic, high care design

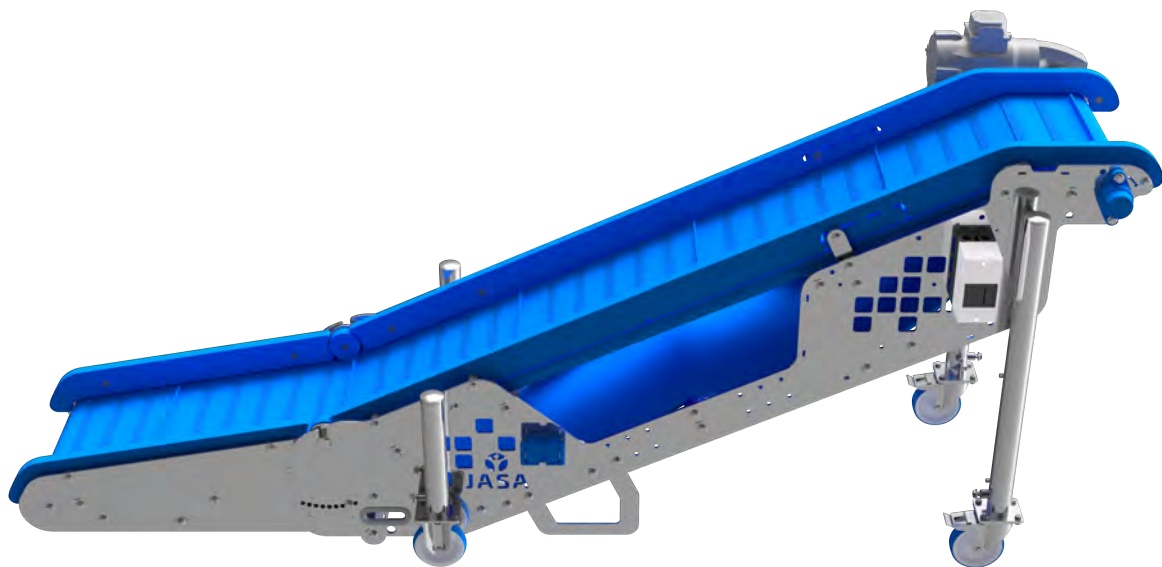


Image 7. JASA output belt.

## Conveyor Belt Systems

Conveyor belt systems are the connecting link between the individual processing steps in the packaging line. All conveyor systems supplied by JASA are designed for their specific application. The conveyor belt systems are maintenance-friendly as well as ergonomically designed. In addition to the various industry standards, JASA also offers customized solutions.

The plastic materials used for the conveyor systems are suitable for foodstuffs, including plant-based meats.

## Platform

JASA platforms are constructed from box sections and may or may not be equipped with floor plates, stairs, and safety handrails. These platforms are designed to absorb static and dynamic loads from, for example, weighing machines. They also provide optimal and safe access for operating, maintaining, and cleaning. The platforms are equipped with brace structures and height-adjustable stands.



JASA offers a range of platforms for dry and wet environments:

- | QC range for use in dry environment painted carbon steel structures
- | QB range for use in damp environment stainless steel structures
- | QA range for use in antiseptic environments stainless steel structures

These platforms are particularly suitable for packaging lines for plant-based meats due to their ease of cleaning. The QA range platforms are built according to the EHEDG (European Hygienic Engineering and Design Group) guidelines.

The QB and QA platforms can be equipped with a cleaning wall for the wet cleaning of weighing and buffer bins. Cleaning is done with a high-pressure water jet whereby the cleaning wall prevents water from being propelled into the facility. The platform floor features a gutter that collects and drains the water from the platform.



Image 8. JASA cleaning wall.

## **Case packing and palletizing**

At the end of the line, a case erector unfolds the box, a case sealer tapes the bottom of the box, and a robotic arm picks up the package and puts it in the box. This process is fully automated. Once the packaging is in the box, the box is sealed, and a palletizer places the box on a pallet.

## **Beckhoff control system**

JASA utilizes the Beckhoff control technology. Beckhoff uses one software platform instead of isolated PLC software, display software, and servo drive software. This enables the option for 'camming & gearing.' This means that movements flow into each other instead of the separate servo movements, the result; shorter cycle times and thus faster machines.

## **Modified Atmosphere Packaging (MAP)**

More than just the plant-based meat can be put into a package. Modified Atmosphere Packaging (MAP) involves packing the product under a protective atmosphere where gas is injected into the package. MAP generally uses one of these three gases: carbon dioxide, nitrogen, and oxygen. It is, however, possible to use other gases. MAP can extend the shelf life of some products. Depending on the application, product technologists will determine whether a gas mix should be used and, if so, which one.

## **Vacuumizing**

Vacuum packaging of fresh plant-based meats gives the product longer shelf life. If required, JASA can vacuum pack on vertical packers. This is especially interesting for large packages, as used in the catering industry.

## 2.2 Tray lines

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See Figure 9 as an example of a complete tray line. This is a basic layout with dimensions of 19m (length) by 3.9m (width) by 4.7m (height). Depending on the area where the line will be placed and all the requirements regarding the line taken into account, the line will be adapted to the available dimensions.



Image 9. Example of a complete scale line.

## 2.3 Bagging line

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See Figure 10 as an example of a vertical packaging line. This is a basic design with dimensions of 10m (length) by 4.4m (width) by 5.9m (height). Depending on the space where the line will be placed and all the requirements pertaining to the line, it will be adapted to the available dimensions.



Image 10. Example of a vertical packaging line.



# 3. Plant-based types of meat and their packaging



Plant-based meats can be packaged fresh, frozen, or processed.

Packaging varies by target group:

- | Hospitality
- | Retail
- | Wholesale

## Hospitality

The hospitality industry mainly uses:

- | Bag packaging
- | Large packaging
- | Vacuum packaging
- | Deep frozen products

## Retail

Retail mostly uses:

- | Skin packs
- | Smaller packaging
- | Fresh produce
- | Tray with top seal
- | Packaging with sleeves

## Wholesale

Wholesale mostly uses:

- | Bag packaging
- | Large packaging
- | Vacuum packaging
- | Deep frozen products

## 3.1 Types of plant-based meats

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A lentil burger, a cheese schnitzel, falafel. Plant-based meats come in all shapes and sizes. These different types require different packaging types, sizes, materials, and packaging lines.



Image 11. Variety of plant based meat.

## 3.2 Packaging types and sizes

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There are four different packaging types for plant-based meats, all of which are suitable for printing, a sleeve or a label:

### 1. | Top seal tray

This tray packaging is sealed with a top seal. The content of the packaging ranges from 85 to 1000 grams and is suitable to be combined with a sleeve.



Image 12. JASA top seal tray.

### 2. | Thermoformed packaging

A thermoformed packaging consists of a bottom and a top film. The film is formed in a mold by either vacuum or compressed air. This makes the packaging suitable for vacuum or gas flushed packaging of products.



Image 13. JASA thermoforming packaging.

### 3. | Skin pack

In this process, the product is completely vacuumized and wrapped into the packaging. The packaging thus takes the shape of the product.



Image 14. JASA skin pack.



## 4. | Bag packaging

This packaging is suitable for vacuumizing and packaging frozen products. Wholesale packaging is also possible, which is ideal for the catering industry.



Image 15. JASA bag packaging

## 3.3 (Sustainable) packaging materials

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When choosing (sustainable) packaging materials, three factors are at play:

- | Type of packaging
- | Thinner films
- | Mono-material

All common types of sizes and films (including biodegradables) are possible on the JASA packaging lines, and depending on the packaging, up to 100 packages per minute can be packed.

### 3.3.1 Type of packaging

After deciding on the best-suited packaging, the packaging material is considered. The two go hand in hand, as the type of packaging is the first and easiest step to save material and thus keep costs low and use the most sustainable packaging possible. For bag packaging, thermoformed packaging, and top seal trays, less and less plastic is being used for packaging.

When choosing the right packaging, consideration is given to, among other things:

- | The design of the packaging and whether it will be easy to handle automated, for instance, considering the de-nestability of the trays
- | Use of printed or unprinted film
- | Whether or not a label or sleeve is added

Because of the market's current (sustainability) developments, a top seal is often chosen when packaging plant-based meats on a tray.

Compared to a bowl with a lid, this saves up to 40% material. Bag packaging is also on the rise; up to now, this has been the packaging using the least material. Also, the production of the bag packaging is more straightforward, and the costs are lower, and with the proper printing, the appearance can be very stylish. Another advantage is the high-speed packing process. Bag packaging is highly suitable for packaging plant-based meats, such as vegetarian nuggets and plant-based meatballs.

### **3.3.2 Thinner films**

The use of plastic can be reduced by packaging with thinner films. Thinner films retain the advantages of plastic packaging but reduce the amount of plastic. However, the packaging line must be capable of handling the thinner films. This can be done by optimizing the sealing systems, filling methods, and film throughput.

### **3.3.3 Mono material**

Mono-materials are increasingly used; they are more suitable for recycling. Complex composite films consist of multiple types of plastics and therefore cannot be easily recycled. Mono-material, on the other hand, is well suited for recycling.

Plastic packaging material can therefore be very sustainably used. Plastic does not have the best name in the game, but yet it offers other great (sustainable) advantages in addition to the points already mentioned:

- | Hygiene
- | Long shelf life
- | Less food waste

# 4. Safety & hygiene



When it comes to hygiene and food safety, some strict laws and regulations stipulate stringent regulations for the packaging of food products. The packaging systems must be made of stainless steel and have a hygienic design that is quick and easy to clean.

In order to comply with hygiene and safety regulations, clean and safe packaging must be guaranteed. Working hygienically is an absolute requirement to ensure food safety for the consumer.

The packaging line is constructed in such a way that maintenance, cleaning, and disinfection can be carried out as quickly and efficiently as possible. The various components of the packaging line, like the platforms, are designed in such a way that no accumulation of dirt is possible, and molds cannot form.

The strict hygiene and safety guidelines do not have to compromise the flexibility and speed of the packaging line.



Ways in which JASA ensures hygiene:

- | Our machines are made of stainless steel, which is easy to clean
- | The vacuum machine empties bags, taking a lot of moisture with it. JASA designed a practical system where the lances are rinsed without having to spend person-hours on it
- | A cleaning wall for cleaning weighing bins with central wastewater drainage
- | There are no inclusions or dead spaces in the packaging lines and machines

Employee safety is also ensured; the system includes an emergency stop for the entire line. When pushed, one knob brings the whole line to a halt.

# 5. A step-by-step plan for choosing the right packaging line

To compile a good packaging line, it helps to have answers to the following questions:

- What is your type of product
- What is your desired type of packaging
- What is the total output
- What is the expected weight per package
- What is the composition of the finished product
- How many packs/total weight of each SKU per day/week do you produce
- Additional preferred options such as:
  - MAP
  - Vacuumizing
  - Adding labels/print to packaging
  - Attractive sleeve around the pack
- Future expansion requirements
- Layout of the packaging area → dimensions to be taken into account

# 6. Conclusion



Food safety is essential in the packaging of plant-based meats. This can be ensured in various ways, including choices of machinery and the construction of the packaging line.

For plant-based meats, JASA offers the ideal packaging solution. JASA distinguishes itself with its turnkey solutions, high quality, and round-the-clock services. JASA has been active in tray and bagging lines for over 35 years. We listen to the customer's wishes and give advice on the best-suited machines, materials, and the outlook for the future.

JASA uses high-quality machines and components, and we can put together a fully automated and adaptable packaging line according to the customer's wishes. While we also consider the space where the packaging line will be installed. JASA packaging lines can even be installed in spaces with obstacles or a low roof.

With its innovative packaging solutions, JASA is a frontrunner and market leader in the packaging industry. JASA offers high-quality packaging lines for plant-based meats with sustainable packaging options that use less plastic while still providing flexibility and high-speed packaging.





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