



The world of

Poultry processing

In close cooperation
with our customers
we create innovative
solutions, driving
excellence in
performance,
food safety and
sustainability.



The world of Poultry processing

The global market for poultry continues to grow. Poultry provides a good, healthy and affordable source of protein. With the increase in world population, the increase in per capita consumption of proteins and the open world market, expectations for growth in the sector are positive.

Markets demand more, safer and an ever greater variety of end products. In many markets this leads to centralization and up-scaling of automated production and to the desire to be able to produce very flexibly and make more different end products.

Responsible efficiency

Moreover, producers are striving for higher efficiency and a reduction in costs, reasons being that labor costs are rising and natural resources becoming ever scarcer. Everyday production must be able to run without problems with the highest possible up-time, the best yields achievable and predictable, lowest possible cost of ownership.

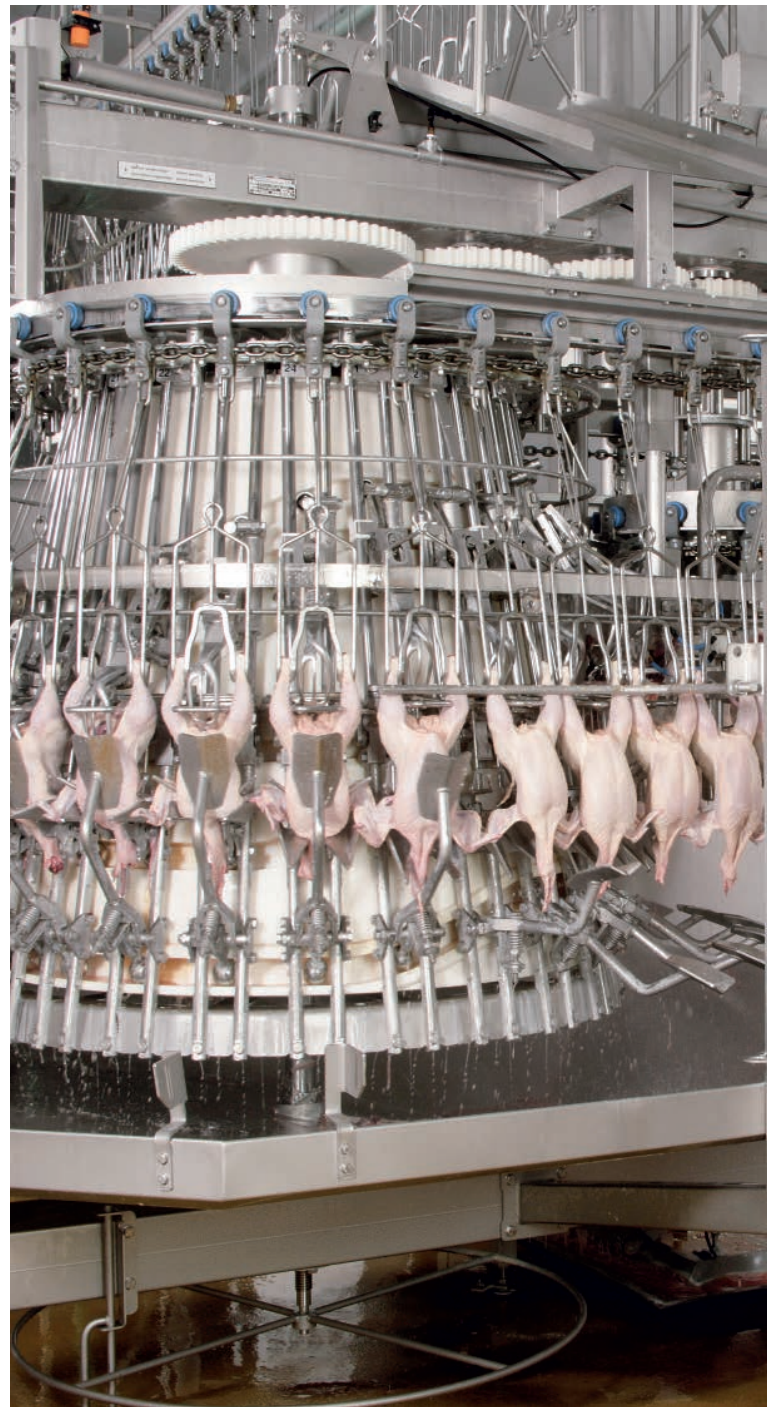
A lot of attention is also being paid to food safety and quality and of course to producing in an ethical and socially responsible way. Animal welfare, water and energy consumption, full traceability and taking care of the raw material are therefore important starting points. The aim is to add value to poultry as effectively as possible.

Leader in technology

Day after day, we at Marel are proving our strength in all global poultry markets with all their facets. With our solutions, we offer our customers the best possible starting point.

We are convinced that developing innovative products offers the best chance of achieving this. We bring our customers the future today.

Our choice for innovation has not happened by chance. Right from the beginnings of our organization in 1963 we have always opted for innovative solutions with added value, solutions based on thorough research. Innovation is a core value; you can say it is in our DNA. We stand with both feet on the ground and are deeply rooted in the poultry industry and its developments.





Passion for poultry processing

Marel is rightly known as the global leader in the development and production of complete processing systems for broilers, layers, parent stock, turkeys, ducks and geese. Working together with our valued customers, we have implemented with passion countless successful tailor-made projects in every corner of the world. This has led to the world's largest installed base in the industry. Our company offers the most complete and extensive product range in the industry. We offer solutions for live bird supply, primary processing, chilling, cut-up, deboning and high speed slicing, (fixed weight) batching, in-line marinating, meat harvesting and further processing (including portioning, coating, frying, cooking and sausage making). Furthermore we offer various end-of-line solutions, like automatic weighing and labeling and a complete range of products for freezing. Software & monitoring solutions and service & training products complete the picture.

Endless product variety

With our solutions, you can make all the end products currently available in the market. Besides well-known whole bird, portion and fillet products, the solutions also allow you to produce and pack automatically at high speed a large number of cut, formed, marinated or coated products. We also offer high quality solutions for processing giblets, feet, skin, MDM-products and cartilage.

Proven solutions for all capacities

We supply in-line solutions for each step in the process, for processing capacities from 500 bph (8.3 bpm) and for every level of automation. We are developing new ways of giving ever better support to our customers. Over the years many newly developed solutions have set trends in the poultry processing industry. We are therefore proud of our proven technology.

Optimum service balance

For us, offering good service is an important starting point. For each customer, we look for the best possible balance between yield, throughput and up-time. In addition to spare parts and complete retrofit and upgrade packs, we also offer different service contracts and training programmes.

Our preventative maintenance contracts are proving their effectiveness on a daily basis. They are an almost indispensable option for completely automated poultry processors, guaranteeing optimum up-time and ensuring that high yields are maintained for longer. At the same time, preventative maintenance contributes to predictable and lower cost of ownership.

Your process

Laying out your process will of course depend on many factors. The production capacity required and the type of product you want to make are naturally important, so too are customer preferences, your possible growth scenario and export potential. The availability of skilled labor will also play its role. Certain processes or parts of them can be done both manually as well as automatically.

The best solution

Our approach, based on many years experience and expertise, focuses on always making the best possible layout, catering for today's needs, but also taking account of tomorrow's requirements and possibilities.

We offer solutions for processing all the usual types of poultry, all possible stages in the process and at any required production capacity starting from 500 broilers per hour (8.3 bpm). Besides broiler processing, we are also specialists in the technology and techniques for processing turkeys and ducks up to the highest possible production capacities. We are of course also able to offer optimum solutions for processing layers and parent stock.

We grow with you – modular approach

Our systems are modular in construction. This means that practically all components of the production process can be scaled up and that you will not need to replace all modules when extending. Our in-line solutions grow along with your business.

In the first phase, for example, a number of part processes in the primary process can be automated, such as stunning, killing, scalding and plucking. These can be combined with manual evisceration, cut-up and filleting.





Step by step

At a later stage, these part processes can be automated in phases. Besides cut-up and deboning steps such as slicing, portioning, forming, marinating, coating, frying and cooking can be automated, as can be weighing, batching, packing and labeling.

Monitoring

When all is said and done, an automated solution is possible for almost every stage in the process. The production process can then be managed and controlled using intelligent management and production software.

Just think for example of the assessment of the various quality aspects of a product at high line speeds, of weighing and selection and of using the information gained to control cut-up

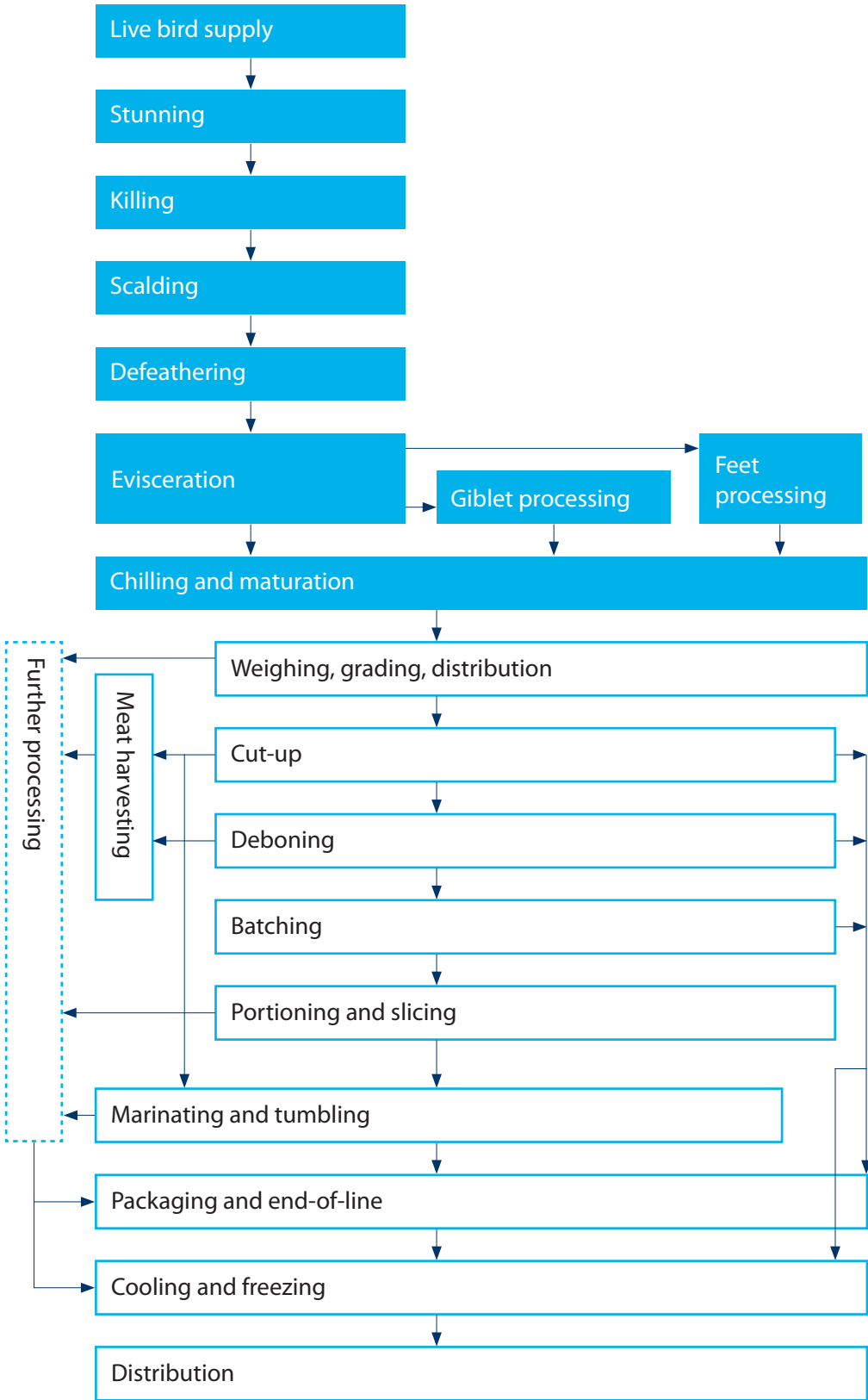
and deboning. Think too of monitoring the technical condition of the equipment, the yield and performance of modules, the complete traceability of all your product flows. All this is possible.

Custom made

We are therefore able to offer solutions for all steps in the process and for every production capacity. We will be describing below a number of the steps for processing broilers, so that you will be able to picture the various in-line solutions possible.

In consultation with your sales manager and his team and on the basis of your requirements, your market and your circumstances, a specific solution is worked out, a solution which enables you to achieve your aims in the best way possible.

Process diagram



Data acquisition and logistic control

Rendering and waste water treatment

Internal logistics

Process steps

Live bird handling

Live bird handling systems

- Most efficient transport modules worldwide
- Humane loading and transport
- Highest load capacity
- Safeguards bird quality
- Options to optimize hygiene
- Saves labor and improves ergonomics

Smooth-running logistics in the supply of product make a very significant contribution to the overall efficiency of a poultry processing plant.

Our live bird handling systems provide effective and animal-welfare friendly conditions for loading and transporting birds from grower to processor. The systems' in-plant logistics meet and even go beyond the highest demands as far as line speed, hygiene and durability are concerned. The modular system can be adapted to all desired levels of automation and production capacity.

There are various cleaning and disinfection options to limit any risk of cross-contamination to an absolute minimum.



Integrated weighing, product detection and dust extraction are available as options.

We also provide a traditional crate system, which can be largely mechanized by using stackers and destackers.

When it comes to animal welfare, hygiene and efficiency, the ultimate live bird handling system is ATLAS. During transport and at the plant, the revolutionary, modular tray design creates more space for the broilers, resulting in highest load capacity!

Stunning

Electrical waterbath stunning

- Effective stunning
- Available for all processing speeds
- High frequency stunning available

Multiphase CAS stunning

- Improved animal welfare
- No compromises on product quality
- Improved ergonomics and labor saving
- Particularly suitable for higher production capacities

We offer two methods for stunning poultry, both of which comply fully with the strictest regulations: electrical waterbath stunning (also available with high-frequency to safeguard product quality) and Multiphase Controlled Atmosphere Stunning (CAS).

Practical experience with this humane way of stunning has shown that blood spots and bone fractures hardly ever occur. The use of carbon dioxide in multiple phases, as applied in



our CAS systems, such as the straight-line CAS SmoothFlow, is specifically mentioned in the list of stunning methods accepted without any additional requirements being necessary.

The modular CAS systems connects smoothly to the live bird handling systems.

Killing

- Double-sided neck cut or throat cut possible
- For all line speeds and broiler weights
- For electrically and CAS stunned broilers

An accurate and consistently executed kill cut is a vital step in the primary process. The cut must ensure that the broilers bleed out fully before they enter the scalding process.

The Marel killer is suitable either for making a neck cut (through the veins and arteries while the trachea and esophagus remain intact) or for making a throat cut (through the veins, arteries, trachea and esophagus).

After broilers have been carefully positioned, the type of kill cut chosen is applied. With both throat and neck cuts head loss after plucking is minimal. It goes without saying that Marel's killer meets all existing legislation.



Scalding

Immersion scalding

- Precise temperature control for a consistent processing result
- Multi-tank counter-flow for a cleaner process
- Low energy and water usage
- Designed for optimal cleanability

AeroScalder

- Up to 50% energy and 75% water reduction
- No more immersion of products
- No cross-contamination in the scalder
- A cleaner, consistent process

The scalding process largely determines the appearance, color and visual quality of your end product. It can also influence yield and shelf life.

Marel scalders ensure optimum heat transfer and precise temperature control, two vital characteristics of a first-class scalding system.



Our scalding systems are easy to clean and maintain and use a minimum of energy. The innovative AeroScalder uses up to 75 % less water and up to 50 % less energy. It is the latest benchmark in top quality scalding systems and has been developed with environmental concerns very much in mind.

Defeathering

- For all types of poultry and all product weights
- A plucker solution for every situation and every capacity
- Easy to set, maintain and clean
- Low cost of ownership

How a product is plucked is crucially important for its presentation. Plucking action will also determine the extent to which the epidermis remains attached to the product and is especially important if birds or portions from them are to be sold fresh skin on.

Marel has a vast amount experience of plucking gained worldwide over many years and backed by solid research. With our wide range of pluckers and the flexible way in which they can be set, we provide the best possible plucking result in all situations.

The machines have long service intervals and the lowest possible cost of ownership per processed product.



Giblet processing

- Modular manual, semi-automatic or fully automatic giblet processing
- Optimum yield, quality and hygiene
- Limitless layout flexibility

Giblets are popular and a profitable part of poultry processing. Processing them effectively and efficiently is most definitely in the processor's best interest. Our equipment is suitable for the production of giblets for human consumption or for pet food.

With the Nuova giblet processing system you can do all giblet processing operations manually, semi-automatic or completely automatic, ensuring the best possible yields, top giblet quality and optimum levels of hygiene.

After harvesting, giblets must be washed, chilled and transported. We offer a comprehensive range of equipment and systems for the highest production capacities.



Evisceration

- Efficient, consistent and reliable evisceration
- Unique hygienic, automated process
- All capacities up to 15,000 bph (250 bpm)
- Customized manual, semi- or fully automatic giblet harvesting for optimum added value

With Nuova automatic evisceration, the entire viscera pack including the crop is removed completely in a single operation. The viscera pack is separated immediately from the product and transferred automatically to a dedicated shackle on a separate pack processing line. This method has major hygiene and product quality benefits and saves labor.

Viscera packs are held in the viscera pack shackle with the intestines hanging down and away from the edible giblets.

There is a wide range of equipment available for the various process steps in the evisceration department. Besides Nuova important modules are the vent cutter, opening machine and final inspection machine. Together they prepare your products in the best possible way for chilling and all other downstream operations.

Our product range also offers several solutions for combined manual and automatic evisceration.



Feet processing

- Numerous in-line processing options
- Fully automated scalding, peeling and chilling set-ups
- Saves labor

Feet and paws are popular. A feet processing system is therefore an interesting option for many processors.

The system processes feet fully automatically from scalding through peeling and chilling. Its flexible and modular setup enables a profitable solution for every processor. Various high yield, high quality feet products can now be processed at the highest possible production capacities.





Chilling and maturation

- Effective chilling for all products and capacities
- Optimal product quality with high yield
- Unique in-line maturation chilling and 'plus'- technology

For optimum shelf life, quality, freshness and food safety, end products must be effectively chilled.

We offer various technologies, which chill birds to the correct breast core temperature without freezing wings or neck flaps. An absolute minimum of weight loss is achieved with water chilled products or superficially dry products which have some moisture retained in the meat.

The consumer gets an end product with attractive texture and color characteristics.

Our chilling solutions include a number of air, (in-line) maturation and immersion options. They supply end products with excellent yield, quality and shelf life, perfect for sale, either fresh or frozen.

We offer chilling solutions for all processing capacities, all product requirements and all products, including giblets and feet.

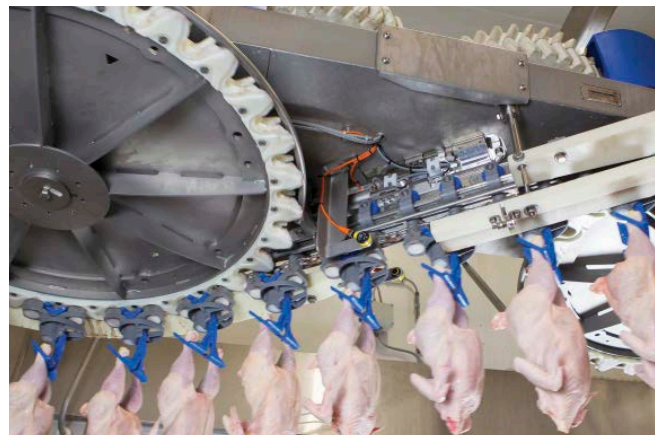
Weighing, grading, distribution

- Fast, accurate 'weight and vision based' selection
- Flexible distribution options
- Reduces give away to a minimum
- Specialized process control software

The weight and quality of both whole products and parts can be determined automatically at various points in the process. The earlier grading takes place, the more accurate will be the decision-making for order production. SmartWeigher and IRIS vision inspection can be implemented at four different locations in the plant to facilitate this: in the defeathering and evisceration department, in the distribution and the cut-up line.

The gathered data will serve as the input for the Innova PDS plant production and control software. As these product details will remain linked to the product, downstream operations can benefit from this precise assessment.

Automatic weighing, grading and distribution are important steps towards good in-plant logistics, full traceability, reduced give away and improved yield.





Cut-up

- Flexible, accurate, high yield cut-up
- Limitless layout and production flexibility
- Highest percentage of A-grade cuts

Our high performance cut-up system is just as flexible as you need it to be. With its numerous module options, the system offers almost limitless layout and production flexibility, regardless of processing capacity.

The system's smoothly rotating product carrier positions product perfectly, even at the highest line speeds. The result is a system producing the highest yields and percentage of A-grade cuts in the entire poultry processing industry.

The system includes a full selection of wing, breast and leg processing modules. The various modules allow you to produce all current products, including those where an anatomic cut is needed.

Deboning

Breast deboning

- Versatile, modular front half and breast cap deboning
- High yield, high quality fillet products
- Endless product possibilities
- Requires less skilled labor

Whole leg and thigh/ drumstick deboning

- Highest possible yields in automated deboning
- Endless end product options
- Integrated in the ACM-NT line or automatic rehangng
- Requires less skilled labor

Our deboning options are all about high-yield, top-quality and safe end products. To that we add limitless versatility in the end products possible and the processing of valuable by products. Thanks to technical and technological refinements, the number of end product options has become ever larger, the number of manual operations fewer and the cuts possible more complex. As a result, the systems' yields have kept on increasing.

Proven solutions for breast filleting are AMF-i - intelligent adaptive breast deboning - and FHF-XB - front half deboning. Besides that, the Marel program also features the Thigh Fillet System. The efficiency and consistency of this inline thigh deboning process results in retail quality products.

X-ray inspection

Deboned poultry meat can be scanned using advanced x-ray technology. SensorX detects the exact location of bone and other contaminants, enabling effective trimming. Products are re-scanned for extra safety. To add extra value to your product, SensorX is the way to go.



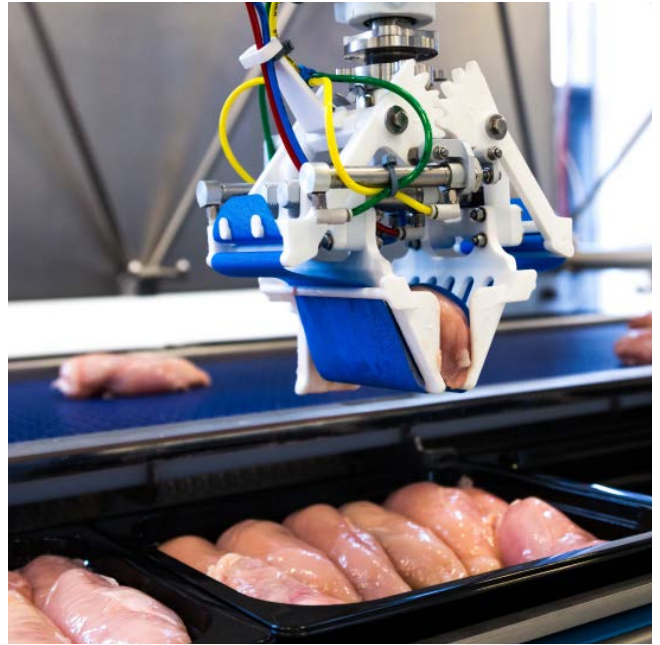
Batching

- Wide range of flexible and in-line solutions
- Extremely low give-away
- Labor saving

We offer all kind of batching solutions, including fully integrated tray loading and packing systems. Marel Multihead Weighers handle all in-feed, sorting, mixing and weighing requirements. They automatically portion and pack all types of fresh or frozen poultry products.

The fully automatic Marel RoboBatcher packs up to 300 chicken fillets per minute into trays. It is known for its high-precision fixed weight batching with virtually no give-away.

Intelligent communication between various batching and portioning equipment lifts the process to a higher level, thereby optimizing product utilization. The "Robot with a Knife" concept illustrates this perfectly.



Portioning and slicing

- Multiple cutting possibilities
- High accuracy
- Minimal product give-away
- Reduces labor costs

Good portioning and slicing is all about automated, high-speed, high-precision performance.

We offer portioning and slicing solutions for the high-speed production of all kinds of fixed weight or fixed length products.

The range of machines also covers horizontal and template slicing of poultry fillets. The equipment is designed to live up to your need for uniform, natural looking end products.

High-precision performance results in minimal give-away, thereby providing excellent profit opportunities.

By combining equipment with Innova intelligent production software, remote programming and control are easy. Processes can be monitored real time and actual performance is reported.



Meat harvesting

- Adding more value to your carcasses
- Harvesting of good quality raw material
- Adjustable pressure and press times
- Easy to operate and clean

One of our goals is to add as much value as possible to every bird. Our meat harvesting equipment gives you the possibility to harvest any remaining valuable poultry meat from e.g. carcasses or necks.

Mechanically deboned meat provides a profitable source of good quality raw material for the sausage, snack and comminuted meat industry.

We offer highly efficient durable meat recovery systems requiring only a minimum of maintenance and easy to operate and clean.



Marinating and tumbling

- Fully automated in-line process
- Uniform distribution of additives
- Easy tracking and tracing of batches

The market for seasoned, ready to cook and ready to eat products continues to grow. Marinating and garnishing all kinds of bone-in and deboned products is very popular. These techniques add value to your products and offer interesting possibilities in virtually all markets, with new tastes and applications being introduced all the time.

With our massage and marinating solutions you can process small batches in-line, either wet or dry, larger or smaller products, with or without bone and with or without additives.

Keeping this process in-line does away with the need for manual product handling operations. There are no longer any worries about logistics as tracking and tracing is easier.





Further processing

- Full line solutions
- Modular, flexible set-up for all desired capacities
- Wide product range

With decades of experience in food technology and animal protein processing, Marel develops, manufactures and installs innovative systems for the further processing of animal proteins.

The product offer includes full line solutions from meat preparation, portioning and coating to frying and cooking and even sausage production. With your end product and all its specific characteristics as starting point, specialists put together the most effective system to meet your requirements.

At the DemoCenter your production facility can be mimicked to make the products you want, giving you insight into the machines or line you are considering buying. You can learn, see, feel, smell and above all taste how your wishes and expectations are translated into attractive end products.

Internal logistics

- Bring the right products to the right place
- Smooth product flow
- Reduces labor
- Safeguard quality: product is touched less

Good internal logistics improve the flow of your end products, safeguarding quality in the various process steps. We offer various types of conveyor belts and overhead conveyor systems for connecting process steps in the most efficient way possible.

Besides bringing product safely to the next process step, another aim can be to reduce the number of times product is touched by operators. One way of doing this is to use conveyor belts which automatically position product correctly for infeed into a downstream machine.

We also offer a complete system consisting of an overhead conveyor equipped with specially developed tray carriers, automatic tray loading and unloading stations. The system takes trays from the end of each tray filling line and distributes them intelligently over a number of tray sealing/wrapping and labeling lines sited in one centralized, dedicated packing area.





Packaging and end-of-line

- Digital weighing accuracy, precision and reliability
- Labeling solutions for a wide range of products and capacities
- Easy label editing with drag and drop touch screen

End-of-line systems perform the final operations to complete the packing process and provide customer specified presentation. The equipment comprises a combination of well-proven elements and can be tailored to your requirements.

Marel labelers provide base, top, side, single, double or 3-panel application, non contact or in-line printing and application.

Our weigh price labelers provide excellent performance with low running cost through class leading print head life. Designed for a wide range of applications, they can handle most current pack sizes at up to 160 packs per minute.

Cooling and freezing

- Compact footprints
- Cost effective, energy saving
- Rapid and uniform freezing

Fast and efficient freezing is the key to superior food preservation.

Marel offers a wide range of energy and cost efficient industrial tunnel, crust, blast, impingement and upwards/downwards running spiral freezers. The range includes small package units to large tailor-made solutions.

With our freezing concepts you can optimize your freezing process and minimize give-away.





Rendering and waste water treatment

Transport

Blood, feathers and other slaughter offal must be transported and collected rapidly, effectively and hygienically. For this we offer various options, ranging from simple pumping systems to extensive vacuum transport systems, including in-place cleaning and disinfection.

Rendering

Some slaughter offal is particularly rich in proteins and fat. We offer a range of systems for the rendering of feathers and slaughter offal, thus producing attractive base materials for other industries.

Waste water treatment

Extending the product range for the poultry processing industry, we offer various solutions for the treatment and purification of process and waste water, tailor-made to suit specific requirements and levels of pollution.

For rendering and waste water treatment solutions we work together with respected partners in the industry.

Data acquisition and logistic control

- Real-time quality data
- Full traceability is possible
- Monitors the complete value chain in real-time

Complex, high capacity processing requires ever more production control and management information. When it comes to optimizing profits and overall production performance, we provide a complete management solution.

Our modular software packages can cover the complete value chain in the production cycle, from the receipt of input material right up to dispatch of the end products.

Innova PDS is the modular production control software for Marel poultry equipment, focusing strongly on those parts of the process where products are transported in a shackle suspended from the overhead conveyor.

Innova modular production control software provides key performance indicators (KPIs) relating to every stage of processing, enabling users to control, measure and monitor virtually every aspect of the production process.

Using a combination of Innova and PDS, Marel is able to offer the most extensive and best process control solution for all poultry processors.

INNOVA

Food Processing Software



Turkey, ducks and more...

Turkey processing

We offer complete solutions for processing all common turkey weights at capacities ranging from 250 turkeys per hour up (4.16 bpm) to a maximum of 3,000 male (50 bpm) or 3,600 (60 bpm) female turkeys per hour. The equipment has been specially developed for turkey processing and is based on decades of dedicated experience.

Today we offer the highest level of automated turkey processing for the highest processing speeds currently available in the market. The level of mechanization in turkey processing nearly equals that of broiler processing.

Besides providing efficient and effective automated processing, our solutions contribute to better working conditions for operators. Automatic solutions include Multiphase CAS stunning, de-feathering and eviscerating, portioning and filleting.

Ducks and geese

Our technology, know-how and experience in broiler processing were the starting points for the development of duck and geese processing equipment. The feather pack of water fowl differs from that of broilers. That's why we developed dedicated equipment for several process steps.

For complete feather removal, ducks must be treated with hot wax. Good skin quality and presentation are crucial when processing ducks.

We are specialists in high capacity automatic duck processing up to 6,000 ducks per hour (100 bpm).

We offer the highest level of automated processing for the highest processing speeds currently available in the market. The evisceration process for ducks is fully automatic, as is the cut-up process.



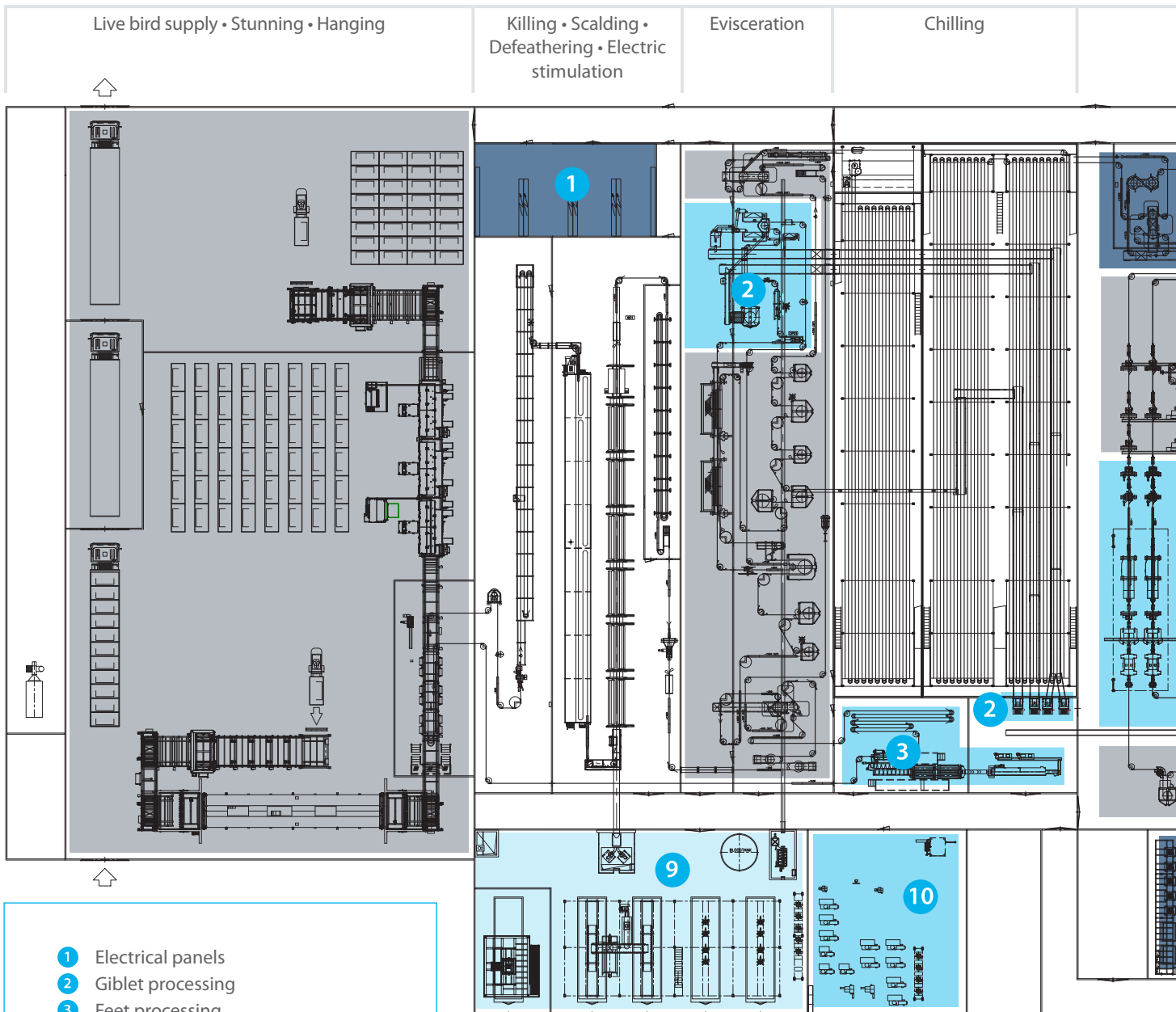
Layers and parent stock

We have developed dedicated processing equipment for the automatic processing of layers and parent stock. Because the weight and conformation of these birds are different to those of broilers, special attention had to be paid to the evisceration process. This has resulted in a technical solution for ovary removal.



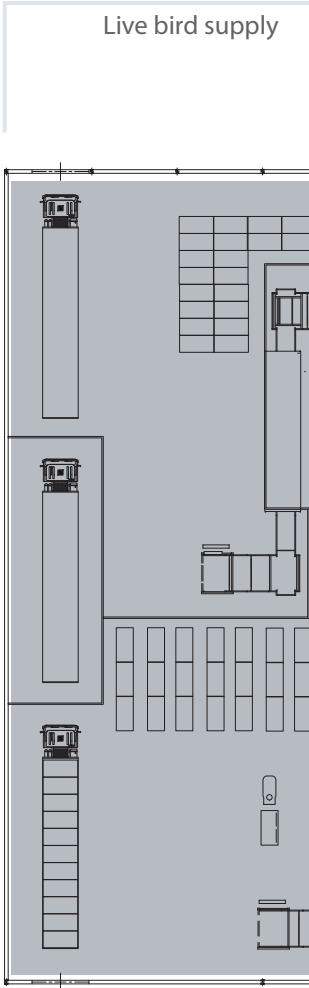
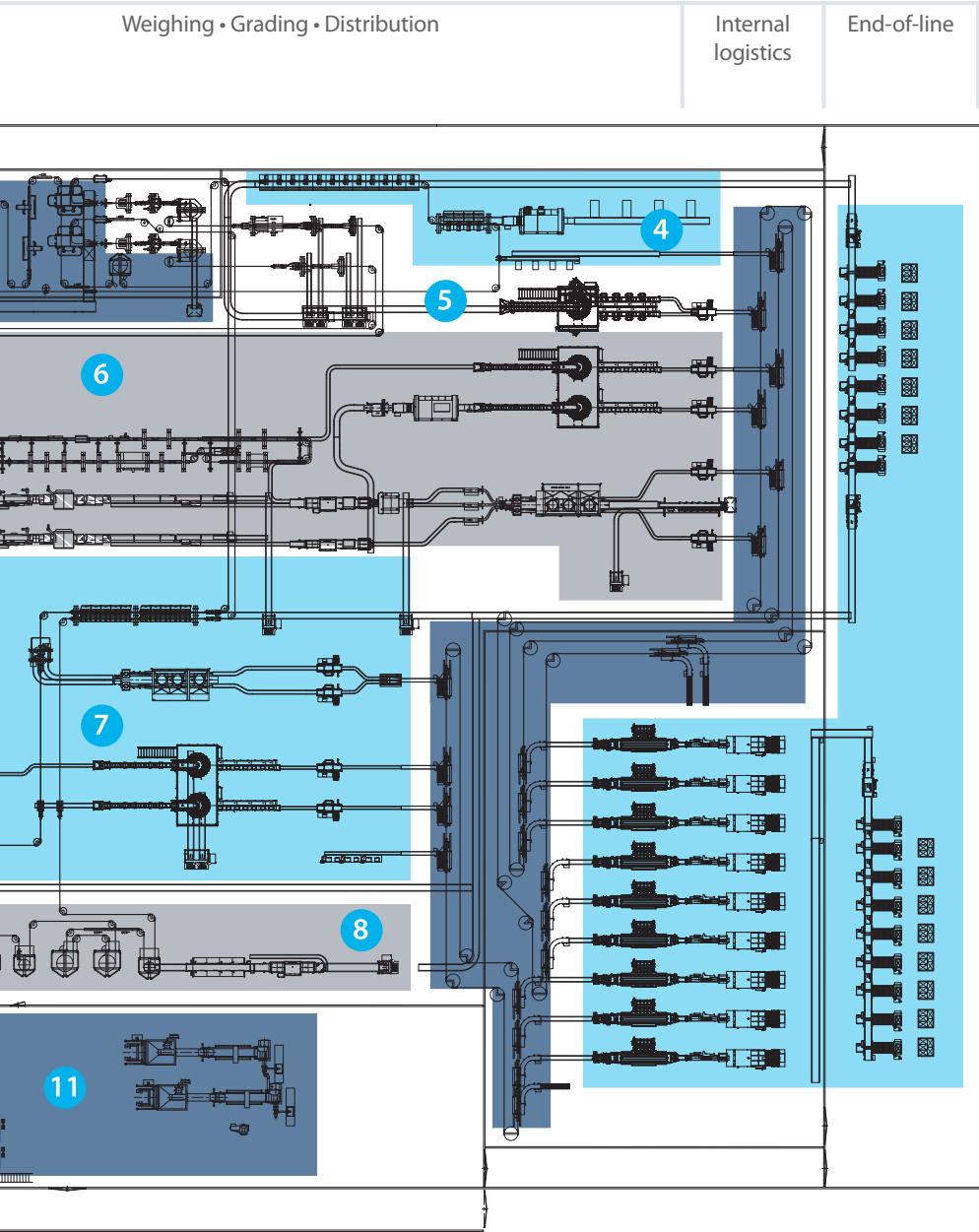
Capacities up to 15,000 per hour 250 bpm

PRIMARY PROCESSING



- 1 Electrical panels
- 2 Giblet processing
- 3 Feet processing
- 4 Whole bird processing
- 5 Wing processing
- 6 Breast filleting processing
- 7 Leg processing
- 8 Thigh processing
- 9 Rendering & by-products
- 10 Pump room / vacuum compressors
- 11 Meat harvesting / vacuum transport

SECONDARY PROCESSING



up to 9,000 per hour 150 bpm

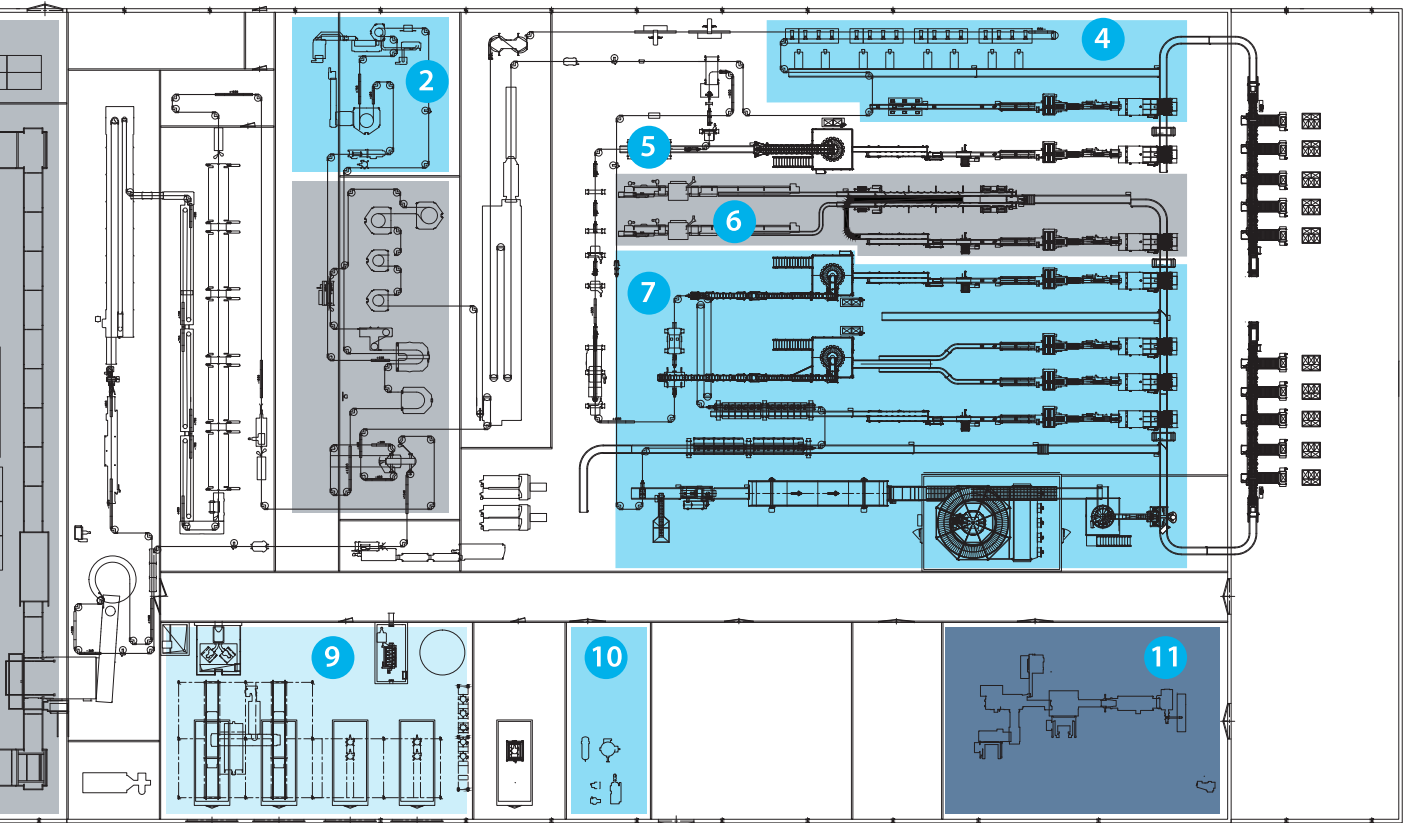
Hanging • Stunning • Scalding • Defeathering

Evisceration

Chilling

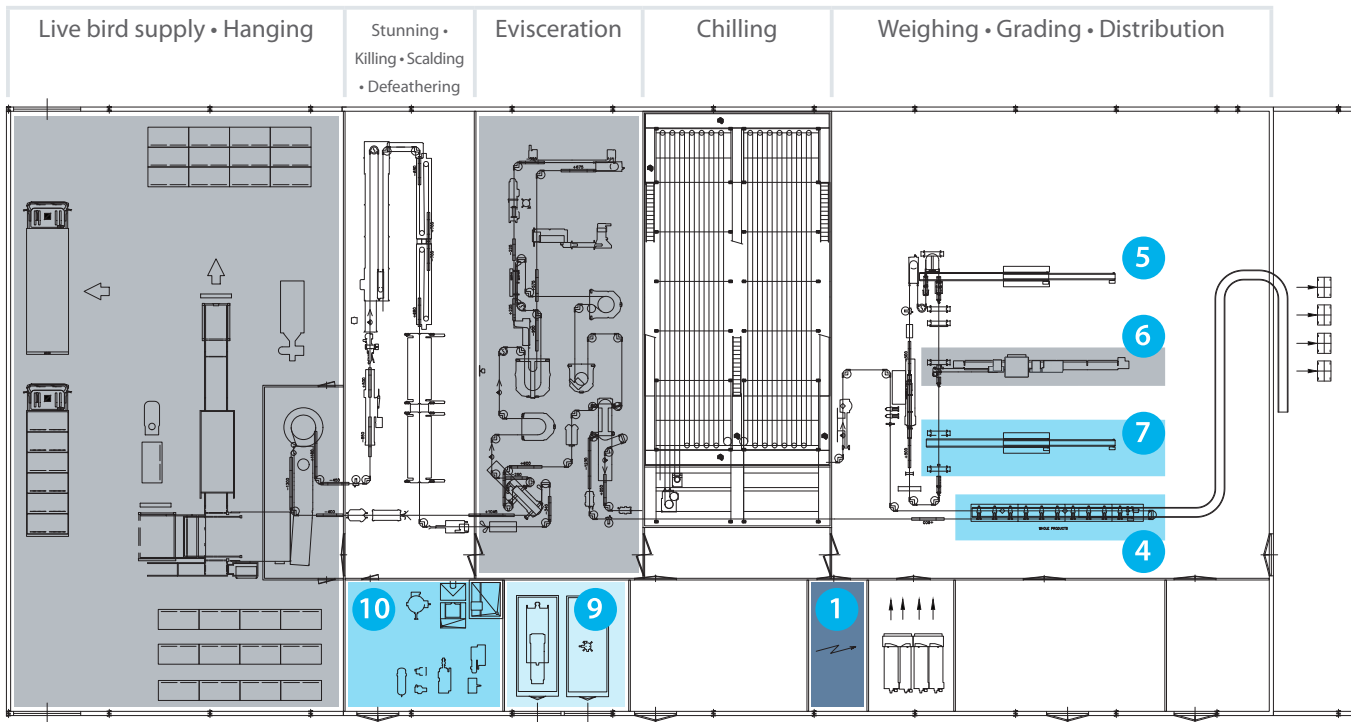
Weighing • Grading • Distribution

Packaging • End-of-line



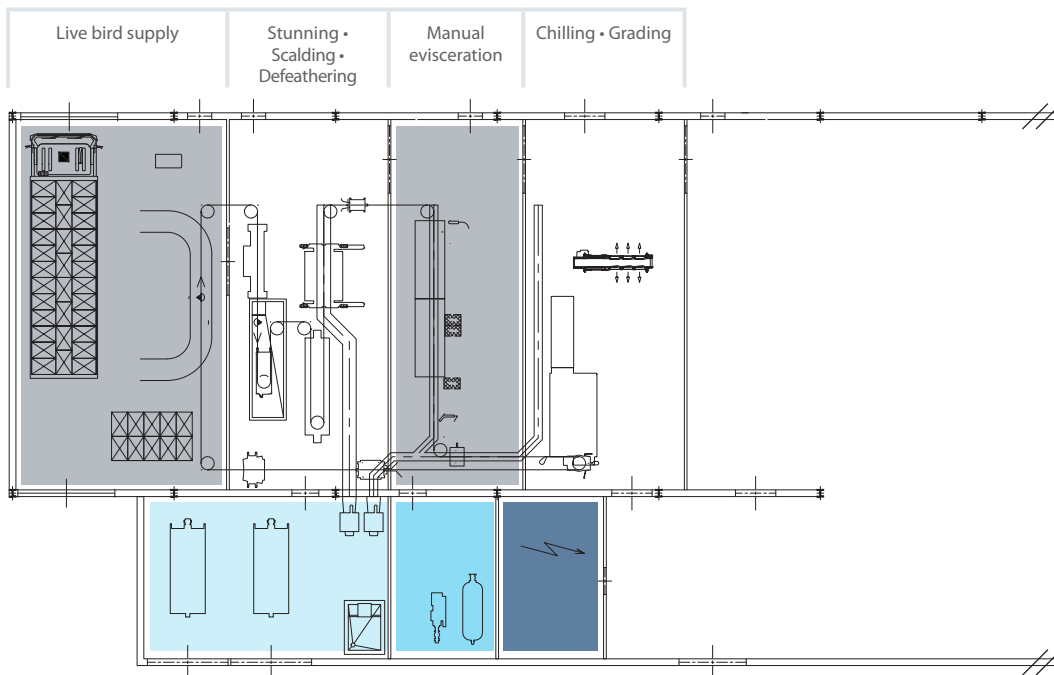
Capacity 2,000 - 5,000 per hour

33 - 83 bpm



Capacity 500 - 1,000 per hour

8.3 - 16.7 bpm





At home throughout the world

Our worldwide network of around forty local offices and an extensive network of more than forty agents guarantee that our customers are served well and promptly. Our knowledge-driven service engineers are always quickly at hand, know their customers and are in continuous contact with our specialist staff, able if necessary to support them. Our aim is to take away, as much as possible, your worries about maintenance. We are truly at home throughout the world.

Marel

With over 4,000 employees worldwide Marel is the leading global single-source provider of advanced equipment, systems and services to the poultry, fish, meat and further processing industries.

From harvesting raw materials to packaging the final product – from standardized stand-alone units to completely integrated systems – our products are designed to meet our customers' every need.



Marel is the leading global provider of advanced equipment and systems for the fish, meat, and poultry industries.

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**In partnership with our customers, we are transforming the way food is processed.
Our vision is of a world where quality food is produced sustainably and affordably.**

**TRANSFORMING
FOOD PROCESSING**

marel.com/poultry