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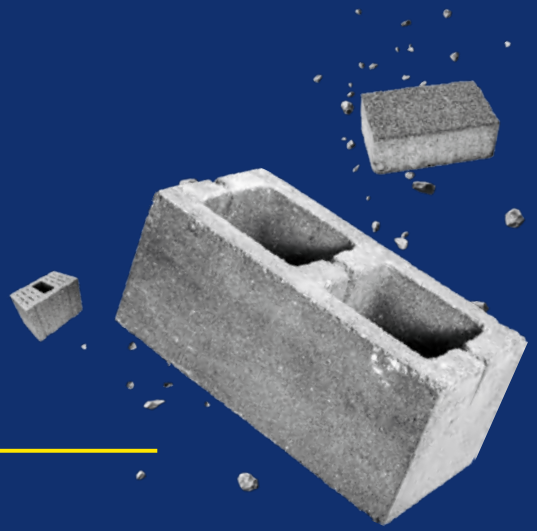

Concrete Block Production

It‘s the filling that counts.

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Introduction

When Masa engineers designed their block and paver making machines, especially the XL and XL-R series, they did so with the goal in mind of providing the concrete products manufacturer with a very versatile machine in terms of application possibilities and performance.

As a result, even in the standard version, Masa universal machines can produce the entire range of high-quality concrete products with standard heights ranging from 40 to 500 mm such as interlocking pavers, segmental retaining walls, kerbstones, patio slabs, concrete masonry units, and garden/landscape products.

Of course, Masa is always looking at market-specific industry product trends, and takes these changes into account when developing further features to their block and paver making machines, especially to the filling box.

With its equipment options and customised solutions available for the universal machine, Masa offers a wide range of possibilities for manufacturing products with special requirements.

Both the filling of the filling box and of the mould and the compaction process itself must be carried out optimally to consistently obtain concrete products that meet or exceed the specific quality requirements.

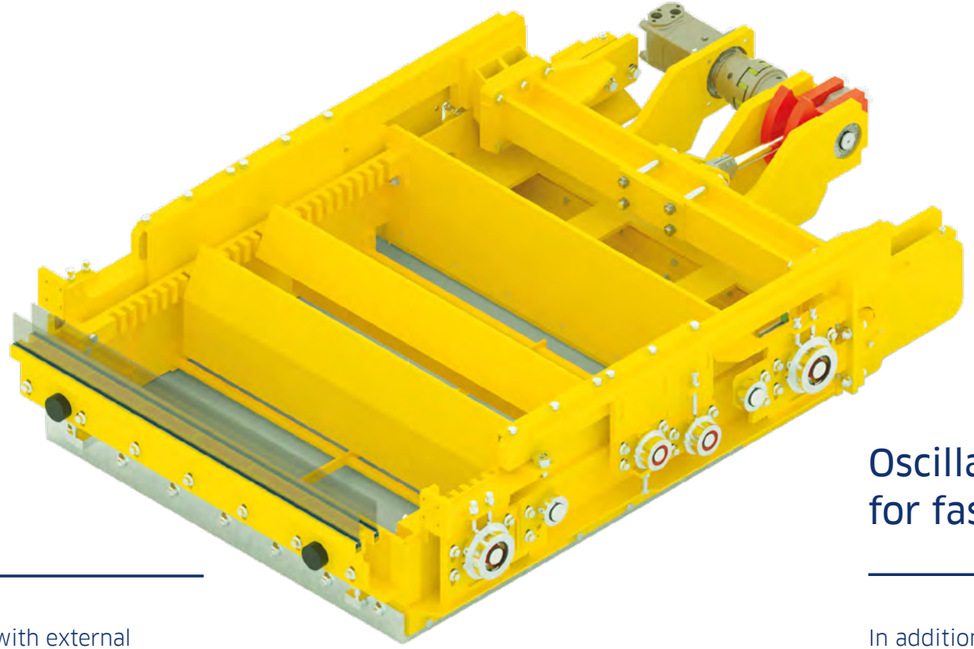
The resulting challenges and possible solutions are explained in more detail using four exemplary product groups:

- Thin-walled wall building materials
- Large-volume concrete products
- Large-format concrete products and slabs
- Pavers with and without chamfer

Thin-walled wall building materials

With the right portioning into the smallest corner

Hollow core masonry units and other products with thin walls present a real challenge in terms of filling the mould. The concrete must be evenly distributed across the production board and, above all, into the narrow faceshells and webs.



Optimised filling box

Masa engineers developed a filling box with external oscillating grate guides that significantly optimises the filling process.

Compared to internal oscillating grate guides, the current design ensures a much more even distribution of the concrete in the filling box and thus an absolutely repeatable, homogeneous filling of the entire mould, which is particularly noticeable in the outer filling areas.

Oscillating grate with eccentric drive for fast homogeneous fill

In addition, an optionally available oscillating grate variant (for XL and XL-R model series) ensures a faster oscillating movement of the oscillating grate for thin-walled wall materials. The drive is provided by a hydraulic motor whose rotary movement is converted into a linear movement by an eccentric drive in conjunction with a push rod.

The variable speed of the hydraulic motor is controlled via a proportional valve, so that recipe-based, individual setting options can be used for each product. In contrast to a conventional oscillating grate driven by hydraulic cylinders, the hydraulic motor does not have to change the direction of rotation during operation, there are also no pressure peaks when switching over.

The movement of the oscillating grate in the end positions is thus much smoother. In combination with an oscillating grate adapted to the mould, this version produces a movement of the concrete in the filling box that is optimally matched to the mould.

The filling is much more homogeneous, the filling time of the mould is reduced by up to 20% provided that the filling box has been filled optimally beforehand).

And, Masa engineers designed the oscillating grate insert to be replaced quickly.

Supporting Features

- Circumferential concrete scraper

  This component runs without gaps around the inner part of the filling box and is pretensioned by spring pressure (adjustable). This reduces concrete residues on the mould and the filling box table during the filling process.

- Servo vibration

  The Masa servo vibration offers a wide range of possibilities for infinitely variable adjustment of frequency and vibration force as standard, so that the concrete flow and the intrinsic vibration behavior of the mould can be optimally matched to each other.

- Mould pre-lifting cylinders

  To achieve an increased breakaway torque during the demoulding process of a product with many hollow chambers (cores), additional mould pre-lifting cylinders can be used to support the main cylinders in the first high-force phase of lifting.

Large-volume concrete products

Uniformly high compaction of large masses

When producing large volume concrete products, currently a popular choice in the European markets for example, in certain circumstances the filling box may not stock enough concrete to fill the mould completely in one filling operation. In this cases, Masa will fill the filling box and mould twice during the production cycle. Therefore, it is essential to ensure a high level of repeatability in the vibration. The key parameters for this are exact vertical vibration and precise control of the filling processes.

Accurate vertical vibration

A harmonious and evenly distributed amplitude over the vibration table is important both for an even filling of the mould and for the subsequent compaction of the concrete. This is because uneven vibration causes the mould to be filled with more or less material in certain areas, depending on the amplitude of the generated vibration. In addition, the concrete tends to migrate if the vibration is stronger in one area, similar to a vibrating trough.

Influencing factors

Significant factors influencing the amplitude are:

- Mass of the vibration table
- Mass of the mould
- Mass of the concrete

Spring constant of the vibrating elements (rubber buffers). The spring constant describes the ratio of the force acting on the spring to the resulting deflection of the spring.

The symmetrical and torsionally rigid design of the proven, onepiece vibration table results in an even distribution of mass and an even input of impact energy when the impact bars bounce against the production board.

The quality and condition of the vibrating elements are extremely important. As part of Masa's quality management, this quality is therefore checked at the beginning, which enables a harmonious amplitude to be achieved in the end.

Regular inspection of the vibrating elements is essential to detect deviations from the standard values or damage at an early stage. With the timely replacement of vibrating elements that no longer comply with the standards, the system operator can avoid uneven vibration and maintain quality products.

The Masa vibration analysis can be optionally installed on the machine for this purpose and thus supports the plant operator in quality control functions.

Exact angular synchronisation (servo vibration) or exact mechanical adjustment of the vibrator weights (frequency-controlled vibration) is important to avoid horizontal force components of the vibration. Only vertical vibration forces are desired that ensure an exact up and down swing of the vibration table.

Variable sequence programmes for repeatable filling

The Masa control system offers with different electrical programs a wide variety of sequence programs for the filling of moulds with large filling contents. Some features of the programs are:

- Moving the filling box with open silo flap (maximum amount of concrete in the filling box)
- Filling the filling box twice to fill even larger quantities of concrete into the mould

The filling process can be optimised through a variety of adjustment options.

Filling box

Another challenge in the production of large-volume concrete products is the uniform filling of the mould with concrete.

Here, the current filling box with the external oscillating grate guides offers the advantages already described.

Large-format concrete products and slabs

Fine-tuning with the right tools

Especially in the production of large-format concrete products and slabs, several quality-determining aspects come into play. The market increasingly demands uniformly closed surfaces with high raw densities and strengths. To meet these requirements, it is very important to ensure high-quality aggregates and optimal production conditions for large-format products.

Scraper on the filling box for a clean and homogeneous surface

Due to the process, a small amount of excess concrete remains on the table plates of the filling box table or on the rim of the lower part of the mould after each production cycle.

This is pushed back into the mould during the next filling box movement. Today's sophisticated color blending processes require increased care to avoid contamination between filling boxes.

To achieve a particularly clean and homogeneous surface and to avoid contamination of the face mix concrete by main mix concrete residues, the pneumatically driven scraper is a reliable machine feature then.

The 'Smoothing roller' and 'Dosing slide' tools, which are optionally available for the face mix filling box, offer various possibilities to change or optimise the product in nuances.

Since a certain fine-tuning is indispensable with both components until marketable products can be produced, Masa is ready to support the concrete product manufacturer's willingness to experiment on site.

Ultimately, both components open the opportunity for the concrete product manufacturer to develop and realise innovative ideas.

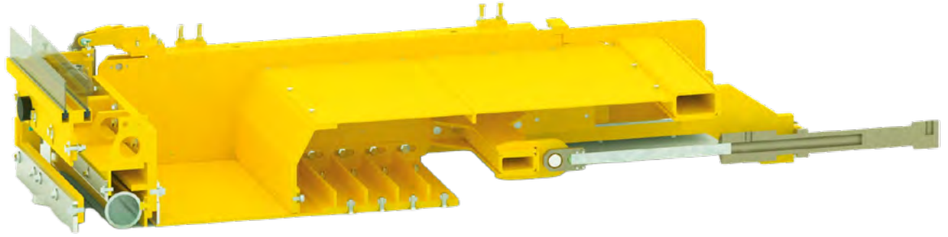
Smoothing roller for a smooth, closed surface

The stainless-steel smoothing roller, driven by a hydraulic motor, can (always depending on the quality of the concrete) with appropriate fine adjustment be a tool that optimises the surface of the product. During the backward movement of the face mix filling box, the smoothing roller rolls the concrete into the lower part of the mould, creating a smooth, evenly closed surface.

The rotation speed of the smoothing roller is adjustable via a proportional valve, so that the rolling speed can always be adapted to the filling box speed, optimising the smoothing result.

Practical: Due to the modular design of the Masa filling box, the smoothing roller simply replaces the standard filling box front wall.

Depending on the concrete product manufacturer's production planning, it may well make sense to replace the smoothing roller unit with the standard filling box front wall. The mechanical conversion is not quite plug & play, but Masa has created a convenient solution for the connection to the hydraulics by using quick couplings.



Dosing slide for an even face mix layer

The dosing slide in the bottom of the face mix filling box, driven by hydraulic cylinders, keeps the concrete chamber closed downwards during the forward movement of the filling box. Only during the backward movement does the dosing slide open to fill the mould.

The filling process can generally be carried out more evenly with this component, and the thickness of the face mix layer becomes more uniform.

The dosing slide also reduces the risk of re-mixing of the concrete in the mould, which is a given with the movements of a conventional filling box.

Especially with multi-coloured product surfaces, this minimises the risk of undesired colour smears and increases the reproducibility of the product patterns.

Oscillating grate for even filling

The filling box oscillating grate can work exactly parallel above the mould due to the external guides. The filling area has no interfering retaining plates or other interfering edges. Therefore, the concrete is filled very evenly into the mould.

Even distribution and harmonious vibration, even under load, are of utmost importance with these products, as any irregularity is immediately noticeable with large-format slabs.

Individually adjustable servo vibration for the most possible harmony

In addition to the general advantages of Masa vibration already described (both servo-controlled and frequency-controlled) and the special focus on the vibrating elements, Masa sees a further advantage in servo vibration for the manufacturing of large-format products:

In servo vibration, the drive of the four vibration motors of the vibration unit is carried out in each case via cardan shaft with servo motor. The servo motors are synchronised via an axis control.

By changing the phase position within a pair of vibrators (two vibrators each with opposite directions of rotation), vertical vibrations of different strengths can be generated at constant speed.

By means of this technique, the vibration force can be adjusted independently of the speed during the production cycle.

The vibration can thus be optimised depending on the product, so that a uniform vibration input into the production board and into the product is ensured, and thus optimum filling and compaction is achieved.

Dosing belt for variable and first-class filling

The dosing belt, which is optionally available for the XL and XL-R series, opens a multitude of possibilities. For Masa, from a technical point of view, the dosing belt represents the machine concept that gives the plant operator the most flexibility in filling the filling box and thus offers many adjustment possibilities with regard to product requirements. The higher the demand for product quality, the more a high-end solution is needed.

In terms of reaction time, the dosing belt has clear advantages over the classic silo flap. The dosing belt is faster to shut off. The dosing belt is frequency-controlled and can thus be infinitely adjusted in speed. The various adjustment options for the belt speed allow variable fine metering.

The dosing process can be carried out with much more repeatability overall, even with short cycle times. As a result, this means a very high reproducibility regarding colour blending, a decisive quality feature for the end customers.

Concrete can be dosed while the filling box is stationary, or while the filling box is in motion. The aim in this case is to distribute the concrete evenly from front to back in the filling box. The required, uniform concrete height can be very well influenced and set precisely by the combination of filling box speed, dosing belt speed, and the dimensions of the silo outlet.

With these parameters accordingly, it is possible to distribute small quantities of concrete evenly in the filling box. A standardised tool addition in combination with the dosing belt is the laser level measurement in the filling box.

Pavers with and without chamfer

Even demoulding must be mastered

For pavers, it is also important to take into account the machine parameters and requirements already mentioned for the other products.Pavers with sharp, highly sensitive edges require special handling.

Uniform demoulding process

The demoulding process must be extremely uniform. Depending on the machine type, the fine tuning between the lower and upper mould parts is ensured by the mechanics (XL series) or servo-hydraulics (XL-R series).

The exact interaction during the product release and the subsequent demoulding process is particularly important here in order to achieve the corresponding product quality.

Depending on the characteristics of the paver edges, further cleaning systems such as a rotating compacting head cleaning brush, installed on the filling box, or a cross-cleaning device can ensure the cleanliness of the tamper head shoes.

With the higher quality demands on the concrete products, the more sensitivity and sophistication is required.

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Milestone to your success.

Just ask our concrete heads for individual advice on the perfect mould filling for your concrete block production!

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