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Automatic, non-contact quality control in concrete block and paver production

Concrete block, paver and slab production places the highest demands on quality control in order to fulfil the constantly growing market requirements. The Hess Inline QC, a system for automatic, non-contact quality control on the production line, offers an innovative solution. This minimises the time required for manual inspection, while ensuring very high accuracy in real-time defect detection.

Function: Automatic quality control in real-time

Inline QC offers automatic quality control on the wet side of the production line. Each production batch undergoes a comprehensive surface inspection to ensure that the concrete blocks, pavers and slabs meet the highest quality standards. The height measurement with color indication ensures intuitive recognition of product quality through objective evaluation.

The freshly produced concrete blocks, pavers and slabs are tested on the wet side immediately after production on the production line using various individually adjustable parameters. Ongoing concrete block, paver and slab production is not interrupted, but continues without delay or stopping the conveyor line. The measurement is carried out using appropriate hardware such as a 3D scanner and a high-resolution color camera. The most important quality parameters are analysed.

Products are measured geometrically. In combination with a weighing station, it is possible to determine the density as well as the height and volume. Defects, colors and grains on the paver and slab surface are precisely recorded and analysed with the help of AI. These Inline QC evaluations are seamlessly integrated into the machine's visualisation and production statistics. The following parameters are analysed



Inline QC - prototype of the camera system on the wet side



Inspection of the blocks using the Inline QC on the dry side

and displayed: heights, weights and densities where applicable, colors, defect rates, surface structures and image representations. With the help of these statistical evaluations, the production processes can be fully analysed and optimised.

The Inline QC also offers a high degree of customisability. It can display 1, 3 or 5 height averages per block and customise the display to provide a recommendation for block sorting on the dry side.



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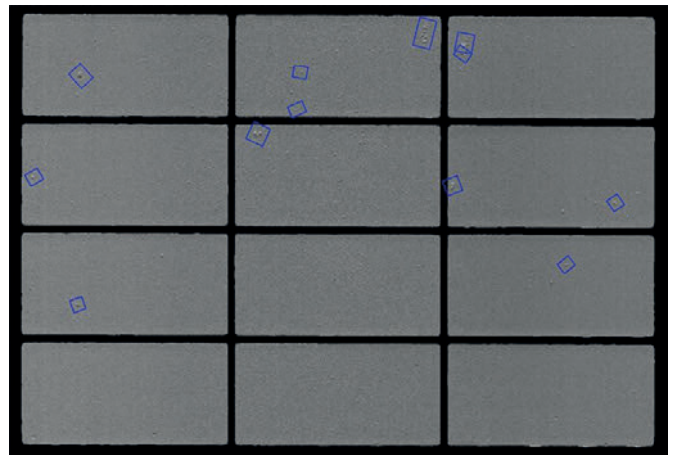
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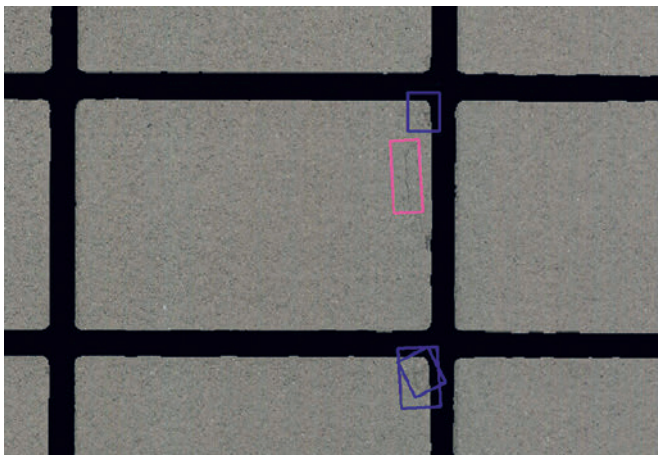
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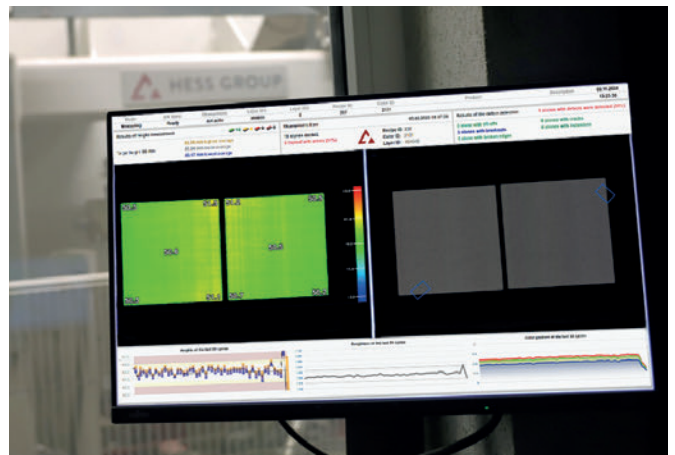
The color indication in the relief can be used to quickly and easily determine the different heights over a measured layer of product.



The minimum sizes for defects can be customised for specific products.



Error marking in pink (crack) and blue (break-out)



Visualisation of the Inline QC within the control cabin

Pilot project: Testing during production

An Inline QC prototype was used in a pilot project to test the system as close to production as possible. Over the past months, extensive validation has taken place under real production conditions, with continuous improvements being made. The prototype has now successfully passed all tests in the production environment.

Performance features of the Inline QC

The Inline QC performs a precise height measurement over the entire product layer and can detect height differences with an accuracy of 0.5 mm. These measurements are suitable for product heights from 25 mm to 500 mm.

The color indication in the relief can be used to quickly and easily determine the different heights over a measured layer of product.

Defects are detected from an area of 1 mm², while lift-offs and cracks are detected from a height difference or a width

of 0.5 mm. In addition, Inline QC can distinguish between surface pollution and actual defects, achieving an impressive defect detection ratio of 99%, according to the manufacturer.

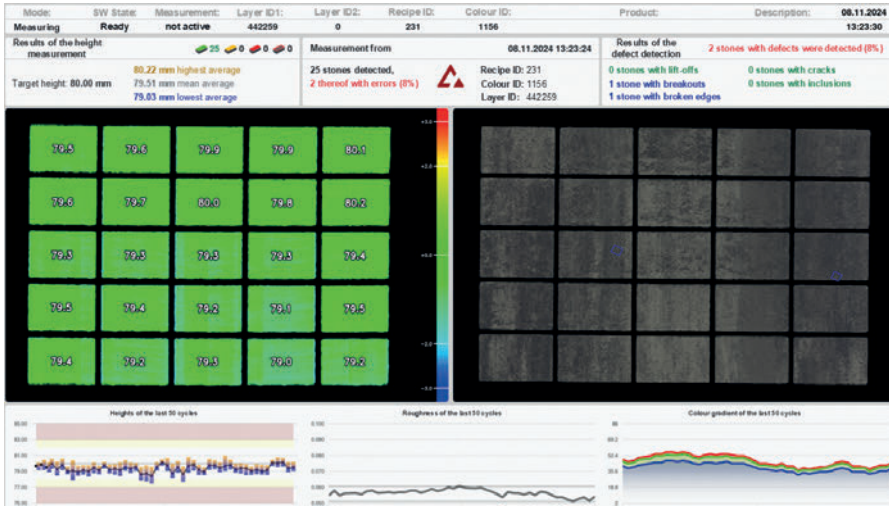
Using a high-resolution gradient display, even defects on the product's surface can be detected that are otherwise difficult to recognise.

The minimum sizes for defects can be customised for specific products so that a wide range of quality requirements can be taken into account. Tolerances are entered directly into the plant control.

When defects are determined, a color distinction is made between break-outs (blue), lift-offs (yellow) and cracks (pink) to differentiate between the causes.

Optimisation of production processes

The Inline QC optimises quality control in concrete block, paver and slab production thanks to its precise automatic



User interface of the Inline QC

defect detection and real-time monitoring. The system enables early detection of deviations and defects, helping to improve concrete block, paver and slab production efficiently.

In addition to an additional view page on the machine control panel, a further screen is provided so that the most important information can be seen at a glance. Immediately after the concrete products have been produced on the wet side, the plant operator receives precise information on the defects. This offers the advantage of immediate adjustments to machine parameters, mixing recipes or raw materials used. Direct integration into the intuitive visualisation of the Hess Group means that the system can be operated in a familiar look and feel without the need of getting used to a new third-party system. Trends and leaps in the production process are quickly identified with easy-to-read diagrams.

Production statistics allow identifying correlations based on recorded parameters and associated scans. This minimises waste, improves production processes and ensures consistently high quality.



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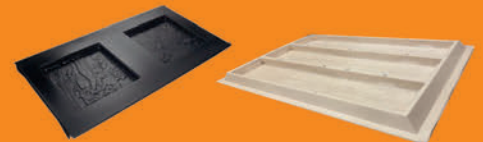
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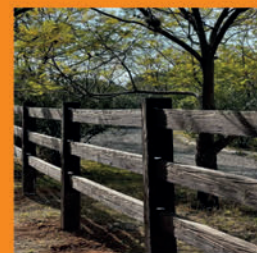
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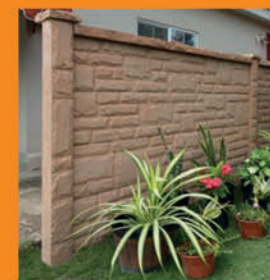
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