

When quality alone is decisive

IPF cameras seamlessly check packaging labeling

Knauf, a leading manufacturer of building materials and building systems, has recently started using image processing from IPF in several plants in order to check the quality of packaging markings without any gaps - with consistently positive results.

One of these plants is located in Lauterhofen, around 50 kilometers east of Nuremberg.

"We produce several thousand tons of lime-cement plaster every month. And every single bag of finished product is labeled on the two production lines for the base and finishing plaster," explains Josef Geitner, operations manager at the Lauterhofen plant. The labeling is done on the respective conveyor belts of the two production lines with a printer that applies the labeling to the packaging using inkjet heads. This amounts to around 1,500 bags per hour per production line.



An average of 1,500 sacks per hour per production line are certified by the camera sensors (one device in the foreground).
Knauf Gips KG, Lauterhofen plant)

(Image:

Failures prevent a safe process

At the connection, the labeling is certified to ensure that it is complete and, above all, legible. "This is not about whether the information is correct, as this is already checked before printing, but solely about the print quality," emphasizes Thomas Schötz, master electrician and head of maintenance in Lauterhofen.

In the early days, this was still done with a visual inspection by employees, whereby the two conveyor belts had to be stopped regularly for this purpose.

Around three years ago, the inspection of the print quality on the packaging was then automated using two camera sensors. One of the reasons for this was the labelling requirement with the so-called UFI code (Unique Form Identifier) in accordance with the EU regulation on the complete traceability of chemical products, CLP (Classification, Labeling and Packaging).

However, the two devices failed to meet expectations, as Thomas Schötz reports: "The cameras stopped functioning several times a day. As the cause could not be reproduced, we had to restart the devices more frequently, which was quite annoying and nerve-wracking. It was therefore not possible to guarantee a secure process flow with consistently reliable inspection of the print quality in the long term."



The three-line marking on the packaging includes the UFI code, the abbreviation of the Lauterhofen plant (LA), the production date and the time. (Image: Knauf Gips KG, Lauterhofen plant)

Lots of flexibility with variable solutions

As IPF was already in contact at the time, the company's application specialist, Christian Büttner, was consulted. He ultimately recommended an industrial camera from the **OC53**. It consists of variable camera sensors in various versions, from compact devices with lens, image sensor and illumination to highly flexible solutions with C-mount lens connection and integrated flash controller for illumination control. The cameras are supplemented with free, powerful parameterization software, which offers a very wide range of graduated feature checks so that the devices can be used in a variety of applications with very different tasks.



The OC53-series consists of variable camera sensors in various versions, from compact devices (left) to highly flexible solutions with C-mount lens connection and integrated flash controller. (Image: ipf electronic)

From high-precision to easy to operate

Naturally, the Operations Manager and Maintenance Manager at Knauf had very precise expectations of the new solution based on previous experience. Josef Geitner explains: "The devices had to enable reliable, error-free recording of the print on the packaging with high reading accuracy. In addition, the solutions had to integrate seamlessly into the two production lines for the base and finishing plaster and communicate easily with the systems' control (units). We also wanted simple operation so that we could make settings and optimizations ourselves. And the demanding operating conditions also had to be taken into account, i.e. a relatively dusty environment with comparatively high temperatures in summer and low temperatures in the winter months."

Compact camera plus industrial light

As a first step, a test system was installed on the production line for the finishing plaster in fall 2024, more precisely a compact camera of the type **OC539E24** with an integrated lens and a robust LED industrial light from the **EM51** from IPF to rule out poor lighting conditions or ambient light from the outset when evaluating the print quality. The camera, which is installed directly behind the printer and connected to the PLC (programmable logic controller), is triggered via a light barrier that detects the individual packages as soon as they are within the detection range of the camera lens.



A compact camera from the **OC53** directly behind the printer seamlessly checks the quality of the labeling on the packaging with finished products. (Pictures: ipf electronic)

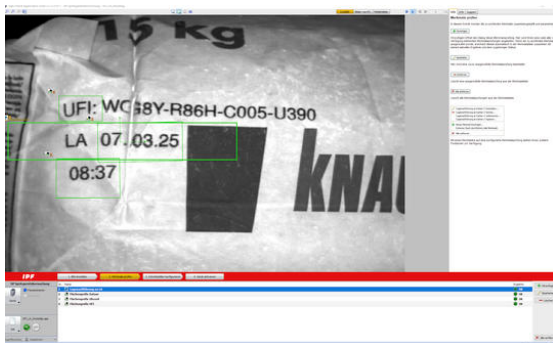


A second camera, also with an industrial light from the **EM51** from IPF, is located on the production line for the basic plaster.

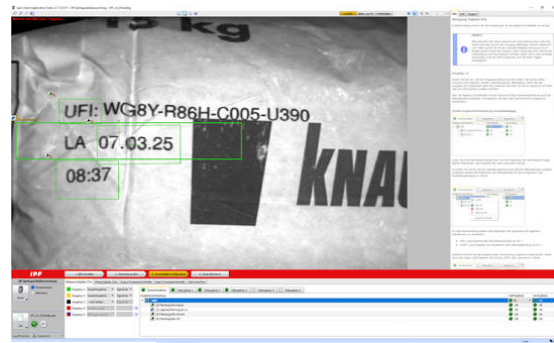
Evaluation based on one feature check

For the self-test, there is basically only one feature to check, namely the quality of the imprint. The position of the three-line imprint in the camera image varies depending on the production process. In order to be independent here, the "part location" software function is used. By teaching this function, the camera software automatically tracks the three relevant inspection areas to ensure that the relevant imprint is fully captured during the inspection. This has the decisive advantage that only the really important inspection areas of an object can be selected, whereby other, possibly disturbing influences on the object surface are specifically ignored during the inspection.

In connection, the print quality is monitored using the "Area size" feature check, whose "sensitivity" is set to the gray values of the imprints. Finally, the reference value for the number of pixels that must be present on the previously defined test areas for the print to be assessed as complete and legible is defined in the area function via teach-in.



The "part location" feature ensures that the relevant part of the imprint is fully recorded during the inspection. (Pictures: Knauf Gips KG, Lauterhofen plant)



The print quality is monitored using the "Area size" feature check, whose "sensitivity" is set to the gray values of the imprints. This checks whether the previously defined number of pixels is present so that the print is assessed as complete and legible.

Seamless automated testing

As the tests with different packaging on the top coat line were extremely successful, two cameras were installed at the beginning of 2025, one in place of the test system and another on the production line for the base coat.

"If the imprints of at least three consecutive packs on one of the two production lines are assessed as NOK, the conveyor belt stops via a PLC (programmable logic controller) signal with an additional acoustic alarm. The system operator can then check the bags in question again and decide, for example, whether the print is still legible or whether the printer has too little ink or the print heads need to be cleaned," explains Josef Geitner.

For documentation purposes, the images of the bags classified as faulty are stored in the internal camera memory and the oldest ones are deleted after more than 38 images. "We use the images to check the legibility of the imprints again afterwards so that we can adjust the camera's software parameters if necessary if we believe the print quality is still acceptable. The software is so easy to use that even our shift supervisors can make minor changes without any problems," says Thomas Schötz.

In the meantime, a total of 12 camera systems have been ordered for installation in other Knauf plants. In one of these plants, there was a desire not only to assess the quality of the print on the sacks, but also to check the inscription itself using the OCR function of the camera sensors. "A camera has been installed in a plant where certification is carried out at even higher process speeds. And here, too, they are extremely satisfied with the reliability of the system," concludes Josef Geitner.