

ALWAYS KEEP THE OVERVIEW

COLOR SENSOR MONITORS AUTOMATED FILLING PROCESS

Flour is not an easy product to handle, especially when a suitable sensor solution is required to monitor the automated filling process into paper bags in extremely dusty and explosive environments.

In a wheat and rye mill in Saarland, Germany, flour sacks, among other things, are filled automatically. The filling process must be absolutely reliable to ensure that no flour is discharged into the machinery and plant technology in the immediate vicinity. For this reason, a sensor solution shall monitor the process and ensure that the paper bag with a capacity of 50 kilograms is completely drawn over a filling spout. In this extremely dusty environment at a distance of 280mm, the sensor system must not only distinguish very reliably between the filling spout and the slipped-on paper bag, but must also be suitable for use in a potentially explosive atmosphere.

„GOOD VISIBILITY“ DUE TO SPECIAL OPTICAL ATTACHMENT

For this special application, the application specialists at ipf electronic recommended a color sensor of the **OF65** series, more precisely the **OF650180**, with a fiber optic cable connection and special attachment optics. In order to achieve the highest possible illuminance at the required working distance, a so-called XXL lens in the M34 design was used instead of a standard zoom lens, which makes it possible to focus the projection of the light spot on the filling spout very strongly.

INTELLIGENT SOFTWARE MASTERS SPECIAL CHALLENGES

Since the individual paper bags vary greatly in color and gloss level, a teaching of all possible bag types was beyond question. Instead, it was decided to query the metallic filling spout. This means that if this is detected by the color sensor used, there is no paper bag above the spout. Decisive for the release of the filling process is therefore the signal change between „teach-in filling spout detected“ and „undefined condition“ (bag present).

However, the varying flour deposits on the filling spout after each filling process posed a particular challenge for the project planners at ipf electronic. Due to these varying deposits, the color sensor repeatedly received different color and intensity values during detection, so that it was not possible to work with constant parameterization. The problem could be solved by the choice of the optical system, and above all by a software that was specially developed by ipf electronic for the parameterization of the color sensors.

COLOR SENSOR ALWAYS „LEARNS“

For this purpose, after each filling process, the current color and intensity values of the nozzle are always re-taught to the input of the sensor via a corresponding teach signal from the system's higher-level PLC. At the same time, the exposure settings are optimized, with the corresponding values being stored in the RAM of the color sensor.

Depending on the color and reflective properties of an object to be detected, the OF65 series sensors allow the setting of different operating modes for the emitting light source. In this application, the operating mode „Pulse“ was selected, in which the emitting LED of the color sensor is briefly supplied (pulsed) with up to three times the nominal current in order to obtain a usable reception signal from the filling spout with regard to the required sensing distance of 280mm and the flour deposits already described.

RELIABLE DETECTION VIA INTENSITY VALUES

In order to clearly distinguish the filling spout from a bag that has been put over it, the XY INT- 3D evaluation mode, which is particularly sensitive to changes in intensity, was also selected. A further decisive property of the „True-Color“ sensors from ipf electronic in this context is that they are not only able to recognize colors „like a human being“, but are also able to evaluate their brightness and thus their degree of gloss via the additional evaluation of the intensity value.

Due to the differences in gloss between the bag surfaces and the shiny spout, the intensity values change to a greater extent than the color values. Since the amount of light reflected from an object surface is relevant in the XY INT- 3D evaluation mode, the sensor reacts very sensitively to changes in gloss intensity, so that the filling spout can always be reliably differentiated from the bag surface. Nevertheless, the coordinates „X“ and „Y“ in the mode designation show that a color evaluation is carried out in addition to the intensity in order to enable a reliable signal change when a bag is above the spout for filling.

HIGHLY AUTOMATED, RELIABLE FILLING PROCESS

Around 250 flour sacks are filled fully automatically every hour in the rye and wheat mill. The intelligent sensor solution from ipf electronic always keeps a „clear view“ and enables a very reliable filling process, which ensures that there is always a flour sack above the filling spout during filling. The problem of contamination of the immediate vicinity of the plant due to the unintentional ejection of flour is thus a thing of the past.



ipf electronic_Farbsensor_Weizen_Roggen-Mühle_001.jpg:
The paper bags are automatically filled through a spout on which flour is deposited. These varying flour deposits posed a particular challenge during the development of the sensor solution.



ipf electronic_Farbsensor_Weizen_Roggen-Mühle_002.jpg:
To achieve the highest possible illuminance at the required working distance of 280mm, a so-called XXL lens in the M34 design was used instead of a standard zoom lens.



ipf electronic_Farbsensor_Weizen_Roggen-Mühle_003.jpg:
Front side of the **OF650180** color sensor with a blow-off device to remove flour dust from the optics.



ipf electronic_Farbsensor_Weizen_Roggen-Mühle_004.jpg:
Rear view of the application: An opening was created on a side wall of the automated filling line for the color sensor.