

Automatic Separation of Plastic Pellets with ROC-GranuControl

During the production and handling of plastic pellets, faulty particles cannot always be prevented from getting mixed up with the product, even when great care is taken to avoid this situation.

Color mix-up occurs when product is changed and not all particles of the previously processed product could be removed from the processing equipment.

Particles may be deformed by deposits or wear occurring in the production equipment.

Foreign matter, such as wood, paper, textile fibre as well as particles of processing equipment, tools, and clothes can not entirely be prevented from contaminating the product.

The above faults are the cause for spoilage and the involved high clean-up costs. These contaminations can be prevented by separating the pellets on the basis of a color and shape analysis of the product.



For automatic separation, the pellets are deposited on a conveyor belt in one layer. The conveying speed is approx. 3 to 5 m/sec. As the pellets are being discharged from the belt, they perform a parabolic trajectory.

While the pellets are airborne, a color sensitive camera takes a picture. The particles are airborne for approx. 70 ms. A rail equipped with nozzles is located approx. 20 cm behind the camera's line of sight. The distance between the individual nozzles is approx. 2.6 mm and the number of nozzles is variable.

An image evaluation computer recognizes faulty objects in the mass flow. The nozzles are accurately timed and positioned by the computer so that the faulty pellets are blown off along with only a few good pellets.



This separation procedure is based on the classification of individual particles in the mass flow according to color and shape. A color classifier serves to identify the color. Based on a decision table, this classifier determines for each image dot whether this dot's color is to be rejected or accepted. The decision tables are automatically memorized when the process starts.

The result of the color classification is a binary image in which all dots are marked whose colors do not or rarely occur in the required pellets. In the next step, the image is modified to measure and classify the remaining objects.



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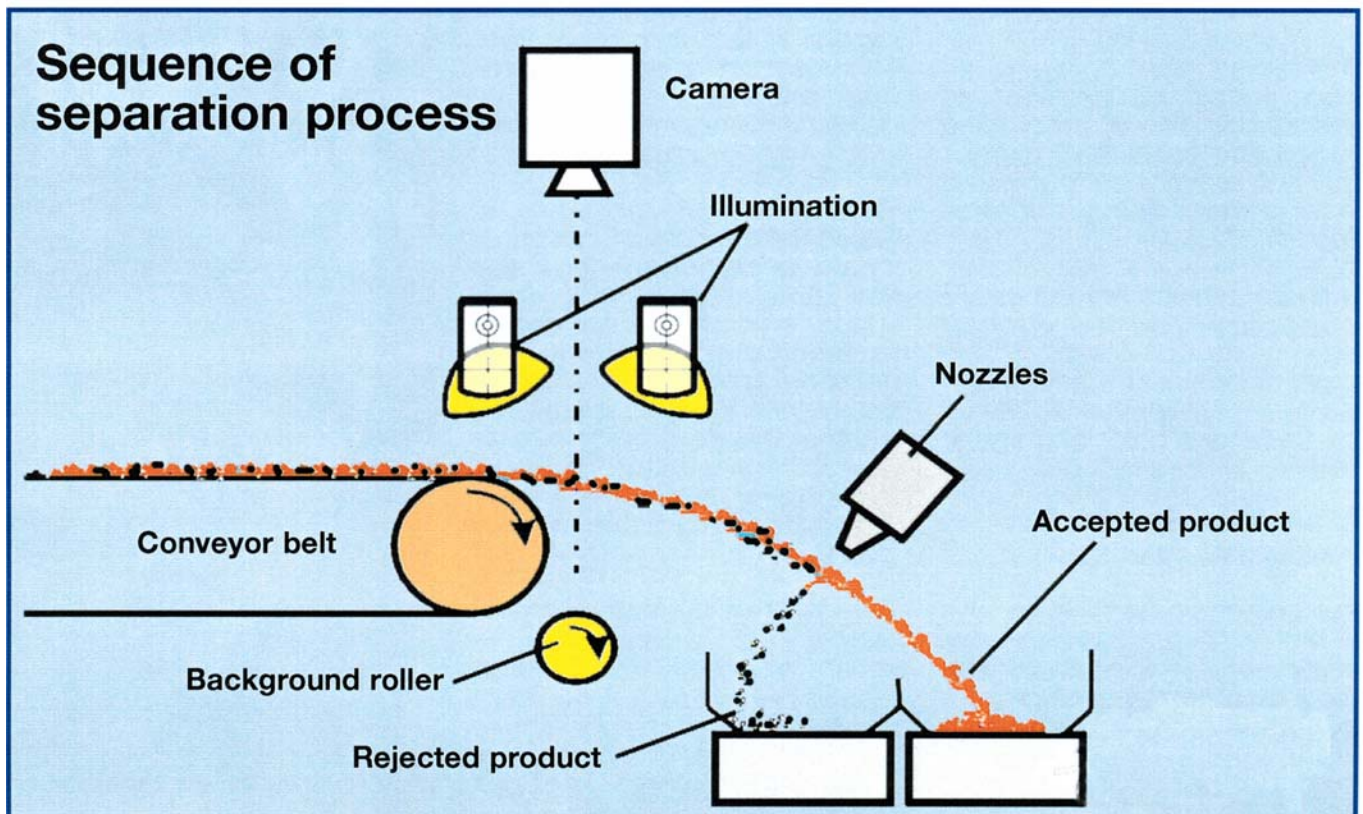
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Parallel to the color recognition process steps, the shape of the right colored pellets can be checked. To check the shape, the first step in the process is to remove all measured objects from the background. By means of morphological operations, those particles of the measured objects are filtered out whose shape of the required pellets.

Technical data:

Sensor:	color sensitive camera with a 3 by 2048 pixel resolution
Illumination:	fluorescent tubes (standard)
Image evaluation:	PC under Windows NT with two special plug-in-cards for computer pre-processing of the images
Throughput:	3 by 20 million pixels/s
Separator:	nozzles including solenoid valves, distance between nozzles 2.6 mm
Memory function (operation of the system):	fully automated, no user interference required, even when product is changed



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