



Filter Coffee was Yesterday

USB and GigE camera based system checks coffee capsules

Whether in offices or single households, the time of filter coffee is over. Pre-portioned coffee in capsules is becoming increasingly popular. The main reason is its ease of use: Choose the coffee type, insert the capsule in the machine, push the button – and enjoy a cup of freshly brewed coffee right away. Another advantage is the broad variety of flavors: Besides classical Espresso and Café Crema as well as flavored and decaf coffees, other hot beverages like tea, hot chocolate and even bouillon are also available as capsules.

To make the quick cup of coffee a real treat, however, highest quality assurance standards have to be met during production. To achieve this objective, the largest Italian coffee producer uses filling stations, machine vision systems and cameras from three German specialists.

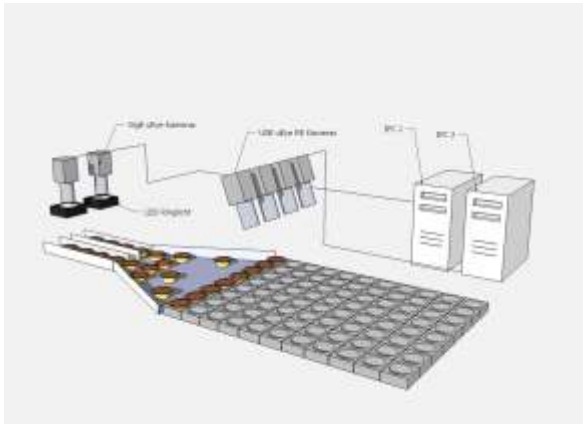
Optima Group Consumer is the global market leader for coffee capsule filling systems. Renowned for its expertise and experience, the German company supplies to major coffee producers worldwide. For a leading North Italian coffee roaster, for example, Optima delivers new packaging stations including a high-performance machine vision system. The complete vision system is provided by Seidenader Automation, another German company. The multi-camera application features two GigE and four USB cameras and is based on models from the uEye series of the German camera specialist IDS Imaging Development Systems.

To avoid wasting precious coffee, the empty plastic capsules are checked for frayed edges and deformations before the filling process. Any capsules damaged in transport have to be reliably detected and separated. That's the job of two uEye VGA cameras with GigE interface, which each monitor a conveyor belt. Together, they can inspect up to 500 capsules per minute. The UI-5220-M cameras are triggered by a light barrier and, in turn, control the incident light from an LED. As the industrial PC used for image processing is located relatively far away from the place of inspection, Seidenader Automation chose camera models with a GigE interface.

Supporting cable lengths up to 100 m, this high-speed interface allows a flexible positioning of the fast CMOS cameras. Within less than a tenth of a second, the Vision Master system detects defective capsules and separates them using compressed air.

Specially designed metal holders convey the capsules in rows of eight and feed them into the filling station. A portion has up to 10 g of coffee powder, depending on the coffee type. The accurate amount of coffee is carefully weighed and pressed into the capsule. The filled capsules are sealed under oxygen exclusion to keep the aromatic coffee fresh for a long time. It is therefore critical to ensure that the membrane seal is placed accurately and that there are no creases at the edges. In addition, the system has to check that the labeling is perfectly centered.

For these tasks, Seidenader Automation uses four USB monochrome cameras from IDS's RE series. uEye RE cameras have a very rugged, dust and water proof housing. Equipped with lockable cables and a protective lens tube for the sensitive lenses, the cameras meet the IP65/IP67 protection class. This ensures that no coffee dust from the filling station can enter the camera optics or electronics.



Layout

The UI-1540RE-M model has a CMOS sensor with 1.3 megapixel resolution and is used for imaging two coffee capsules at a time. At throughput rates just above one second, a quick analysis of the captured images is essential. The Image Expert image processing software from Seidenader uses operators from MVTec's powerful HALCON library to check the sealing at that speed. As a result, a row of eight capsules is inspected in only 600 ms. Capsules with a defective seal can be separated immediately, so that there is no scrap at the end of line. The fact that, according to Optima, competitors are still struggling with scrap rates in a two-digit percentage range underlines the superior performance of the integrated inspection system.

The system is supplied as a complete solution including filling and inspection unit, and increases both production output and quality. Particularly for a major internationally renowned coffee producer, the system has to be perfect in every detail. "This system features over 20 different detail solutions that competitors don't have. From the high-precision press to the exact positioning of the coffee capsules and the integrated vacuum sealing – all of these innovations guarantee highest product quality," says Michael Wittman of Optima Group Consumer. Regarding the choice of components, the head of sales Fritz Bernhardt confirms: "We knew from the outset that we would need strong partners to realize this project – and we have found them in IDS and MVTec."

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"A close eye on quality: Six cameras monitor the filling process"

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