

Summary

Company: Feintechnik GmbH
Country: Germany
Industry: Consumer goods / cosmetics
Product: In-Sight
Description: Visual inspection of razor blades

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Visual inspection of razor blades using In-Sight from Cognex**Tender skin on sharp blades**

It makes no difference - chins and legs both look attractive when smooth. The outcome may be designed to get under your skin, but the process to make skin soft enough to stroke absolutely must not! Quality blades from Feintechnik GmbH Eisfeld provide a shave as gentle as it is thorough. In collaboration with SmartVision GmbH, a new production facility for triple-bladed razor heads has been equipped with 10 In-Sight cameras to detect every potential defect - no mean feat at 1.3 to 1.5 million individual parts a day.

Under the inspecting eye of the In-Sight cameras, 13 individual parts are combined to form one blade unit at Feintechnik GmbH Eisfeld. Two plastic housing halves surround three blades, between which a total of eight so-called spacers provide distance and stability. The correct distance between the blades ensures maximum flushing of the blade unit to guarantee clean, thorough shaving.

But as in most mechanical production facilities, defects can occur in the individual parts for processing, even in the production of razor blades. In the cutting and stamping processes, tools are subjected to wear, in exceptional cases, plastic parts may deform in an undesired manner during cold-riveting and in extreme cases, fluctuating ambient temperatures may take production facilities to their tolerance limits. This made it all the more important for Feintechnik GmbH Eisfeld to identify potentially defective product parts during the production process itself. For it is precisely in the private label business that the company has a dual obligation, responsible for the satisfaction of both its direct customer and the customer's customer.

The best by some margin

The individual parts have to show whether they satisfy inspection criteria at three stations with two In-Sight cameras and one station with four such cameras. SmartVision GmbH (from Amberg), specialists in turnkey vision systems in electronics manufacturing and in the automotive and plastics industries, is responsible for image processing. Independent, intelligent In-Sight cameras from Cognex, renowned for their sturdiness and reliability, were used for this purpose.

The blade units are produced on a workpiece carrier which carries four units in pairs. The blade unit is manufactured in reverse sequence from top to bottom. Production starts with the so-called top cap, the top plastic cover which is introduced into the production process upside down. The top cap is designed so that all the subsequent components are anchored in four plastic rivet bolts plus additional registration devices.

In the first step, a pick-and-place solution inserts the 0.1 mm-thick top blade into the top cap. Four spacers punched out of coil are then placed on top of this. After the first production step is complete, each of the spacers is inspected by a separate In-Sight camera to ensure that all of them have been applied and that they are in the correct position.

A particular challenge for the vision specialists at SmartVision GmbH were the surface reflections and low contrast of the silver blades and spacers. Red LED illumination ensures good contrast, making the aluminium of the spacers appear much brighter than the steel of the blade. The In-Sight cameras from Cognex with their intelligent and flexible vision technology, which is also perfectly adaptable to the requirements of awkward inspection items, ensure clear inspection results and high quality, despite possible reflections. Other reasons for using the In-Sight cameras included the inspection program stored as a tabular calculation which is simple to compile and easy to adapt to modified production conditions, as well as PatMax technology from Cognex. PatMax allows patterns to be detected even if the reflective behaviour of the inspection items changes.

At the second production station, the next pick-and-place solution puts the central blade on the first line of spacers. Another four longer spacers are placed on top of this. As at the first inspection station, two In-Sight cameras check for the presence and position of components.

In the last production step, the bottom blade is put on and completed by the so-called guard bar, the bottom plastic cover. The unit is joined together by a cold-riveting process. This completes production of the blade unit, but at two further inspection stations, another six In-Sight cameras are waiting to identify potential defects. Two cameras initially check the cold-riveting. In exceptional cases, there may be uncontrolled cracking. Inspection criteria are the shape and roundness of the rivet. This is because the quality of the riveting guarantees the stability of the whole blade unit. Standard LED ring lamps with white light are used to achieve a good contrast here.

Gothic arch shapes accurately reflected

At the fourth inspection station, the four In-Sight cameras take care of the final quality inspection. The cameras detect the three blades as bright lines and can identify damage as dark interruptions. The blade itself is just 0.3 mm wide and ground to the so-called Gothic arch shape for optimum cutting results. This means that the incident light is reflected only within a very small angle. Moving the camera just a few centimetres is enough to render the blade invisible, no matter how sensitive the vision system. This is why each camera inspects just one blade unit. The four cameras are aligned so that the blades reflect brightly. The key factor here is less the illumination and more the angle position of the camera in relation to the blade unit. In addition, the entire blade unit is examined for the presence and completeness of the foam edge and the lubricating strip.

In order to guard against undesired reflections and to achieve optimum contrast, the experts at SmartVision GmbH used particularly high-quality illumination involving semi-transparent mirrors: this causes white light from a homogeneous light source behind a milky plastic disc to fall onto a semi-transparent mirror attached at an angle of 45°. This reflects the light onto the underside of the blade unit and back to the relevant In-Sight camera through the semi-transparent mirror. Although only a quarter of the initial quantity of light then falls on the camera downstream of the mirror arrangement, this is enough for the highly sensitive sensor system of the In-Sight.

The member of staff responsible for the line can access the camera images of the inspected parts on a flat screen at any time. Images of defects are stored and can be used to evaluate the current production process.

The parts are only released for further processing once all the parts of the blade unit have been fully inspected and found to be OK. The line rejects defective products, because safety comes first for gentle shaving with sharp blades.

About Cognex

COGNEX designs, develops, produces and sells machine-based vision systems and computers which allow machines to see "intelligently". Cognex is the world's leading supplier of machine-based vision systems, with over 400,000 vision systems already supplied, corresponding to a cumulative turnover of over 2 billion USD since the company was founded in 1981. The Modular Vision Systems Division of Cognex is based in Natick, Massachusetts, and specialises in machine-based vision systems used in the automated production and quality assurance of individual parts. The Surface Inspection Systems Division headquartered in Alamenda, California, concentrates on the high-speed surface inspection of sheet product made of metal, paper and plastic. In addition to the headquarters in Natick, Massachusetts, there are other subsidiaries in North America, Japan, Europe and South-East Asia. The head office of Cognex Europe is in Rueil-Malmaison, near Paris. Further information can be found on our website at <http://www.cognex.com>.

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