Foto: Peugeot

GAP AND FLUSH MEASUREMENT AT A CAR MANUFACTURER

Seeing Deeper into the Gap

A car manufacturer had long been looking for a measurement system to gauge gaps and flushes in frame construction, painting and assembly. This measurement task is now performed by the visual measuring device from the NextSense company in Graz, Austria. This makes it possible to measure gaps and flushes in various phases of production in a user-independent and reproducible way.

For a long time, Magna Steyr (see side bar on page 98) had been looking for a measuring device for gauging gaps and flushes in automobile production. The measuring device was to be used for quality assurance in frame construction, painting and assembly.

The problem with the models on the market was mainly their high level of user-dependence.

"If the user did not put the device in the exact position, held it a bit crooked or pressed it a bit too firmly then it resulted in values that were not reproducible and thus not usable," says Günter Legel, manager of 3D measuring technology at Magna Steyr. That meant a technical solution had to be found that was able to gauge special contours in as user-independent a way as possible.

Since the painted vehicle can be damaged by mechanical procedures, only an optoelectronic measuring device could be considered. Günter Legel finally came across the Calipri-Gap measuring device from the NextSense company in Graz, Austria (see side bar on page 98): "What immediately persuaded us was the user-independence of the measurements, such as the error compensation when the sensor was held at an angle, for example. That wasn't available on the market at that time and still isn't today, as far as I know." Günter Legel and his team then formulated the requirements: the types of gaps to be measured and the best way to analyse these.

Gap contour from various perspectives

If one of Günter Legel's employees works with the measuring device, he hangs a tablet PC round his shoulder, attached to a strap. A cable runs from the computer to the sensor that he holds in his hand. The technician starts the computer and enters various data such as the vehicle number. After choosing the type of gap, he presses the start button, and the glow of a laser beam can be seen coming from the front of the sensor.

The technician passes the sensor round the gap at a distance of approximately 10 centimetres. A friendly female voice tells him if, for example, he's holding the sensor too far away from the gap. The angle of the measuring device to the surface is recognised by a patented process and the measurement results are corrected accordingly (pictures 1 and 2). The measurement takes about 5 seconds. A few seconds later the normal cut of the gap and other measurement values such as gap width and misalignment are displayed.

The movement of the sensor round the gap is necessary in order for the built-in laser camera system to record the gap contour from various perspectives. That enables the measurement system to see deeper into the gap, and also provides a complete profile of both sides of the gap for angles of more than 90 degrees.

The measurement device automatically evaluates the quality of the measurement data recorded and eliminates inap-

propriate data. That largely frees the measurement results from user influences and means that these are objective and reproducible. This is followed by intelligent calculation of the characteristics from the recorded measurement data. These are automatically segmented into external, angle radius and interior components according to the shape characteristics, and the gap and flush measurements are calculated on this basis. The user can determine whether he prefers the left or right side as reference here. A symmetric variant can also be chosen. The measurement direction for the gap width can likewise either be defined via the exterior surfaces or be taken parallel to one of the two interior surfaces.

Measurement results practically always identical

"There is only user influence if the measurements are not taken on the exact same spot. And of course the correct sequence must be observed. Then you have excellent reproducibility," says Legel with satisfaction. He says that the measurement results themselves are practically always identical. "Accessibility is only a bit restricted in the interior area in some places. We can't properly reach these even with pens or other methods," Legel describes the potential for improvement that he still sees in the measuring device.

The Calipri-Gap is utilised on vehicles from various manufacturers at Magna Steyr. Measurements are either taken in spot check fashion or, in the case of major analyses, a vehicle is followed through the whole production process. For example, the gap in a vehicle's engine bonnet is precisely analysed. It's examined how the bonnet is delivered after structural assembly, what happens in the paint shop and how the gap will look in the finished vehicle. That way it can be determined, for example, how the bonnet will change during the thermal process in the paint shop.

For vehicle manufacturers, the fact that the data are collected electronically and can subsequently be used further in their own analytical tools is one of the key criteria for a viable measuring device. Various formats such as XML or CSV can be used to export the data into downstream CAQ systems.

In response to the question of whether the purchase of the measuring device has been amortised, Günter Legel says, "Most definitely. We bought a second device

Picture 1. The angle of the measuring device to the surface is recognised and the measurement results corrected accordingly. No precise orientation of the hand sensor is necessary for the measurement.

Picture 2. The gap measurements are taken throughout the entire production process, from the structural phase to painting and assembly.

Photos: NextSense

The User

A brand-independent global leader, Magna Steyr is a development and production partner for car manufacturers. With flexible development and production strategies, the company offers OEM's solutions for a wide range of services: from component units such as door modules and roof systems to entire vehicles, from extra small batch production to peak shaving to volume production. Magna Steyr has more than 8,800 employees worldwide, in 36 locations in Austria, Germany, France, Italy, Hungary, Poland, the USA, Mexico, Russia, China, India, Japan and Korea (as of November 2010).

The Manufacturer

NextSense is a high-tech start-up that provides solutions for measurement and test engineering in the growing optoelectronic sensors market. The company develops, produces and markets mobile, laser-based profile measuring devices as well as individual system solutions for users from various sectors. In addition to renowned automotive companies such as Daimler, VW and Magnetto, the clientele also includes rail and steel companies. The ISO 9001:2008-certified company is a spin-off of an Austrian research firm and currently employs 15 people at its Graz location. The company won the NoAE Innovation Competition in 2010 in the field of efficient and flexible production.

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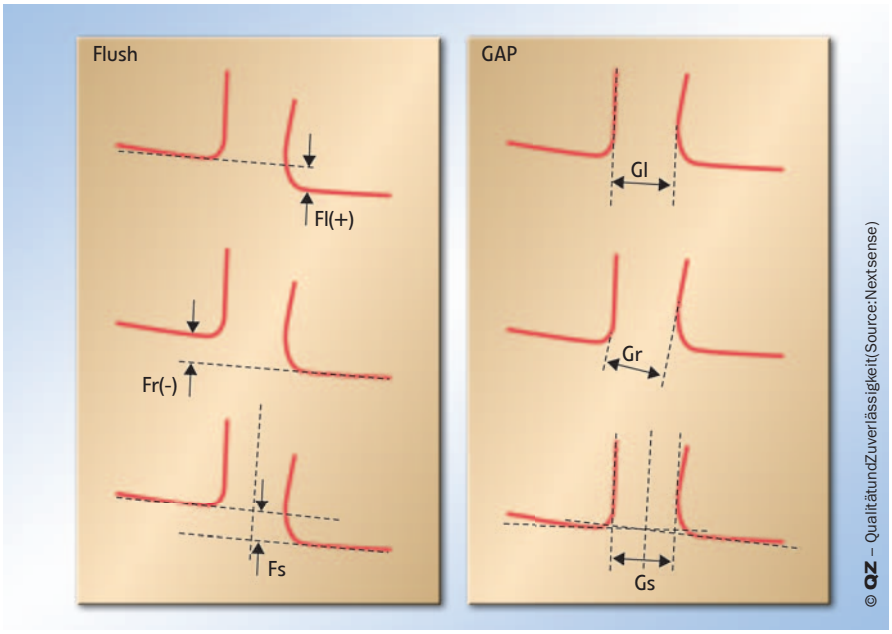

Picture 3. Various analysis strategies for gap and flush measurement

shortly afterwards." He gives the overhang measurement as an example. Back then a separate adapter had to be designed and built for every type of vehicle. The testing expenditure was also substantially higher. When you apply it to the entire vehicle and also include the earlier risk of damaging the vehicle, the measuring device quickly paid for itself. Günter Legel is "very satisfied in every regard" with the collaboration. He says the NextSense team quickly implemented the vehicle manufacturer's special requests. □

Hemma Maiberg

NextSense
Mess- und Prüfsysteme GmbH
T 0043 316 232400-0
office@nextsense.at
www.nextsense.at