Breakthrough in caliper measurement

# Non-contact sensor gentle on paper

**Marks, holes, breaks – the contact between caliper sensor and web can often impair paper quality. Now, for the very first time, a sensor has been developed that measures accurately without any contact whatsoever.**

*Put an end to marks and holes in paper:*
*Voith LSC QuantumSens*
*measures entirely without contact.*

It is virtually impossible to conceive of modern papermaking without the online analysis of caliper or paper thickness. Until now, paper manufacturers have had to resort to contact-type measuring methods if they needed to obtain accurate data. With these methods one sensing element above and one below the web contact it from both sides. The caliper results from the distance between the two sensing elements. The advantage of this method is a very high measuring accuracy, which has not been achievable to date using alternative solutions.

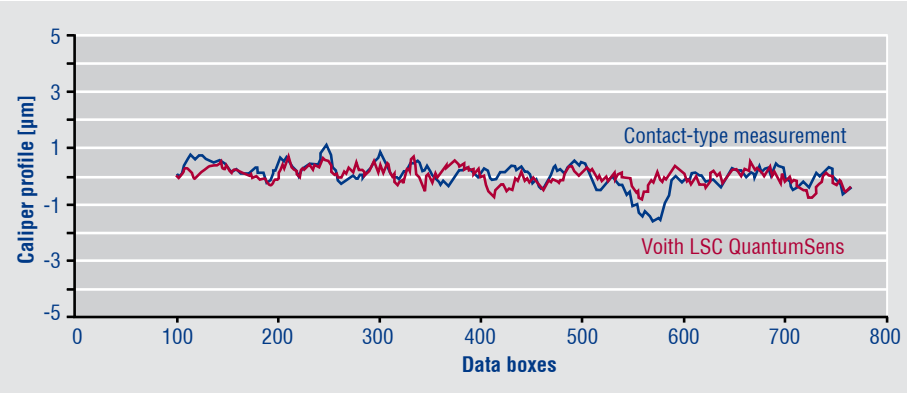
## Risky contact

The limitations of this measuring technique, however, are inherent in the contact itself. An ideal balance has to be achieved between stronger contact pressure with high measuring accuracy and lower contact pressure but significantly reduced accuracy.

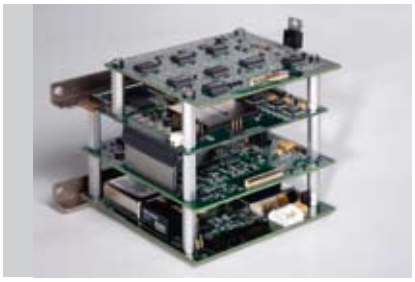
If the papermaker wants as accurate a measurement as possible, damage to the paper during the measurement due to contact with the sensor has to be expected. In coated papers in particular, this is seen in undesirable markings left in the paper by the sensor or by holes that can appear in the paper. In the worst case scenario these holes can even cause a web break.

The sensor does not emerge unscathed from its permanent contact with paper running at speeds of up to 120 km/h. Even after a relatively short time, permanent deposits form on the sensor's contact surfaces. These have to be removed regularly by operating personnel. If the sensor is not cleaned its measuring accuracy will be substantially impaired. In addition, the contact surfaces of the sensor have a limited service life due to the high mechanical load. The use of contact-type caliper measurement is therefore not the ideal solution, particularly for low grammage paper grades. The paper manufacturer has to contend with higher scrap production, increased manpower requirements and higher costs for spare parts. In addition there are some applications where contact with the paper cannot be tolerated, for example in the case of high-gloss papers. Until now, this has meant that an online caliper measurement has had to be dispensed with completely in such circumstances.

Due to the drawbacks of contact-type caliper measurement, paper manufacturers have been calling for an alternative measuring method, a completely non-contact measurement. However, all completely non-contact options available to date substantially reduce measuring accuracy and therefore are not suitable for all applications, such as thin, graphical papers.




*High accuracy: The new Voith LSC QuantumSens also impresses in a direct comparison with conventional, contact-type caliper measurement.*



*The Voith LSC QuantumSens makes possible, for the first time, a completely reliable and at the same time extremely accurate measurement of caliper.*

## Non-contact precision

The new Voith LSC QuantumSens is now the first caliper sensor that not only measures completely without contact but can also match the most accurate sensors on the market in terms of measuring resolution. When installed on a paper machine it works with a resolution of around 0.1 µm, equivalent to about 0.1% of the thickness of a human hair.

The high accuracy is achieved by means of optical measurement using completely innovative components known as 'superluminescent diodes' (SLDs). These high-tech light sources offer considerably improved measurement compared with the laser diodes used by other manufacturers, which have limited accuracy due to interference effects caused by the coherent light.

The QuantumSens uses almost microscopically small optics to measure the respective distance between sensor and paper surface from both sides. In order to establish the caliper, the distance between the two sensors is also measured. The difference between these two measurements corresponds to the caliper.

## Air cushions provide stability

A decisive factor for the high accuracy of the caliper measurement is the stabilization of the web as it runs between the two sensor blocks. If the paper is not completely flat, but tilts in the measuring gap, it is difficult for the sensor to determine whether it is really the caliper or just the position of the paper that has changed.

Therefore QuantumSens relies on a patented stabilization technology, proven over many years, that uses air cushions on both sides. These air cushions form on both sides of the paper, holding it firmly in place and thus substantially reducing the potential for measuring errors. However, if there is a slight tilting of the paper, this will automatically be corrected by the intelligent software used.

## In-sensor processing

The measured values are digitized within the sensor. This allows an enormous amount of data to be included, and also the recording of as many side-effects as possible, e.g. geometrical changes. With the help of these additional readings the caliper measurement as such can be corrected with a great degree of accuracy. For the first time, a major part of the processing takes place directly in the sensor, in a 'field programmable gate array' (FPGA). This processor allows the parallel processing of data volumes on this scale. The already digitized and processed data can be transferred more quickly and securely.

As well as non-contact caliper measurement, a double-sided gloss measurement, integrated completely into the sensor, is available as an optional extra to QuantumSens. This also makes QuantumSens ideally suited for high-quality calender applications, where it replaces the combination of two gloss sensors and one caliper sensor, a configuration that is still common today.
In 2010 Voith LSC QuantumSens will be available on the market for all graphical and specialty papers. Existing Voith LSC scanners can then also be easily retrofitted.

**Contact**

**Susanne Moses**
susanne.moses@voith.com