MASC-VQC
HOMOGENEITY OF NON-WOVENS

What is VQC?

One of the most important properties of fleece is its mechanical firmness, which is to a high degree correlated to fleece homogeneity. VQC determines the fleece homogeneity quantitatively by methods of image processing, thus allowing conclusions about the fleece firmness.

Product properties

- 100% automatic control of the fleece homogeneity ("cloudiness") at high belt velocity
- calibration in order to compensate inhomogeneous lighting
- robustness with respect to disturbances, such as displacement of the image section or variations of lighting
- integration into the production process
- easy adaptation of the configuration, e.g., with respect to the desired resolution and inspection severity
- generation of test statistics, e.g., for the determination and analysis of trends
- evaluation protocols in order to guarantee production quality
- user-friendly interface

Applications

- hygienic sector (e.g., diapers)
- medicine (e.g., bandage materials)
- filters (e.g., in the automobile sector)
- textile industry (e.g., technical textiles, padded garments)
- agriculture (e.g., field coverings)
Laboratory determination of fleece quality

1. Inhomogeneous fleece with some fiber defects and agglomerations

2. Relatively homogeneous fleece

MASC-VQC: Application

Fleece firmness

Fleeces are subject to increasing quality requirements. One of the most important properties is the mechanical firmness, where an essential criterion is the uniform fiber distribution, which is disturbed by inhomogeneities such as fiber agglomerations and fiber defects. During fleece production, the homogeneity is used as an indirect indicator for the rating of the fleece firmness. At a very high resolution scale — if the fleece is observed from a very small distance —, the individual fibers of which the fleece consists are still visible; the fleece seems inhomogeneous. At rough scales — observing from a far distance —, the fleece appears very homogeneous if it does not show extremely distinctive defects. Thus, the fleece “homogeneity” refers to several scales.

Defect detection

Apart from its firmness, the surface quality of the fleece is also an important criterion for the fleece quality. At the Fraunhofer ITWM, the systems MASC-SPOT and MASC-TASQ have been developed for defect detection within the product series MASC. The modular structure of these systems allows a simple combination of several products, resulting in a complete quality control.

Software tool for homogeneity rating

The Fraunhofer ITWM has succeeded in developing an algorithm for a qualitative and quantitative rating of fleece homogeneity. The software tool VQC allows the secure and robust evaluation of fleece homogeneity (the so-called “cloudiness”) by methods of image processing. It can be applied to laboratory examinations, as well as for the online determination of product quality during the production process.

Image processing

The original image is subjected to a multiscale analysis according to the Laplace pyramid, a method which suggests itself since fleece homogeneity is a multiscale phenomenon by nature. As a measure of homogeneity, the variance of the images is computed on each scale. The variances of the individual scales are added up to a homogeneity index in a weighted sum. The scale gradations can be customized, enabling the user to adapt the system easily to very different types of fabrics.