

**Project title:** Development of an optical measuring system for in-line Evaluation of web quality of carded nonwovens - NowoVISION

**Partners:** Axon Machine Vision GmbH & Co. KG, Bergisch Gladbach  
proCtec GmbH, Viernheim  
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**Duration:** 04/2019-03/2021

**Funding Agency:** AiF/ZIM

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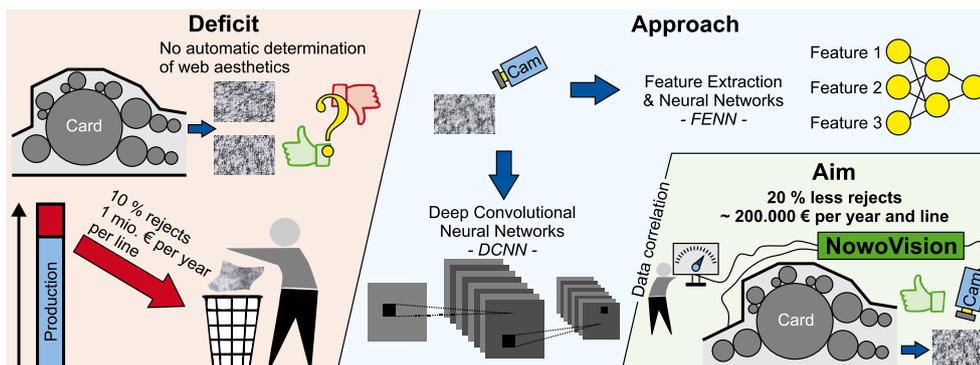
Ref.: CM  
**06.06.2019**

### Mission Statement

In the carding process, staple fibres are processed into fibre webs and further into nonwovens. Due to the low density of the material, the long transport of nonwovens is financially unaffordable so that the nonwovens are usually produced in the vicinity of the processing industry. The nonwovens industry as a whole is growing at a rate of approximately 3% per year. The production volume of nonwovens in Europe will then be around € 5.2 billion per year. A total of around 450 lines for the production of carded nonwovens will be in operation in Europe in 2020.

Crucial evaluation criteria for the quality of nonwovens are the optical aesthetics of the material i. e. the so-called cloudiness. The measuring systems currently available on the market are only able to determine contamination or basis weights inline. Aesthetics are usually determined solely subjectively by experts, e.g. at display cases or transmitted-light stations on the plant. There is no possibility to automatically record the aesthetics. Temporarily unnoticed deteriorations in aesthetics therefore usually lead to complaints and rejects. In a survey conducted by the ITA, it was determined that approx. 10 % of the production time of carding lines is spent producing rejects. The loss due to rejects in Europe thus corresponds to a goods value of approx. € 520 million per year or approx. € 1 million per year and production line.

**The aim of the NowoVISION project is the development of an optical measuring system for the inline evaluation of the pile quality/aesthetics of carded nonwovens. A waste reduction of about 20 % is expected.**



## Approach

The optical detection of the fibre web takes place directly behind the card by means of a camera system. For the development of the evaluation function, the project partners Axon Machine Vision GmbH & Co. KG, Bergisch Gladbach (AMV) and the Institute for Textile Technology at RWTH Aachen University (ITA) are investigating various innovative concepts. proCtec GmbH, Viernheim, develops a correlation function between the quality data determined and the process data in order to create a process assistance for the operator.

The development of AMV's evaluation function is based on the use of Deep Convolutional Neural Networks (DCNN). Different network architectures and filter cores are used. Since DCNN training requires large amounts of test data (several million images), an algorithm is required to generate mathematical test sets beyond real process images.

The development of the evaluation function by ITA is based on the combination of Feature Extraction with single- and multi-layer neural networks. The derivation of the characteristic "features" is based on expert surveys carried out in the industry and collected training data. After the training of the neural networks these will be unfolded and the weightings of significant features will be transferred into the DCNN's of the AMV. The combination of the attachments is expected to increase the robustness of the overall system.

Since proCtec has developed an interface and a correlation function, the correlation between the different aesthetic parameters and the process and environment variables (speeds, temperatures, humidity, fibre blends) can be determined. A process assistance for the operator is then derived in order to counteract deviations from the desired quality.

The knowledge gained will be implemented within the project in one or more demonstrators and tested in the field at ITA pilot plants and industrial production facilities. The goal is to create a validated demonstrator on whose basis a product suitable for series production can be developed and distributed by AMV and proCtec. The final product would be available both as a retrofit and for new plants. A variable interface enables the connection to different machine control systems.

## Acknowledgement:

The ZIM project NOWOVISION (ZF4558930LP9) is funded by the Federal Ministry of Economics and Energy within the framework of the Zentrales Innovationsprogramm Mittelstand (ZIM).

