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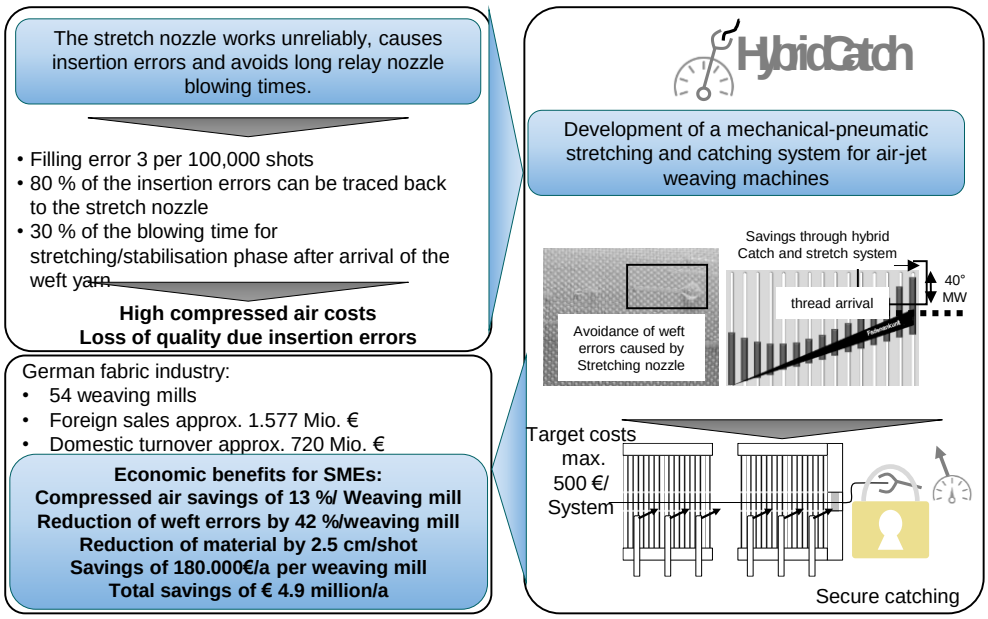
Project title: Development of a mechanical-pneumatic stretching and catching system for air-jet weaving machines - HybridCatch

Partner: none

Term: 1/2018 – 12/2020

Funding agencies: IGF-research project 19738 N

Mission Statement



Motivation:

With around 1,200 companies, the German textile and clothing industry is one of the largest branches of industry in Germany. One of the main characteristics of this branch of industry is the high number of small and medium-sized enterprises (75%). In 2014, German weaving mills alone achieved a turnover of € 1,577 million. There are 61 weaving companies in Germany with a total of approx. 8,600 employees. The export quota of the produced fabrics (e.g. for the automotive industry) amounts to approx. 54 % with a foreign turnover of approx. 570 million €. Approximately 60 % of the companies (in about 40 companies) are located in the field of technical textiles, which produce high-quality goods such as airbag fabrics.

The majority of technical fabrics are produced using the air-weaving process, which is currently the most productive weaving process. According to ITMF, about 45 % of the weaving machines sold in Western Europe are air

jet machines. The motivation for the research proposal is based on a recognised challenge from industry. During weft insertion, the stretching nozzle on air-jet weaving machines does not reliably capture and stretch the weft thread. This misconduct leads to fabric defects. 60 - 80 % of machine downtimes during the processing of staple fibres and up to 90 % of weaving faults in filaments are due to weft faults. These faults are particularly problematic for technical products such as airbag fabrics. It is also possible that weft defects can only be detected after layering. This often occurs, for example, with coating substrates for membranes. In order to remedy such shooting errors, a longer blowing time of the relay nozzles, which is not necessary for the process, is currently being accepted. Furthermore, the length of the selvedge is increased so that the stretching nozzle can reliably grip the thread.

Aim:

In order to avoid weft errors, a new type of catching system is being developed within the scope of the project, which reliably tightens the weft yarn and does not require any additional stabilisation. A hybrides catching and stretching system for weft threads is planned, consisting of a pneumatic and a mechanical component. Air-jet weaving machines can be retrofitted with this system. With the help of the system, weft errors caused by the stretching nozzle can be reduced by 42 % and the stabilization time for the weft thread can be reduced so that approx. 13 % compressed air can be saved. At the end of the project, an acceptable defect size for the industry of approx. two weft defects per 100.000 weft entries can be achieved. Furthermore, the use of the new system will reduce the edge waste by 2.5 cm/weft insertion.

Results:

The developed system was first validated on a laboratory scale at ITA. The weft yarn is safely caught and stretched with the help of the system. The system was installed on the machine in a static position and not in motion. Because of its static position in the weaving machine, the time available for yarn stretching is reduced. Due to the shortened time period, the system falls short of expectations in terms of energy savings, with energy savings of up to 4.1%. The yarn length at the prewinder could be reduced by 2 cm/weft. The economic viability of the system net present value method

has been demonstrated and shows that the system is a sensible investment.

Outlook:

In the project it could be shown that a hybrid catching and stretching system can be energetically reasonable. According to the identified limitations in the application of the system, further research is needed to fully prove the technical feasibility.

For technical feasibility, the weaving machine should be adapted with regard to the fabric table. A modular fabric table, which allows a length variation, would enable the system to be carried along with the reed. With the help of the new fabric table, it is possible to exploit the full potential of energy savings.

Acknowledgements:

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