OPTIMIZING THE DIRECT CABLING PROCESS

Project manager: Dipl.-Ing. J. Grünert Duration: 05/99-07/00

Initial Situation

Tyre cord is among the most important technical textiles. The current annual production of tyre cord yarn amounts to approximately 10^6 tonnes worldwide. This corresponds to approximately 5% of the total production of manmade fibres, and forecasts predict even more growth in future. Annual tyre cord production growth rates of 3% are considered to be a realistic prognosis. Direct cabling will gain even more importance as it offers high profitability opportunities.

The current state of the art in the direct cabling of tyre cord is reflected in the machine equipment marketed by few manufacturers. Focus is on obtaining the highest possible yarn quality as well as improved profitability, flexibility, and operational ease. The equipment available is provided with individual process monitoring and remote diagnosis systems.

Research target

The project was aimed at performing theoretical investigations and practical tests to find out possibilities of optimizing the cabling process making use of simple but efficient equipment for obtaining almost identical tensions of inside and outside threads. Research efforts centred on possible approaches for optimizing the overall machine concept to reach more flexibility and profitability by improving peripheral conditions. Additionally, basic approaches for integrating a comprehensive quality management system were elaborated.

Research results

Based on the current state of the art, the direct cabling process was investigated in an in-depth analysis. Research efforts concentrated on the cord formation process as well as on the peripheral conditions of the process. Problem points were analysed and recorded. Terms of reference were formulated and possible solutions and designs of constructional elements and components were discussed and recorded.

The theoretical understanding of what happens at the twisting point during the cabling process is of decisive importance for the design implementation of various technical solutions aimed at influencing the tension of inside and outside threads and the resulting geometry of the cabling area. Basically, there are two possibilities of influencing cord formation: either by installing a compensation unit at the twisting point, or by adjusting the setting ratio of the thread brakes in cabling processes involving with a freely rotating cabling point. The implementation of the principle largely depends on how the setting problem at the brake for the inside thread is solved.

An electronic stop motion featuring a relatively simple design and low-cost manufacture and eliminating the weak points of currently used stop motion systems is used to monitor the drawn off cord for breakage and/or breakage of one single thread. The system is based on supervising the thread tension and evaluating the thread tension characteristics by means of an integrated evaluation electronics unit. Once evaluation is completed, the machine control system is given a specific thread breakage signal.

Application and economic advantages

The general know-how gained in this research work may be used to develop customized machine options by combining the individual solutions found. This know-how may be directly employed in development work aimed at creating a series-type machine as well as for a considerable reduction of development times required for creating new comprehensive and complete solutions.

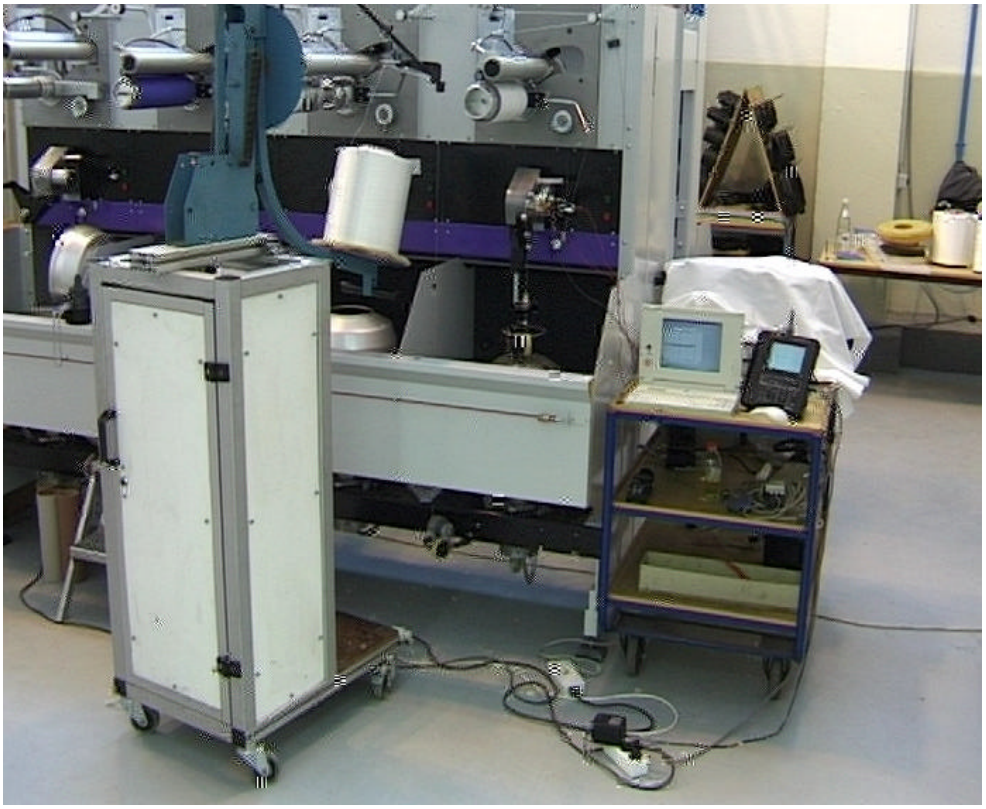

Figure 1: Testing arrangement at the cabling station

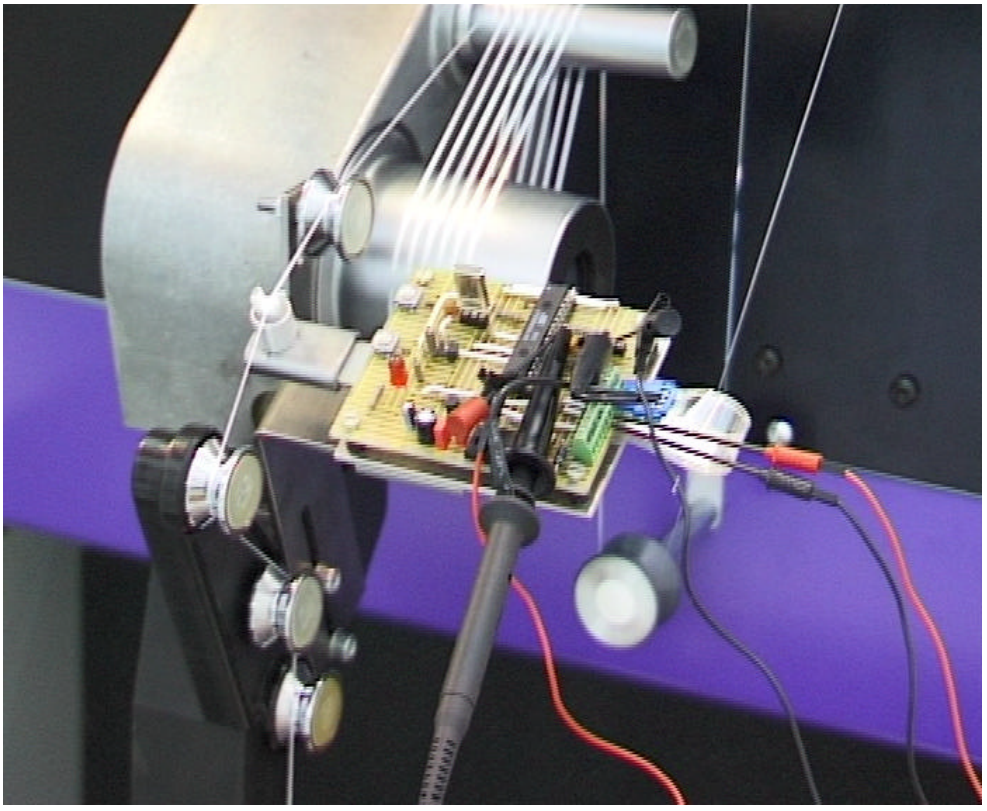

Figure 2: Stop motion at test