Solutions to Reduce the Impact of Paper Properties to Print Quality and Runnability in the NexPress 2100

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Abstract

Paper interacts with almost every subsystem in the electrophotographic process. The physical properties of the paper have an great Influence on the paper handling capability of the engine and the image quality of the print-out. This paper gives an overview of important paper properties and explains the solutions taken by NexPress to reduce the impact of these paper properties to print quality and runnability. It is shown that it is possible to expand the amount of printable papers by adapting the printing process to the paper properties. Special emphasis is given to the fusing process, the transfer unit and the paper path.

Introduction

It was NexPress' strategy to design the NexPress 2100 to be a *production colour press* and as such the engine should be distinctively different to other digital printing presses on the market. One of these differentiators is the broad range of substrates which can be handled by the engine. The reason for this is the NexPress substrate strategy which is focused on three major directions:

1.) Substrate Qualification to provide script files to the customers for a wide range of different substrates.
2.) Development of the SubstrateAssistant – an end user substrate scripting tool - to enable the customers to create their own script files.
3.) The third important direction was the specific development of Software and Hardware to reduce or manage the influence of substrate properties to the print process and the printed product.

These features are embedded in the NexQ Quality Control System.

The NexQ Quality Control System ensures perfect printing by taking care of paper handling, sheet positioning, imaging units, fusing step, and the environmental control.

It was developed to reduce the impact of interferences to the print process and to increase the quality of the final product.

One of these interferences is "change of substrate properties or fluctuation of substrate properties". Since substrate properties like electrical resistivity, coefficient of friction or heat capacity sometimes vary from ream to ream and batch to batch the strategy was developed that the engine should control these parameters which are impacted by such properties.

The system consists of various sensors and software algorithms to continuously monitor the state of the engine in each printing mode. Due to a closed loop system the print parameters are adapted to the process in dependence of the substrate, print mode and other conditions. This ensures that the engine can print on many different paper types with high quality and consistency.

NexQ Quality Control Features

With the NexQ system almost every step of the process gets controlled. Feeding and transporting of the substrate is a good example. The NexPress 2100 draws its substrates from three trays. Various substrate types and sizes with a format up to 350 x 470 mm can be combined within a single print job. These different substrates then must reliably be transported through the whole engine. For this purpose all common paper transport mechanisms are used: vacuum transport, belt transport, moving of paper with rollers and transport of paper with the help of a web on which the paper is fixed electrostatically. The reliability of such transport mechanisms depends on a number of different substrate properties which varies from type to type and sometimes from sheet to sheet. Particularly substrate porosity, substrate size, weight, and coefficient of friction have an influence to this process. It's hard to reliably control such a complexity with a static system. The implementation of the NexQ system features ensures regardless of various paper qualities precise alignment and perfect timing adjustment of the sheets and high runnability of the papers.

Another example is the transfer process. Substrate surface roughness and the electrical properties like surface and bulk resistivity are important factors to ensure high and repeatable print quality. It is well known that particularly the electrical properties of papers are strongly impacted by the moisture content of the paper or moisture variations within one sheet. To compensate such resistivity fluctuations NexPress incorporated two features into the transfer step: a web with constant electrical properties, which stabilize the electrical properties of the complete transfer system, and a closed loop control system which adjusts the required transfer

voltage to every paper individually. One other important development was the introduction of a blanket cylinder between the imaging cylinder and the substrate. With its flexible surface and high wear resistance the blanket cylinder concept ensures high image quality and long life time of the photoconductor layer on the imaging cylinder.

Another important step in the electro photographic process is fusing of the toner particles. Several hard ware and soft ware features like the Constant Force Approach and the introduction of the Energy Flow Parameter ensure high fusing quality regardless of heat capacity, thickness and roughness of the substrate.

Conclusion

NexQ Quality Control System was developed to reduce the impact of interferences to the print process and to increase the quality of the final product. One of these interferences is variability of substrate properties or fluctuation of these properties. The NexQ Quality Control System ensures perfect printing by taking care of paper handling, sheet positioning, imaging units, fusing step, and the environmental control. This increases reliability and Image Quality of the printout.

Biography

Johann Weigert holds a Ph.D. in Chemistry from the Technical University of Darmstadt, where he worked on papermaking chemistry and chemical modification of pulp. He joined NexPress GmbH in 1999. Since then he is working on several substrate related issues. Now he is responsible for substrate evaluation at NexPress.