Research Institute:

PTS Munich
Hess-Str. 134
80797 Munich

Internet: www.ptspaper.de

Head of the research institute:

Dr. Frank Miletzky

Project leader:

Herman Schmid
Tel: 089 / 12146-406
Fax: 089 / 12146-36
E-Mail: ralf.gericke@ptspaper.de

Research area: Product aims

Paper paperboard and board // Packaging papers and paperboard

Key words:

Corrugated board, flexo post print, striping, coating

TITLE:

Reduction of the striping in flexo post printing through optimization of the coating layer properties in such a way that the dependence of the ink uptake from the plate pressure is reduced

Background/Problem area

The market for corrugated board is a sustainable and growing market. According to vdw, the turnover in Germany increased in 2008 by 4.0% compared to the preceding year. Products manufactured from corrugated board involve e.g. "point-of-sale" display boards which are intended to attract the customers' attention. Therefore the print on these boards should be as good as possible, whilst also being produced cost efficiently. Post printing on the finished cardboard is one advantage in terms of cost efficient manufacturing. The other advantage would be to use the "cheaper" printing process which is flexo printing compared to the more expensive offset printing. A known problem with direct flexo printing – and direct printing in general – is the formation of stripes due to the flute-tip architecture of the corrugated board.

One of the possible ways to reduce striping is to use liner with a higher grammage. This results in a significant increase in costs. In practice, an attempt is also often made to increase the contact pressure in the printing nip until a sufficient amount of colour is transferred, again resulting in less striping. However, this procedure suffers from the great drawback that the structure of the corrugated board is badly affected. Another measure is the adjustment of the hardness (elastic modulus) of the flexo printing plates. The exclusive use of smaller and stiffer flutes also presents a limitation towards mechanical demands and profitability in certain fields of application.

Objectives/Research results

The aim of the project is to reduce striping in flexo post printing through optimization of the liner coating. The coating(s) are to be optimized in such a way that ink transfer becomes pressure-independent over a broad range. It is desirable that this is the case especially at low pressures because of damage occurring to the flute structure at high pressures. It is also desirable to achieve a quantitative correlation of coating parameters to the striping in order to create general predictions for the reduction of striping.

The optimization of the coating is to be achieved mainly by varying different types of pigments with small or larger particles and/or narrow or broad particle size distributions. Also, mixtures of different pigments are varied. This results in different porosity and capillarity values, which definitely influence the speed and/or amount of the uptake of flexo ink. In combination with pigment variation, additional variations such as coat weight, number of layers (2 or 3) and influence of thin barrier layers between pre- and top coating are of interest.

The research started with an analysis of the reasons for striping and existing solutions from the literature. It could be deduced that to a great extent quick absorption of rather large amounts of ink on the liner coating would probably be beneficial to reduce striping. Initial results showed that it is possible to achieve high absorptivity by using certain pigments. PCC and NPSD GCC are more absorbent than BPSD GCC and SiO_2. Nano PCCs show good absorptivity as well, one of which being the most absorbent pigment of all pigments tested. The coating structure also influences absorptivity. Calendered papers are less absorbent than uncalendered ones due to reduced porosity and the sealed surface of the coating layer. Blending a GCC pigment with a PCC pigment increases the absorptivity of the coating due to greater amount of PCC.

Initial laboratory-scale print trials (IGT F1) did not reveal any significant changes in the dots. However, the formation of "print donuts" occurred on coated samples with pigments and with high surface tension. Laboratory-scale print trials on corrugated board samples resulted in less stiffness in the printed image when mixtures with nanoscale pigments were used in the coating. A barrier layer between the precoat and top coat did not have any significant impact on stiffness in laboratory-scale flexography. The best coating formulations consisting of nano pigments and normal coating pigments were included in coating trials on the pilot coater, laboratory-scale corrugated board samples and flexographic trials. As the final step, the best coating formulations were used to coat linerboard and the corrugated boards made from it were printed by flexographic printing on an industrial scale.

Application/Economic benefits

The results of this project are mainly of interest to the industrial sectors paper, publishing and printing. Furthermore, branches of the chemical industry (additives) may also profit from this research project. More specifically, the corrugated board and printing ink industry may profit.

The reduction or complete avoidance of striping in corrugated board flexographic post printing bears great potential for the quality improvement of packing materials or e.g. displays manufactured from printed corrugated board. High quality corrugated board products are often printed via the preprint method, which involves additional effort und costs. Through the prevention of striping in flexo post printing, the overall deficits of this method can be crucially reduced compared to the preprinting method.

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Remarks

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