Background/Problem

Unlike other printing processes, the gravure process can lay claim to high productivity and high quality at one and the same time. Printing inks used for gravure printing contain a thinner that evaporates during the drying process. Toluene is the only thinner up to now which complies with the requirements of the printing process. Since toluene is a hazardous substance, like any other organic thinner, it is subject to maximum allowable concentrations (MAC values) that have been lowered again and again during the past few years. Nowadays, 95% of the toluene is returned to a recycling plant after use. The finished gravure prints contain no more than 0.05% toluene. Even these minute quantities, however, can clearly be perceived by the human senses. The long-term goal should therefore be to reduce the residual toluene content in printed products, particularly against the background of a possible tightening up of the legal guidelines. One effective way of reducing the residual toluene content in the print products is to subsequently dry the products by means of microwave radiation. This, however, causes a more or less pronounced cockling of the paper and thus to considerable quality losses in addition to impairing the further processing.

Research objective/Research results

The objective of this research project is to optimise microwave after-drying in gravure to reduce the toluene content. Selection of the formula parameters of the paper coating and continued improvement of microwave dryers are measures intended to avoid or at least reduce the cockling phenomena that currently occur during microwave drying to such an extent that no significant reduction of product quality can be detected.

On laboratory scale, a LWC base paper was coated with different coating colours. An initial test series were conducted using a coating colour formulation that remained constant except for the pigment mixtures that varied. Eight different pigments in eleven combinations were used in this series. The coated papers were calendered and than printed and the adsorption and desorption of water as well as the retention of toluene were determined. The pigments which showed a distinct influence on these properties were used in following test series. Here, talc and clay, ground and precipitated calcium carbonate, and ground calcium carbonate and bentonite were analysed in different amounts. The test series with clay and talc, for instance, showed a minimum in toluene retention with equal distribution of both pigments around 50 parts each) and increasing toluene retention with increasing amount of one pigment in comparison to the other (e.g. 80 parts clay, 20 parts talc). Coating colour formulations selected from the previous steps were used in a pilot trial at VESTRA pilot coater. Here, the runnability of the coating colours was determined. After calendering the paper, a print trial with following drying in a microwave to quantify the cockling tendency of the different papers is planned.

Application/Economic benefits

The economic situation of print shops and prepress shops is currently very strained. As the example of the Brent Spar offshore oil rig owned by Shell Oil demonstrated, consumers, especially German consumers, are extremely hypersensitive about announcements concerning environmental or health hazards. A press campaign about fictive health hazards due to residual toluene in certain magazines or mail-order catalogues is almost certainly cause enormous drops in sales at publishing houses, mail-order firms and in particular in print shops which would then be forced in turn to introduce massive job cuts as a result. Since the number of employees in the German printing industry has been dropping sharply in the past few years anyway, stabilising the jobs that still exist is of utmost importance. Any drop in sales on the part of the mail-order firms would also have an impact on the firms that supply the goods that are sold in the catalogues. If this project succeeds in developing and optimising a cost-effective generation of microwave drying systems, it can be assumed that the medium-sized provider of microwave drying
systems that is involved in this research project would turn out to be a major global player with sales of as many as 200 systems.

**Project period:**
01.12.2003 – 30.11.2005

**Remarks**
Research project AiF 13999 was funded by the Federal Ministry of Economics and Labour in collaboration with FOGRA.

Are you interested? Then send us this short description with your name and address via fax. The project manager will contact you afterwards.

- [ ] I want more information
- [ ] I want to participate in the project

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