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Research area: Product aims
Know-how about the interaction between paper board, printing ink and sheet-fed offset printing machine

Keywords:
Paper board, ply bond strength, sheet-fed offset printing

Subject:
Influence of the ply bond strength of folding box boards on runnability by sheet-fed offset printing.

Background/Problem area
Many different paper board grades are used within the wide spectrum of different printing orders in the folding box industry. All these different grades can have significantly different properties. There are paper boards based on primary pulp (mechanical and chemical pulp) and paper boards based on recycled pulp. There are also one-side coated and uncoated paper board grades. Despite this variety of paper board grades, the operator of a printing machine must expect that all paper boards should have common properties which make runnability and transfer of printing ink possible in accordance with the standardisation of printing process. Runnability specifies how the paper board passes through the printing machine and how the paper board tends to cause printing faults. The latter means all reductions in machine productivity indicated by the paper board such as frequently executed wash cycles as a result of surface and edge dust as well as sheet-feeding problems due to dimensional deviations. Another failure is the delamination of the paper board which is the focus of this research project. Large-area delaminations as well as transitional forms like scarcely identifiable damage to the structural strength of the paper board might appear. The results of this include serious impairment of the mechanical properties of the paper board such as bending stiffness, which could also cause other failures along the process chain.

Objective/Research results
The project aims at finding an optimum within the complex system of paper board, printing ink and printing machine. The paper board should have the lowest ply bond strength possible while maintaining high bending stiffness. Furthermore, the boundary conditions of the printing process should be chosen in such a way that the paper board is prevented as much as possible from being damaged, without affecting print quality. A total of 23 paper board samples (with critical and uncritical ply bond strength) were obtained from different manufacturers of paper board and folding boxboard. The samples were examined with respect to their physical characteristics (grammage, thickness, specific volume, bending stiffness, tensile strength, strain to rupture, E-module, hygroexpansivity, ply bond strength, and penetration). Based on a critical analysis of the results achieved, eight paper board samples were ultimately chosen that had ply bond strength ranked from low to high. These samples are presently being printed using a lab printing machine and then tested for ply bond strength (test method: TAPPI T 833 pm-84). To investigate the interaction between paper board, printing ink and printing machine (sheet-fed offset) with respect to the delamination of the paper board, the following parameters of the printing machine must be varied during the printing tests: viscosity and film thickness of the printing ink, the speed of the printing machine, the printing blanket cylinder, printing pressure adjustment and dampening film.

Application/ Economic benefits
At the conclusion of the project, an instrument is to be made available to evaluate the above-mentioned system. This instrument should include know-how about the minimum values for the ply bond strength of paper board as well as the effects of typographical criteria (ink, fountain solutions, layout, state of rubber blanket and rubber blanket cylinder) on delamination phenomena. Pre-press aspects will also be taken into consideration. This is intended to establish a basis for quality control in printing plants and paper mills and to prepare an expert opinion. From an economical point of view, the results may make a contribution to avoiding expensive complaints in the printing industry or to handling complaints more quickly, once they have been lodged. Based on the study, a quality guideline will be defined which is frequently requested from printing plants and from the paper industry.

Project period: 01.04.2003 – 31.03.2005

Remarks
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