Effect of bending on sheet structure and its relevance to offset printing

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Synopsis

Modern methods of printing, particularly the sheet-fed and web-fed offset lithographic processes, subject the printing paper to considerable bending stresses and tensions at high speeds. Close register colour printing, especially, requires that the paper should have sufficient bonding strength to withstand the forces arising from the tack of the ink and the bending at the point of peel.

On leaving the printing nip, the paper is shown to adhere to the blanket for some distance before being peeled under tension. This results in bending at the point of peel. A quantitative assessment of the effects of bending on the physical properties of paper are concerned here, with particular relevance to the offset printing process. The passage of the paper through the printing nip and its peeling beyond the nip have been photographed; the bending angle and radius were measured from the ciné photographs. The authors have designed and made a bending apparatus with which paper can be subjected to similar tensions, bending radii and angles to those occurring in offset printing.

With this apparatus the change in properties on bending have been examined for three coated art papers and three corresponding uncoated base papers. The physical properties particularly relevant to offset printing are modulus of elasticity, picking resistance, oil penetration, smoothness, stiffness and curl. Stress/strain properties of the printed paper showed that similar changes took place to those occurring on the mechanical bending apparatus.

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Introduction

KOHLER[1] found that on creasing paper the outside of the fold tended to rupture and the inside either to crease or to rupture. Kubát[2,3] showed that stiffness and breaking load were reduced, but extensibility was unaffected by dragging greaseproof and kraft papers over an edge of small radius. By folding the paper, then causing the crease to travel along it by compressing it between two flat discs (one faced with rubber), this decreased the breaking load and elastic modulus, but increased the extensibility. In the Clupak[4] process, moist paper is compressed in the machine-direction by a rubber blanket while coming into contact with a hot cylinder. This increases the

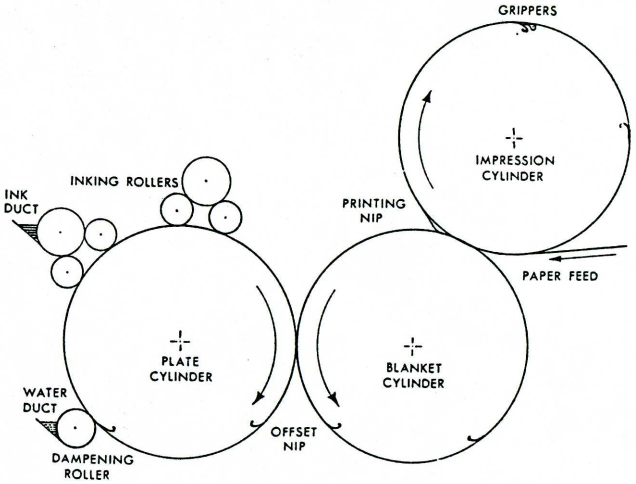

Fig. 1—Schematic diagram of the printing, inking, dampening and paper feed arrangements of a rotary offset printing press