RESEARCH IN PRINTING PRESS ENGINEERING

Under this heading we publish scientific reports on research in the field of printing press engineering. Center of the printing press research in the Federal Republic of Germany is the Institute for Printing Machines and Printing Processes of the Technical University Darmstadt. The Printing Machinery Research Association, of which all major German printing press manufacturers are members, contributes greatly to the promotion of research in the field of printing press engineering.

About Measurement and Computation of Ink Transfer in Roller Inking Units of Printing Presses

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1. General remarks

The inking unit, rightly considered as one of the most important parts of a printing press, has the function, to apply ink as uniformly as possible to the printing areas of the plate. Hence it follows that the final quality of the printed products will depend on the thickness of the ink film transferred.

In order to clarify the process of ink transfer, Walker and Fetzko (1), Albrecht and Schirmer (2), Wultsch and Schubert (3), Rupp and Rieche (4), have carried out studies using small test printing devices to determine empirically the ink transfer function. This was done on the basis that the printing form has a uniform ink layer and produces one print only. This, however, corresponds only approximately to the real conditions in a press where inking is much more complicated. There occur variations in ink film thickness caused by a number of certain factors and affecting the printed result, the so-called ghosting. In the ideal case, all printing areas of the plate would have a uniform ink film thickness and transfer a uniform ink layer to the material to be printed. In the last analysis, the quality of an inking unit will therefore depend on to what degree the disturbing factors can be removed that stem from an interrupted printing form or from a discontinuing ink supply.

The theoretical investigations carried out up to now dealt mostly with average values. Both, Morosow (6) and Ruder (7) assumed a completely homogeneous ink feed, i. e. the ductor roller supplied a constant ink layer and the printing form transferred a constant ink layer. In his studies for determining the ink splitting factor, Bradford (8) found it to be about 0.5. Similar results were found by Ruder (7) and Wirz (9). The object of our work was to find not only average values of the ink layers in order to be able to describe the overall behaviour of an inking unit during an increase or reduction of the ink feed, but to examine theoretically and experimentally the actual layer thickness shape. This lead necessarily to divide our work into a theoretical and an experimental part.

2. Experimental investigations

In a production press it is very difficult to follow the ink transfer from ductor to printing form. For this reason, a special test printing press was designed and built by the Institute for Printing Machines and Printing Processes of the Technical University Darmstadt, in cooperation with German printing press manufacturers. Inking unit and all important parts of this test rotary press model are easily accessible from one side. The heart of this test models is the inking unit which has high flexibility for arranging a number of different roller configurations. The 90 mm wide paper web from the reel ist first printed in the printing unit, then passes a numbering machine and ist finally cut into sheets of cylinder circumference length (fig. 1).

In front of the inking unit there is a removable auxiliary sensor frame on which are mounted the photoelectronic transducers. The signals from the transducers are converted by an analog computer and finally recorded by a U.V. oscillograph.

2.2. The layer thickness measuring method in the press

The film thickness measuring method had set the following standards: non contact, poor of inertia, small dimension of the transducer, high constancy of temperature, linear relationship between layer thickness and indicated value, simultaneous measurement of serveral layer shapes, high reproducibility, longtime constancy, and easy calibration. It was found that, with few restrictions, the photoelectronic measuring method was best suited for it. The necessity of measuring on metallic shining steel rollers required to depart from the 45°/0° geometry and to maintain the angle of incidence somewhat identical to the angle of deflection. Its advantage is that there is no need for producing special rollers with mat, diffusing surface.

In this measuring method, the signals are, of course, not proportional to the ink film thickness. For this reason, it was necessary to linearize the signal with the aid of an analog computer. Fig. 2 is a block diagram of signal processing.

By measuring the film thickness at various positions of the inking unit with a number of transducers, an overall picture of the ink transfer in the roller inking unit can be obtained. The ink layer thickness relief on the substrate may then be determined by difference formation of the amount of ink on the form cylinder prior to printing and of the amount of ink remaining on the form cylinder after printing (10). By using appropriate elements and recording instruments it

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