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Control of Color Register

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ABSTRACT

Recent studies examined how an observer's visual impression of color register is influenced by misregister between ink layers and by the nature of the image being reproduced. Color register during the pressrun is considered from two aspects: control of the gripper and side-guide edges of the sheet, and the fit of the ink layers in each image on the sheet. Variations in register, due to small, chance effects and to assignable causes, are described. Guidelines for setting control limits for misregister during the pressrun are considered from the pressman's viewpoint.

This is the second in a series of reports on quality control measures for the pressman.

INTRODUCTION

Color register is the name given to the visual impression a person forms on viewing, at normal reading distance, the fit of individual ink layers in a multicolor print. In multicolor prints, when all the layers of inks are in perfect register, the visual impression is that of a single image depicting some scene, object, or design. One is not aware of the individual ink layers, only their combined color image effects.

If one or more of the individual ink layers begins to move out of register, the image begins to appear softer, with poorer definition. As the ink layers continue to move farther out of register, they first cause color fringes to appear at the edges of detail, and finally the color image begins to break up.

There is no sharp end point at which the loss of register between the ink images causes the color to misregister and become unacceptable.

No simple relationship exists between color register, which is a subjective impression, and misregister, which is the distance an individual ink layer is displaced from coinciding with the other ink layers in the image. Misregister can be expressed in thousandths of an inch or millimeters or in angular degrees, but its effect on color register will vary, depending on several factors.

Experienced four-color pressmen have a general awareness of some of these factors. However, little detailed information on the nature of each factor has been available. Since a better understanding of the factors should improve the control of register, some brief research studies into their nature were recently made at GATF.

This article discusses these new studies and gives some simple guidelines for the pressman to follow in controlling color register on his press.

FACTORS IN COLOR REGISTER

In a random collection of multicolor prints of various subjects, several types of misregister may be found. If one ink layer is selected as the reference standard, each of the other layers may be in misregister with respect to it in several ways. Some examples of misregister of this second color layer are shown in Figure 1 in dashed outline. Many types of misregister are possible. For example, the horizontal misregister in *A* could also have a rotation or tilt, as in *B*.

It is important to note that of the misregisters shown in Figure 1, only *A* can be described with a single number because it has only horizontal displacement. The others require more than one measurement, in either linear distances or angular degrees or in both, to express the kind and amount of misregister.

For our immediate purposes, expressing the misregister of a print in several dimensions (the horizontal, vertical, angular, etc.) is too complex. A simpler, though less exact, description of the misregister can be made by just measuring, along the angle of maximum displacement, the separation of the two color layers that are farthest apart. This measurement should first be made on detail within the central area of each image. This is necessary since masking, stripping, or assembly errors can cause the image borders and register marks of each ink layer not to register along the same lines as those of the original artwork. Exceptions are solids and flat tints where border edges are the only register references available.

In a recent study, this maximum displacement measurement was made on each print in a random collection of four-color process prints (1). These measurements were compared to color register of the prints as rated by one observer from a viewing distance of 12 to 14 in. (300 to 350 mm). The prints were rated as either good or poor. In prints rated good, the misregister varied from about 0.001 to 0.007 in. (0.025 to 0.18 mm). In those rated poor. the misregister varied from 0.004 to 0.012 in. (0.10 to 0.30 mm).

A search for the causes of overlap in misregister values of the two print groups disclosed several possibilities.