УДК 655.226.5

CONFIGURING RISOGRAPHIC PRINTING, TAKING INTO ACCOUNT THE PRINTING PROPERTIES OF PAPER

Yudenkov V.S., Sulim P.E.
Belarusian National Technical University
Minsk, Republic of Belarus

Paper is porous–capillary sheets consisting mainly of plant fibers, firmly interconnected by chemical hydrogen bonds. Thus, printed paper for books differs from writing paper, packaging paper and other types of paper in that it must not only have good consumer qualities, but also meet the specific requirements of the printing process. Along with paper, other types of paper are often used for making books – newspaper, cartographic, writing and others.

To ensure high quality of printed products, printed paper must have a certain set of properties, such as smoothness, softness, stiffness, dustiness. However, during risographic printing on hard papers, indistinct reproduction occurs, as well as hard papers lead to mechanical damage to the mesh of the mold cylinder of the risograph. The paper used for risographic printing must have the ability to perceive the ink and hold it on its surface. This is ensured by the ability of the paper to be wetted with paint, as well as absorb it into the pores. The absorbency of the paper is especially important when printing with paints used in risography, since the ink is fixed on the impression due to its absorption into the pores of the paper. Only in this case, the paint is fixed on the impression and dries. The absorbency of the paper depends on the type of fiber mass, porosity of the paper, filler, composition and type of sizing, as well as the physical properties of the absorbent paint components. To characterize the absorbency of paper, a number of methods have been proposed based on measuring the rate of absorption of solvents or measuring the amount of ink retained by paper. Being in a humid atmosphere, the paper absorbs water. In this case, the cellulose fibers swell, as a result of which the paper sheet deforms when moistened. Deformation of the sheet can lead to a mismatch of colors in multicolored printing. Therefore, an important technological property is the deformation of the paper during humidification. The considered paper properties are also determined using special devices. The optical properties of the paper determine the appearance of the printed product and the image quality. Optical properties include opacity, whiteness, color and gloss of the paper.

The paper must be light-proof so that the image printed on the reverse side does not shine through. Therefore, transparent papers can only be printed on one side. Light transmission decreases with increasing paper thickness and the introduction of fillers.

The high whiteness of the paper provides a sharp, contrasting image perception. Whiteness is ensured by the selection of the appropriate fibrous material, bleaching of the semi-finished product, the introduction of fillers and

dyes. The paper is usually white in color, but colored paper grades are also used in offices.

The surface of the paper can be matte or shiny, which affects the appearance and quality of printed products. The optical properties of paper can be tested on visual cameras or other devices that measure transmittance, reflection, or optical density with high accuracy.

To eliminate the complex of disadvantages for the original layout, it is necessary to use two types of filters (standard and specialized).

It has been experimentally revealed that obtaining a high-quality impression of a digital image on a risograph is often hindered by defects in contrast and clarity. It is also necessary to adjust the brightness alignment of the image in accordance with the flowchart.

To do this, the software provides two tools: manual and automatic brightness correction. The automatic brightness correction function is enabled by checking the box in the optimal brightness program. The first step of the automatic brightness correction algorithm is to calculate the average brightness of the image points. This brightness is compared with *the optimal brightness*. The brightness of 127 units is accepted as optimal. If the brightness of the image is higher than the optimal brightness, then the difference between them is subtracted from the brightness of each point in the image, except for the black dots. Otherwise, the difference between the average brightness of the image and the optimal brightness is added to the brightness of each point in the images, except for the white dots.

The Adjust Contrast tool application improves the image without changing the pixel values. *The imadjust* function is used to change the intensity values.

After launching *the Adjust Contrast tool*, a window opens with an image histogram. It shows ranges of image and display data. The range of image data conveys the existing coverage of the intensity values of the elements.

The display range provides information about the maximum possible coverage of the original layout image. The histogram of the original layout is presented in *usint8* format in the dynamic range from 0 to 255. There is a red rectangular area above the histogram, which adjusts the contrast of the original.

The next step in improving the quality of risographic printing is the additional use of adaptive image rasterization.

Algorithms for the automated application of combined filtering have been developed, including primary processing of the original image by linear filtration and secondary processing by nonlinear filtration; operation of linear filters; operation of nonlinear filters; brightness and contrast settings. Based on the obtained algorithms, a program for forming the print profile of the original layout for the risograph has been developed.