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Technologie graphique — Maîtrise des procédés — Confection des plaques offset

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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Annex A forms an integral part of International Standard. Annexes B to F are for information only.

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Introduction

During the production of an offset printing plate, a carrier material is coated with a thin radiation-sensitive film. The plate is referred to as pre-sensitized, if it has been produced by a plate manufacturer rather than at the printing site. The radiation-sensitive coating on the offset printing plate may be either positive-acting (for positive polarity films) or negative-acting (for negative polarity films). Some offset printing plates with positive-acting coatings can be used as convertible plates together with negative polarity input material.

During preparation of the offset printing forme, analogue information is transferred from half-tone film to an offset printing plate by means of a contact exposure step with radiation to which the plate coating has been sensitized. Alternatively, offset printing plates may be exposed using optical projection of reflection or transmission copy or by direct writing techniques. While such alternative processes are not covered by this International Standard, many of the principles included may be applied by analogy.

Before the exposure step, the emulsion side of the half-tone film is brought into intimate contact with the sensitized plate coating, usually by means of a vacuum contact frame. The radiation used for the exposure step may contain both diffuse and unidirectional components. The benefit of diffuse radiation is that artefacts like film edges of positive polarity films, scratches and dust particles are not rendered on the plate. However, care is required because diffuse radiation accentuates any artefacts associated with areas where film and plate are out of contact or where the contact is poor.

During the exposure step, the optical spread function of the printing plate and the diffusive component of the radiation cause final detail on a positive-acting printing plate to be reduced in width so that the image elements are somewhat smaller than the original on the film. With negative-acting plates, the same physical phenomena result in fine detail on the plate that is somewhat larger than the original.

After the exposure step but before development, the coating usually shows a colour difference between exposed and unexposed areas.

The development of an offset printing plate normally consists of the removal of the coating in the non-printing areas. These are the exposed areas of a positive-acting plate and the unexposed areas of a negative-acting plate.

The quality of the printing forme produced by the platemaking operation depends in particular on the following process parameters:

— exposure step, especially vacuum conditions (including drawdown);

— chemical composition and temperature of the developer fluid;

— condition of rollers and brushes;

— processing speed (development time);

— finisher condition.

After development, the colour contrast between printing and non-printing areas is usually much greater than before.

Following exposure and processing, baking or post-exposure treatment may be used prior to correction and gumming. The developed offset printing plate is thus transformed into a press-ready offset printing forme. During correction, image elements are deleted (negative correction) or added (positive correction). At the gumming stage, a thin coating of a colloidal solution is applied to the image side of the plate in order to protect the surface and to prevent toning during the printing operation. Baking or post-exposure treatment is a heat treatment which increases the durability of the coating with regard to chemical or mechanical wear.

Determination of the optimum exposure for positive-acting offset printing plates: There are three important considerations.

a) The exposure should be strong enough for artefacts like film edges and dust particles to not normally show on the offset printing forme.

b) The exposure should not be so strong that the transfer of fine highlight half-tone dots is impaired.

c) Since the exposure also determines tone value, which is very important in process control, the exposure should be controlled such that the tone value decrease from the half-tone film to the offset printing forme is constant, irrespective of the offset printing plate type and processing conditions.

For half-tone screens with screen frequencies of 70 cm^{-1} or less, it has been found in practice that it is possible to meet considerations a) and b) with a single exposure step. The exposure used is appreciably stronger than one which would result in the best possible resolution (but where artefacts would also be rendered). Consideration c) can be met in addition by observing a suitably selected microline reading.

For periodic or non-periodic fine screens which contain image elements of less than 25 µm size, conditions a) and b) cannot be met with a single exposure step. Instead, a first exposure step is carried out that yields the best possible resolution or slightly above. During the second exposure step, the subject areas are protected by a so-called burnout mask; an extended exposure removes the artefacts.

For positive-acting printing plates, it has been found that microline targets can be used to define an exposure range which ensures a reproducible tone value decrease from the half-tone film to the offset printing forme. In this range, the tone value decrease from the half-tone film to the printing forme is a linear function of the microline reading; the function depends on the platemaking resolution. For a particular plate, under given exposure and processing conditions, the graph of the positive microline reading over the logarithm of the exposure thus characterizes the tone value dependence on exposure. The slope of the graph is a measure of the rate of tone value change with exposure change. Therefore, a steep slope indicates less exposure latitude than a less steep one.

Microline targets useful for process control of platemaking contain a number of subtargets with graduated linewidths ranging from a few micrometres to several tens of micrometres. As distinct from the targets

line-to-space ratios other than 1:1. Usual ratios are 1:9, 3:5 and 1:4. Within the usual exposure range the microline reading depends very slightly on the line-to-space ratio. It is important to realize that the microline reading depends on the density level between the microlines. It must not be appreciably higher than elsewhere on the control strip film. As an alternative to a division into subtargets of constant linewidth, a single target with microlines of continuously variable linewidth may also be used. Since there can be directional effects during the manufacture of printing plates as well as during plate processing, it is a good plan to average over readings taken at right angles or to use targets with circular microlines. It is important to note that microline readings always refer to the width of the microlines on the film, not to the (unknown) width on the printing forme.

Determination of exposure negative-acting offset printing plates: There are three important considerations.

1) The exposure should be strong enough to achieve a sufficient and reliable run length.

2) The exposure should not be so strong that there is excessive tone value increase from the half-tone film to the printing forme or that extreme shadow detail is lost.

3) The tone value increase from the half-tone film to the offset printing forme should be at a specified level.

Since the first criterion is overriding, negative-acting offset printing plate exposures usually follow the recommendation of the plate manufacturer, which is expressed as the reading of a continuous-tone step wedge. Once the optimum exposure has been established, microline targets may be used to additionally monitor the consistency of subsequent exposures. They should not be used as the primary exposure determinant.

Some users employ weaker exposures than the manufacturer recommends, in an effort to obtain a desired tone reproduction in automatic processing systems with plates that have long run-length coatings which require more aggressive processing.

With some plates, the run length may be extended by post-exposure or heat treatment. In these cases, the manufacturer may recommend a lower range of allowable exposures and a post-exposure or baking treatment to extend press life. This may result in a lower tone value increase than otherwise.

Apart from its use for determining the exposure of negative-acting offset printing plates, a continuous-tone step wedge may also be used to assess the development process. A useful quantity in this respect is the platemaking gradation; it characterizes the reaction of the plate coating to the amount of radiation under a given processing condition. A change of the platemaking gradation indicates that the processing conditions or the coating have changed.

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