TECHNICAL BULLETIN

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Addressing Plate Distortion with Creo Copydot Solutions

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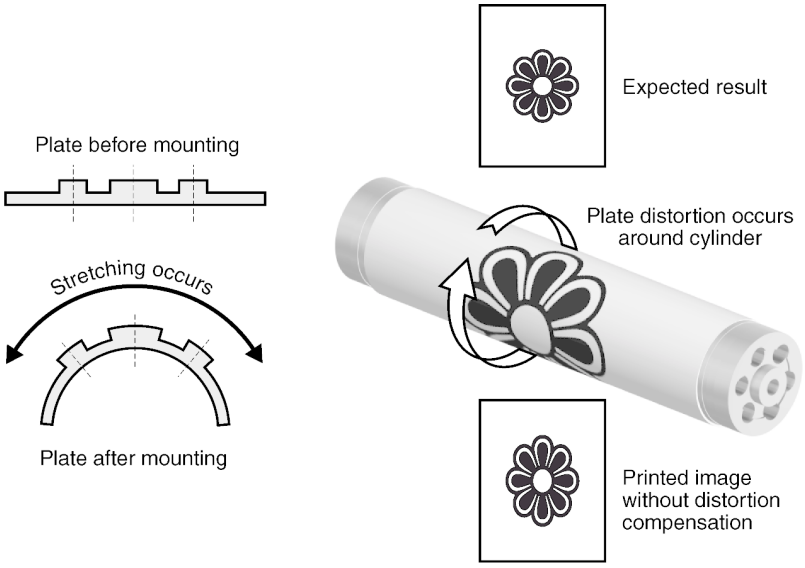
Introduction

This technical bulletin provides an introduction to the concept of flexographic (flexo) plate distortion and how Creo copydot products can be used to address it. Specifically, it explains how the Renaissance Scanning System and Copydot Toolkit allow flexographic printers and tradeshops to reuse archived plate negatives and artwork files. To illustrate these benefits, we provide some typical workflow use cases.

What Is Plate Distortion?

Plate Distortion, also known in flexography as "Plate Elongation," refers to the image distortion that occurs on a flexo plate when it is mounted on press. This distortion occurs when the flexible plate is wrapped around a curved press cylinder because the outside plate surface—which is the side from which the image is printed—is stretched, while the inside surface is compressed. A circle, for example, will distort into an oval when the plate is wrapped around the cylinder. For an illustration of this concept, see Figure 1.

Figure 1: Plate Distortion



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The amount of distortion that occurs depends on several factors, such as the size of the cylinder, the thickness of the plate, and the plate type. However, the most significant of these factors is plate thickness.

Distortion and Plate Thickness

The thicker a plate is, the greater the circumference of its outside surface in relation to the inside surface when it is mounted on the cylinder, which in turn causes the plate distortion to increase. Because flexo plates are relatively thick—ranging from 0.040" (1mm) to 0.275" (7mm)— the magnitude of this distortion can be substantial, making compensation for it critical to the production of quality presswork.

How is Distortion Compensation Calculated?

The first step is to calculate the distortion compensation that is necessary to ensure that the final image is printed without being stretched vertically or horizontally. It is important that distortion calculations are precise, because even a small error can create problems in the final printed image. In most cases, flexographers prefer that graphic designers not compensate for distortion in their artwork files. Instead, the distortion compensation is typically performed by the flexographer on-site at the printing or tradeshop facility.

Most flexographers use a standard formula to determine distortion compensation percentages. This formula can be expressed as follows:

$$\text{Distortion Compensation \%} = \frac{K}{R} \times 100\%$$

where K = Constant
where R = Repeat Length

Determining the "K" Factor (Constant)
The distortion produced relative to the plate thickness is known as the "K" factor (K). It is possible to calculate the constant K factor using the following formula:

$$K = 2\pi t$$

where $\pi = 3.142$
t = plate thickness

Example 1: Plate Thickness is 0.067", Polyester Adhesive is 0.005"

$$K = 2\pi \text{ (plate thickness + thickness of the polyester adhesive)}$$
$$= 2 \times 3.142 \times (0.067" + 0.005")$$
$$= 2 \times 3.142 \times 0.072$$
$$= 0.452$$

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Determining the Repeat Length (R)
The repeat length (R) is normally specified with the print job, however if repeat length is not known, it can be determined by measuring a printed sheet (See Figure 2 for an illustration of Repeat Length). If this is not possible, then it can be calculated by adding the radius of the printing cylinder, the thickness of the polyester adhesive, and the plate thickness and inserting the results into the following equation:

$R = 2\pi x$

where $\pi = 3.142$

x = (cylinder radius + adhesive + plate thickness)

Example 2 : Plate mounted on a 8" diameter cylinder (radius of 4"), Polyester adhesive is 0.005", Plate Thickness is 0.067"

$R = 2\pi$(cylinder radius + adhesive + plate thickness)
$= 2 \times 3.142 \times (4 + 0.005 + 0.067)$
$= 2 \times 3.142 \times 4.072$
$= 25.58$"

Completing the Calculation
With the K and R values known, the distortion compensation percentage can be calculated using the original formula.

$$\text{Distortion Compensation \%} = \frac{K}{R} \times 100\%$$
$$= \frac{0.452}{25.58} \times 100\%$$
$$= 0.0176 \times 100\%$$
$$= 1.76\%$$

$$= 100\% - 1.76\%$$
$$= 98.24\% \text{ (Scale source image to this value)}$$

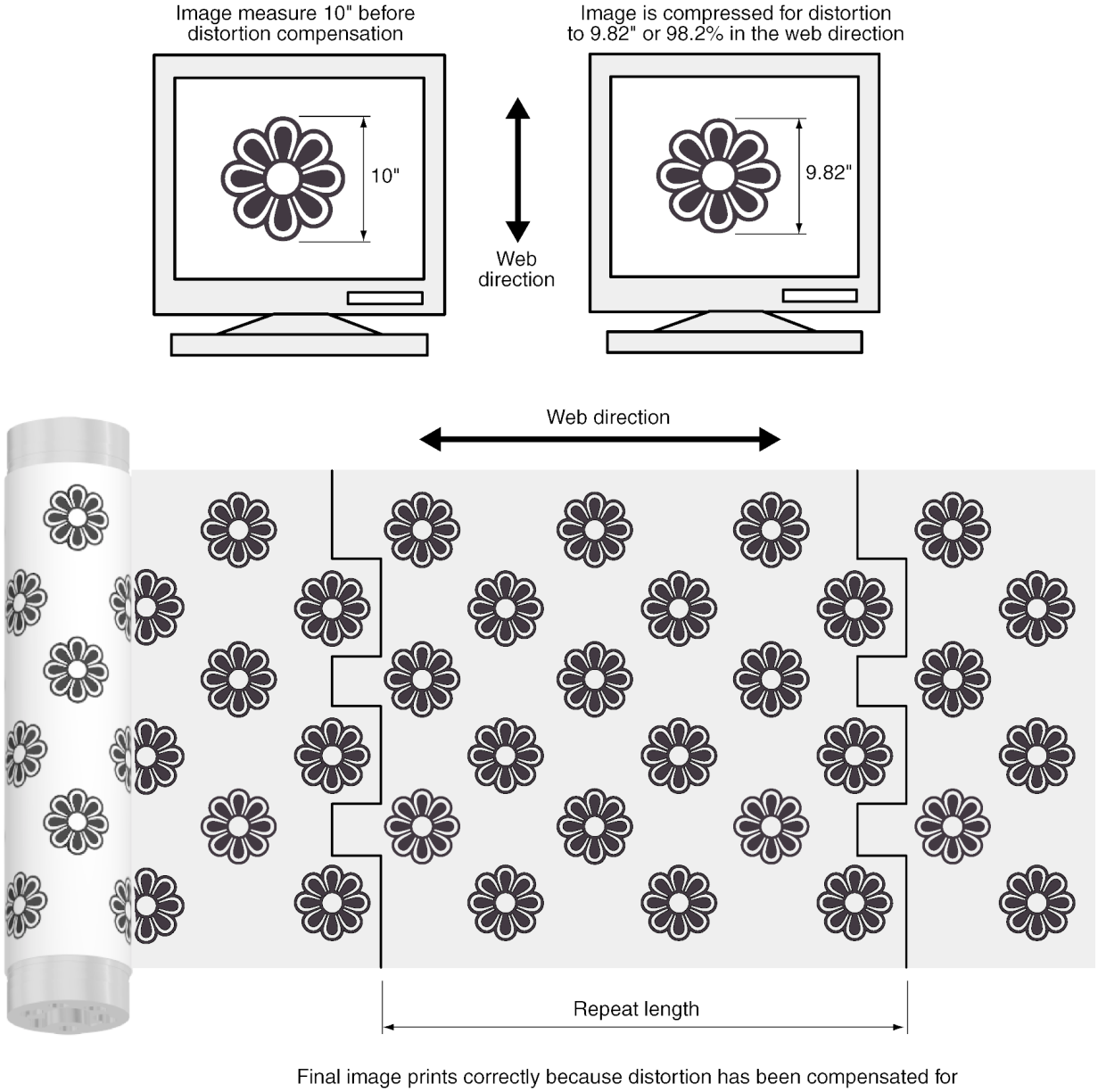
How Is Distortion Compensation Applied?

Once determined, distortion compensation must be applied to the digital file. Typically, compensation is applied prior to—or during—imaging of the final plate negatives (films). Compensation occurs through anamorphic scaling (scaling in one direction without effecting the other) of the image. Next, plates are made from the negatives and mounted on the press cylinders, at which time printing can commence. Since the plates have been created with the correct compensation already built-in, images are printed in their originally intended shape. For an illustration of this process, see Figure 2.

Because factors such as plate type, plate thickness, and cylinder size change frequently, it is difficult to reuse plate negatives if any part of the job setup changes. As a result, new plate negatives must often be produced for every job—even repeat jobs. This means increased consumable costs, more time spent preparing files, and high potential for run-to-run mis-matches.

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Figure 2: Applying Distortion Compensation



Final image prints correctly because distortion has been compensated for

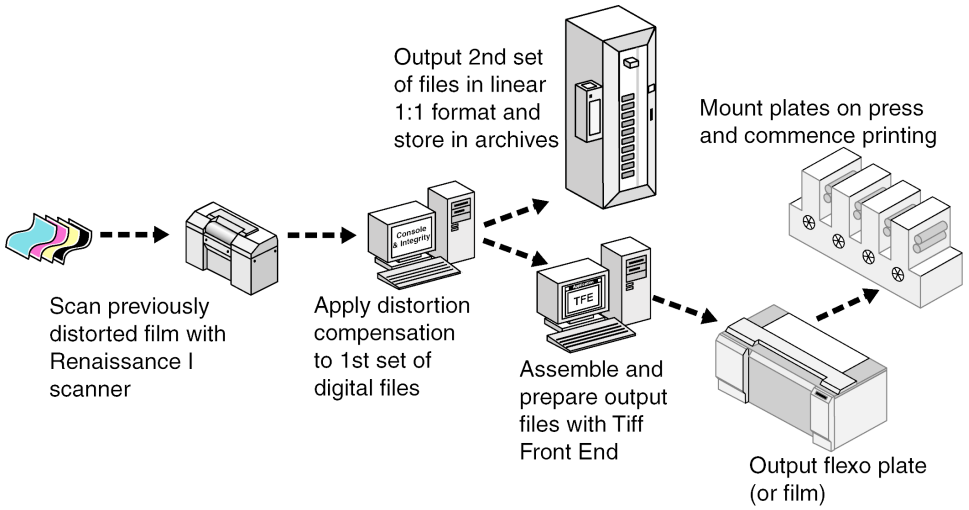
Repurposing Archived Film with the Renaissance Copydot Scanning System

The Renaissance family of copydot scanners incorporates anamorphic scaling capability in the system software. Flexographers can use this functionality to repurpose archives of plate negatives even if printing factors—such as cylinder size, plate type or thickness—change. Compensation can be applied on an as-needed basis. Once films are scanned, the digital files—also known as copydot files—can be reused over and over again for many different purposes. Furthermore, these copydot files can be edited, scaled, and calibrated inside the Renaissance software, providing the flexographer with an extraordinary new level of control

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over the printing process. Figure 3 illustrates the workflow benefits of scanning archived film with the Renaissance system.

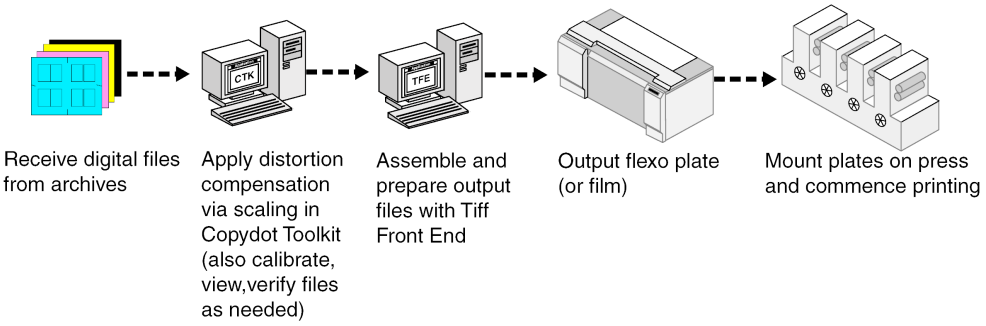
Figure 3: Using the Renaissance Copydot Scanning System to Repurpose Archived Film



Scaling files with the Copydot Toolkit

For flexographers who already work with digital files, but who need to change job settings to suit a new printing factor, there is the Copydot Toolkit. In addition to many other features, the Copydot Toolkit allows files to be anamorphically scaled as needed. This means that distortion compensation can be applied quickly and easily in software on a job-by-job basis. Simply call up the file and scale to the appropriate distortion compensation percentage. For an illustration of this concept, see Figure 4. Alternatively, the flexographer may use the Copydot Toolkit to adapt existing digital files into a standardized workflow system. For example, converting files into a 1:1 linear format allows them to be quickly and easily reused in the future for just about any purpose.

Figure 4: Using Copydot Toolkit to Apply Distortion Compensation



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