COMMON SENSE FLEXO

How much ceramic-coating porosity is acceptable in anilox-roll manufacturing?

By David J. Lanska, "The Anilox Guy"

In what may be the most important component in flexographic printing, an anilox roll's manufacture starts with the steel base core. The core—whether machined from a solid piece of steel or from a steel tube with fitted plugs that form the journals—is the foundation of the roll. Bearings fitted onto the journals allow the roll to rotate in place in the press. To insure a snug fit for the bearings, the journals are precision-machined to exacting tolerances for diameter and concentricity with the face. The face of the core is machined to a predetermined dimension under the finished diameter tolerance. Undercutting the face provides room for the ceramic coating. The surface is then grit-blasted to rough it up so the ceramic can grip to it.

The ceramic used for anilox rolls is chrome oxide (Cr_2O_3)—essentially crushed rock. The microscopic particles of chrome-oxide powder are fed into an intense flame (plasma) formed as a gas is fed into a high-voltage electrical arc between an anode and cathode. The particles melt and are accelerated at high velocity through the nozzle of the plasma gun at the surface of the roll. When they hit, they flatten out like a snowball hitting the side of a barn. Since the particles are extremely small compared to the roll, the heat from the particles is immediately transferred into the roll. The particles cool and harden like lava.

Some particles may be too small to maintain their molten state until impact. These particles go back to their solid state before they hit...and bounce off. Others may be too large to fully melt, so upon impact they don't flatten out as thoroughly. Some may bounce off, while others become trapped by smaller, molten particles. Typically, there will be air pockets that result adjacent to these "unmelts." These air pockets are known as porosity.

Porosity is generally considered to be a "bad" thing for anilox rolls, and this is for a good reason. When trying to engrave into ceramic, any porosity has the potential to alter the microscopic wall structure. Put simply, if there is a void, there is not as much material to fully form the cell walls.

Another significant issue with porosity is its effect on cell depth. When manufacturers are trying to engrave cells with depths of micron precision, any porosity can affect the depths achieved. With extremely fine linecount engravings, the pores can actually be larger and deeper than the cells being engraved.

Certainly, the goal is to create a ceramic layer with maximum density (minimal porosity). "Density and

As print demands increase, especially with fine process and vignettes, porosity's effects become much more apparent.

ceramic consistency are critical for insuring even absorption of the laser energy, as well as the uniform displacement of recast to produce cell walls of consistent thickness." (Source: Stork Cellramic's article "Engineered Coatings: A New Approach to Improved Print-Shop Productivity." *Flexo*, Sept. 2002). It is important to keep in mind, however, that all thermal spray coatings have some degree of porosity. Porosity is inherent to the plasma spray process.

So how much porosity is acceptable? That generally depends on linecount. Low-linecount engravings are usually used for more forgiving applications. If you are dumping down adhesive or varnish (or even solids and reverses), chances are good you would never notice the effects of 5 percent or more porosity as long as it was evenly distributed throughout the roll face. As print demands increase, especially with fine process and vignettes, the effects become much more apparent. With high porosity, you might see color variations or notice rapidly muddled plates from ink free-flowing over incompletely formed cells walls. With these applications, 2-3 percent porosity is preferred.

Excerpted from Common-Sense Flexography: A User's Guide to Improved Pressroom Productivity, © 2007, Printing Industries of America/Graphic Arts Technical Foundation. Used with permission. All rights reserved. Full book is available for purchase from PIA/GATFPress at www.gain.net or by calling 866/855-4283.