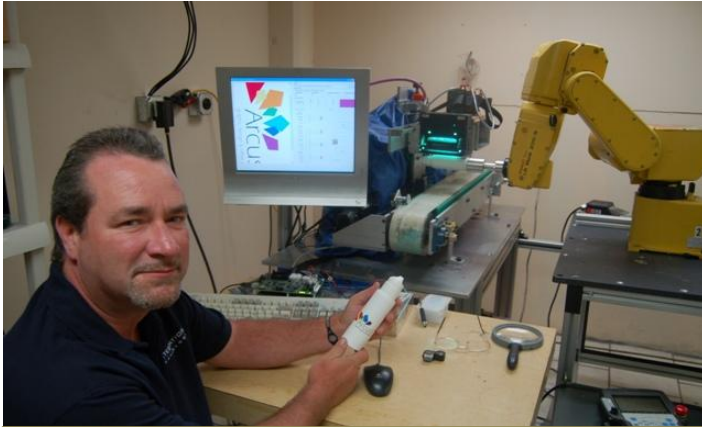


Digital Inkjet Printing with a Twist: Scribe uses Robotics and UV Curing to Print on 3D Parts

The world of digital inkjet printing is exploding with new applications, and Bob Deets, the founder and president of Scribe Inc., is putting his companies own twist on the technology.

While many printers and packagers are using inkjet technology to apply labels, bar codes and other forms of data, outside of Scribe, these applications have all been limited to flat surfaces. Scribe is



Bob Deets, president and founder of Scribe, Inc. has mastered the science and art of applying and curing inkjet printing on 3-D curved surfaces.

developing systems which can jet ink onto virtually any part regardless of its geometry. That unique capability is helping to fill Scribe's Meadville, Pennsylvania lab with everything from coffee mugs to medical supplies, and from cosmetic containers to appliance parts.

To accomplish this feat, Scribe's engineers had to master a world both big and small. Their machine building skills allow them to design and build systems that can robotically pick parts from a conveyor line and position them accurately beneath inkjet heads that apply images that are instantly cured using UV lamps. But at the

same time, a mistake of even .001 inch can mean a rejected part. Those are the kind of tight tolerances needed when jetting ink at 720 dots per inch onto a curved plastic container.

Deets has been working in the plastics decorating field for nearly 25 years, coming up through the ranks at a family-owned advertising specialties company that injection molds and decorates a wide range of novelty items. "We molded parts and decorated them using silk screening, pad printing and hot stamping. We ended up with rooms full of tooling, dies and screens for the large volume jobs we ran. But we also had to turn away customers who wanted batches too small to be produced cost-effectively". Deets felt that digital inkjet printing solved two problems in his business – it cut the time and cost of developing the tooling needed for printing, and it provided a way to offer small volume runs of custom imprinted parts.

"So we designed the first machines for our own use in the specialties printing business" recalls Deets. "And while we were building our own system, the growth in other markets requiring variable data was turning everybody's attention to the digital inkjet process at the same time. So our development ran head-long into a whole new world of uses that can take advantage of our 3D inkjet printing technology."



Digital inks are cured almost instantly by UV lamps supplied by Integration Technology, Ltd.

That may be why application engineers at Konica-Minolta, one of the leading inkjet print head manufacturers, send leads Scribe's way. "Konica-Minolta gets lots of calls from customers looking at inkjet for their printing – and they send us the ones who have something other than a flat part". Scribe has forged a strong relationship with all their key suppliers including Industrial Inkjet Ltd., the official distributor and technical support centre for Konica Minolta industrial inkjet products sold throughout much of the world.



Ameri-Vac is able to custom imprint on these cone shaped medical vacuum canisters using Scribe's 3-D inkjet technology.

To be good at what they are doing, Scribe's engineering team has developed expertise in each link in a fairly complex process.

First, Scribe must be able to work with customer artwork and 'rip' the images into coded instructions that allow multiple inkjet print heads to accurately shoot ink onto the part. And since each part is frequently unique, Scribe has developed an extensive bag of tricks for adapting the process to different materials. "Getting the ink to both stick and look great requires knowledge of materials and surface treatment so we can achieve the optimum dyne levels" explains Deets. Often flame, corona or plasma treating equipment is needed to get the right surface energy.

But simply getting ink to onto a part is just the beginning of the challenge. Many applications require that designs from coding to artwork be faithfully reproduced on millions of parts. Controlling near-microscopic parameters of the ink application such as drop gain are critical hurdles on each project. "We have learned it's not just the application of the ink that can make or

break a beautiful image, but the curing profile of each droplet as well" says Glenn Sahlin, Scribe's Technology Manager. To UV cure their inks, Scribe turned to Integration Technology Ltd., a leading supplier of UV curing and pinning systems for the print industry. "The Integration Technology UV units allow us to achieve the level of control needed for precise UV curing of digital inks" says Sahlin. "ITL partnered with us to help understand how UV energy and dose affects the shape and reproducibility of jetted inks and that work has been paramount to some of the applications that require high precision inkjet printing".

Perhaps the most unique aspect of Scribe's technology is their ability to manipulate parts underneath inkjet print heads and UV lamps in such a way that they can apply images to virtually any shaped part. "The ready availability of very precise 6-axis servo robots allowed us to begin experimenting with parts that were impossible to print with flat-line systems" explains Frank Pagano, Scribe's engineering manager. "The robot can pick up an odd shaped part and place it in just the right spot for printing and curing. Controlling the motion of these parts under delicate print heads and UV lamps requires extreme precision that requires both mechanical and



High-quality cosmetics manufacturers look to digital inkjet as a solution to packaging problems where both beauty and flexibility are required for their packaging.

electrical tools and techniques that we have developed at Scribe" says Pagano.

And when commercially available robots may not provide the best solution, Pagano designs his own custom automation. For example a top quality cosmetics supplier wanted to custom imprint the name of each shade onto beautifully decorated cardboard boxes for their make-up. “There are dozens of possible labels, and digital inkjet printing provided the ideal flexibility for their variable data printing. But this job couldn’t have been done on a flat-line, and robots weren’t the right answer either” recalls Pagano. “So we designed, tested and built a special box printing machine that solved the problem”.

The same sort of innovative thinking allowed Ameri-Vac, a medical supply manufacturer to decorate vacuum canisters used in hospitals and healthcare facilities. To print markings on these cone-shaped containers Scribe used a robot with specially designed end-of-arm tooling to move each canister rapidly from printing to curing stations. Ameri-Vac is now able to provide custom imprinted products to their customers, a feat that could never be achieved with the high setup and changeover costs of conventional printing.

Even as Scribe is busy enabling inkjet printing on parts that were never possible before, the team continues to look for ways to improve their technology. “We are always looking at new control schemes, and automation” says Deets, “but we are especially excited about the future of UV curing” says Deets.”

Integration Technology Ltd. is currently developing UV LED systems for inkjet curing that will transform the next generation of machines. These LED sources are more compact and may allow us to cure an even wider range of parts in the future” says Sahlin “but they also generate far less heat, and that expands the list of thin and heat sensitive plastics and foils our customers can print on” says Deets.

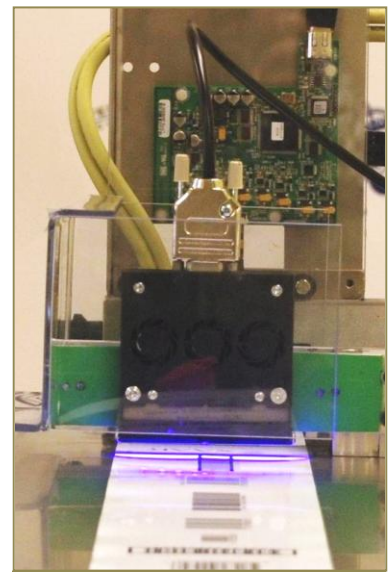
The development of UV LED curing systems has already produced a number of commercially successful inkjet printing applications for narrow web printing of bar codes, labeling and addressing systems. So look for Scribe to continue to make their imprint on the fast-changing, multi-dimensional landscape of inkjet printing.

For additional information, please contact the following companies. Additional information as well as regional offices, phone numbers and email addresses can be found on the respective websites.

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The next generation of UV curing is likely to rely on energy efficient, solid state UV LED light sources that offer a number of advantages including less heat transfer to substrate.