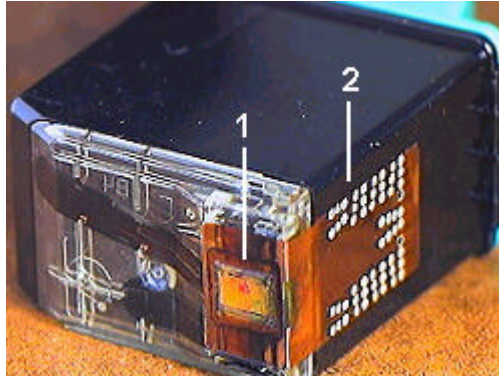


Inkjet Technology Inspection



Introduction

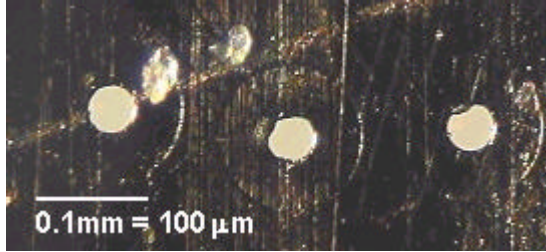
When one understands the details behind modern inkjet technology, it becomes evident that it is a true marvel of miniature engineering and electronics. Personal inkjet printing has exploded with the increased popularity of the internet and digital photography. To keep up with increased resolution requirements, inkjet technology has moved from the initial thermal technique to the more accurate and controllable piezoelectric technique. Piezoelectric printer heads come in two classes, continuous and drop-on demand. The former can be found in very high resolution applications like carton and product marking. The latter is the format that everyone is familiar with, the replaceable cartridges found in our personal inkjet printers at home (see above picture). The black container is what holds the entire reservoir of ink (i.e. the bottle), the print head (labeled #1) is a multi-layer ceramic substrate that contains the tiny ink “jets” and the flexible circuit (labeled #2) is what makes electrical contact with the printer housing. The ink “jets” are ink filled cylinders with diameters of 16um to 60um (depending on the dpi resolution of the print head) that expand or contract when subject to an electric field. This expansion produces a mechanical pressure on the ink, and thus ejects the ink onto the printer media. The piezo mechanism is capable of firing at 100kHz, however the operation of the head is ultimately regulated by the thermodynamics of the ink in the jets.

The Measurement Need

To ensure that the inkjet cartridge operates properly and at the specified resolution, certain features of the unit must be measured to ensure quality. Some features that are important are:

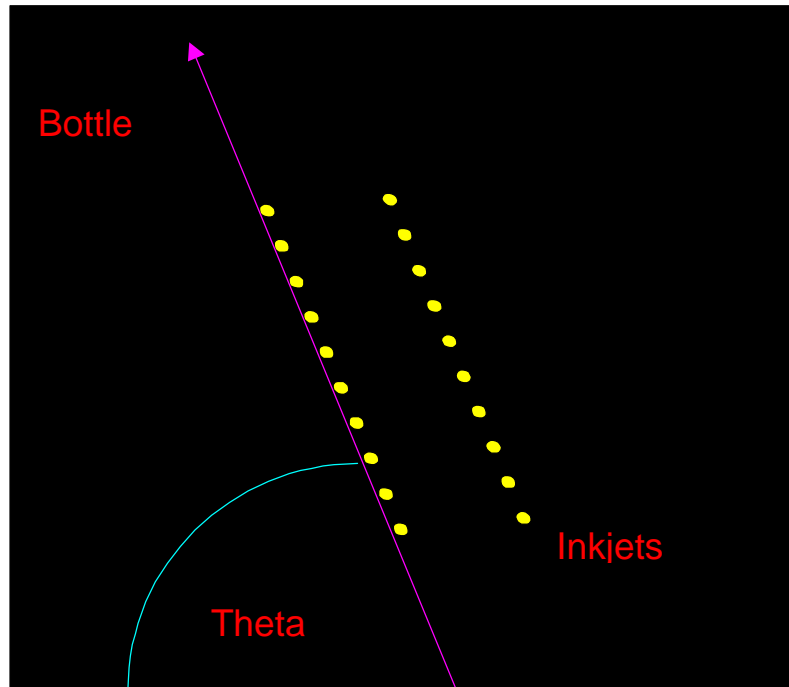
- 1) Inkjet Entrance and Exit Diameters, since these determine the total volume of eject ink
- 2) Inkjet Hole Placement, since this determines line-to-line print quality
- 3) Inkjet Hole Alignment to Bottle, since also this determines print quality

Some of these measurements are easily accomplished by a number of video coordinate machines on the market, but only one makes these measurements at the highest accuracy, repeatability and reproducibility with the highest throughput, and that would be the Mirage™ and Lumina™ products from JMAR Precision Systems.



Diameter Measurements

	Repeatability (3 Sigma)
InkJet Diameter	0.05um
Fiducial Alignment	0.07um
Bottle/Circuit Alignment	1.0um



Bottle/Inkjet Alignment Measurements