

## Setting The Standards in Inkjet Ink Testing

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From time to time chemists notice that people from other activities still believe formulating could mean writing down a formula, mixing some ingredients and "voilà" a new ink would come out of the magician's hat.

Reality is far from this belief. Experience shows that hard formulation work and application tests have to be done to design an inkjet ink. It has to comply with all the remanufacturer's and enduser requirements and this represents the quality level which Inkjet Inks manufacturers should achieve.

Sellers and endusers of compatible and remanufactured inkjet cartridges should execute some extensive application testings to evaluate their quality and not content with limited examinations, because limited checkings eventually lead to adopting inks with "limited" properties, which could cause surprising complaints later on.

These limited testings can only benefit those inkjet ink manufacturers not ready to use the best raw-materials and to perform extensive quality controls and bench testings, cutting down their R&D time ... but also finally the confidence in their inks.

Sellers and endusers of compatible and remanufactured inkjet cartridges should ask a reliable Inkjet Ink manufacturer for his **Inkjet Ink Test Protocol** used for developing a specific ink. It should be important to **set up the standards of quality control to adopt inks** and refuse those inks not complying with a determined **Test Protocol** (it is obvious, anyone should determine which tests to execute, according to the needs of his clients and their applications):

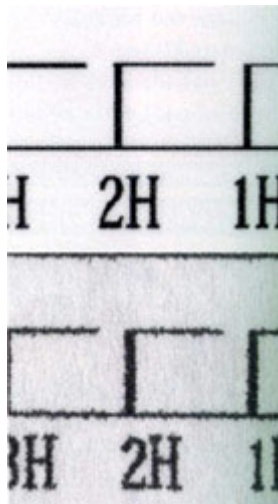
However, before start testing, it is important to have at least one full and unused OEM cartridge ready to perform parallel testings for comparison. **Repeated tests should be complete (including also the OEM cartridge), because temperature and humidity may vary from old tests and can affect the print performance.**

**The printer has to be the same one for the parallel testings**, since there could be differences between printers even from the same model, due to the fact that their electronic parts deteriorate depending on the heavy-duty work (far above normal end users work charge) each of the printers have been exposed to. Even better, **the inks should be tested on a new (scarcely used) printer**, because its printing performance could vary a lot from the one observed when printing with a heavily used printer in production controls. Many remanufacturers do so because an old printer might be good for production control (controlling simple issues) till "exhausting" the printer, but not for accurate testings where you need a spare printer.

It is naturally understood that to compare printing performances you must also **apply the same print pattern, paper type and print quality driver setting, and the paper itself**. The paper should be chosen preferably from the same parcel of 500 sheets, because sometimes there could be differences between

the different paper parcels, even **the paper quality should be assured**. In case of doubts you may overprint on a used (printed) paper to see if the print performance is the same as before (= same ink) or if the new ink behaves differently (= different ink?).

Finally, but quite important, assure a **safe cleaning of the cartridges** and an **appropriate filling**: correct ink quantity injected in the appropriate way, depending on the cartridge type: internal air bladder, Mylar bags, sponges or tank-sponge combinations. That is, taking care not to leave air inside the bags, injecting ink to the right sponge area, getting the adequate underpressure in the cartridges, etc. A good **sealing of the print head** will also be essential to avoid clogged nozzles.



*Good (top) and bad sharpness examples (pictures courtesy of KDY Inc. USA)*



*Over-spray example*

Above were preliminary requirements to the ink testings. Now let's really start testing inks: You may choose essential tests such as checking how well a cartridge with black or coloured ink(s) prints some text, bar graphs or solid colour blocks and scales, symbols, vertical and horizontal lines, etc. to determine basic parameters:

**Sharpness:** Everybody knows what that means and how to evaluate it, but don't forget that it strongly depends on the paper, specially when using dye-based inks. Good sharp characters should also avoid over-spray.

**White lines:** If they appear it is important to check the nozzles have been carefully cleaned. Correct filling (pressure in internal air bladder cartridges, well soaked sponges in sponge cartridges and no air-bubbles in Mylar bag cartridges) grants a good flux of ink to the nozzles. Finally a good non-sticky sealing is important to avoid clogging nozzles or ink drying on them.

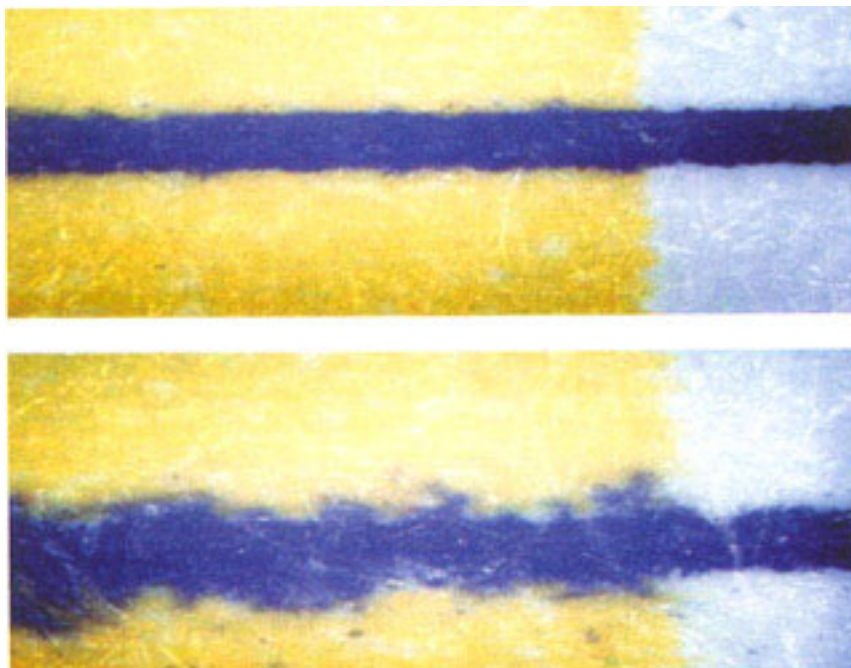
**Blackness and colour matching** (optical density): The human eye is easily tricked, so it is important to keep the print samples to compare very close to each other and under the same light. To measure it scientifically you would need a Colorimeter, Spectro Colorimeter or Densitometer.

**Dry speed:** Does the second sheet of a letter get smudged on its reverse side because the first sheet was not dry? It is important this is tested with pigmented inks and it will also depend on the quality of the paper. Finally, the ink should dry on the paper, not on the nozzles. Check that!

**Show-thru** (on the reverse side): This strongly depends on the paper, but it is desirable this does not happen since some endusers like to also print on the reverse side of the paper.

**Paper dependency:** As mentioned before, print performance may vary tremendously on different papers. Testing is recommended as well on papers of major clients if this is possible. It is desirable the ink suits many kinds of papers without losing other important performance parameters.

**Inter-colour bleeding:** A common error is to forget how the black ink will perform when writing black over original or compatible colours (specially over yellow or viceversa). Although you do not recycle the colour cartridges, from time to time your client will print colourful presentations and inter-colour bleeding must be avoided. You should make this test at least the first time before adopting a new black ink and check it sporadically.



*Good (top) and bad inter-colour bleeding*

We could continue with other tests depending on the needs of the end-users, such as testing the **mottling and banding** (to be seen on solid black block printing), **cockle effect** of the paper, etc. but we would like to concentrate on other more relevant tests:

**Cartridge yield:** How many pages can you print well with one ink compared to another (always using the same ink quantity, paper and print pattern)?

**Stress test:** unlike the previous test, here you look at how the print quality varies till the cartridge is exhausted.

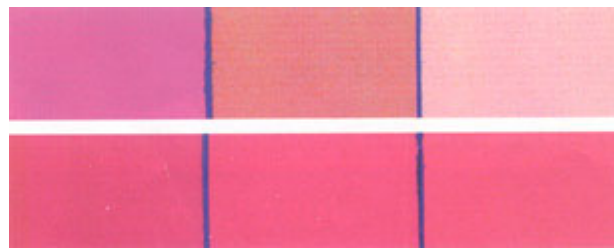
**Water fastness:** This is to measure the fading of the print out per each second of immersion of the same in water. This is normally more required from pigmented inks. It also depends on the paper.

**Light resistance:** Colour fading is measured after exposing a print-out to real sunlight or U.V. rays in an accelerated test. This is specially required from inks used in graphic applications (wide format printers). Light resistance is highly media dependent.

Special tests for remanufacturers:

**Ink stability test:** What happens if the cartridge goes to the trade and is used after some time? Will it still write? Inks should be compatible with OEM ink residue (if any left inside the cartridge !) and also remain stable in time. Dyes or pigments used should not settle down within a reasonable long period of time. The manufacturer should ensure this by performing accelerated ageing tests and also under normal storage conditions. The latter test may also be easily executed by remanufacturers who sell to the trade.

**Pass rate:** How many cartridges can be remanufactured successfully in one go (without having to repeat some recycling steps), using the same source of cartridges and identical cleaning and refilling method and, of course, the same ink?



*Light resistance test - fading examples*

And finally, **the latency or better called no-returns test:** A correctly sealed cartridge is left undisturbed for several weeks. Then start the cartridge in the printer following the printer's instruction manual: correct priming, cleaning cycles, etc. After the cartridge has correctly started, it is left undisturbed in the printer's stand-by position overnight, over the week-end and over a holiday period simulation. After those stand-by periods the cartridge should always start at once. This test, along with the above mentioned Ink stability test and a correct sealing of the cartridge determines the no-returns rate, which is more crucial than the pass rate: After all, what we want is repeat orders!

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