

Comparing and Calculating VOC's in CIJ and TIJ Printers



CALCULATING VOC IN PRINTING INKS



VOCs are Volatile Organic Compounds. The Federal Clean Air Act Amendments were passed in 1990 to reduce the amount of common air pollutants and materials such as VOCs which contribute to ozone formation. Federal and state environmental protection agencies have been directed to develop and implement programs which will reduce emissions of these materials.

VOC IN CIJ INK

Many inks contain VOC's. and more and more end users are requesting VOC information today.

It is useful to have a method for calculating the potential amount of VOC released for different inks.. And you can usually get all the information you need straight off a data sheet or MSDS.

You need only to look for two pieces of information

- Specific Gravity
- Percentage of Materials which are classed as VOC's.

As many of the values are given as a range, always use the highest numbers in estimating.

For example, the picture to the right shows the chemical composition for a CIJ ink. All four chemicals are VOC's. Adding the maximum percentages up gives us 84% (75+3+3+3).

SECTION 3: Composition/information on

Substance/mixture	: Mixture	
Product/ingredient name	CAS #	%
1) butanone	78-93-3	65 - <75
2) ethanol	64-17-5	1 - <3
3) Isopropyl alcohol	67-63-0	1 - <3
4) [3-(2,3-epoxypropoxy)propyl] trimethoxysilane	2530-83-8	1 - <3

To calculate the total VOC weight uses a very simple calculation

$$\text{VOC Weight} = \text{Specific Gravity} \times \text{Percentage VOC}$$

In the previous case, the Specific Gravity given on the MSDS sheet is 0.87, so the VOC weight per mL will be

$$0.87 \times 0.84 = 0.7308 \text{ g/mL}$$

To calculate the total VOC from any system is then a matter of knowing how much ink will be used in a predefined period of time and multiplying simply:

$$\text{Total VOC weight} = \text{VOC Weight} \times \text{Amount of ink used}$$



HOW THEY COMPARE

CONTINUOUS INKJET (CIJ)

CIJ works on the principle of jetting a continuous stream of electrostatically charged ink droplets into a gutter that returns it back into the ink supply. When a print pixel is required, it is deflected for a brief moment away from the gutter and this drop impacts onto the substrate. Only a small fraction of the droplets are used to print, the majority being recycled. The ink is held in suspension in a solvent and some of this will vent to the atmosphere. The returned ink is constantly monitored for viscosity and a solvent (makeup) is added to counteract fluid loss.



THERMAL INKJET (TIJ)

In TIJ the print cartridges contain a series of tiny chambers, each containing a heater. To eject a droplet from each chamber, a pulse of current is passed through the heating element causing a rapid vaporization of the ink in the chamber to form a bubble, which causes a large pressure increase, propelling a droplet of ink onto the substrate



Printing on metals, plastic and glass takes a special ink from both TIJ and CIJ. Both are solvent based and have comparative amounts of VOC's per mL because of this

For TIJ, TSD1010 can be used, for CIJ, MEK based inks

Although TSD1010 and MEK based inks have similar degrees of VOC's potentially released, there is another factor to be considered and that is the use of Makeup with CIJ systems.

Ink	Specific Gravity	VOC Percentage	VOC Weight (gm/ml)
Norwix TIJ Inks			
TSD1010	0.80	85%	0.680
Carton Black Plus	1.10	10%	0.110
Basic Black	1.00	0.1%	0.001
CIJ Inks			
MEK Ink	0.85	90%	0.765
Makeup	0.81	100%	0.810

If you use 1 liter, for example, of TSD1010 to print (that's 680gms of VOC's), the equivalent quantity of MEK and Makeup required to print the same images can be in the range of 3 to 6 liters depending on a variety of factors including temperature. This amounts to a whopping 5,625gms of VOC's. A factor of over eight times more!

So when you are explaining VOCs between differing print technologies, always make sure you have the facts straight.

