



green *ink!*

considerations for environmentally sound printing

why green ink?

The purpose of this white paper is to provide our customers with a framework by which they might begin to assess their options for greening their printing environment.

If your company is anything like ours, your interest in green business solutions may be simultaneously motivated by any of the following:

- a genuine commitment to doing the right things to sustainably steward our planet;
- a desire to create a safe, pleasant work environment for your employees;
- a mandate to achieve the lowest total cost of production, including minimizing investments in filtration equipment, scrubbers and toxic waste disposal fees
- local state and/or federal government regulations and/or industry-driven green initiatives;
- customer demand for cleaner, greener finished products.

Depending on who you speak to at Sawgrass, you might find a different emphasis placed on one or another of these motives, each of which is a legitimate reason to make a commitment to offering green solutions.

At Sawgrass Technologies, we are pleased to be able to make the claim that our inks can help our customers respond to the growing demand for green solutions. Our sublimation ink products qualify as "green ink" in that they are water-based... and as such, are measurably less harmful to the environment than *any* solvent based ink currently being touted in the industry...eco-, bio- or traditional. The VOC-free nature of a water-based ink provides a safer work environment for production employees as well -- a fact that is bourn out in our MSDS sheets.*

The result is a product that -- when paired with recycled, recyclable, biodegradable or natural substrates -- creates a finished product that is certifiably green.

How do we define “green” when it comes to ink?

Sawgrass Technologies defines a “green” product as one which accomplishes the job at hand (with the appropriate level of vibrancy and durability), while avoiding and/or minimizing any or all adverse impacts on human health or the environment. As our benchmark, we employ the most stringent standards established in the markets we serve, including Occupational Safety and Health Administration (OSHA), the Environmental Protection Agency (EPA), as well as local standards, such as California’s Office of Environmental Health Hazard Assessment (OEHHA), who oversee compliance with California’s strict Proposition 65 legislation which governs the use of chemicals in a wide variety of commercial applications.

As a general guideline, we strive to work within the **Twelve Principles of Green Chemistry**, available on the EPA website and originally published by Paul Anastas and John Warner in **Green Chemistry: Theory and Practice** (Oxford University Press: New York, 1998).

1. **Prevent waste:** Design chemical syntheses to prevent waste, leaving no waste to treat or clean up.
2. **Design safer chemicals and products:** Design chemical products to be fully effective, yet have little or no toxicity.
3. **Design less hazardous chemical syntheses:** Design syntheses to use and generate substances with little or no toxicity to humans and the environment.
4. **Use renewable feedstocks:** Use raw materials and feedstocks that are renewable rather than depleting. Renewable feedstocks are often made from agricultural products or are the wastes of other processes; depleting feedstocks are made from fossil fuels (petroleum, natural gas, or coal) or are mined.
5. **Use catalysts, not stoichiometric reagents:** Minimize waste by using catalytic reactions. Catalysts are used in small amounts and can carry out a single reaction many times. They are preferable to stoichiometric reagents, which are used in excess and work only once.
6. **Avoid chemical derivatives:** Avoid using blocking or protecting groups or any temporary modifications if possible. Derivatives use additional reagents and generate waste.

7. **Maximize atom economy:** Design syntheses so that the final product contains the maximum proportion of the starting materials. There should be few, if any, wasted atoms.
8. **Use safer solvents and reaction conditions:** Avoid using solvents, separation agents, or other auxiliary chemicals. If these chemicals are necessary, use innocuous chemicals.
9. **Increase energy efficiency:** Run chemical reactions at ambient temperature and pressure whenever possible.
10. **Design chemicals and products to degrade after use:** Design chemical products to break down to innocuous substances after use so that they do not accumulate in the environment.
11. **Analyze in real time to prevent pollution:** Include in-process real-time monitoring and control during syntheses to minimize or eliminate the formation of byproducts.
12. **Minimize the potential for accidents:** Design chemicals and their forms (solid, liquid, or gas) to minimize the potential for chemical accidents including explosions, fires, and releases to the environment.

Sawgrass Technologies does not employ solvents in any of our sublimation ink products.

Why do we avoid the use of Solvents?

According to the American Chemistry Council, "Air emissions from organic solvents degrade readily in the atmosphere and when that occurs in the presence of NO_x [Nitrogen Oxide] and sunlight ground level ozone can be produced. This is a key component of the summertime smog contributing to poor air quality, which can have a harmful effect on human health and plant life. The rapid degradation of organic solvents in the lower atmosphere also means that these VOCs do not cause any problems with the stratospheric ozone layer because they degrade before they get to the stratosphere."

In addition to having harmful effects on human health and the environment, some solvents (primarily HFCs) have been directly linked to global warming.

Solvent based inks generally fall into one of three categories -- traditional, full-solvent inks, mild/light eco-solvent inks, and bio-solvent inks. Although the aggressiveness of different types of solvent used varies greatly in each of these, the common denominator is...solvent.

When trying to determine the relative severity of the environmental and/or health impact of the solvent ink you are considering using, investigate the following:

- 1) Does the product contain chemicals that are listed as **hazardous air pollutants (HAPs)** or **toxic air pollutants (TAPs)**?
- 2) Does the product contain **volatile organic compounds (VOCs)**?
- 3) Does the product or any of its ingredients have a **personal exposure limit (PEL)** established for it by OSHA?
- 4) Ask for the MSDS fact sheets from the manufacturer, and verify whether any of the chemicals identified are on well recognized "watch lists" with organizations such as **OSHA**, the **EPA**, or **California's** Proposition 65.

In most cases, there are alternative approaches to achieving the quality and effect your customers are looking for. When considering which alternative technologies to implement in your operation, we recommend you compare data to see how each performs against a variety of criteria, such as:

INK	HAP	TAP	PEL	VOC	GREEN	VIBRANT COLOR	DURABILITY	UV STABILITY FOR OUTDOOR
Sublim Sublimation Ink	●	●	●	●	●	●	●	●
Full Solvent	●	●	●	●	●	●	●	●
Mild/Lite Solvent	●	●	●	●	●	●	●	●
Eco Solvent	●	●	●	●	●	●	●	●
Bio Solvent	●	●	●	●	●	●	●	●

Green = Meets Criteria; Yellow = Does Not Meet Criteria

If Solvents are so bad, why are people still using them?

There are many reasons why solvent-based digital inks have enjoyed the popularity that they have. Before the present awareness level of environmental issues had fully matured, the industry migrated to solvent-based inks because of the solid image quality they could achieve. Solvent inks provide rich, vibrant, durable colors that are UV stable, quick drying and which adhere to a wide range of substrates. In a business climate that was not fully aware of the worker health implications and environmental legacy that these substances bring with them, the equipment side of the business quickly developed printers that were specifically designed to work with solvent-based inks.

Rapidly-changing environmental and health constraints are placing pressure on the industry's choices in today's market. The good news is that there are now myriad high-performance non-solvent ink options for balancing image quality, flexibility and stability with a need for regulatory compliance and environmental protection -- particularly in the wide format arena where the print width is 100 inches or less. These water-based ink solutions have no hazardous material disposal costs, require no special equipment to capture fumes -- because there are no harmful fumes -- and allow users to avoid costs associated with government compliance with regard to occupational, safety, health and environmental regulations. Beyond the business reasons, from an environmental standpoint, choosing solvent-free inks whenever possible is just the right thing to do.

For indoor applications where a polyester or poly-coated hard substrate or fabric is the medium of choice, aqueous sublimation printing is a green option that is hard to beat. Sublimation provides rich, vibrant, durable colors and photo-quality output. Recent breakthroughs in the ink, fabric and hardware technology make printing directly on the substrate possible. SubliM ink from Sawgrass Technologies is specially formulated for production and high volume printing environments. With faster drying times required by high speed printers, SubliM allows for faster print speeds these environments demand. Eight distinct colors provide for an expanded gamut, allowing commercial shops to hit even the most difficult to replicate spot colors. Image quality meets or exceeds that of solvent printing -- without the

environmental baggage. Where the application is apparel, signage and banners, tradeshow graphics narrow web, gaming felts or rigid substrates, Sawgrass Technologies understands the unique requirements of a particular application, and has developed an optimized "whole product solution" that incorporate the very best printer, paper, RIP and heat press to get the most out of the green ink solution.

The future of green ink has arrived.

Sawgrass Technologies is proud of our track record for creating innovative green ink technologies that enable the digital printing industry to transform their businesses to a sustainable model that benefits all of us. As we look to the future, we hope that our legacy will be helping our industry add new beauty and color to the world while leaving no long term impact on the planet.

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