



Preton Ltd, white paper:

Environmental issues associated with toner and ink usage

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Environmental issues deriving from printer use

Global paper products consumption has tripled over the past three decades and is expected to grow by half again before 2010. Ever since the ancient Egyptians invented the papyrus, through the Chinese perfection of paper manufacturing and ever more increasing with Gutenberg's invention of the printing press, paper has been the main resource for the storage of information. Recent decades have introduced a technology promising to replace our need for these physical, costly and waste inducing products, so much that a "paperless office" was a commonly used term introduced back in the 1970's.

European paper production has increased an average of 2.5% per year

Unfortunately, this premonition has not yet held up to its enormous potential. At this day and age, as information flow is growing faster and wider spread, the human society's tendency to print not only does not diminish, but actually increases. European paper production has increased an average of 2.5% per year

(see Figure 1) and has been almost in constant growth since the turn of the century, declining only in 2008 following the economic downturn¹. World demand is expected to grow by 2.1% per year until 2020². the tendency to print has grown rapidly

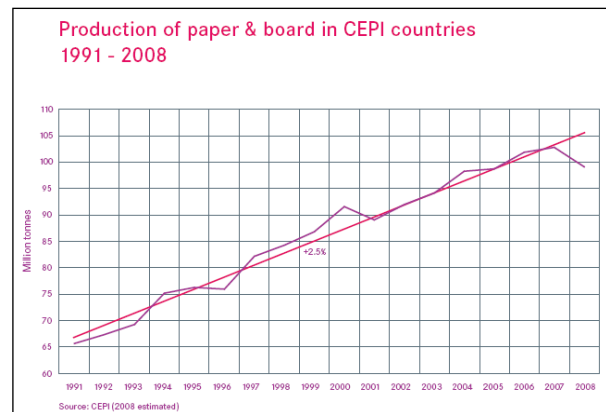


Figure 1

since the introduction of the personal computer and even more so since the internet became a major part of people's lives. Information has become much more

¹ Confederation of European Paper Industries. *Preliminary Statistics 2008*.

http://www.cepi.org/docshare/docs/1/AOJICIAAEBHCDMEOPPFEBGFB5LKG41YDY6AAV9VN4DCC/CEPI/docs/DLS/CEPI_PrelimStats_08_Web-20090224-00014-01-E.pdf

² Szabo, L. et al. *A world model of the pulp and paper industry: Demand, energy consumption and emission scenarios to 2030*. *Environmental Science & Policy* 12 (2009) 2 5 7–2 6 9

accessible, but reading it – now that's a whole different story. After being bound to paper for centuries, be it with books, typewriters or plain old bureaucracy, we have grown accustomed to having hardcopies in our hands. Reading it off the screen remains uncomfortable for many of us, and since printing technology has spread almost as fast as computers it has become second nature to hit PRINT. It seems that paper is still considered to be much more tangible, independent of a constant energy supply, lightweight and allows for a more intuitive work area. An Average employee prints 6 wasteful pages per day, that's 1,410 wasted pages per year for a total of 84.6\$

Our tendency to print bears a heavy environmental cost. In addition to the obvious environmental footprint caused by paper consumption, as we will show below, the increased toner and ink usage also have an environmental price. Since it is not practical to expect that the increasing environmental awareness will actually change human tendency, a more realistic and subtle approach is needed; one that understands that our tendency to print can actually grow, but as an alternative suggests a means to alleviate its negative impact on the environment.

It takes 12-24 trees to manufacture one ton of paper¹, resulting in an average of 18 trees cut down for every 10 employees per year.

Environmental Impact of Paper Consumption

Estimations of office paper consumption per employee are at approximately 10,000-20,000 sheets a year³, and can even go as high as 40,000 in the banking sector⁴. At 500 sheets per ream, an average employee consumes 30 reams each year. A ton of paper consists of about 400 reams, therefore 10 to 15 employees use-up one ton of paper per year. It takes 12-24 trees to manufacture one ton of paper⁵,

³ Australian Department of Families, Community services and Indigenous affairs (FaCSIA), *Sustainability Report 2006-2007*. http://www.fahcsia.gov.au/about/publicationsarticles/corp/sustainability/Documents/2007/docs/facsia_06_sustainreport_06-07.pdf

⁴ Leumi Bank. (2006) *Corporate Social Responsibility Report*. [http://english.leumi.co.il/static-files/Media%20Server/BLITA%20English/PDF%20files/Social_Responsibility_Report_\[Eng\].pdf](http://english.leumi.co.il/static-files/Media%20Server/BLITA%20English/PDF%20files/Social_Responsibility_Report_[Eng].pdf)

⁵ *Environmental concerns of paper making*. <http://www.paperindustry.com/environmental-concerns.asp>

resulting in an average of 18 trees cut down for every 10 employees per year. Office paper usage is in fact cutting down millions of acres of forests every year. The larger the organization, the larger the problem.

The environmental effects of this rapid consumption of paper are many. Paper, especially the printing paper in use in most work places, is manufactured mainly out of pulp, produced almost entirely from trees. Tree "harvesting" for the pulp industry accounts for over 42% of logged trees⁶. Global warming is just one aspect affected by this resource consuming industry. The world's forests are its lungs, converting Carbon Dioxide (CO₂) into Oxygen and supplying us with breathable air, while helping to maintain a constant global average temperature. Massive deforestation, removes these vital organs from our eco-system, aiding the rise of global warming caused by the greenhouse effect. Deforestation is also a cause for soil erosion, since roots of the trees are the ones that bind soil together. Removing trees and other plants from the environment exposes soil to the elements and in affect washes away with every rainstorm or strong wind. While topsoil is washed away vast regions formerly covered by forests and wildlife are left barren and lifeless, not even fit for agriculture⁷.

Tree "harvesting" for the pulp industry accounts for over 42% of logged trees¹

The manufacturing process of paper is also an issue for concern. Apart from the energy put into the logging and transporting of pulp, the extraction of the pulp itself is extremely energy consuming and involves dangerous chemicals, Phosphorus emissions from pulp production stages and NO_x emitted during transport are accountable for eutrophication of water bodies⁸.

During its complete life cycle each ton of office paper emits the equivalent of 6.3 tons of CO₂¹

⁶ Abramovitz, J. and Mattoon, A. *Paper Cuts: Recovering the paper landscape*. Worldwatch Institute Report (1999)
<http://www.p2pays.org/ref/37/36252.pdf>

⁷ Butler, R. *Erosion and its effects*. <http://rainforests.mongabay.com/0903.htm>

⁸ Dias, A. et al. *Evaluation of the environmental performance of printing and writing paper using life cycle assessment*. Management of Environmental Quality: An International Journal Vol. 15 No. 5, 2004 pp. 473-483

Paper ending its life in landfills decomposes and emits large amounts of methane, a greenhouse gas (GHG) 23 times more potent in global warming than CO₂. Despite recycling, during its complete life cycle, each ton of office paper emits the equivalent of 6.3 tons of CO₂ ⁹ an extremely harmful GHG.

Here are some of the scary numbers:

- In 2004 the United States used 8 million tons of office paper, that's the equivalent of 178 million trees!
- The U.S. pulp and paper industry is the second largest consumer of energy and uses more water to produce a ton of product than any other industry.
- Production of 1 ton of copy paper uses 11,134 kWh (same amount of energy used by an average household in 10 months).
- Production of 1 ton of copy paper produces 2,278 lb of solid waste

The Environmental Impact of Toner & Ink Consumption

Alongside the impact of paper consumption exist the devastating consequences of toner and ink usage. The environmental impact of these consumables relates to their entire lifecycle, their manufacturing, the pollution that they cause during the printing process, and finally their disposal.

The environmental Cost of Manufacturing

It takes a gallon of fossil oil to produce one laser cartridge, and 2-1/2 ounces of oil to manufacture each new inkjet cartridge. In addition, the energy used to manufacture 350 million cartridges is enough to make tens of thousands of SUVs. Ingredients in toner cartridges are toxic and contain some amount of volatile organic compounds (VOCs) in the form of solvents. GHGs emissions from

⁹ Counsell, T. and Allwood, J. *Reducing climate change gas emissions by cutting out stages in the life cycle of office paper.* Resources, Conservation and Recycling 49 (2007) 340-352.

manufacturing a single mono toner cartridge have been calculated to approximately 4.8 Kg CO₂. Using a remanufactured cartridge still emits an estimated 2.4 Kg CO₂¹⁰.

Indoor Pollution

Although not often brought to attention, office printers have a major influence on indoor air quality. Studies show a clear rise in the concentration of ozone, VOCs and ultrafine particles (UFPs) during operation of printers as compared to idle mode. This is prominent especially in laser printers although ink-jet printers show an increase in contaminant levels as well. Laser printer toners are filled with a fine powder-like substance more tending to disperse. These compounds and particles have both short and long term impacts on human health, ranging from simple discomfort, fatigue and irritation to higher mortality rates due to respiratory and cardiovascular diseases^{11,12}.

GHG emissions caused by manufacturing a single mono toner cartridge have been calculated to approximately 4.8 Kg of CO₂

Toner and Ink Disposal

The average toner cartridge is composed of 40 percent plastic, 40 percent metal and smaller amounts of rubber, paper, foam and toner. Each year over 350 million cartridges are thrown out. Approximately thirteen cartridges are discarded every second, in the U.S. alone. In 2007, there were 375 million laser cartridges and a whopping 1.5 billion ink cartridges dumped — and those numbers are expected to grow to 500 million and 1.8 billion respectively in 2012. The problem gets even

¹⁰ Centre for Remanufacturing & Reuse. *The carbon footprint of remanufactured versus new mono-toner printer cartridges.* http://www.remanufacturing.org.uk/pdf/the_carbon_footprint_of_remanufacturing_printer_cartridges.pdf

¹¹ Australian Department of Environment and Heritage. *Health Impacts of Ultrafine Particles.* 2004. <http://www.environment.gov.au/atmosphere/airquality/publications/health-impacts/pubs/health-impacts.pdf>

¹² US EPA. *An Introduction to Indoor Air Quality.* <http://www.epa.gov/iag/voc.html>

worse considering that each cartridge becomes 3.5 pounds of solid waste sitting in a landfill and can take up to 450 to 1000 years to decompose, as it includes mixed resin, one of the most difficult plastics to recycle.

If you thought recycled used toners will spare your conscience, think again. It's true, some recycling of toners and cartridges is better than no recycling at all, but this industry too has its problems. One of the more prominent one is the export of used toners to third world countries (especially China) for remanufacturing¹³. What happens in practice is that cartridges are only seldom reused. Instead they get swept off the residual toner and then often burned. Workers work with no protection gear, exposing themselves to various illnesses. Burning cartridges emits dioxins and polycyclic aromatic hydrocarbons (PAHs), both cancerous pollutants that pollute local rivers and lands, make their way into the food chain and affect all levels of species.

PretonSaver's customers report up to 20% overall reduction in print volume

How PretonSaver™ Helps the Environment

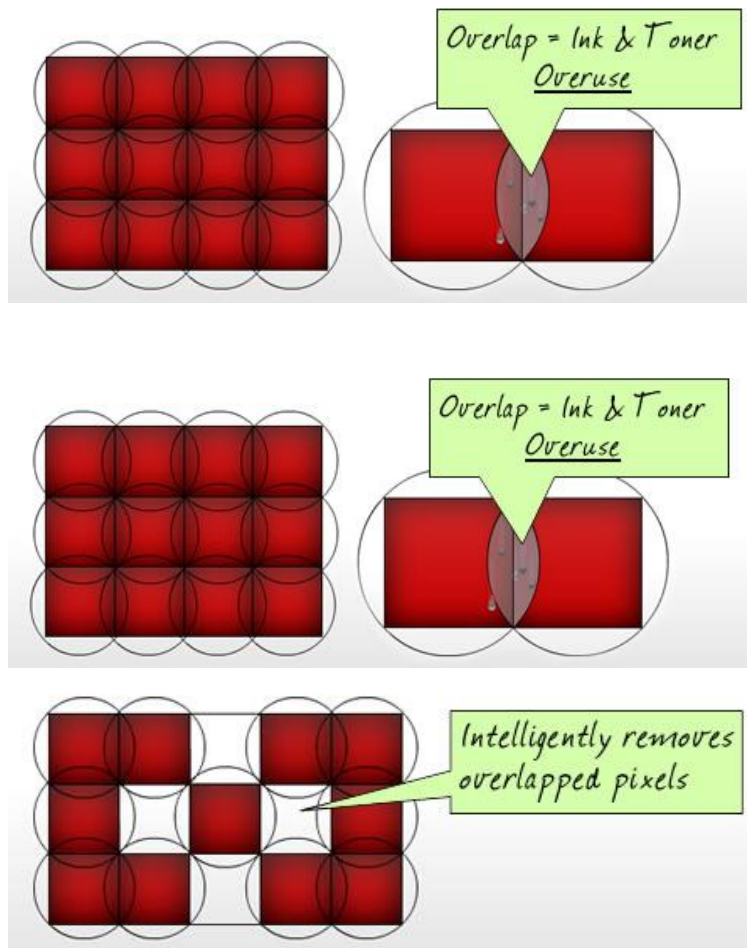
PretonSaver offers a practical solution that does not try to stop printing, but rather to alleviate its environmental and economical consequences. PretonSaver products combine toner and ink usage optimization with print management (for enterprises). It offers significant reduction in toner and ink usage, which translates into less need for manufacturing, less waste, and less indoor pollution, as well as significant reduction in paper consumption.

Reducing Toner and Ink Usage

PretonSaver reduces toner and ink consumption without affecting the print quality. This means that you can save money and save the planet, without any tradeoffs. To do so PretonSaver combines two technologies:

¹³ The Basel action network. *Exporting Harm: The Hi-tech trashing of Asia*. 2002.
<http://www.ban.org/E-waste/technotrashfinalcomp.pdf>

Pixel Optimizer™ - Printers and computer screens use pixels (dots) to describe data (text, graphics and images). Yet there is a difference between the screen and the printer pixels. While the screen pixels are square, the printer pixels are round. In order to represent these square pixels, the printer uses overlapping pixels that create ink and toner overuse. Pixel Optimizer™ (patent pending) solves this problem. It uses advanced algorithms to identify and delete wasteful overlapped pixels. The spaces left by the removed pixels are covered by excess toner/ink from adjacent pixels... with no degradation!



Elements Identifier™ - A trade mark technology identifies the various elements on the page (text, pictures, and graphics) and applies the most adequate optimization algorithm to each.

This selective approach keeps the desired quality level each element requires and yields a non draft quality document while saving up to 70% on ink or toner.

For example a document composed of both text and graphics does not have to settle for the lower savings applied to graphics as a whole but can enjoy a mixture of maximum savings possible, attributed per element and not per page.

While the reduction of ink and toner consumption averages at 35%, avoiding the consumption of one toner cartridge will result in preventing emissions of up to 4.8 Kg CO₂. For example, a company with 1,000 employees may reduce its toner consumption by 350 cartridges per year reducing its carbon footprint by 1.68 tons of CO₂ annually.

PretonSaver™ can reduce paper demand by up to 20% and toner and ink demand by up to 70%.

Reducing Paper Consumption

PretonSaver manages the entire organization's printer fleet, cutting paper demands by up to 20%. Using the print management capabilities you can ensure reduction in paper consumption by:

- a) Eliminating unwanted printing that usually ends up as waste can be achieved by determining page quotas for users, keeping track of user print volumes, omitting pictures and other unneeded elements, reducing the number of pages needed per print job etc.
- b) Duplex printing, an attribute seldom used by employees even in a duplex enabled printer environment, can be defined as default for all or specific users in the organization. This results in potentially reducing demand for paper by up to 50%.
- c) N-up function compresses more than one page into a single sheet and serves as a more economical use of paper. For example, 2-up compression will reduce print volume by 50%

These features, are efficient and reduce waste production during printing hence assisting the company both by cutting down on costs and by reducing its carbon footprint.

PretonSaver's customers report an up to 20% overall reduction in print volume, which can translate into 28 USD per employee per year and into the savings of 3.6 trees for every ten employees. This comes in addition to 35% toner and ink savings, which can translate into 50-100 USD per employee per year on average and the prevention of 16.8 kg of CO₂ emissions per every ten employees.

Reducing paper and toner/ink consumption is more than just a way to reduce high costs Since indoor pollution is increased mainly by a working office printer, reduced volume and shorter printing periods can largely aid in preventing VOCs and UFPs from accumulating indoors, Bearing a significant positive effect on employees' health and sick days requested.

On top of all this rests the concern for global warming. Lower volumes of printing in the organization will first and foremost assist in cutting back on excess logging, decrease the demand for energy and reduce the harmful emissions during paper production. Scale down quantities of methane emitted from decomposing paper in landfills. Soil erosion and chemical dispersion will also be affected for the better.