PRINTCITY SPECIAL REPORT

GB

Sustainability, Energy & Environment

Frequently asked questions ... and some answers

PrintCity

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Selected bibliography and sources of information

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"Environmental Considerations"
Web Offset Champion Group, 2005, www.wocg.info
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Envirowise UK. Multiple publications for download
www.envirowise.gov.uk:
- "How to become a green printer",
- "Cost-Effective Substrate Management For Printers",
- "Cost-Effective Chemicals Management For Printers",
- "Cost-Effective Management Of Cleaning Materials For Printers"

FSC Forest Stewardship Council
www.fscus.org
Institute for Sustainable Communications
www.sustaincom.org
PEFC (Programme for the Endorsement of Forest Certification scheme) www.pefc.org
SPC (Sustainable Packaging Coalition)
www.sustainablepackaging.org
United Nations Environment Program
www.unep.org
World Council for Sustainable Development
www.wbcsd.ch

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Introduction

Sustainability, energy and the environment

Once a limited regulatory constraint, environment issues have become a profound mainstream concern that impacts on every business, government, organisation and individual on the planet. These issues are so important that they will increasingly dominate the economic, political and social agenda of the 21st century and will be the driving force of new industrial revolution (EC Energy & Climate Change 2007).

In its 2007 report the UN's Intergovernmental Panel on Climate Changes (IPCC) found that unless global warming is dealt with in the next 10-15 years it will lead to catastrophic consequences. The primary cause of climate change is greenhouse gases (GHG) produced by a wide range of human activities, including agriculture, transport, sewage treatment and energy generation. There is a direct correlation between CO_2 (carbon) fossil emissions and energy consumption. Climate change is global in nature and only coordinated international actions can resolve it.

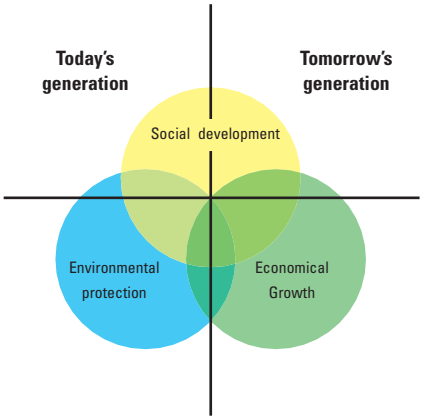
Climate change, resource availability, waste disposal and pollution are linked to sustainability. Sustainable development is that which meets the needs of the present without compromising the ability of future generations to meet their needs. It is the balance of three interconnected dimensions defined by The Declaration of Rio on Environment and Development in 1992 as environmental protection, economic growth, and social development

Sustainable development calls for long-term changes in patterns of production and consumption. These changes are being driven by international intergovernmental agreements that will impact on all businesses and individuals. The Kyoto treaty requires emissions of GHG to be reduced to their 1990 levels by 2012. The 2020 European target is a 20% reduction compared to 1990 and for 2050 a 75% reduction.

There appears to be a growing consensus on environmental economic implications. The Stern Report on the Economics of Climate Change found that addressing global warming by cutting emissions will cost about 1% of the world's GDP — but doing nothing will cost 5 to 20 times more. A more recent IPCC report identifies that the most stringent mitigation target would reduce global growth by 0,12% per year to 2050; it could be less.

Improved energy efficiency is the fastest and cheapest way to reduce CO_2 because investment in available technologies would cut carbon emissions by about half of the amount needed to stabilise them. There are two other realities concerning energy — supply is limited and expensive, and the cheapest kW of energy is the one not used. The McKinsey Global Institute in 2007 concluded that investment in energy efficiency of about $170 bn a year worldwide would yield a profit of about 17%. A responsible company environmental policy has compelling business advantages – opportunities to reduce costs, increase competitiveness, become more innovative and enhance staff and customer confidence, while avoiding the potentially expensive risks of non-compliance. Any waste reduction goes immediately to the bottom line and, generally, this will also reduce energy demand and associated carbon emissions. The environment is also an excellent business opportunity for printers to review with their customers and suppliers how to optimise the efficiency of the process-value chain within which they all work.

The environmental subject is emotive and complex, and many of its aspects are misunderstood, which invites commercial and political opportunism that can distort effective solutions. Successful responses require effective cooperation across the entire process chain. This is the reason for PrintCity to produce this report, because the Alliance fosters industry cooperation within its connection of competence philosophy. The report's modest objective is to give some answers to frequently asked questions, and to improve the understanding of the issues as a starting point to address them in a clear, open and responsible manner.



"Over 60% of global executives regard climate change as strategically important. Executives are relatively optimistic when anticipating the business prospects that climate change could represent."
'How Companies Think About Climate Change', McKinsey global survey 2007.

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Frequently Asked Questions . . .

What is sustainability? *See page 8*
This is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

What about air pollution and the ozone? *See pages 10 & 18*
Air pollution can have a significant environmental impact locally, regionally and globally. This includes smog, acid rain and greenhouse gas emissions.

What role does waste play? *See page 7*
Landfill using untreated waste material has been coming to an end in all developed countries but will pose a significant long-term risk. These sites are a source of methane emissions — a greenhouse gas 20 times more potent than CO_2 — and from groundwater and other contamination.

What is happening on biodegradable packaging waste?
Certification, promotion of retailers, and legislation to promote better recovery options that reduce the environmental impact.

What about biodegradability?
Biodegradability is the deterioration of a product into harmless substances. Paper and some plastics are biodegradable; however, this attribute does not resolve dumping in landfills.

How should we treat waste? *See page 7*
Avoid, Reduce, Reuse and Recycle.

What should my company do now?
Introduce an environmental management strategy to reduce energy consumption and related carbon emissions, improve recycling, and minimise waste from all sources.

What do I have to do 2008-2020?
Continuously improve environmental performance to meet demanding legislation.

What is the environmental impact on business?
Several studies find that the economic impact on many businesses can be positive if proactively managed. The environment will impact on all levels of a business: production, materials purchasing, logistics, profitability, credit rating, employee motivation, company reputation and marketing.

What is the role of forest products? *See page 9*
They are a recyclable and renewable raw material that provides an important carbon sink and can be converted into bioenergy at the end of its life. Forests also play a very important socio-economic role and provide a recreational habitat.

What is the role of Sustainable Forest Management? See page 9
Provides standards to sustain the world's forests with all their benefits for the environment and people.

What is carbon footprint? *See page 10*
This is a measure of the specific total amount of fossil carbon dioxide (CO_2) emissions directly and indirectly caused by an activity or accumulated over the life stages of a product

Why should we care about carbon footprint? *See page 11*
There is a direct correlation between CO_2 emissions and energy generated from fossil fuels. If the full life cycle of a product is taken into account this becomes more transparent.

How do I measure carbon footprint? *See page 10*
There are multiple methods to measure the footprint. CEPI has published a framework on carbon footprint assessments and Intergraf is working towards a common European definition.

What are "offsetting", "carbon credits", "carbon neutral" *See page 13*
These are financial incentives to improve emission reduction. They essentially reward good performers and make poor performers pay.

How well is the print and packaging industry doing? *See pages 10 & 20*
It has shown a good track record in continuous improvement. New technologies have significantly improved energy and overall environmental efficiency.

Is the print and packaging industry sustainable? *See page 20*
It is based on a sustainable raw material with an efficient exploitation of its complete life cycle.

Why is PrintCity concerned about the Environment?

The PrintCity Alliance is a grouping of technology led businesses with significant collective knowledge about sustainability, energy and environmental issues. Individually and collectively the alliance members are available to help advise printers, converters and publishers on aspects of selection and operation of equipment and consumables to reduce their environmental and economic impact. The PrintCity Alliance has created this Sustainability, Energy and Environment report to help the industry better understand the complex issues involved and some of the possible solutions.

. . . and Some Answers

What is the relationship between fresh and recycled paper and raw materials? *See page 9*
The input of fresh fibre is essential to sustain the paper recycling chain. Wood fibres can be recycled up to 7 times before they become too short and weak for further use. Fresh fibres from sustainable forestry should be used for papers where they gain the highest benefit.

What can be done to make a difference? *See page 22*
End users, direct customers, printers and suppliers should together make the process value chain more efficient to improve its environmental efficiency: specifying efficiently produced paper with a low environmental impact, promotion of recycling, reducing waste and improving energy efficiency of production and logistics.

What's in it for me?
The opportunity for reduced costs, improved profitability, competitive differentiation, enhanced reputation, long-term orders, and business sustainability.

Should we have world standards - (measurement, accreditation/certification)?
Yes. They need to address the complexity of the forestry value chain, define a single carbon footprint method for paper and printing, and to address global trade flows. In the interim it is important for Europe to establish common policies.

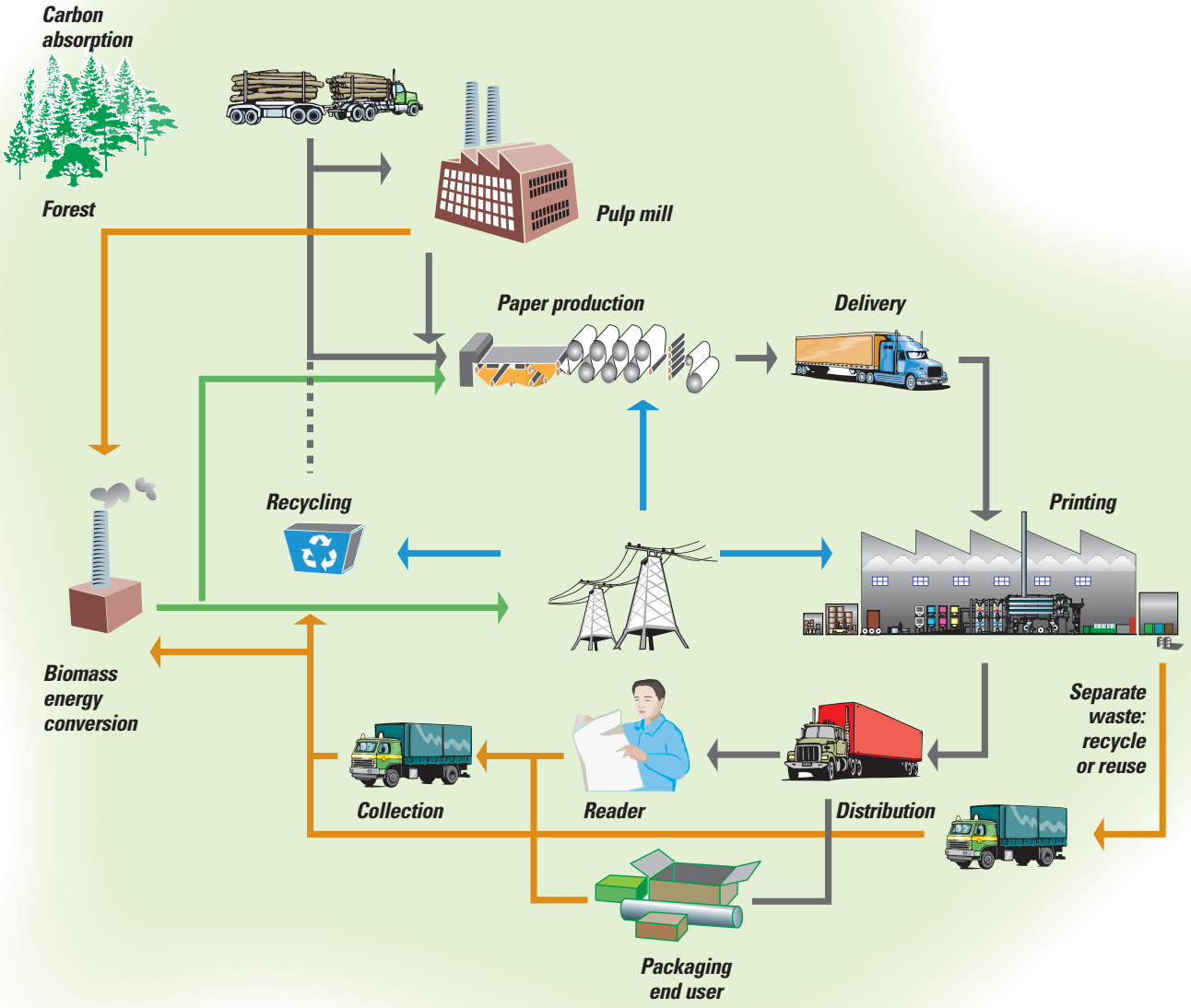
How can I measure my environmental performance?
Use one of the Environmental Management Systems (EMS) like EMAS and ISO 14001. The most important action is to measure selected key performance factors to identify which to improve, in what priority, and to monitor results over time.

How does the industry performance fit into Kyoto 1990-2012 targets? *See page 20*
Printing equipment, consumables and processes demonstrate significant improvements in environmental performance. Paper and pulp manufacturers in Europe are leaders in sustainability, e.g. counter current processes to increase efficiency, combined steam and power generation, abandoning chlorine bleaching, certification of management systems.

Energy efficiency opportunities, what are they? *See page 14*
Start measuring your performance – make the whole process transparent. Take a holistic systems approach to the entire business, manufacturing and logistics process. Carefully review new technologies to select those that deliver best available energy and environmental performance.

Optimisation of the printing value and process chain provide environmental, economic and business benefits.
Source PrintCity.

What is the printing ecosystem?



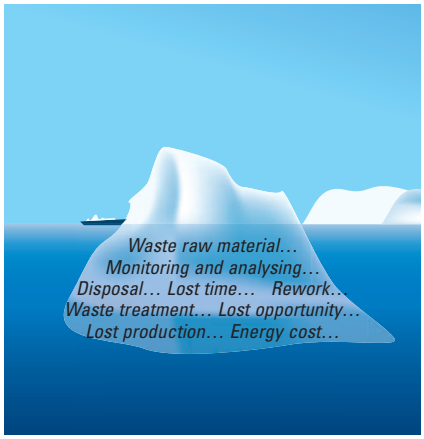
Raw material flow
Biomass energy generation
Electricity grid
Waste recycle & reuse

The printing ecosystem is a complex value and process chain that offers substantial opportunities to improve its economic and environmental performance.

Why is waste so important?

"A major payback from a proactive environmental programme is improved business efficiency. An increase in productivity often takes place when a printer works towards environmental compliance, so much so that the profitability of operations frequently increases significantly." 'Environmental Regulations for Printers', Fred Shapiro.

Waste is a good measure of plant efficiency and a little effort can yield cost savings that increase productivity. A waste minimisation programme can often cut waste by 25% — if total waste is 12% of turnover this would add 3 % to company profits. Waste is often seen as valueless but its recycling/re-use value can be many times higher than the cost of its disposal (Environwise UK).
"I've seen grown men all but cry at the results of a comprehensive waste audit. The financial savings are amazing. What people don't realise is the financial benefit of even modest disciplines in and around the factory." Richard Grey, British Printing Industries Federation.



The true cost of waste is like an iceberg with only a small proportion visible. Source WOCG

The integration of an effective environmental policy will improve business performance through:
- Cost savings from waste reduction, reuse, recycling and lower disposal costs
- Reduced purchasing cost from using less ink, paper, solvent, water and energy
- Reduced Volatile Organic Compound (VOC) emissions
- Improved product quality and process control
- Providing a sound basis to comply with regulations to avoid risk of non-compliance costs
- Improved employee working conditions and motivation
- Reduced insurance premiums
- Improved brand image and differentiation to customers, financers, investors, neighbours and regulators.

The five steps for successful waste minimisation:
1. Gather available information
2. Identify opportunities and prioritise
3. Make initial savings
4. Measure savings
5. Review to identify more savings

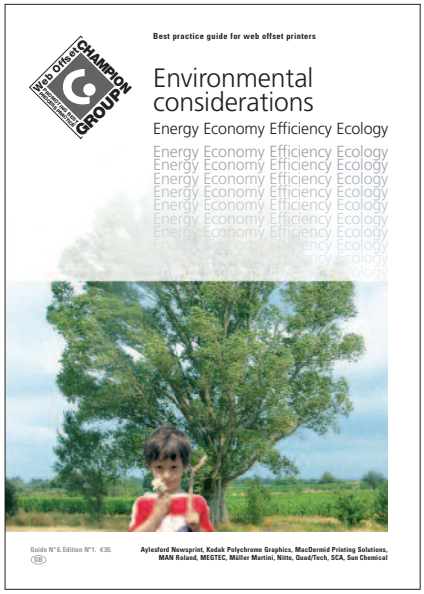
The 4 Rs — Redesign, Reduce, Reuse, Recycle — Control, Disposal
Systematically conserve resources through redesign, reducing waste, reusing materials where practical, collecting and separating leftover materials for recycling. Control is for air and water emissions. Finally, correct disposal of any residues.

Redesign: How can processes be made more resource and cost efficient? Examples are the elimination of film and processing by CTP, direct drives that reduce energy consumption, closed loop colour control and automation to reduce makeready and running waste.

Reduce: Less material in and less waste out — improved resource efficiency through continual attention to waste streams and processes to reduce emissions, energy use and waste. A waste reduction plan is an opportunity to improve overall business efficiency by reducing manufacturing and waste disposal costs without compromising quality. Waste is not just solids and liquids that require disposal; it is also wasted time and costs.

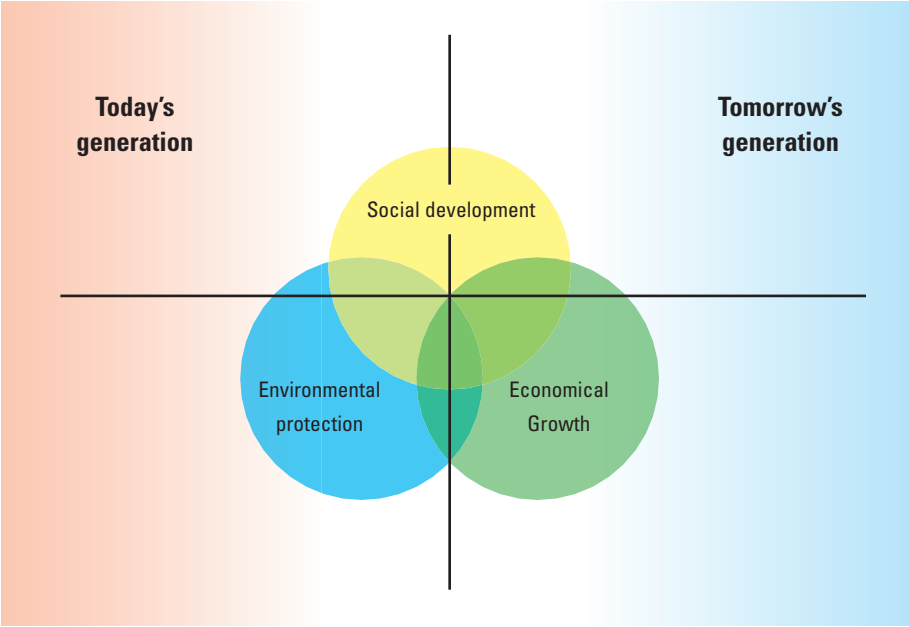
Reuse: Identify waste materials that can be reused for another purpose to reduce purchase and disposal costs; or find ways of converting waste energy into reuseable energy.

Recycle: Waste is a valuable secondary material (ink, plates, paper and plastics) transformed into other products that typically use less energy and resources than for products made from fresh materials. However, in some cases, the viability of recycling-to-reuse may be an issue if significant additional energy is needed.
Resources that cannot be redesigned, reduced, reused or recycled should be disposed of responsibly and, preferably, in a sustainable way (e.g. biodegradable, non-fossil energy generation).



This page is an extract from "Environmental Considerations" published by the Web Offset Champion Group www.wocg.info.

What is sustainability?



Sustainable development is the balance of three interconnected dimensions defined by The Declaration of Rio on Environment and Development in 1992.

Recovered paper for paper production is an efficient environmental and economical resource. Photo UPM.

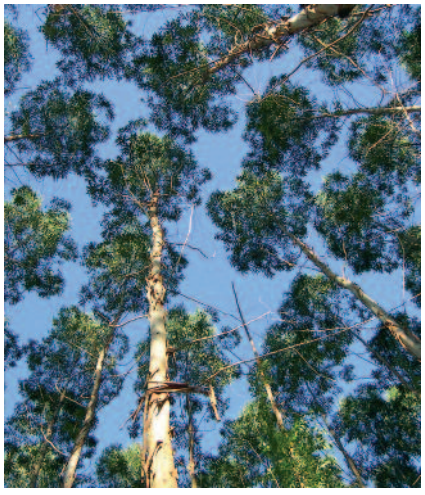


Photo Sappi.

"Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
— World Commission on Environment and Development, 1987 definition.

The Declaration of Rio on Environment and Development in 1992 recognised that sustainable development was a balance of three dimensions:
1. Environmental Protection
2. Economic Growth
3. Social Development

Economic, social and environmental processes are interconnected. Neither public nor private entities can work in isolation on a single dimension because their actions must take into consideration the interplay of them all.

Sustainable development goes beyond environmental preservation. Economic prosperity and solidarity is required by society to satisfy its material and non-material needs. Sustainability should also contribute to the bottom line performance of business.

Sustainable development calls for long-term changes in patterns of production and consumption. The aim is to protect the environment and its resources while at the same time satisfying human needs and boosting progress. Global interdependencies also need to be balanced. The implications of today's actions must be considered to ensure that future generations are able to satisfy their needs.

Is the print and packaging industry sustainable?

Printed paper and board are valuable products as a durable information carrier and functional packaging medium. It is both economically and environmentally of benefit to society. Paper and board has several sustainable characteristics:
1. It is a renewable raw material, that is, it is reusable, recyclable and biodegradable; and principally manufactured with renewable energy.
2. Paper can be recycled several times before ending up as a biofuel and for this reason should not have any contribution to landfill. Everybody should be encouraged to help recycle paper.
3. Sustainable managed forests absorb carbon dioxide from the atmosphere.

What is the role of sustainable forest management?

Managed forest sustainability ensures meeting the social, economic and environmental needs of present and future generations. This means that no more wood is removed than is planted and biodiversity is maintained in defined areas. Modern forest management with controlled harvesting assures that forests bind a maximal amount of CO_2 as a carbon sink.

Forests cover different ecological zones across the world — the boreal conifer forests of Canada, Finland and Russia are quite different to the tropical forests of South America and Asia. Therefore international agreements have defined sustainable forest management according to local circumstances and the stakeholders involved. The European criteria and indicators for sustainable forest management were defined in Helsinki in 1993, and the 1998 Lisbon declaration further recognises the social and cultural importance of forestry in Europe.

Paper from recycled or fresh fibre?

The input of fresh fibre is essential to sustain the paper recycling chain. Wood fibres can be recycled up to 7 times before they become too short and weak for further use.

Recovered paper for paper production is an efficient environmental and economical resource. However, recycled paper does not automatically mean that it is more environmentally friendly. This depends on factors such as the type of paper being produced and the availability of recycled paper. Recovered paper needs to be available close to the mill to minimise the energy and carbon impact of transportation. Therefore, fresh fibre predominates in countries with a small population and large forest resources, and recovered fibre for countries with a high population and small forest resources.

The proportion of fibre sources used is determined by the paper's quality requirements — opacity, brightness or roughness. It is important to select the most appropriate fibre composition for each specific end use and the lowest possible environmental impact. Generally, the higher the paper quality, the higher the level of fresh fibre required.

Recycled fibre requires less energy than mechanical pulp. Mechanical fibre separation produces more fibre from a given volume of wood but consumes much more energy. The chemical pulp process produces less fibre from a given volume of wood but it is energy self-sufficient and even generates excess energy to the power grid.

In addition, there is a potential price premium for publishers to use recycled paper. A 2006 study in the USA found that 80% of consumers surveyed are willing to pay more for magazines and books printed on recycled paper.

Packaging sustainability

The Sustainable Packaging Coalition has identified sustainability as packaging that is beneficial, safe and healthy for individuals and communities throughout its life cycle, while meeting criteria for performance and cost. That is: sourced, manufactured, transported, and recycled using a maximum of renewable or recycled source materials, combined heat and power generation and renewable energy; and is manufactured using clean production technologies and best practices from materials that are healthy in all probable end of life scenarios — effectively recovered and utilised in biological and/or industrial cradle-to-cradle cycles.

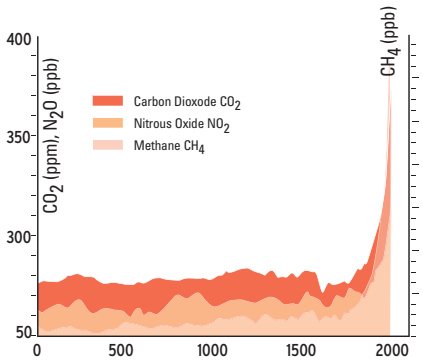
Inks and coatings

Ink manufacturers are increasingly using renewable and recyclable resources such as soy, vegetable oil, and starch. They are also helping printers to recover and recycle inks and solvents. Sustainable products minimise environmental impact from one or a combination of benefits: more renewable resources, reduced waste, energy conservation, and lower emissions. Customer requirements for performance influences ink composition and its environmental profile. Inks must also comply with regulatory requirements in the markets where they are used.

Sheetfed inks now have significant improvements from the reduction of VOC emissions, energy consumption by rapid setting, or reduced paper wastes through quick start-up. Sheetfed inks are also integrating up to 100% renewable vegetable oils, while energy curable UV inks have also a very good environmental profile from the absence of VOC and the low energy needed to cure them. Coldset inks are available using renewable soy oil and with lower VOC emissions. Water based inks for packaging are VOC free, and bioethanol is used for solvent based inks.

Sustainable packaging is manufactured, transported, and recycled using a maximum of renewable or recycled source materials, Photo UPM.

Why should we care about greenhouse gases (GHG)?



The increasing concentration of greenhouse gases from the year 0 to 2005.

In its 2007 report the UN's Intergovernmental Panel on Climate Changes found that unless global warming is dealt with in the next 10-15 years it will lead to catastrophic consequences. There is already a clear trend both for a contraction of the polar ice caps and for an increase in natural catastrophes. The nature of climate change is global. It makes no difference if greenhouse gases (GHG) are emitted in Buenos-Aires, Melbourne, Paris or Chicago — only the type and quantity emitted counts. In the same way, no part of the planet is immune to the effects of climate change.

The greenhouse effect is where most infrared radiation is absorbed by the atmosphere and re-emitted in all directions by greenhouse gas molecules and clouds. The effect of this is to warm the earth's surface and lower atmosphere. The Kyoto treaty formally identifies six greenhouse gases (CO_2, CH_4, N_2O, HFC, PFC and SF_6). These are produced by a wide range of human activities, including agriculture, transport, sewage treatment and energy generation. There is a direct correlation between CO_2 (carbon) fossil emissions and energy consumption.

What is a carbon footprint?

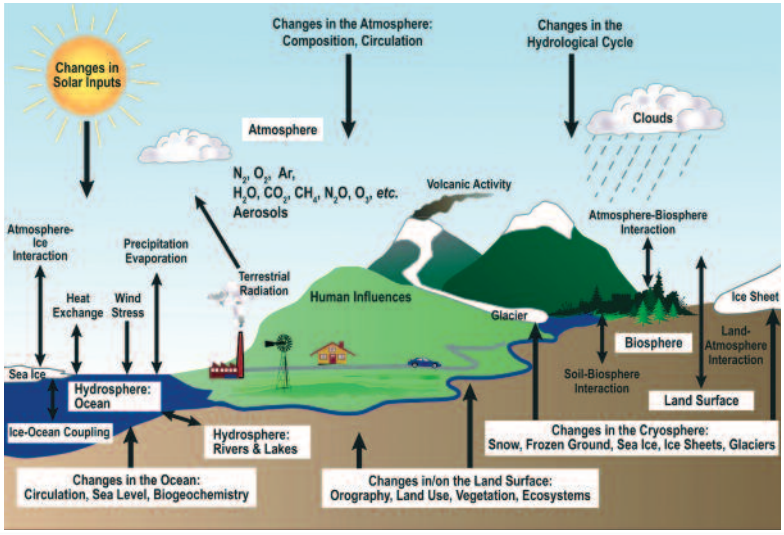
The carbon footprint is a frequently used term that has no precise scientific definition for fossil CO_2 emissions. A commonly accepted description is "The carbon footprint is a measure of the exclusive total amount of carbon dioxide emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product." — ISA Research Report, UK 2007. The term embedded carbon emissions is also used for products. A source of confusion is that the measurement of CO_2 is expressed frequently as carbon — 1 gm of carbon (C) is the equivalent of 44/12 of 1 gm of CO_2. This is reinforced by the names of organisations dealing with the subject such as the British Carbon Trust and the French Bilan Carbone.

European carbon emissions continue to rise by over 1% per year, in spite of the Kyoto treaty's commitment to reduce them to the 1990 level by 2012.The announced 2020 European target is a 20% reduction compared to 1990 and 75% by 2050.

It is estimated that an average person in the UK contributes about 11 tonnes of carbon to the atmosphere each year through their non-professional actions. Politicians are increasingly looking at standards, labels and other instruments relevant to consumers to involve them in climate change mitigation. Therefore, attention goes beyond carbon emissions of production activities, companies or sectors, and is also focussing on emissions associated with products.

In this context, buyers are asking for the carbon footprint associated with the supply chain for the manufacture, distribution and disposal of products supplied to them. Customers want a simple statement and the guarantee that it is accurate. However, there is a complexity of facts, philosophies and models to calculate a carbon footprint. This is partly due to an initial series of uncoordinated national and commercial initiatives (Wal Mart, Tesco, Casino, etc).

A schematic view of the components of the climate system, their processes and interactions. Source: IPCC



Calculating carbon emissions

Through their associations, the Confederation of European Paper Industries (CEPI) and Intergraf, the European paper and printing industries are working in parallel to establish common frameworks for the carbon footprints of paper and printed products. The European Printing Ink Association (EuPIA) believes that detailed assessment of printing inks has to wait for wider agreement on standardised methodology for carbon footprint calculations.

Two principle European carbon measurement approaches

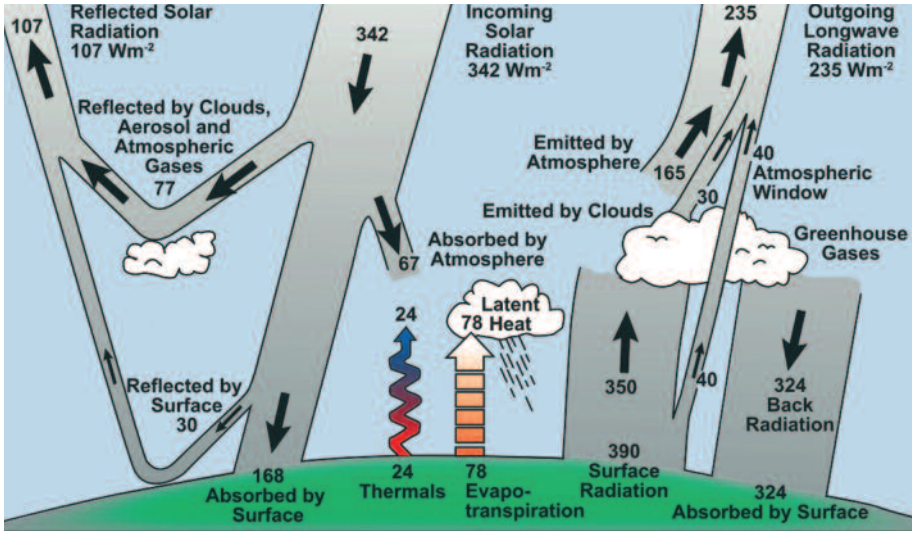
The printing and paper industry are directly concerned by their GHG emissions, and in particular carbon and to some extent HFC. Consequently, for the printing and paper industry it is important to measure these carbon emissions to determine their energy dependence in order to reduce them — and to minimise the impact of higher energy tarifs. Two principle carbon measurement approaches coexist in Europe:

- The French method Bilan Carbone™ (carbon balance) of l'Agence de l'Environnement et de la Maîtrise de l'Energie, is based on a given production site. It accounts for emissions related to energy consumption at the site, to all related transport (including employees), as well as the emissions from the manufacture of the raw materials utilised, waste treatment and the product's use until the end of its life cycle.
- The British Carbon Trust method measures a given product's carbon emissions from energy consumed by its manufacture and related transportation.

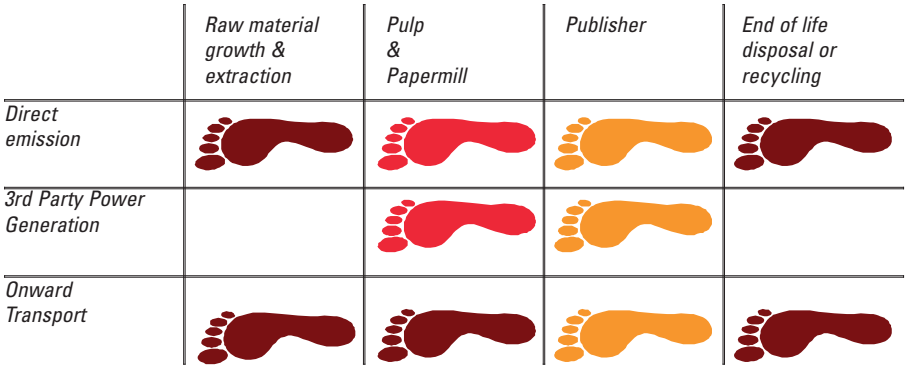
The two methods are not contradictory and both are more or less compatible with ISO 14064. However, they each respond to distinctly different objectives. The Carbon Trust permits the estimation of CO_2 created from a given stage of production. On the other hand, the Bilan Carbone considers all emissions — upstream, downstream as well as at the plant — to calculate the total carbon intensity of the product. It is therefore possible to consider the Carbon Trust as an evaluation tool and Bilan Carbone™ as a management tool.

The Bilan Carbone's advantage is its ability to make obvious the cascade effect of a possible carbon tax — for example a tax on the cost of paper or plates. This method also estimates the indirect emissions of a company not controlled by them — this is not included by the Carbon Trust.

There are also economic and commercial interests related to the carbon approach — in addition to the environmental responsibility of companies to contribute to global GHG reduction. The economic interest is to establish the hierarchy of the points where energy is consumed in the value chain as a first step towards their reduction. Anything that makes the supply chain more efficient generally saves carbon. The commercial interest is a more subtle customer loyalty opportunity because the carbon approach is a collective method. For example, the reduction of the carbon footprint of a magazine requires all participants in the supply chain to work together — the publisher, paper maker, printer and distributor. The carbon reduction objective can therefore facilitate the transformation of simple supplier-customer relationships to one where common projects are



The greenhouse effect is where most infrared radiation is absorbed by the atmosphere and re-emitted in all directions by greenhouse gas (GHG) molecules and clouds. The effect of this is to warm the earth's surface and lower atmosphere. Source: IPCC.



Which carbon footprint do we mean? There are currently multiple models and philosophies for calculating a carbon footprint; these frequently seem to be related to their position in the process chain. Source UPM.

defined that can last several years with more durable contractual relations.
Another opportunity is that carbon reduction objectives can be shared. For example, a bank sets the objective to reduce its carbon footprint by 15% over five years. An initial simplistic solution could be to reduce all of its supplies by 15% — including printing. A more favourable solution would be for a printer to share the same objective without a reduction in printing volume but with a 15% reduction in the carbon emissions generated from it.
In some cases, the optimisation of transport to reduce carbon may lead to more distributed printing. This will require a case-by-case evaluation, particularly the origin of the paper used at the different locations.
Correctly used, the carbon method presents environmental, economic and commercial advantages. It is a strategic tool for companies to provide them with a clearer vision of the future.

Life Cycle Assessment (LCA):
CEPI recommends Life Cycle Assessment (LCA). Its results will normally be accompanied by a public background statement of data and studies to avoid misinterpretation. ISO 14040 LCA provides the principles and framework and ISO 14044 the assessment requirements and guidelines. Environmental Management Systems (EMS) like EMAS and ISO 14001 are mill site related systems ensuring continuous improvement of the environmental performance within a systematic framework of environmental policies and programmes. LCA concepts include:
Cradle-to-Grave: LCA of the materials and energy needed to make a product from their extraction to their discarded destination. For example, waste paper that is recycled with low energy production into building insulation that becomes an energy saving device over many years, saving much more fossil fuel energy than was used in its production.
Cradle-to-Gate: LCA of the environmental efficiency of a product or service until it is produced or delivered. It is often is used for environmental product declarations (EPDs).
Gate-to-Gate: A concept that reviews individual production sites. A reporting tool available for many years is Paper Profile — a uniform voluntary declaration for presenting environmental product information. It covers relevant environmental aspects related to pulp and paper production including product composition and emissions, wood procurement and environmental management.
Cradle-to-Cradle: Considers the whole life cycle, including if the grave of one cycle can be the cradle of another. For example, printed products are collected as waste paper after use and reused to produce paper again. Even the by-products from these processes provide raw material for insulation and building materials, biofuels and non-fossil energy generation.

What does carbon neutral mean?
All commercial/industrial activities and processes generate carbon dioxide emissions. Carbon neutral is defined as no net carbon emissions across a product's entire life cycle (including that of its raw materials, the product's use and disposal) achieved by applying an administrative system of offsetting emissions. A more accurate term would be "carbon neutralised". Many first movers are claiming, or committing, to be carbon neutral but their definition is often confined to their own business — direct emissions of GHG from their own processes and indirect emissions of GHG emitted by the generators of their purchased energy. Their measure of carbon footprint does not include raw materials or the use and disposal of the product. The business may be carbon neutral . . . but the products are not.

What is a carbon offset?

This allows a company to negate the creation of its carbon by avoiding the release of, or removing from the atmosphere, the same amount of carbon somewhere else. The Kyoto treaty mandates that this must be "…real, verifiable, and additional to what otherwise would have occurred." Examples include: methane destruction by farms and landfills to earn offsets by using digesters to collect and destroy methane; agricultural practices to earn offsets including planting grass and trees, and by collecting methane from manure; forest enrichment and conservation projects, and planting of trees in urban areas; renewable energy projects like wind, solar, hydropower, and biofuel systems to earn offsets based on the amount of energy supplied to the grid that replaces carbon emitting generation.

Carbon trading and caps

The European Union Emission Trading Scheme (EU ETS) is one of the most significant measures of the EU climate policy. Industrial installations within the European Union exceeding certain emission thresholds are obliged to participate — these represent about 40% of GHG emissions. Permits for carbon emissions can be traded on regulated markets to ensure their net reduction. Offset emissions can be purchased to allow expansion. Companies that reduce emissions gain credits to sell as offsets or to hold for future expansion. The maximum emissions can be capped at or below the current permitted level. As the cost of permits increases so does the economic incentive for remedial action at source.

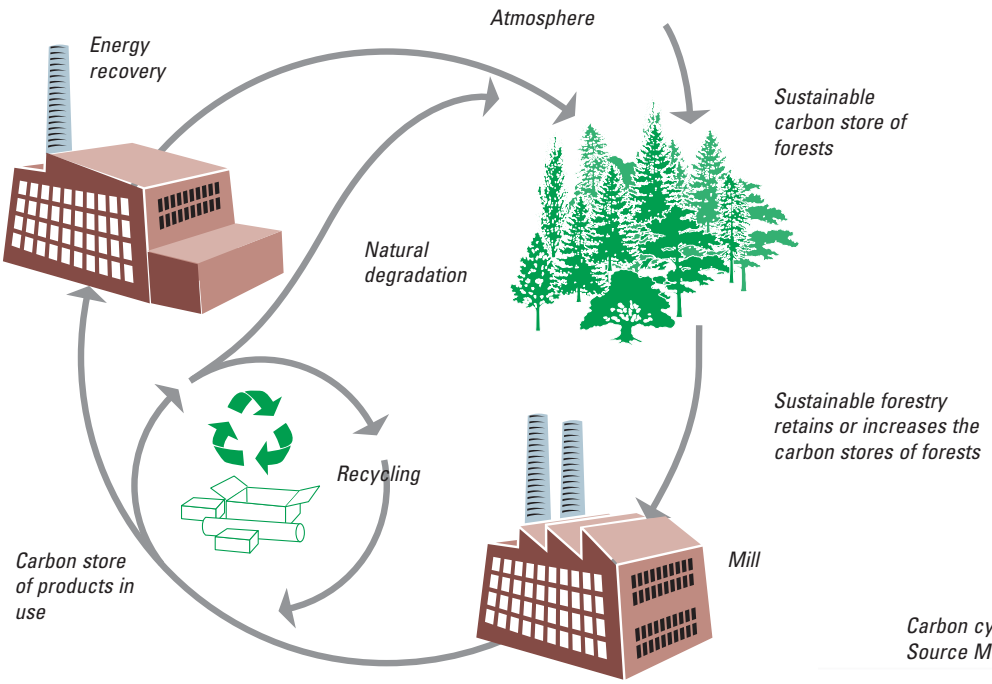
What can I do to improve my carbon footprint?

The principal actions are:

1. Implement an environmental and energy management strategy.
2. Measure energy consumption (from fossil fuels) and identify areas for improvement.
3. Reduce energy consumption by improving efficiency of production technologies, their use and maintenance. This includes secondary use of hot air and water, and power generation.
4. Improve the energy efficiency of buildings and their services.
5. Reduce transportation energy used.

See page 23 for details.

Photo UPM.



Carbon cycle of forest industry products. Source M-real.

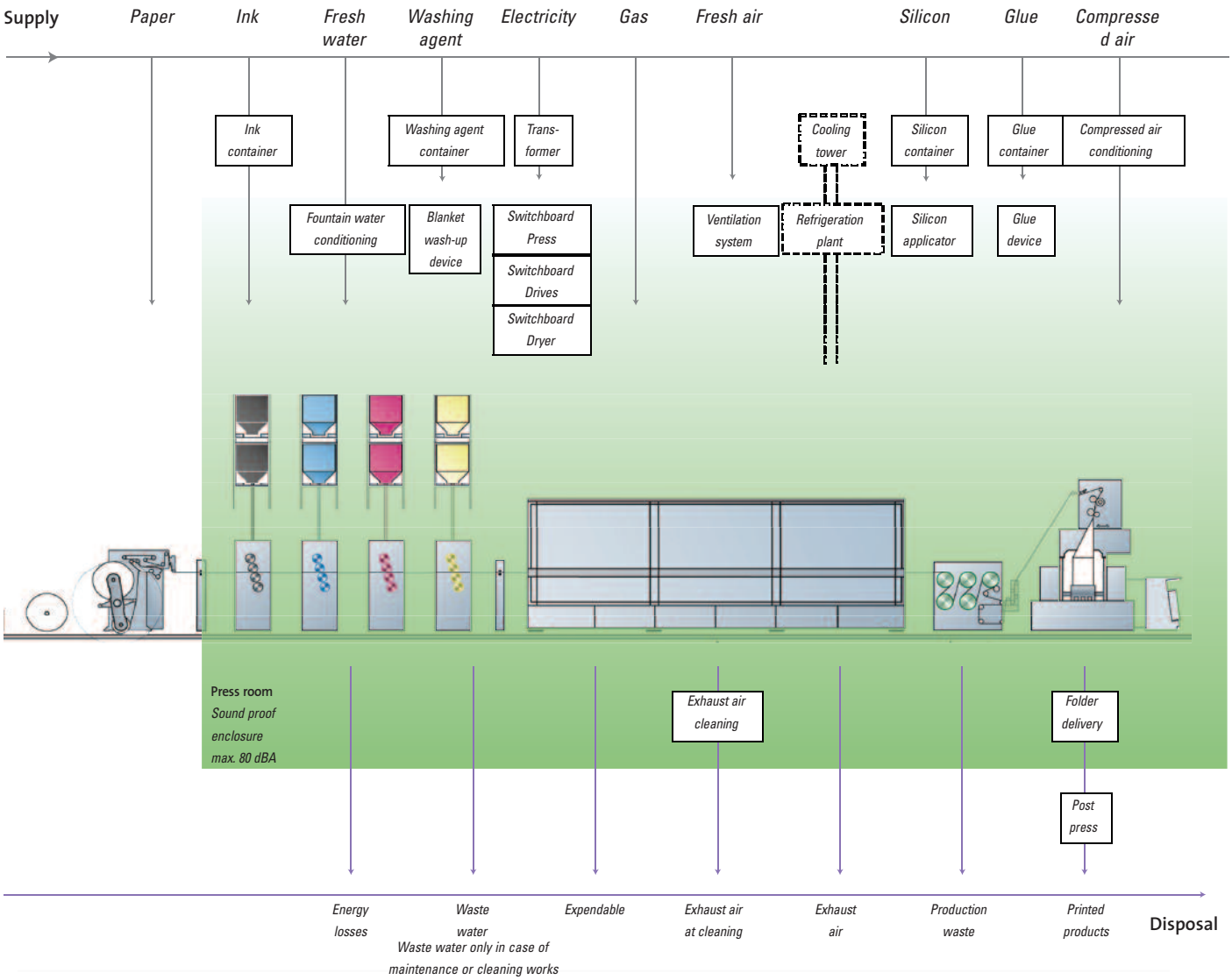
How can energy efficiency be improved in printing?

There are three realities concerning energy that impact on all users:

- Supply is limited and it will remain expensive.
- The cheapest kW of energy is the one not used.
- Priority to reduce fossil fuelled energy greenhouse gas (GHG) emissions

Most experts predict high long-term prices due to rising energy demand and limited supply. The other key driver is to the need to reduce GHG from fossil fuelled energy generation. These realities require a high priority on improved energy efficiency, lower consumption and cleaner generation. Effective management of all energy (electricity, gas, propane, diesel, and petrol) combined with implementing appropriate technologies will reduce operating costs, improve working conditions and help protect the environment. The McKinsey Global Institute in 2007 concluded that investment in energy efficiency of about $170 bn a year worldwide would yield a profit of about 17%. While energy efficiency has been improving on average 1,3% a year since 1980), there is significant global variation and best practices need to be adopted worldwide. Improved energy efficiency is the fastest and cheapest way to reduce GHG because investment in available technologies would cut carbon emissions by about half of the amount needed to stabilise GHG.

System overview of energy used by a heatset web offset press line. Source: manroland



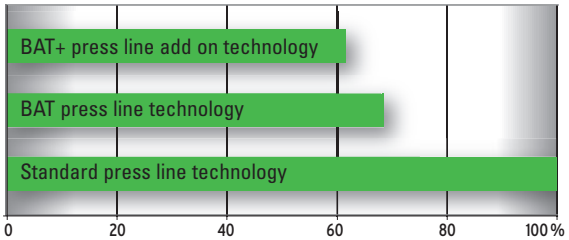
Energy management strategy?
If the answer to any of the following three questions is 'NO' then you may want to consider implementing an energy management strategy:
• Does the site have an energy efficiency programme with a person responsible for it?
• Is the site's energy consumption known and regularly reviewed?
• Is the site as energy efficient as possible?

Energy Efficiency
The PrintCity Energy Efficiency report summarises that the optimal way to conserve environmental resources and reduce operating costs is to take a holistic approach to the design and running of production plants. This means: investing in technologies with the best life cycle costs, including all ancillary systems; taking into account the economic viability of recovering waste heat for cooling and heating, or to generate electricity; optimised running of the production equipment; and systematic maintenance.
The primary sources of energy consumption in a printing plant include:
- Building & services
- Internal transport
- Production equipment.

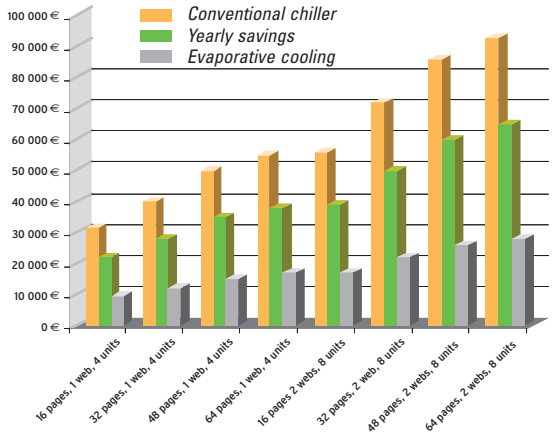
Building energy consumption is around half to one third of that used for production. Potential for readily available savings includes: eliminating excessive consumption from over heating, lighting areas not in use, draughts, heat loss and air leaks; computerised control of heating, ventilation, air conditioning and other support systems; new lighting technologies that can save up to 50% of energy; improving energy efficiency of buildings and their use.
Minimising workflow distances and using best practice operating procedures can improve internal transport efficiency. Effective maintenance of roll and fork lift truck units will significantly lower their energy consumption.

Improving production equipment energy efficiency will also help optimise overall process efficiency and quality. Regular preventive maintenance is essential to ensure correct lubrication and settings, and that air filters are not blocked. Ancillary equipment can be the source of significant energy savings — compressors, cooling, drying. When assessing new equipment it is important to assess lifetime energy consumption.

Technologies to optimise energy consumption
The PrintCity Energy Efficiency of Web Offset report identifies three energy technology levels when specifying a new press line:
1. Standard technologies: Usually the lowest investment cost and the highest energy consumption.
2. Best Available Technologies (BAT): Generally have higher investment but lower running costs.
3. Supplementary BAT + systems: Have the minimum energy consumption. Some, like process cooling and drives, can be integrated into the press line. Others allow secondary re-use of waste process energy — their economic viability will depend on local costs of energy. Heat recovery additionally depends on the geographic position of the company, the building's energy efficiency, and the heat radiation of installed equipment.



The selection of technologies used in a press line will determine the energy required during its lifetime operation. Source: PrintCity Energy Efficiency of Web Offset



Evaporative process cooling. Source Axima

These principles also apply to sheetfed, postpress and prepress equipment. There are many opportunities to improve energy efficiency provided that the entire press, its ancillaries, operating environment, and procedures are considered as an integrated system.

Energy saving technologies
Prepress: Process-less can save up to 30% of energy by eliminating the processing step.

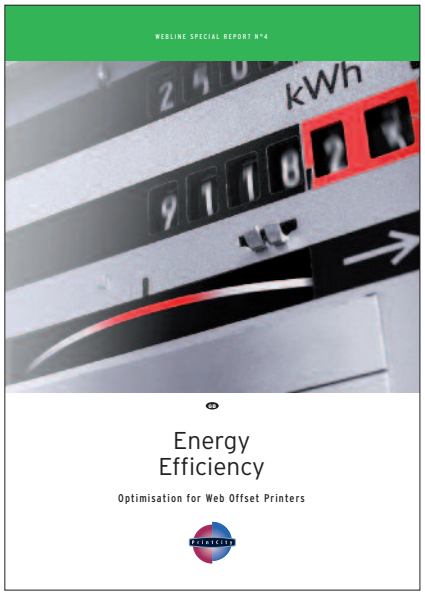
Press size: There is an almost linear relationship between the energy consumption per printed page and the press format size. New investment is the ideal opportunity to assess the optimum press format size in relation to the work being produced. In the last 10 years there has been a significant trend to larger format presses to reduce the total cost of printing. Larger formats are used across all segments — sheetfed, newspaper and heatset web printing.

Direct motor drives: These have demonstrated significant advantages in web offset and are now being used for some sheetfed and postpress applications. The electrical efficiency of common DC drive solutions is 78-91% with a power loss of 9-22% (from gears, belts and pulleys), whereas direct drive is 95- 96% efficient with a power loss of only 4-5%. This means a 20-50% reduction in electricity costs depending on the application. Incorporating energy regeneration with direct drive provides even more significant savings. Energy efficient drive systems also reduce maintenance and emission of CO_2.

Blankets: Can play an important role to minimise energy in the printing unit, in some cases by up to 20% depending on its feeding and other characteristics.

Rollers: The right selection of components such as rubber rollers can decrease heat build-up and save energy. Poorly set rollers increase energy consumption and reduce quality. A self-adjusting roller lock-up system automatically and dynamically adjusts the roller nips.
Drying and curing can have high energy consumption for heatset and sheetfed printing that can be minimised.
Heatset web offset: Integrated regenerative thermal oxidation (RTO) dryer-oxidisers give the highest energy savings possible (97% heat exchange efficiency v 65% for recuperative technologies). In many production conditions the system requires no additional energy because it is self-sustaining, using only the energy from the process solvents. Most dryer-oxidisers can be fitted with secondary heat exchangers for energy recovery to produce warm or hot water, or electricity.

Sheetfed IR/hot-air dryer: New generation designs with individual adjustment of dryer output through stepless control ensure energy utilisation is optimally matched with the substrates, inks and coatings used to consume only as much energy as is necessary. Optional hot-air recovery system is used to pre-heat dryer input air to give energy savings of up to 30%.



"Energy Efficiency — Optimisation for Web Offset Printers" is a new PrintCity report from Axima, Baumüller, manroland, MEGTEC, Sun Chemical, Trelleborg and UPM.

Sheetfed UV curing: The PrintCity Optimised Sheeted UV report finds that UV curing uses less energy than IR/hot-air and that the total cost of printing is about the same as for conventional oil-based inks.

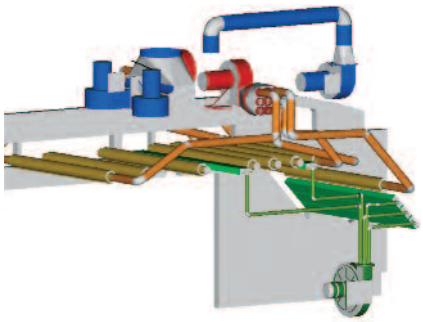
Ancillary equipment: Often a source of significant energy savings for chilled water, compressed air, damping solution cooling units, and air supply. A pressroom climate having constant air temperature and relative humidity is essential for stable high-quality production, which impacts on energy required.

Heatset process cooling: An evaporative cooling tower combined with water-cooled refrigeration can save considerable energy provided there is good PLC control to maintain precise temperatures in all circuits with automatic monitoring. Presetting the temperatures for the ink oscillator and ductor rollers before the press starts and adjusting the temperature automatically to printing speed further improves efficiency.

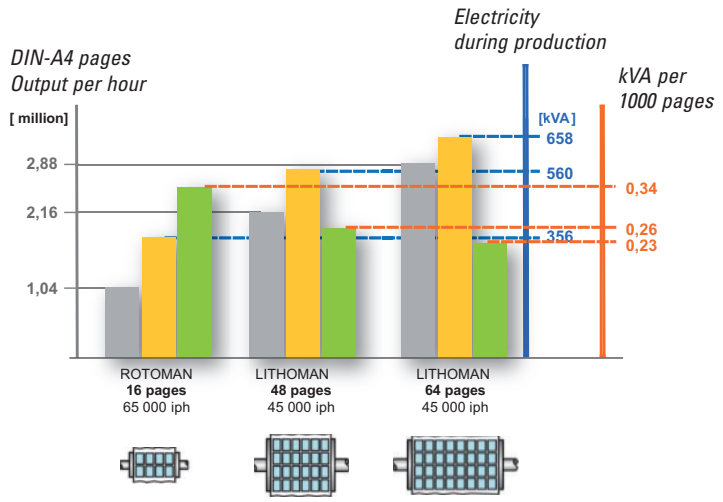
Sheetfed process cooling: Water-cooled units use significantly lower energy than air cooling because permanent air exchange, fans, air humidifiers, or heating of outside air in winter is needed. The water/glycol mixture dissipates heat four times more efficiently than air, and uses "free external cooling" as a heat exchanger. Above 40°C, a water evaporation spray system can be used in addition.

Inline finishing: Eliminate multiple processing. Inline finishing of sheetfed and web print products offers high potential savings of energy consumption, paper waste and logistics. Energy efficiency per finished product rises and paper waste declines with every pass through the press that is saved.

Inline quality control: Minimises total waste and production energy while optimising delivered quality.



The ROLAND SelectDryer IR/TL hot-air dryer with heat recovery.
Source: manroland.



Larger press formats reduce the energy required to print a page.
Source manroland.

What about air pollution, the ozone and VOCs?

Ozone at ground level is manufactured on a daily cycle:

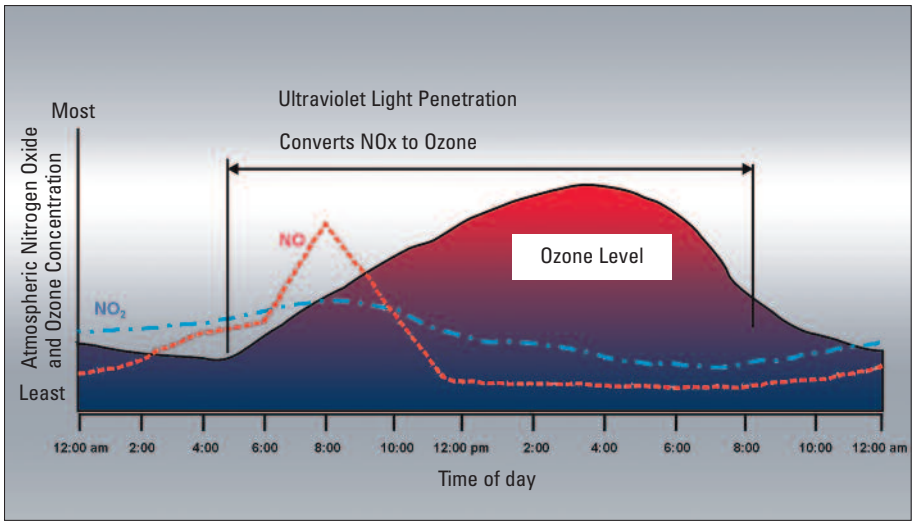
1. Some levels of VOCs and NOx from industrial and other sources exist in the atmosphere at all times. The concentration of VOC and NOx increases significantly during peak motor vehicle use.
2. From sunrise to sunset ultra violet light converts these chemicals into ozone.
3. Ozone production stops with nightfall and the ozone slowly decomposes until the cycle begins again the next day.

At one time, process emissions were directly exhausted into the atmosphere, resulting in a visible smoke plume and odours. These emissions contributed to public health problems, including the formation of ground level ozone that, together with NOx, is a precursor for the formation of photo-chemical smog. Even low ozone concentrations at ground level can cause serious damage to plants, animals, buildings and plastics and is a breathing irritant. As a result, governments have introduced laws to protect public health and the environment. These began in the US in 1970 with the creation of the Environmental Protection Agency (EPA) and the Clean Air Act, which have been progressively strengthened and replicated worldwide.

Today, process exhaust streams must meet strict regulations to reduce chemical emissions. Volatile organic compounds (VOCs) are organic carbon compounds and gases emitted from certain solids or liquids. Chemical compounds regulated by law include evaporated solvents (VOC), carbon monoxide (CO), nitrogen oxides (NOx), particulates and sulphur oxides. These noxious gases originate from high temperature combustion and incomplete combustion from motor vehicles, power stations and industrial exhaust streams. Common VOCs found in industry today usually start out as either fractions of crude oil or synthesised products from the petrochemical industry.

Air emission compliance principles

Air quality directly affects quality of life and most countries have pollution control regulations to protect public health and the environment. However, the control levels and measurement of air pollution are variable, not only between countries but also between different areas in the same country. Compliance levels may be determined and enforced either nationally or locally. In some regions, Best Available Technology (BAT) legislation may reduce the minimum compliance levels below those currently in force as more efficient technologies become available. Due to highly variable legislation it is essential that printers carefully check the control regulations in force at their site(s).
The EC 1999 directive (VOC 99/13/EC) limits solvent emissions into the atmosphere and requires a management plan to control them — including fugitive emissions through doors and windows. There are also specified VOC exposure levels in the press room that impact on all printing



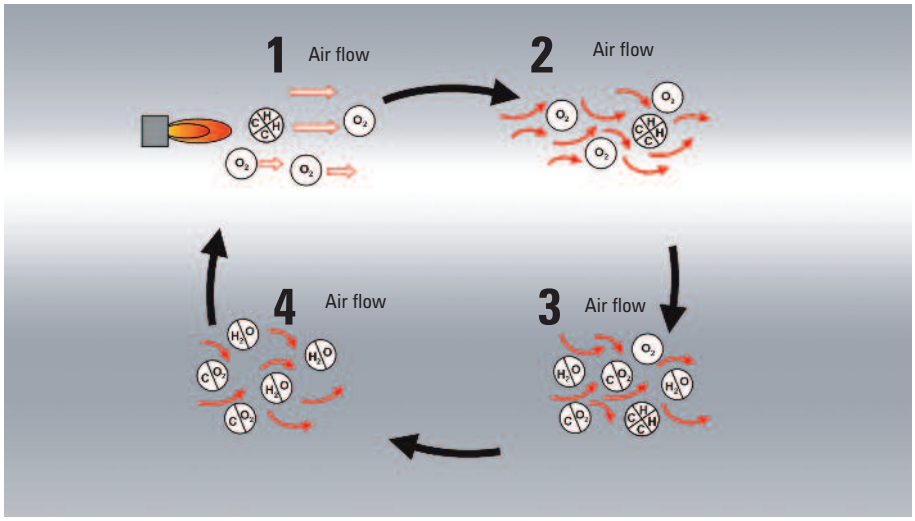
Ozone is produced by UV rays from the sun that convert VOC and NOx at ground level into ozone with the peak concentration at the end of the day. Source MEGTEC.

processes using oil based inks including sheetfed, newspaper coldset and heatset. For coldset, fugitive emissions of 20% are normally allowable. Polymer based UV inks do not contain VOCs.
Heatset levels are set at Hydrocarbons CnHm 15-20 mg/Nm³ (varies by region), Carbonmonoxide CO 50-100 mg/Nm³, Nitrogenoxide Nox 50-100 mg/Nm³ at oxidiser exit and fugitive emissions are set as a % of annual solvent consumption. Heatset inks are classified as a VOC in the EC when they are in the dryer (but not when they are at room temperature); emission control is based on the performance of the oxidisers and regulations vary depending on site size, location, products and local regulations.

Emission control technologies

Web offset pollution control technologies were originally add-on units such as afterburners that cleaned emissions at the expense of additional investment and energy consumption. The underlying trend during the last 15 years has been to integrate thermal oxidation with the drying process to reduce overall energy costs, improve clean-up performance and minimise capital and installation costs. Thermal oxidisers convert hydrocarbons into carbon dioxide (CO_2) and water (H_2O) through the process of oxidation, which raises the temperature of the process exhaust to break the hydrogen-carbon bonds and create new bonds of CO_2 and H_2O. Heat is released when these new bonds are formed (exothermic reaction). Two oxidation processes are generally used in web offset:
Recuperative Thermal Oxidisers: The term 'recuperative' describes a heat exchanger that recovers 60-70% of energy from the oxidation process. The exhaust air from the dryer is pushed by a fan through the cold inlet side of the heat exchanger to pre-heat the air as it moves to the combustion chamber, where the air is then heated to oxidation temperature. The time-temperature-turbulence relationship is critical to the oxidation system performance. Many designs fall short in the areas of residence time and mixing and, consequently, require higher temperatures to ensure high destruction efficiency. Hydrocarbons typically oxidise at 600 - 650°C. However, carbon monoxide (CO) production is relatively high at these temperatures. CO conversion to CO_2 requires temperatures of 760°C or higher

Regenerative Thermal Oxidiser (RTO): These more recent systems use multiple beds of ceramic media to collect and store energy between oxidation cycles. The recovered energy is used to pre-heat the process exhaust air as it enters the oxidation system and can recover up to 97% of the energy required for the oxidation process. An RTO burns ink solvent at a combustion temperature of about 100°C above the temperature of recuperative systems. The result is a guaranteed 50% reduction in NOx and CO_2 emissions without negative impact on the lifetime of the oxidiser. CO_2 emissions are reduced under all printing conditions to make RTO the Best Available Technology for environmental compliance.



1 - Hydrocarbon molecules are heated to approx. 760° C /1400° F by oxidiser burner.

2 - Heated hydrocarbon molecules are mixed at high velocity with induced turbulence.

3 - Chemical reaction (oxidation) takes place between hydrocarbon and oxygen forming carbon dioxide and water vapor.

4 - Carbon dioxide and water vapor are exhausted into atmosphere or used as heat supply in a heat exchanger, then exhaust.

The time-temperature-turbulence relationship is critical to the oxidation system performance.
Source "Clean Air Compliance Handbook" MEGTEC Systems

Kyoto 1990-2012 . . .

Printing presses with larger formats and direct drives require less energy and produce less waste. Photo manroland.

The 1997 Kyoto Protocol is the first binding international agreement that sets targets to reduce greenhouse gas emissions that cause climate change. It was signed by 157 countries, but the US is not a signatory. The conference decided upon:

1. GHG emission reduction targets that, by 2012, energy consumption will be reduced to the 1990 level.

2. A GHG emission trading program.

3. To set penalties for violators of the targets and regulation rules of the emission trading program.

Government programs that support the Kyoto Protocol can include initiatives such as mandatory emission reductions for manufacturing plants; requiring automotive manufacturers to improve automobile fuel efficiency; funding to purchase carbon credit offsets and emission reduction credits; or investing in infrastructure projects that would decrease greenhouse gas emissions.

The printing and paper industry is seriously concerned with carbon emissions and these are directly linked to fossil fuel energy use and derivates used for diverse industrial products. While hard comparative data is not readily available, there are many examples where the development of technologies and working practices used by the industry have exceeded the target — which by 2012 is the reduction of around 20% of energy. The principal improvement is in energy efficiency. In addition, there has been a substantial reduction in materials waste and its disposal. Some examples:

Prepress

CTP has replaced film and silver-based processing of printing plates. This has eliminated the energy required and related chemicals use. Process plates can reduce energy by up to 30%.

Digital proofing and virtual on-screen proofing has eliminated processing of laminated substrates and, particularly, energy used to transport proofs from client to printers.

Presses

Most web presses now use direct drives that use about 20-30% less energy than mechanical drives.

Printing makeready and running waste has been reduced by around 80% since 1990 with consequent reduction in energy, not only of the press but also for paper and ink, as well as disposal.

Integrated heatset drying-oxidation has reduced total energy required by 65-90% (depending on technology) compared to independent systems used in 1990. Current systems have very high efficiency to negate VOCs, carbon monoxide (CO), nitrogen oxides (NOx), particulates and sulphur oxides.

Larger press formats used by sheetfed, newspapers and heatset presses have substantially reduced energy required to per printed page. Dampening re-circulation systems, process cooling, drying and air systems have also substantially improved efficiently.

Paper and board

Paper has two enormous advantages – it is a renewable raw material and the industry principally uses renewable energy. The paper industry was an early environmental adopter and almost all mills in Europe have ISO 14001 certification and EMAS registration. Its achievements over the last 20 years are substantial and an example to most other industries.

There has been a continuous improvement of energy efficiency and reduction of carbon emissions. Energy efficiency is extremely high with over 93% using combined heat and power (CHP) generation. About 54% of energy requirements are met from recovery boilers with biomass energy conversion. The pulp and paper industry currently generates 50% renewable energy and is the biggest industrial user and producer of 'green' energy. Fuel sources include wood, de-inking and effluent residues.

Increasingly lighter weight substrates increase the number of printed copies per tonne with less manufacturing and transportation energy requirements. This includes efficient light weight technological solutions for packaging.

Increased use of recycled fibres make this the most important raw material for European paper manufacturing (63,4% in 2006, target 2010 is 66%). Advanced recycling technologies are geared to manufacture tissue, newsprint, SC, corrugated and solid box board made from 100% recovered fibres. Recovered paper also reduces landfill and increases value from paper mill waste, such as building material and fuel fertiliser.

Sustainable forest management is used by a very high proportion of paper companies certified for FSC and PEFC Chain of Custody.

Recycled fibres make up 64% of raw material for European paper Manufacturing. Photo Sappi.

How well is our industry doing?

Development of environmentally friendly production processes like neutral sizing, bleaching without chlorine, recovery of bleaching chemicals, continuous reduction of air and water emissions.

Paper is made from a renewable and recyclable raw material. Photo Sappi.

Commonly used labels (PEFC, FSC, Nordic Swan, EU Flower, Blue Angel)
Forest certification labels are a specific type of eco-label that guarantees that the wood used in the product is legally sourced and originates from certified, sustainably managed forests. The two international forest certification systemswhich have developed standards for sustainable forestmanagement are Programme for the Endorsement of Forest Certification Schemes (PEFC) and Forest Stewardship Council (FSC). Their labels can be used if standards aremet and by tracing thewood from forest to product with a certified chain of custody. Forest owners decide which certification scheme to use, if any—only about 7%of the world's forests are currently certified. Paper fibre must be recycled and/or fresh fibres from sustainable managed forests with more than 10% from certified forests (PEFC, FSC). The European Union's ecolabel EU Flower confirms that a paper product has a lower overall environmental impact. It is only awarded if the production process meets strict criteria for the use of natural resources and chemicals, energy consumption, emissions to air, and water and waste management.
WWF has launched the WWF Guide to Buying Paper and Paper Scorecard. This allows paper producers to score their papers according to criteria based on recycled fibre, sustainable forestry, emissions and landfill.
Printers' environmental programmes are either independent company initiatives or, more commonly, voluntary regional schemes like those of the Scandinavian Nordic Swan or France's Imprim'vert (Green Printer). The latter is an initiative launched by the French Printing Federation (FICG) in association with Chambers of Crafts and Commerce. Participating printers are given assistance to define their environmental priorities. A network of over 60 engineers has been created to visit these printers to assist them in implementing their policies. At the same time, FICG helps promote companies that have obtained the Imprim'vert classification by using the logo as a value added brand to print buyers, administrators and insurance companies. Printing Industries of America is currently introducing a Sustainable Green Printing Partnership.

Inks and Coatings
Ink manufacturers offer products and services that help customers conserve energy, reduce emissions and waste recovery, and in the recycling of inks and solvents. There is an increasing use of renewable and recyclable resources such as soy, vegetable oil and starch. Bioethanol is used in solvent based inks for packaging. There is also a growing availability of low VOC inks and 100% solid energy curable inks (UV and EB).

Chemicals
REACH (Registration, Evaluation, and Authorisation of Chemicals) is a European regulation that came into effect in June 2007. It requires products to be registered in a central database administered by the European Chemicals Agency. The purpose is to centrally manage risks associated with chemicals manufactured and imported into the EU. REACH requires registration and evaluation of all chemicals and authorisation of 'high concern' substances (e.g. carcinogens, mutagens). There will be a requirement for downstream users to communicate information on uses and exposure back up the supply chain, including the printer's own uses and those of customers down the supply chain.
The European printing ink industry published the EuPIA Exclusion List for Printing Inks and Related Products in 1995 (www.eupia.org). This voluntary agreement bans the use of raw materials that are classified as toxic or known to be carcinogenic, mutagenic or toxic affecting reproduction. Ink manufacturers are working with their suppliers to ensure compliance and availability of the raw materials used with the REACH regulation.

How can I make a difference?

Using lighter weight paper yield more copies per tonne. Photo Sappi.

Adapt graphic design to minimise ink coverage. Photo UPM.

Avoid using inks containing heavy metal components. Photo UPM.

Choices can be made to help reduce the environmental impact of the printing and publishing industry. The most important factor is early and frequent consultations with printers and paper suppliers to evaluate the process, materials and design criteria. It is important to take into account regional variations that may change a preference.

Some environmental issues for publishers, print buyers and designers

Can lighter weight paper/board be used to yield more copies per tonne? There is an almost linear relationship between paper weight, energy consumption and carbon footprint per printed copy; this impacts both on paper manufacturing and the transport of the paper. Lighter weight paper/board has been an underlying trend for 10 years in newspapers, magazines and packaging.

Check the environmental credentials: Do the paper and printing companies have a clear commitment to environmental stewardship, minimal ecological impact and long-term sustainable production? Are they accredited with industry environmental initiatives? Do they have ISO 14000 certification.

Are there opportunities to use recycled paper? This may depend on the location of paper making plant and its fibre sources.

How easy is it to recycle the printed product when its intended use is over?

Promote actions for reader recycling: Encourage readers to correctly recycle printed products when they are finished with them.

Design to minimise ink coverage: This reduces usage of both curing resources and drying energy. The amount of ink required to achieve the target print densities has an impact on energy used in printing and ink demand is primarily related to the type of paper. Coated papers have lower ink consumption than uncoated papers. The effective use of UCR and UCA can reduce ink consumption.

Process control: The use of quality standards and profiles for each paper type, combined with on-press colour measurement prevents over-inking, minimises drying energy and reduces waste.

Select inks: Avoid using inks containing heavy metal components that can cause environmental and worker health hazards - use substitutes that are better for the environment.

Use finer screens: Comparative heatset ink consumption tests by GATF in 2004 showed that the conventional AM 69 l/cm (175 lpi) and 25 micron Alternative Screening Technologies (AST) both used 15% less ink than conventional AM 52 l/cm (133 lpi) screens. The experience of some large AST users indicates savings of 10-15%. The use of densitometers or closed loop colour control reduces a natural tendency to over-inking.

Minimise processing: CTP and process-less plates are good examples of how production is simplified to use less energy, chemicals and residual waste.

Use virtual proofing: Eliminate materials, processing and transport of substrate based proofs where possible.

Coating and lamination: Varnish, water-based and UV coating can all be treated by modern flotation recycling plants providing they are not in excessive quantities - coating weight higher than 2,5 gsm may impair recycling. Solvent-based lamination uses large quantities of VOCs and adhesives that are a recycling problem. UV coatings contain no VOCs.

Optimise print run length: Are mailing lists regularly updated? Remove duplications and use more target-specific lists to minimise print and mailing quantities and reduce cost and environmental impact.

Improve distribution efficiency: Minimise publishing return copies - around 30-40% of most publications are unsold and recycled. Use Geodata Information Systems to minimise transport distance and driver training to minimise fuel consumption.

Reducing format size: Newspapers, magazines and some advertising catalogues are using smaller formats for a variety of reasons. In all cases, a smaller format size reduces cost and environmental impact of paper, ink, chemicals and transportation. There has been a significant downsizing of newspaper formats in the last five years.

Print on Demand: Avoid overproduction of printed products as a preventable waste strategy. Consider multiple print runs with better targeting. Consider splitting existing print products into special interest products for different target groups to improve marketing efficiency. Smaller, targeted distribution saves costs and resources.

Carbon footprint reduction: Measure and report the direct carbon footprint and focus the business on your future mandatory CRC target. Think laterally beyond the actual footprint of your publication. Promote public action and responsibility with consistent and responsible messages to positively influence global carbon emissions. Influencing reader actions has a 'Ripple Effect' because these will deliver a far greater contribution to reducing carbon emissions than offsetting arrangements.

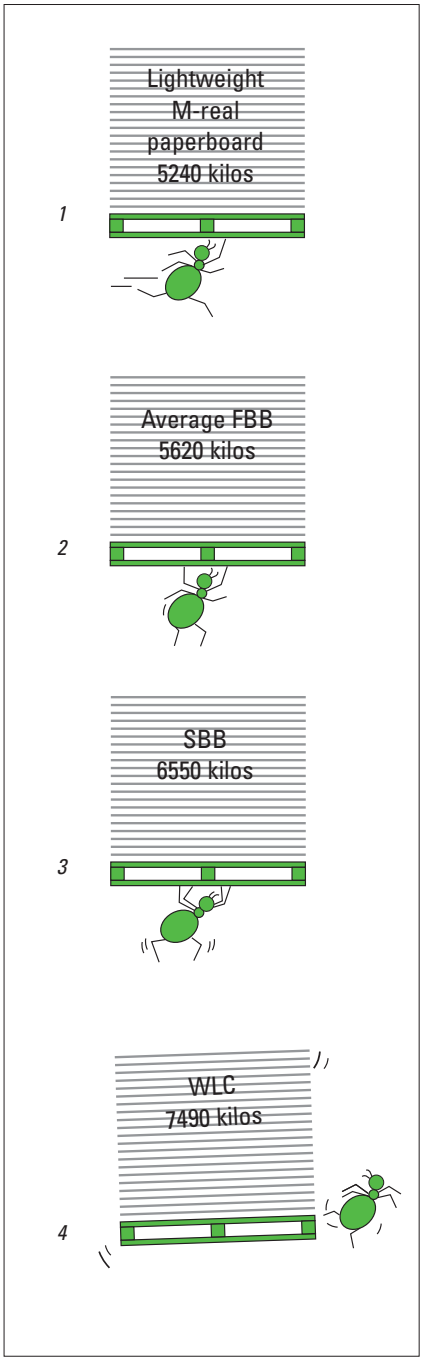
Considerations in the printing supply chain

New products are constantly being added to the list of alternative and recycled goods. The characteristics of new products that will decrease their environmental impact should be discussed with printers and their suppliers. This can include:

1 Select consumables and equipment on the basis of their lifetime environmental impact and operating costs — not just acquisition cost.
2 Will the product deliver environmental improvements without compromising performance or cost? Does it last longer than the current product (total cost for service)?
3 What are the economic and environmental costs associated with the product, its packaging, transport and disposal? Does the product contain dangerous or hazardous substances, VOCs, or chlorinated substances? What waste by-products result from using the product and how can they be properly disposed of? How can waste be prevented?
4 What bulk options are available? Can inks and chemicals be delivered in bulk or in concentrated form to reduce packaging and transportation? Can chemical containers be reused, recycled or returned to the supplier for further use? Does the supplier have a container collection programme?
5 Is it recyclable? What can it be recycled into and is there a market available for it? Does the supplier have a recycling programme for it?
6 Can the product be made from recycled material? Is there a difference in cost and quality? What proportion is recycled?
7 What is the energy efficiency of the product? Is there a more efficient alternative available?
8 What is the product's impact on greenhouse gas emissions?
9 What is being done to improve the efficiency of supply chain management?
10 For new equipment decisions, quantify comparative performance that reduces materials waste, eliminates process steps, and reduces process waste (air, water, energy), maintenance and noise.

Key environmental management success factors

- Provide clear management motivation with a policy that integrates environmental issues into a global purchasing and manufacturing strategy.
- Appoint a person responsible for environmental issues.
- Measure key environmental indicators, for example kW per tonne of paper printed, waste and recycling rates.
- Create multi-competence project teams (production, quality, health, safety, environment, finance, purchasing, and suppliers) to identify actions and implement change.
- Address one issue at a time. Set quantitative targets over time - challenging but achievable.
- Provide adequate resources and time to achieve measurable objectives.
- Systematically use appropriate tools to identify, analyse and record issues.
- Communicate the environmental programme and results in a way that motivates staff, shareholders, customers and suppliers.
- Motivate and train staff to develop a more efficient and sensitive attitude to environmental questions. Give them an active role in redesigning systems and a responsibility to ensure that the policy objectives are met.
- If needed, establish partnerships with experts from different fields for environmental problem solving.



"Lightweight paperboard provides the same amount of high-performance cartons at a weight up to 44% less. This also reduces transport volume and disposal waste at the end of the delivery chain."
1) Lightweight M-real paperboard
2) Average FBB (folding boxboard)
3) SBB (solid bleached board)
4) WLC (white lined chipboard)
Source M-real.

MEMBER **www.adphos.de**

Adphos-Eltosch supplies innovative drying and curing solutions for the graphic arts and coating industry from its worldwide sales and service organisation. More than 40 years of experience provide an expert know how for UV, IR, NIR radiation and hot air drying technologies. TwinRay for cold UV, LightGuide UV for high efficiency and less energy, WhiteCure for opaque white inks, PowerCube for UV Ink-Jet and EcoDirect for water based coatings. These are only a few milestones for a wide range of applications over recent years. Extraordinary solutions offer our customers a step to the Innovative Side of Light.

MEMBER **www.manroland.com**

Manroland's sheetfed and web presses deliver unrivalled environmental performance. In 2000, the Augsburg plant joined the Bavarian environmental pact and participated in the Ökoprofit project of the city Augsburg in 2003. manroland then committed themselves to set up an environmental management system. All production centres are certified for ISO 9001 quality management while Augsburg and Plauen also comply with ISO 14001. The Offenbach and Mainhausen plants received the 2007 Glanzlicht-Auszeichnung award from the Ministry of the Environment in the German state of Hesse. This recognised improvements since 2001 to reduce energy by 30%, natural gas by 38% and water by 32%. Teams of specialists have optimised environmentally relevant production processes, and the company has invested in energy efficient equipment and buildings.

MEMBER **www.megtec.com**

MEGTEC Systems is the world's largest supplier of webline and environmental technologies for web offset printing. The company is a specialised system supplier for roll and web handling (loading systems, pasters, infeeds) and web drying and conditioning (hot air dryers, oxidisers, chill rolls). MEGTEC combines these technologies with in depth process knowledge and experience in coldset and heatset printing. MEGTEC has manufacturing and R&D facilities in the US, France, Sweden and Germany, China and India along with regional sales, service and parts centres. MEGTEC also provides energy and efficiency consulting and machine upgrades.

MEMBER **www.m-real.com**

M-real is one of the leading producers of paperboard and paper in Europe. M-real Consumer Packaging's portfolio includes paperboards for packaging and graphics applications, wallpaper base and speciality papers for flexible packaging, labeling and self-adhesive laminates. M-real is focusing on high-performance lightweight paperboards based on primary fibres from sustainably managed forests. Through its well-established worldwide sales network, M-real serves brand owners and packaging converters in industries such as beautycare, healthcare, foods, cigarettes and consumer durables. M-real is part of the Metsäliitto Group.

MEMBER **www.sappi.com**

Sappi is the world's leading producer of coated fine paper. Its brands include Magno, HannoArt, Tempo, Quatro and Royal graphic papers, as well as Algro, Leine and Parade speciality labelling and packaging papers and boards. Customers in more than 100 countries worldwide specify these for the highest quality publishing, promotional and packaging applications. The papers are produced in mills accredited with ISO 9001, 14001 and EMAS certification and Sappi was the first paper company in Europe to hold group chain-of-custody certification for its entire European operations under both the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC) schemes

MEMBER **www.sunchemical.com**

The world's foremost producer of inks, pigments and colour technology, **Sun Chemical** is leading our industry in developing and producing products which minimise our impact - and our customers' impact - on the environment and is striving to maximise the use of renewable resources. We consider it our responsibility to be involved in the communities in which we live and work and to offer direction in meeting today's needs without compromising the ability of future generations to meet theirs.
Sun Chemical offers products and services today that can help you conserve energy, lower emissions and reduce waste. However, the route to sustainability is a journey and we continue to invest in Research and Development to develop future ink, pigment and coating solutions that meet the needs of the present but also consider the needs of our future generations.

MEMBER **www.upm-kymmene.com**

UPM is a leading forest product company and paper manufacturer. The professionalism of our worldwide production and sales writes the story of our high quality papers every day, offering multiple inspiring paper platforms for various end uses. The environmental quality of UPM's papers is nurtured throughout the life cycle of the product – from a tiny seedling to the recycling of the used product. Continuous improvement is at the core of our operation. We use wood raw material and energy efficiently, prefer renewable energy sources, force emissions down as far as possible and use recycled materials to make new products. All UPM employees follow this philosophy in their daily work to accomplish proper practice of sustainable business. Certifying and monitoring proves that UPM's papers are made with sustainable fibre, fresh or recycled, low emissions and low carbon footprint.