



**PRINT:** **BOOK**  
**seen** **2**  
**lean & green**

*connection of competence*



# PRINT!



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## CROSS-INDUSTRY NETWORKING WITH



PrintCity is a Strategic Alliance that connects worldwide expertise from independent companies in the graphic arts industry. Members work together in partnerships within a complete workflow — from prepress to press to postpress — across the packaging, commercial and publishing sectors.

**BOOK**

**PRINT:**  
**seen!**  
lean & green

**2**

# Welcome to

## PRINT: **seen!** lean & green

PrintCity's view of the future of print is that it will be an evolving mix of multiple scenarios for different market segments, economies and cultures. However, all of them will have a common need for a 2-part strategy to optimise their success. Firstly, print must be **seen**, it needs to stand in its own right and be valued as a functional media. This needs to be underpinned with a combined **lean & green** manufacturing strategy to ensure its profitability and sustainability.

To reflect this dual strategy we have chosen an innovative 2-in-1 format that combines two related books into a single revolving back-to-back book.

This book reflects the input from PrintCity members and associates, the Stuttgart HdM Media University, FIPP, University of Swansea, and Print Power. We would like to express our appreciation at their combined 'connection of competence' contributions

PRINT: lean & green

This supporting strategy combines productivity benefits from **lean** manufacturing that also improve **green** performance from resource and waste reduction. Print's environmental performance has significantly improved since the **1992 Rio Sustainability Declaration**. This is the result of introducing more efficient production technologies and techniques. While the initial driver was economic, it then became apparent that significant environmental benefits could be delivered simultaneously — a win-win result. Print's sustainable attributes also have a positive impact on its value both as a media, and for packaging that uses paper and board substrates.

BOOK

2



## Contents

# BOOK

2

1

# BOOK

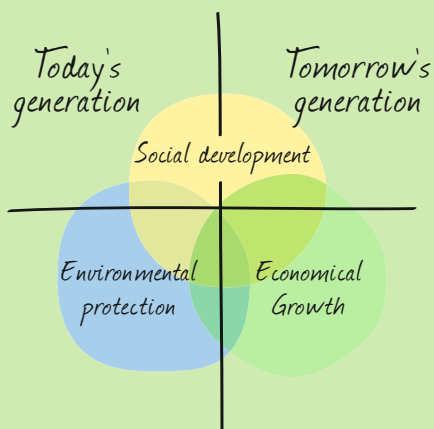
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Two events mark 2012: the first is the four-yearly drupa technology exhibition and the second is the 20th anniversary of the Rio Sustainability Declaration.

This report relates these two events by considering some of the environmental and economic changes within the graphic industry over the past 20 years.



«Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.» Brundtland Report, from the United Nations World Commission on Environment and Development (WCED), 1987.

**Sustainability** Climate change, resource availability, waste disposal and pollution are linked to sustainability, which is the outcome of three interconnected human activities: environmental protection, economic growth, and social development.

Consumers are increasingly demanding more sustainable products. This has implications throughout the supply chain as many customers expect to see voluntary best practice schemes that go beyond basic compliance with environmental legislation.

**Lean & Green strategy** Lean manufacturing reduces waste to minimise costs and time while simultaneously improving Green performance because any waste reduction provides direct environmental benefits as well as economic efficiency. Since 2010, PrintCity have promoted this win-win strategy, which was inspired by the US Environmental Protection Agency's promotion of Lean to address environmental issues.

#### CASE STUDY ELLE

This report's case study evaluates the experience of ELLE magazine from 1992 to 2012.

The improvement results are impressive. Paper production now uses less water and energy, with all fibre certified and the recycling rate doubling from 35% to 71%. Prepress has eliminated film, and CTP has reduced platemaking water use by 92% and dangerous waste by 98%. On-press changeover time is 66% lower, printing speed about 50% faster, unplanned downtime has fallen 50%, overall paper waste down from 15% to 12%, and gas consumption 50% less.

These **Lean & Green gains are impressive**, and for the publisher they also add '**Seen**' media benefits. Higher magazine paginations, volumes and versions are delivered with a three-day shorter lead time to allow sales to start earlier at the beginning of the weekend. **The sales price today is almost identical to 1992** but, at a constant price, it has fallen by 35%. This reduction comes from productivity gains of the editor, the suppliers of paper, other consumables and the printer- most of which have been transferred to the readers.

**Improving value chain performance** Improving performance requires a cross-process approach to understand where improvements can be made, then to continuously improve working practices and select technologies that deliver good Return on Investment (ROI).

**Lean manufacturing** Research by the Aberdeen Group found that manufacturers are three times more likely to be an industry best-in-class performer when a Lean strategy is applied across the organisation; and up to six times less likely to be as severely impacted by pricing and service demands from customers and the related squeeze on profits.

Reduction of energy consumption and greenhouse gas emissions also takes a value chain approach. There is a direct correlation between CO<sub>2</sub> fossil emissions, energy generation and consumption.

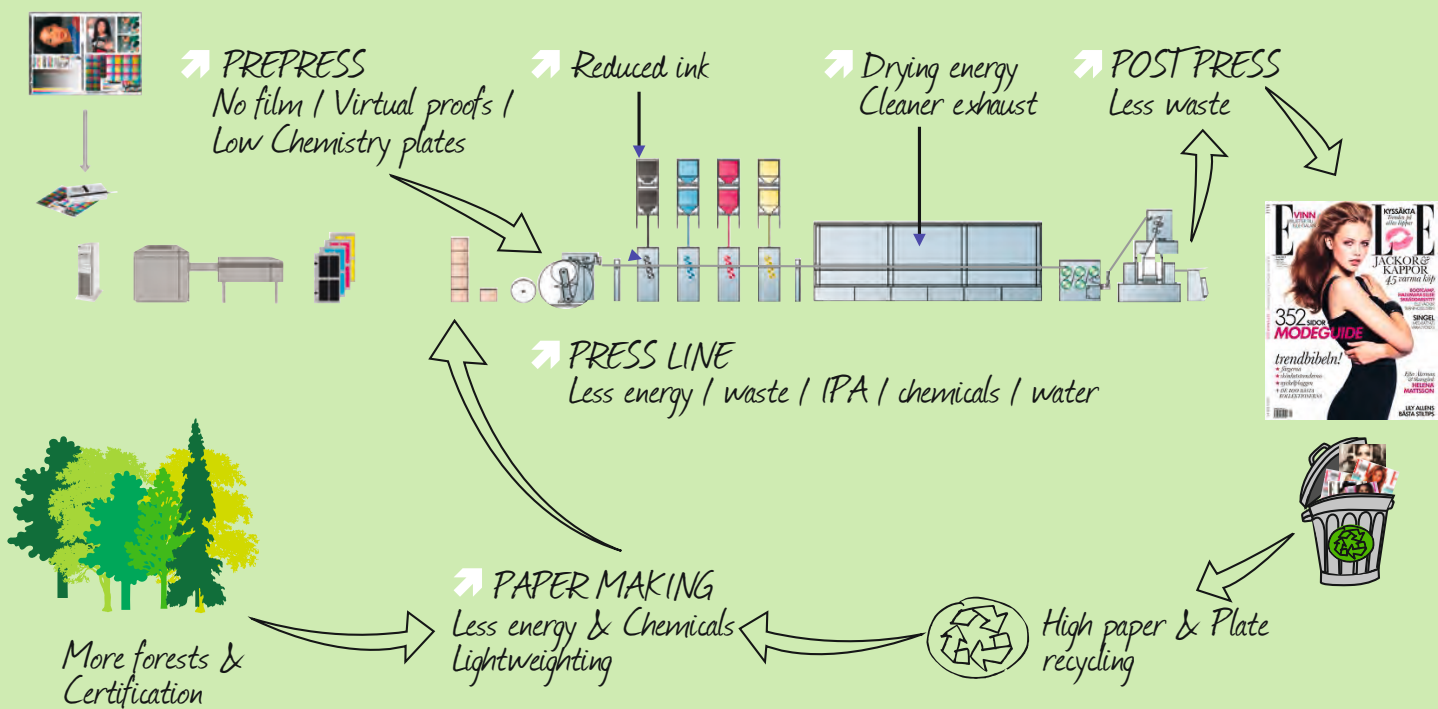
# green

**Value chain starts in the forest** European forests now cover almost half of Europe's land surface and continue to increase. Most of these forests have a management plan, and 92% of forests managed by European pulp and paper companies are independently certified. Biomass is increasingly used for primary energy in the European pulp and paper industry. The paper recycling rate in the EU rose from 47% in 1995 to 72% in 2009. Lightweighting of paper and board is an important factor in reducing environmental and economic impacts.

**Technologies** Prepress time, cost and environmental impact have been massively improved by CTP and low chemistry plates. The cost and environmental footprint of the substrate is the principal material input and, consequently, the biggest single contribution to press performance is minimisation of paper waste for any reason. Process standardisation and automated inline control are two essential actions.

In the last 20 years offset printing productivity has more than doubled as a result of higher press speeds, larger formats, automation, and process control. Fewer presses are now required to produce the same quantity with less waste, while providing improved environmental performance. There is increasing attention to reducing energy consumption by using a combination of best available technologies, including energy recovery.

Consumable materials such as inks, foils, blankets and chemicals demonstrate performance improvements. In addition, all suppliers are continuously improving their own manufacturing methods



**Value chain improvements 1992-2012.** Source: PrintCity

# ELLE

## 20 YEARS OF TECHNOLOGY AND ENVIRONMENTAL IMPROVEMENT

Two events mark 2012: The first is the four-yearly

drupa exhibition that is a focal point for the technology suppliers to the printing world; the second is the 20th anniversary of the Rio Sustainability Declaration that will be marked by the Rio+20 conference. This case study by UNIC and PrintCity seeks to relate these two events by evaluating the experience of ELLE magazine. This evaluation is not intended to promote the magazine or its suppliers; its objective is to illustrate the environmental evolution of publishing, paper and printing since the 1992 Rio Sustainability Declaration.



### The magazine

ELLE was created by Hélène Lazareff in 1945, her motto was “serious in frivolity, irony in the serious”. Today, the magazine is published by Hachette Filipacchi Médias (Groupe Lagardère). This study covers only the French edition — there are 43 other national editions.

In 1992, the format of the magazine was 227 x 297 mm with an average of 160 pages that were produced in 10 different local editions. In 2012, the magazine is slightly smaller but averages 28% more pages. There are many more editions — 25 on average in 2011 — with a maximum of up to 50. The difference between editions 20 years ago was purely in advertising, but they now also include changes to some editorial content, plus special regional editions that are bound into the magazine. Since 2007, the summer editions are also published in a pocket format.

**In 20 years, the number of sold copies has grown, there are also 28% more pages, and 165% more versions.**

Technical evolutions have contributed to the title’s publishing development. In 1992, the magazine was distributed on Monday with the last file deadline to the printer by Tuesday noon, a 5,5 day lead time. In 2012, the magazine is published on Friday, with the same last file deadlines and a lead time reduced to 2,5 days.

➤ **Result:** Higher magazine paginations, volumes and versions with a lead time three days shorter to allow sales to start at the beginning of the weekend instead of the beginning of the week.

ELLE per edition	1992	2012	% change
Sales price (€)	2	2	0%
Evolution sales price in constant euros	-	-	-35%
Average pages per edition	160	204	28%
Number of versions in France	20	53	165%
Page size mm	227 x 297	220 x 285	-7%

## Materials

### Wood for pulp

Information on the origin of the wood used to make the paper pulp for 1992 is not available. At that time FSC and PEFC certifications of origin did not exist.

Today the paper for the French edition is made at two Italian paper mills with a mixture of chemical and mechanical pulp.

The chemical pulp is sourced from Finland, Sweden, France, Brazil or Canada. In 1992 Brazil represented 8% of pulp imported by France, this rose to 23% last year at the expense of North American sources. The mechanical wood is manufactured at the sites of the Italian paper mills from timber that comes from France, Germany, Austria and Italy. The origin of the wood used to produce the paper for ELLE is estimated to be 80% from Europe, 15% from Canada, and 5% from Brazil.

➤ **Result:** All of the paper used by ELLE today is certified by PEFC as coming from sustainable managed forests and controlled sources. The purchased chemical pulp uses a chlorine-free bleaching process.

## Paper

In 1992, the text paper was a 70 gsm LWC, probably produced in Germany. Today the paper is 65 gsm Improved LWC made in Italy.

On the basis of a constant number of pages over 20 years, the reduction in paper basis weight and printing conditions (described later) have reduced paper consumption by 10%. In reality, the magazine has higher pagination and distribution that has increased annual paper consumption by 27% from 9 600 tonnes to 12 200 tonnes.

A current copy of ELLE weighs 414 grammes, to which needs to be added 12% production waste for a total weight per copy of 464 grammes. Paper suppliers' data (excluding chemical pulp) indicates that 36 litres of water and 329 Wh of energy are used to produce the paper for one copy of the magazine. In 1992, to produce one copy of 378 grammes, 15% of production waste was required for a total of 435 grammes. Applying CEPI's reduction proportions for the data of all European paper supplier makers (40% water consumption and 10% energy), then in 1992 the paper required for one copy consumed 47 litres of water and 339 Wh.

➤ **Result:** Over 20 years, the production of paper per copy of ELLE requires 24% less water and 3% less energy in spite of more copies and more pages. In addition, electricity generation has moved from coal to gas and biomass to significantly reduce greenhouse gas emissions for the energy used.

## Recycling

In 1992, only 35% of magazines sold in France were collected for recycling. In 2011, widespread selective waste collection has increased the recycling rate to 71%, a 100% improvement.

ELLE Materials	1992	2012	% change
Text paper weight gsm	70	65	-7%
Water used by paper/copy (litres)	47	36	-23%
Paper consumption energy/copy (kWh)	329	339	3%
Overall paper waste rate (%)	15	12	-20%



1992 > 2012

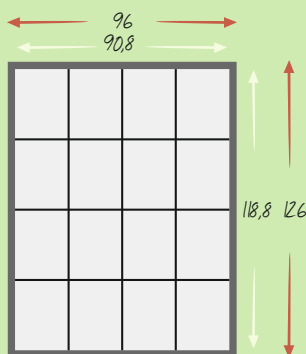


## ELLE

20 YEARS  
OF TECHNOLOGY  
AND ENVIRONMENTAL IMPROVEMENT

1992 → 2012

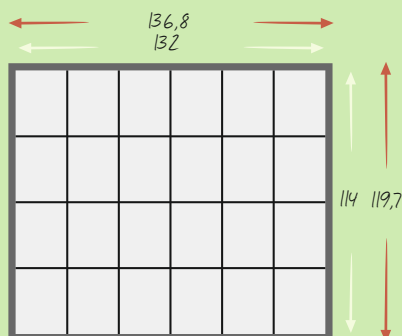
1992



**32 pages**

Web width	960 mm
Cut-off	1260 mm
Trimmed page size	227x297 mm
Paper per revolution	1,2096 m <sup>2</sup>

2012



**48 pages**

Web width	1368 mm
Cut-off Coupe	1197 mm
Trimmed page size	220x285
Paper per revolution	1,637 m <sup>2</sup>

Heatset web offset printing format size has increased by 50% since 1992. Source UNIC/PrintCity.

## Ink and coating

The evolution of ink consumption is difficult to quantify. It is influenced by the covering power of the ink, its absorption by the paper, and the type of image. It is estimated that, today, ink represents about 3% of the total weight of the ELLE magazine. Heatset offset ink is mineral oil based. The cover today is UV flood coated, which was not used in 1992.

## Production and formats

The change to a larger web offset press format for printing the text has an important impact on the environmental and economic performance:

**1992** — the magazine comprised 1 x 48-page gravure section; 3 x 32-page sections printed heatset offset, on 960 mm wide web with a 1260 mm cut-off; and 1 x 16-page cover section;

**2012** — the magazine has 2 x gravure sections totalling 88 pages and 2 x 48-page sections printed heatset offset, on 1368 mm wide web with a 1197 mm cut-off; and 1 x 16-page cover section.

This configuration is theoretical because, in reality, the magazine has more sections. The only change on the cover is the addition of UV coating. This evaluation does not consider sections printed by gravure because inadequate data is available.

## Prepress and plates

Offset printing requires aluminium plates to be imaged. The prepress technology for plate-making has changed enormously. In 1992 the production process required the use of films from which the plates were imaged, but by year 2000 plates were made directly by CTP (Computer to Plate), eliminating the film step.

The surface area of plates made by the printer for 96 pages of text has changed:

**1992** — 28,6 m<sup>2</sup> for 3 x 32-page 4-colour sections (width 960 mm x cut-off 1260 mm, lock-up 10 mm);

**2011** — 26,5 m<sup>2</sup> for 2 x 48-page 4-colour sections (width 1368 mm, cut-off 1190 mm, lock-up 10 mm).

Using plates 0,4 mm thick and an aluminium density of 2,96 t/m<sup>3</sup>, the weekly printing of 96 pages in 4-colour required 1,76 tonnes of aluminium in 1992. In 2011 it requires only 1,63 tonnes, a reduction of 7%.

In 1992, the annual water consumption to develop films was 1,1 l/m<sup>2</sup>, or 1600 litres a year of which 1200 litres was contaminated by developer and fixer chemicals and had to be treated as dangerous waste. This step has now been eliminated. Annual 1992 water consumption for plate development was around 15 000 litres of which 150 litres had to be treated as dangerous waste. This annual consumption has been reduced to 1250 litres of which only 20 litres is dangerous waste.

➤ **Result:** Annual platemaking in 1992 required around 16 600 litres of water compared to only 1250 litres today, a reduction of 92%. The quantity of dangerous waste for disposal has been reduced from 1350 to 20 litres, a reduction of 98%. Also, there has been an elimination or large reduction in chemicals used, and 7% less aluminium for plates.

## Printing

In 1992, the printed sections were 32 pages. Today's 48-page format prints 50% more pages per revolution. The manufacturer's specified printing speed is around 50% faster. In 1992, the 16-page press used to print the cover had a rated speed of 40 000 cph; in 2011 the rated speed is 60 000 cph. Other productivity improvements come from faster job changeover, automation and electronic control systems.

➤ **Result:** The changeover time from one section to the next in 1992 took around 90 minutes; today it is about 30 minutes. In addition, machines are more reliable, web breaks and jams are less frequent, reducing unplanned downtime from 25% to 15%. These different technology evolutions have combined to reduce overall paper waste from 15% to 12%, and have shortened the production deadline from 5,5 days to 2,5 days. Manning of a web press in 1992 required nine staff that today requires an average of 3,5 people.

## Energy & emissions

The heatset process emits VOCs during the evaporation of ink solvents in the dryer. Isopropyl alcohol (IPA) is a high VOC source used in the dampening system solution and for press cleaning. French printers had only a minor impact from the 1999 EU directive on VOC because a 1988 instruction notice had already been applied. The majority of European printers have significantly reduced their emissions during the last 20 years. Most heatset printers are now equipped with integrated dryer-oxidizers that incinerate solvents to reduce VOC emissions to 20 mgC/Nm<sup>3</sup>. In addition, European regulations stipulate that a maximum 30% of total consumption can be emitted; this has obliged printers to select less volatile cleaning solvents and to reduce or eliminate IPA. Data from the printer of ELLE indicates that their emission is only about 0,05 grammes.

It is very difficult to estimate the evolution of electricity consumption due to the absence of precise data from 1992, and even today suppliers only provide the connected energy rating for start-up that does not represent running electricity draw. Shaft-less press drives significantly reduce mechanical inertia and corresponding energy, but widespread automation and electronic control systems requires more electricity.

However, the evolution of gas consumption by the dryer-oxidizer is much clearer. The dryer heats the paper to evaporate ink solvents from it. These are then incinerated in the oxidizer, resulting in low pollution emission to the atmosphere. In 1992, the gas consumption to dry 3 000 32-page text sections was around 120 kWh, and 1000 covers 6 kWh. Therefore, printing 1 000 copies of 96 pages and the cover required about 126 kWh of gas. In 2011, the printer's data to produce 2 000 48-page sections was around 64 kWh of gas and printing 1 000 covers 3 kWh. Printing 1 000 copies of 96 pages and the cover required about 67 kWh of gas.

➤ **Result:** In 20 years gas consumption has been reduced by 50%. This reduction is related to the change from independent-recuperative to dryer-integrated recuperative systems where the calories from the incinerated solvents are recycled into the dryer.

<i>ELLE Case study - printing 96 pages text + cover</i>	1992	2012	% change
<i>Aluminium per year (tonnes)</i>	1,76	1,63	-7%
<i>Platemaking annual water consumption (litres)</i>	16600	1250	-92%
<i>Platemaking annual dangerous liquid waste (litres)</i>	1350	20	-99%
<i>Gas consumption per 1000 copies 96 pages+cover (kWh)</i>	126	67	-50%

## CONCLUSIONS

ELLE is now printed on presses that are larger, faster, stop less frequently, consume less gas for drying, emit fewer VOCs, create less waste and require fewer staff than 20 years ago.

The sales price per copy in 1992 was € 1,98 (13 francs), today it is almost identical at € 2. At a constant price the real price per copy has fallen by 35%. Using newer technology could further increase savings.

This reduction comes from productivity gains of the editor, the suppliers of paper, other consumables and the printer — most of which have been transferred to the readers.

This case study was made by UNIC, the French printing federation led by their environmental manager, Benoit Moreau, who is also closely involved with Imprim'Vert and ClimateCalc initiatives.

The magazine's technical and editorial teams agreed to participate in the project and have provided access to their data — the treatment of which is uniquely the responsibility of UNIC and PrintCity.

# LEAN MANU- FACTURING

**“The first principle of environmental improvement is to avoid waste.**

**The fundamental principle of Lean is to avoid waste,”** —asserts the US Environmental Protection Agency that has adopted Lean techniques to improve manufacturing environmental performance.

Environmental wastes add no value and can negatively affect production flow, time, quality, and cost — making them prime targets for Lean initiatives. In many cases the costs associated with pollution and wasted energy, water and raw materials can be significant.

**“Lean Manufacturing is the elimination of waste in every area of production, including customer relations, product design, supplier networks and factory management.”**— definition by Massachusetts Institute of Technology.

Waste is anything that does not contribute directly to adding value for the customer. The key metrics are cost and time.

MINIMISING  
WASTE IS  
FUNDAMEN-  
TALLY GOOD  
MANAGEMENT



## Attacking the 7 Wastes

A Lean focus on identifying, analysing and reducing the “7 Wastes” is good environmental management and a great tool for cost reduction.

- 1. Overproduction** consumes valuable resources with avoidable costs and environmental impact from unnecessary overruns of finished products, or sections.
- 2. Inventory** excessive work in progress increases spoilage risk from deterioration or damage, and consumes energy used to heat and light the storage space. Review just-in-time production.
- 3. Transportation** unnecessary handling of raw materials, partial or finished goods, should be eliminated. Impacts are energy use, greenhouse gas emissions and needless packaging.
- 4. Waiting/ unstable process** workflows and equipment incorrectly set up, operated and/or maintained lead to breakdowns, late materials, late prior steps and missing data that can delay deliveries and incur downtime costs of people, equipment and energy.
- 5. Motion** poor layout, lack of teamwork and process organisation lead both to unnecessary movement to get tools, materials and information and to excessive movement of work into and out of storage.
- 6. Over-processing/over-production** avoidable waste from exceeding the customers’ job specifications, over-packaging, or producing more copies than the next step in the process requires.
- 7. Defects and spoilage** the greatest single cause of all waste is quality that is unacceptable to the customer. Consequences include waste of employee time, equipment, materials and energy, extra processing and disposal costs, plus resources to rectify defects.

**Overproduction is the Mother of all wastes.**



*“The ‘7 Wastes’ are the core Lean principle, with overproduction being the biggest single cause of all waste,” Source Vision in Print/PrintCity.*





## Tips to become Leaner & Greener

- Measure how many runovers are left at the end of jobs — why so many (or not enough)?
- Look in waste bins to identify and eliminate the causes of waste.
- Calculate company material yield (annual waste tonnage/annual procured tonnage).
- Calculate what a 1% reduction in material waste could add to profits.
- Quantify the cost of energy and utilities consumption and assess opportunities to reduce their waste.
- Establish cross-functional multi-level teams to reduce waste.
- If you don't know where to start then seek external assistance — the right support should pay for itself many times over.
- Start by making the job easier, faster and better, for the staff — then it will be adopted by them and it will become cheaper.
- Do only what is needed, when it is needed. Start with small and quick success steps.



## What not to do

- Try to implement improvements without engaging your entire workforce.
- Ignore Key Performance Indicators — measurement is essential to improvement.
- Fall for the recycling-is-OK rationalisation — avoiding waste is more profitable than recycling.
- Think you have done it already — there is always opportunity to improve.

Some examples of

## Lean improvements include

### Offset envelope manufacturer:

An audit identified savings of 1.1% of turnover from improved material waste and energy efficiency. The analysis of materials and energy data, along with identifying the 'root causes' of wastage, allowed managers and production staff to identify improvement opportunities and prepare for the introduction of ISO 14001 environmental certification.

### Flexographic label printer:

A process improvement programme focussed on the waste of around 16% of 1.2 € million/year of materials. A pragmatic awareness campaign to the 40 staff members used simple statistics and examples to show the real cost of waste. Optimising overruns rapidly reduced waste by over 60%. Other improvements came from better control of part rolls, always leaving presses webbed-up, and re-use of press waste downstream.

### Offset newspaper printer:

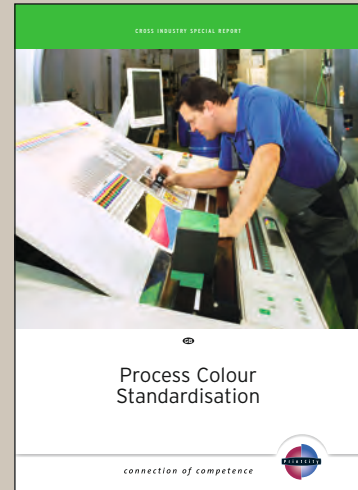
A cross-functional improvement team identified energy reduction actions including an employee awareness campaign, installing PIR lighting in infrequent use areas, auto-sleep on IT equipment, localising shut-off valves for compressed air, and closing doors. As a result the newspaper reduced its kW/hours per tonne of paper by 50% (on about 5 000 tonnes of paper per year).



## The Lean and Environment Toolkit



'The Lean and Environmental Tool Kit' from the US Environmental Protection Agency offers practical techniques to implement and improve Lean results while achieving environmental performance goals. [www.epa.gov/lean](http://www.epa.gov/lean).



PrintCity has published "Process colour standardisation" to promote the better understanding and use of process standardisation and workflow optimisation. This guide is not intended to replace and is complementary to the work of ISO, PSO, Fogra, IDEAlliance®, ECI, ICC, and other organisations. Copies available from project members Fujifilm, GKG, sappi, Sun Chemical, manroland, Trelleborg and UPM. [www.printcity.de/shop](http://www.printcity.de/shop) Source PrintCity Alliance

Vision in Print —ViP, in the UK is one of the most experienced organisations applying Lean in the printing and packaging industry. They have made several hundred audits identifying significant cost savings and environmental improvements with average identified savings ranging from 100 000 - 300 000 € per improvement project.

# CARBON FOOTPRINT & ENERGY REDUCTION

Climate change, resource availability, waste disposal and pollution are inextricably linked to sustainability. The primary cause of global warming leading to climate change is greenhouse gas emissions (GHG) produced by a wide range of human activities. For publishers, advertisers, packagers, printers, and their suppliers, climate issues have an accelerating impact on industry-wide process and value chain systems.

THE CHEAPEST AND CLEANEST KW/H OF ENERGY IS THE ONE NOT USED



## Why is energy policy important?

There is a direct correlation between CO<sub>2</sub> fossil emissions, energy generation and consumption. There are three realities concerning energy that impact on all users:

- Conventional energy supply is limited and many alternatives are expensive = need to reduce.
- The cheapest kW/h of energy is the one not used = need to improved energy efficiency.
- Significant reduction of fossil fuelled energy = need to have cleaner generation.

The pulp and paper industry is one of the world's largest users of renewable, low-carbon energy. Around 50% of the primary energy used to make paper in Europe and the US comes from carbon neutral renewable resources and is produced on site at mills. Recycling can significantly reduces energy use.

## Carbon Footprinting

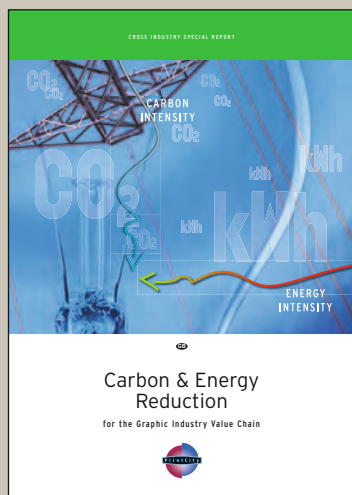
Carbon Footprinting measures the GHG emissions of a business, production site, product, or service. The primary reason to do this is to drive steps to reduce GHG emissions and fossil energy use. A secondary reason is to act as a base for carbon offsetting and communication.

Carbon Footprinting calculators have been primarily developed by industry associations in Europe (Intergraf, ClimateCalc and BVDM) and the Japanese Printing Federation. These organisations are participating in the ISO Working Group to develop a harmonised carbon footprint standard (draft 14067).

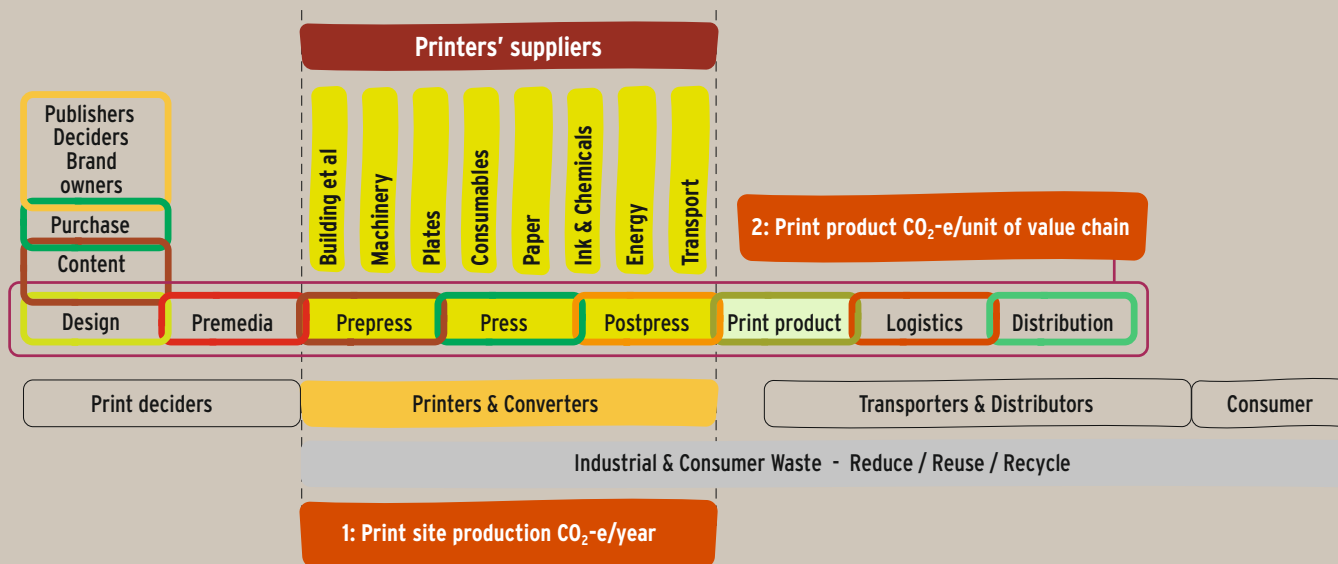
Intergraf recommends that 13 principal parameters be included in any calculation of emissions of a printing site or product because these usually cover around 95% of all GHG emissions in the life cycle of printed material — this scope excludes emissions related to capital assets, customer distribution and end-of-life of printed material.

Printing process optimisation should begin with control of the workflow and process, including the use of quality standards and profiles to minimise paper waste, over-inking and excessive drying energy. Optimised maintenance is also crucial to minimise the consumption of energy and materials.

New technologies can provide significant reductions in energy consumption and emissions. However, the industry has relatively long reinvestment cycles, which means there will be periodic large step-change improvements.



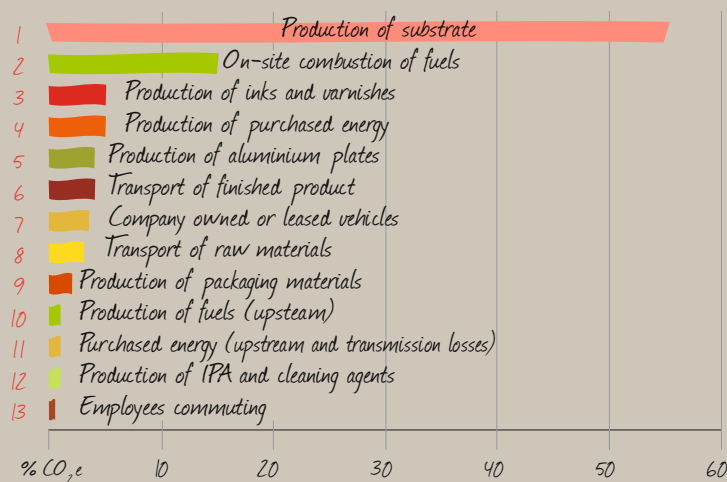
PrintCity published in 2011 a special report: 'Carbon Footprint & Energy Reduction for the Graphic Industry Value Chain' to facilitate the collaborative environmental performance of the industry. Copies are available from [www.printcity.de/shop](http://www.printcity.de/shop) Source PrintCity Alliance.



Mapping of Value/Process Streams identifies the multiple sources of CO<sub>2</sub>e and energy consumption. The most effective optimisation approach is to work across the entire value stream to measure, identify and prioritise areas where improvements can be made. Anything that makes the supply chain more energy efficient generally saves carbon. This approach can use techniques from Lean Manufacturing, Six Sigma and Lifecycle Analysis. Graphic PrintCity

### Some PrintCity conclusions:

1. Climate change is a dynamic international issue driven by geopolitics, NGOs, legislation, customers and users.
2. Fossil fuelled energy supply is limited and it will become more expensive. Energy optimisation is a key to reducing demand and emissions.
3. 'Lean' and 'Green' generally go hand-in-hand to improve both environmental and business performance.
4. Carbon Footprinting is an evaluation tool to measure the environmental impact of a product or process. It facilitates the reduction of energy consumption, leading to lower emissions, and provides a calculation base to offset emissions that cannot be reduced.
5. Carbon Footprinting need to be clear, concise and credible. A harmonised international approach across all elements of the graphics industry value chain is required.
6. Uncertainty needs to be removed from some Carbon Footprint issues, including definition of scope or boundaries, methods to calculate energy mix and conversion factors, avoided emissions, sequestration, and biogenics — many of these are general issues.
7. Caution — the inappropriate use of Carbon Footprinting as a single parameter to compare goods or services can lead to unbalanced environmental decisions.
8. For those companies seriously interested in reducing their overall energy consumption, it is recommended to use Tonne of Oil Equivalent (toe) as a parallel metric to CO<sub>2</sub>e.
9. Inflation of ecolabels leads to confusion and their devaluation (over 300 label types from more than 200 countries).
10. Ink-on-paper is the only media with a onetime carbon footprint — all other media require energy every time they are looked at.



This example shows the top 13 sources of CO<sub>2</sub>e (carbon dioxide equivalent) emissions — these vary from plant to plant. Source UNIC/PrintCity.

# THE VALUE CHAIN STARTS IN THE FOREST

14



OPTIMISM TO THE  
SUSTAINABILITY  
OF THE  
PAPER CYCLE



Following the United Nations Conference on Environment and Development (UNCED) in Rio in 1992, an independent study on the sustainability of the pulp and paper industry was undertaken by the International Institute for Economic Development (IIED) for the then newly formed World Business Council for Sustainable Development (WBCSD). The study's report, 'Towards a Sustainable Paper Cycle', published in 1996 examined fibre availability and forest management, cleaner pulp and paper manufacturing, and issues of transport, consumption and recycling. The study described a paper industry that was improving in a number of aspects and concluded that there was optimism with regard to the future sustainability of the paper cycle.

In the 20 years since the Rio conference these improvements have continued making the industry increasingly Leaner and Greener.

## Forestry and fibre **availability**

The recent UN report 'State of Europe's Forests 2011' provides a compelling view of the good health of European forests:

### “ **Forests cover almost half of Europe's land surface and forest area continues to increase**

- There are 1,02 billion hectares of forest in Europe, which amount to 25% of the world total. Over the last 20 years the forest area has expanded in all European regions and has gained 0,8 million hectares each year. Over the same period the total growing stock of forests in Europe has increased by 8,6 billion m<sup>3</sup>, the equivalent to the total combined growing stock of France, Germany and Poland. Growing stock has increased faster than area, which means that the average standing volume of wood per hectare in Europe has increased.

### **European forests sequester increasing amounts of carbon in tree biomass**

- Between 2005 and 2010 about 870 million tonnes of CO<sub>2</sub> have been removed annually from the atmosphere by photosynthesis and tree biomass growth in the European countries. This corresponds to about 10% of the gross annual greenhouse gas emissions over the same period.

### **Felling is well below increment**

- In almost all countries the net annual increment is higher than the annual felling. In the European region approximately 40% of the increment is used.

### **Most forests in Europe have a management plan**

- Management plans and their equivalents are key tools for sustainable forest management. Most of the forest areas in Europe are covered by a forest management plan or its equivalent.

### **The area of protected forests is expanding in Europe**

- Protected forests are important to maintain and enhance biodiversity, as well as to conserve landscapes and provide recreation opportunities. The area of protected forests in Europe has increased by around half a million hectares annually over the last 10 years due to policies to improve biodiversity.

- Forests have shown a steady increase in species composition. ”



Photo Sappi.



## Certification

### Certification demonstrates that fibre originates from sustainable managed forests

Prior to 1992 forest certification existed only in theory. Since the launch of the Forest Stewardship Council (FSC) in 1993 and the Programme for the Endorsement of Forest Certification (PEFC) in 1999, certification and chain of custody have established themselves as a primary means of demonstrating that the fibre in wood products originates from sustainable managed forests.

Currently, 10% of the world's forests have been certified to one of these international standards, representing about 30% of the commercially used forest area. In Europe the picture shows even greater success (Source: Confederation of European Paper Industries (CEPI) Sustainability Report):

- **92,2%** of forests managed by European pulp and paper companies are independently certified.
- **71,1%** of pulp delivered to paper and board mills in Europe is certified by independent forest management certification schemes.
- **69,5%** of total paper, tissue and board production capacity is chain of custody certified.
- **25,6%** of total paper, tissue and board is sold with a chain of custody certificate enabling further labelling.

## Biodiversity

The Convention on Biological Diversity (which was opened for signature at the Rio Earth Summit) was inspired by the world community's growing commitment to sustainable development. It represents a dramatic step in the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources.

The recently published '2050 Roadmap to a Low-Carbon Bio-Economy' has presented CEPI's vision that by mid-century European forests will offer an attractive investment for ecosystem services and related products: forestry, biodiversity, wetlands and eco-tourism.

"The launch of the Best Practice Guide 'Sharing Experiences: Promoting Biodiversity in the European Pulp and Paper Industry' in 2009 was a great success. Following its publication, CEPI was selected to be a partner for the UN International Year of Biodiversity in 2010 as well as in the European Union Business & Biodiversity platform [www.forestbiodiversity.org](http://www.forestbiodiversity.org)."

Source: CEPI 'Sustain'.

## Plantations

Softwood fibres in most paper grades have decreased over the last 20 years with a corresponding increase of short hardwood fibres. The star tree species in this development is the eucalyptus, indigenous to Australia. The eucalyptus has high growth rates and is adaptable to different climate conditions. In Brazil it was initially used to produce charcoal for pig iron production, while the South African forest industry partly depends on eucalyptus plantations, which are also found in Western Africa, the Mediterranean, and North America.

Compared with fibre sources from natural or semi-natural forests plantation fibre pulp usually has a cost advantage due to very short rotation periods, clear-cut harvesting, and better logistics.

## Case Study

### Biodiversity In Good Company:

In 2008, Germany hosted the Convention on Biological Diversity. The Federal Ministry for Environment launched the initiative Biodiversity in Good Company to engage pioneering private companies to achieve the objectives of the Convention on Biological Biodiversity.

At the launch of the United Nations International Year of Biodiversity in 2010, UPM's global biodiversity programme was showcased; the programme aims to maintain and increase biodiversity in company forests and to integrate best practices in sustainable forestry. The programme focuses on six key elements for biodiversity: native tree species, deadwood, valuable habitats, forest structure, water, and natural forests and is implemented through country level targets and action plans.



Photo UPM.

## VIRGIN AND RECYCLED FIBRES ARE COMPLIMENTARY



### New Generation Plantations Project

A project coordinated by WWF in partnership with some leading forest industry companies and national forestry organisations. The New Generation Plantations Project provides a better understanding of the role that plantations can play in future societies, as key features of healthy, diverse and multi-functional forest landscapes compatible with biodiversity conservation and human needs. New Generation Plantations are those forest plantations that maintain ecosystem integrity, protect high conservation values and are developed through effective stakeholder participation processes, while contributing to economic growth and employment.



The CEPI Sustainability Report 2011  
[www.cepi.org](http://www.cepi.org)

However, clear-cut puts a very high stress on the soil and this needs to be addressed by forest managers. This can be done in a proven sustainable way. In Brazil the average yield per ha of eucalyptus plantations increased from 26 m<sup>2</sup> per ha/year in the early 90s to 41 m<sup>2</sup> per ha/year — a success story also owed to silvicultural developments. (Source: Bracelpa, CIRAD Press Release 16.12.2011.) Top performing stands reach up to 68 m<sup>2</sup> per ha/year, so the experts agree that there is still potential. In comparison, the average growth rate in central Europe is 8 m<sup>2</sup> per ha/year and less than 2 m<sup>2</sup> per ha/year in Northern Scandinavia. High yield timber plantations are also seen as a sustainable answer to the growing need for forest products, including biofuel. FSC and PEFC standards have laid down the conditions for the sustainable management of plantations.

### Biomass

The European paper industry contributes more than a fifth of Europe's biomass-based energy production, most of which is used to cover the sector's own energy needs while contributing to the success of EU climate and energy policies.

Biomass used for primary energy in the European pulp and paper industry reached 54% in 2010. This is the result of long-term investment in Combined Heat and Power (CHP) recovery boilers, biomass boilers, heat recovery projects and other energy efficiency projects.

The industry is developing methods to maximise the value realised from commercially managed forests: optimising use of the whole tree by producing products and services that enable industrial symbiosis (solid wood products, pulp, paper, biomass energy) to be complemented by bio-fuels, fibre plastic composites, and biochemicals.

### Recycling

The recycling rate in the EU rose from 47% in 1995 to 72% in 2009, the highest rate ever achieved anywhere in the world, and 90% of newspapers and corrugated boxes are made from recycled fibre. Overall, 54% of the fibres now used in new paper and board products are sourced from the 'urban forest' of used paper-products.

Demand for recycled fibres exceeds supply. Wastepaper collection systems and recycled fibre processing paper mills are looking at possibilities to maintain the quality of the collected wastepaper and to optimise recycled fibre use in those paper grades where they are easiest and most efficient to use. Machine and equipment manufacturers are working on further improving the fibre recovery technologies that will facilitate this process.

**"Primary and secondary fibres should not be seen as opposites, but ideally as complementing each other. If the recycling frequency of the fibres can then be increased by further technology development then we are on the right track."**

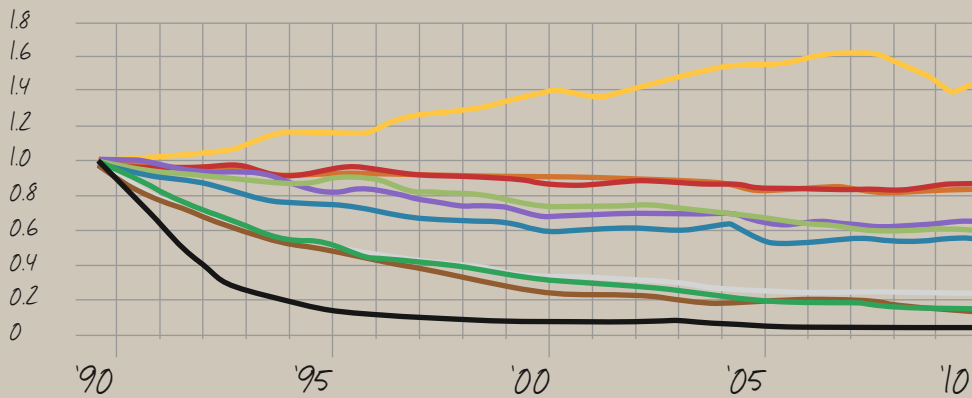
**Dr. Hans-Peter Sollinger, Voith Paper, 2011**



### Sources:

- "Towards a Sustainable Paper Cycle" IIED/WBCSD, 1996
- "State of Europe's Forests 2011, Status & Trends in Sustainable Forest Management in Europe", UNECE. / Bracelpa, CIRAD Press Release 16.12.2011)
- 'Sustainability Report 2011', CEPI
- 'Unfold The Future, The Forest Fibre Industry: 2050 Roadmap to a low-carbon bio-economy' CEPI
- [www.business-and-biodiversity.de](http://www.business-and-biodiversity.de)

## Reduction of specific emissions



Production of Market Pulp and Paper  
 Electricity consumption  
 Total Primary Energy Consumption  
 NO<sub>x</sub> \*\*  
 CO<sub>2</sub> \*\*  
 Water Intake \*\*  
 COD \*\*  
 SO<sub>2</sub> \*\*  
 BOD \*\*  
 AOX \*\*

The graph shows a reduction in the paper industry's total environmental impact since 1990. Source: CEPI Sustainability Report 2011.

Chlorine-free pulping processes were developed in the early 1990s and quickly adopted in Europe (initially peroxide bleaching and later chlorine dioxide). Only a few pulp mills still use a polluting bleaching process outside of chlorine-free Europe.

The specific AOX (adsorbable organic halides) levels are only a fraction of what they used to be. Today's chlorine dioxide processes use very low levels of AOX to allow biological treatment of mill wastewater.

The production of pulp and paper remains an energy intensive process. However, specific energy use and all other emissions show a continuous downwards trend and further improvements are certainly feasible.

Photo UPM.



Photo Sappi.



Photo UPM.



Sappi is the world's leading producer of coated fine paper. Its papers are produced in mills accredited with ISO 9001, 14001, OHSAS 18001 and EMAS certification. Sappi was the first paper company in Europe to hold group chain-of-custody certification for its entire European operations under both FSC and PEFC schemes. [www.sappi.com](http://www.sappi.com)

UPM – The Biofore Company – leads the integration of bio and forest industries into a sustainable and innovative future. The Group is a leading producer of printing and publication papers, pulp, timber, engineered wood materials and low carbon energy. UPM strives to manage its part in the life cycle and challenges everybody in the production chain to reduce the environmental impact over the entire product life cycle. [www.upm.com](http://www.upm.com)



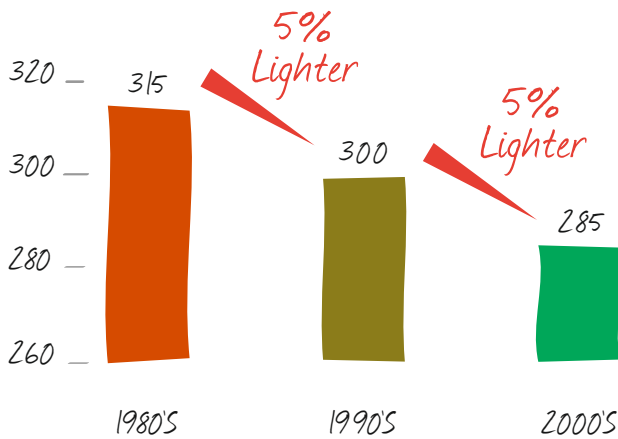
# PACKAGING TO IMPROVE PRODUCT SUSTAINABILITY

FRESH FOREST FIBRES ALLOW LIGHTER AND STRONGER BOARDS



Packaging board contributes positively to product sustainability if it is designed holistically to optimise its environmental performance. This requires it to be made from responsibly sourced materials using clean production technologies; to meet market criteria for performance and cost; to have efficient recovery after use; and to maximise renewable energy to source, manufacture, transport and recycle the product.

Fresh forest fibres from certified forests produce lightweight boards and cartons with superior appearance, safety, and performance. Lighter weight boards with the same strength improve processing speeds, reduce transportation energy and emissions, and have less to dispose of at the end of the life cycle. An example of carbon footprint reduction is that a 25 gsm lighter board on 100 000 cartons is the equivalent of not driving 1000 km by car (17 kgCO<sub>2</sub>/100 km) when using Metsä Board's lightweight boards.



Fresh forest fibres allow lighter and stronger boards. This example is a reduction from 315 to 285 gsm while retaining the same properties. Source Metsä Board.

Metsä Board Corporation is Europe's leading fresh forest fibre folding boxboard and white-top liner producer and a major paper supplier. Lightweight and ecological boards based on fresh forest fibres is its core strength.

	Duplex board 250 gsm	Kemiart Lite + 200 gsm
Flexoplate washing intervals	5	2
Total washing time/hour	0,96	0,38
Waste sheets per 1000 copies	6,3	1,4
Net printing speed	1677	2975

This case study shows that lighter material provides higher productivity when run under the same conditions. Source Metsä Board.



# CORE SUSTAINABILITY

The paper core is an integral part of the printing supply chain. Its manufacture needs to take a Lean and sustainable approach for the full life cycle, from sourcing raw materials to product design and waste management. This is demonstrated by Sonoco Alcore's 7-step production process.

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**1. Raw materials:** Sonoco Alcore is an integrated manufacturer producing over 350 000 tonnes/year of its own coreboard from five paper mills in Europe. Its cores use 100% recycled fibre from Old Corrugated Containers (OCC) that are bound together with adhesive. The quality of this material directly influences the properties of the core produced. OCC is preferably sourced directly from local markets with a structure to ensure the desired quality. Scrap waste from coreboard manufacturing is sent back to the paper mills to re-enter the production process.

The transformation of OCC into coreboard uses water to remove plastics and metal impurities. These impurities can be used to fuel biomass power plants, while wastewater goes directly to local treatment plants. The adhesives that join the coreboard together come from natural or biological sources that are 100% biodegradable.

**2. Design:** Different board grades are used depending on the type and quality of the core. Optimum design ensures that the right coreboard grade and dimensions are selected to deliver the specified user requirements while minimising raw material waste and energy during production. Rigorous testing ensures that a core meets the specific requirements for each paper mill's production process. The result is a core that runs more efficiently on the winder to decrease waste and optimise paper production. Minimising vibrations allows higher winding speed with reduced energy use; and during unwinding permits higher speed and minimal web fluttering.

**3. Winding:** The spiral winder is the primary manufacturing equipment used and is designed to produce cores consistent to a certain specification.

**4. Drying:** The core is dried after winding to solidify the glue and remove moisture. Heat from a biomass plant can heat the thermal oil used as part of the drying process, and can also provide hot water supply and space heating at the Grunsfeld site.

**5. Energy:** During 2011, significant investments were made to improve the energy efficiency of the uncoated recycled paperboard mills in Cirie, Italy and Kilkis, Greece.

**6. Packaging:** Standardised packaging initiatives improve the delivered quality of cores, as well as reducing material consumption and waste. Plastic and wood is either reused or recycled.

**7. Recycling:** Sonoco began recycling in the 1920s and today is a world leader. Sonoco Recycling collects over 3,5 million tons of paper, plastic, metal and other materials from more than 125 communities with more than 40 recycling facilities globally. In Europe, the company offers waste management services for used cores and scrap rolls collection, along with consulting to help customers develop programmes to reach their environmental goals.

## New core designs decrease downtime and reduce waste.

The M-Core™ series provides ultra-high speeds and roll widths for web printing, with a low residual paper diameter and fewer paper bursts and web breaks. Low vibrations on the winder and on the unwind stand reduce paper mill downtime, leading to more efficient paper production with lower waste. The M-Core™ HT is engineered to reduce centre bursts and elongation during winding and unwinding. This ensures that paper makers and printers have improved roll structure and runability from the core to reduce their waste and downtime.

Intellicore™ has a Radio Frequency Identification (RFID) tag inside each core to continuously track the paper roll from production in the mill to printing, improving efficiency through minimising buffer stocks and working capital and decreasing waste.

The Adaptor core allows double drum winders to continuously wind cores with different inside diameters, reducing costs and increasing the printing speed safety margin. The Adaptor core can be inserted into a 150 mm core before or after winding.

## CORES THAT DECREASE DOWNTIME AND REDUCE WASTE



The M-Core™ HT is engineered to reduce centre bursts and elongation during winding and unwinding.  
Photo Sonoco Alcore.

Recycled Old Corrugated Containers is the primary material for manufacturing coreboard.  
Photo Sonoco Alcore.

**Sonoco Alcore® is Europe's leading producer of industrial packaging products and services and a wholly owned subsidiary of Sonoco (NYSE: SON), one of the largest diversified global packaging companies.**

# FOILS ADD PROCESS VALUE

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Hot and cold stamping foils require little energy and produce no emissions during processing. The hot stamping process involves the transfer of ultra-thin lacquer layers from a PET carrier that is not incorporated into the stamped product. The applied decorative layers are only about one twentieth of the diameter of a human hair.

## FOIL DECORATED PRODUCTS ARE STRAIGHTFORWARD TO RECYCLE



Foil decorated products are straightforward to recycle, or dispose of. This was confirmed by the PIRA report 'Repulpability Of Foil-Decorated Paper'. The most environmentally efficient action is to incinerate the residual PET foil to recover its energy to directly reduce consumption of natural gas or heating oil (approx. 30 MJ/kg).

As the world's largest producer of hot and cold stamping foils, LEONHARD KURZ, invests substantial effort to ensure the environmental compatibility of its processes during all stages of manufacture, processing and disposal, including all its worldwide locations that are all ISO 14001 compliant.

The company only uses REACH compliant raw materials and substances in the manufacture of its foils. No product contains more than 0,1% by weight of any SVHC (Substance of Very High Concern) on the current candidate list. Neither are any poisonous or cancer inducing substances processed; nor any chlorinated hydrocarbons; nor raw materials containing cadmium, lead, mercury or chromium.

No wastewater is produced in the manufacture of the stamping foils. Unavoidable manufacturing waste is pre-treated and either cycled back into the production process or otherwise recycled.

The level of emissions from the combustion of solvents in regenerative oxidation systems is over 50% lower than prescribed statutory values. These regenerative systems recover energy from the solvents in the lacquer and achieve a thermal efficiency of up to 95%, which almost fully covers the energy needed for the heat drying tunnels. The voluntary implementation of energy recovery systems in all manufacturing plants represents another important environmental investment.

Current technology coating machines are more efficient in their energy consumption than older machines because their class IE2 drives save around 15 000 kWh of electricity per year. The new machines are 35% faster, with lacquer formulations optimised for these higher speeds while maintaining a consistently high quality.

Specially developed automatic measuring equipment provides inline quality assessment to achieve a consistent quality and minimise marking. Precise process control prevents excessive foil loss during start up, and the inking systems virtually eliminate spoilage to avoid residual lacquer at the end of production.

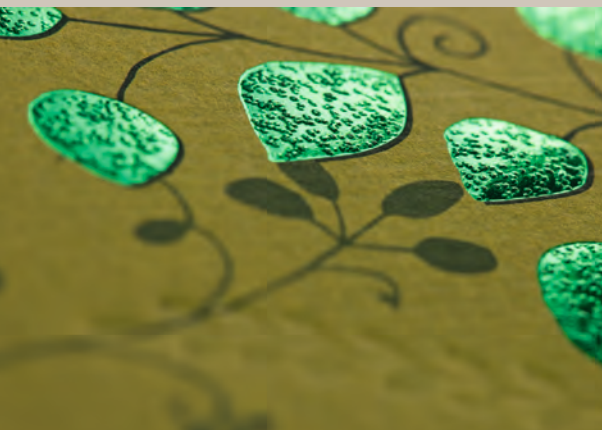


Photo Kurz.

**KURZ, as the world's largest producer of hot and cold stamping foils, is a partner dedicated to the foil application process and its own foil manufacturing. KURZ's hot stamping and cold foiling technologies offer a globally unique combination of environmentally relevant manufacturing and application advantages.**

# INKS & CHEMICALS

Printing inks are continuously evolving to follow press productivity improvements and increasing regulatory requirements, while reducing their environmental footprint. The industry has generally anticipated regulation to avoid any disruption to the supply chain.



- The 1999 European solvent directive increased emission control of VOCs (Volatile Organic Compounds), leading to improved solvent recovery or oxidation, along with some shift to non-solvent based inks in packaging. Dampening systems of both sheetfed and heatset offset now run with no, or low, isopropyl alcohol. IPA is a VOC that contributes to the greenhouse effect, can be a health issue, and has strict storage, handling and use requirements. New SunClean and SunWash cleaner and wash technologies are VOC free while retaining good cleaning performance for a wide range of ink types.
- Regulations of inks used on food packaging has become much more complex in the last five years. Safer inks for primary food packaging include low migration inks that are free of low molecular weight organic species to dramatically improve food packaging safety.
- There is also a higher bio-derived content for some conventional sheetfed inks. Completely mineral oil-free sheetfed inks are now available to improve packaging safety while sourcing sustainable raw materials. In 2009 Napim (National Association of Printing Inks Manufacturers) launched the US BioRenewable Content (BRC) to identify bio-renewable resources in individual inks. Sun Chemical is the market leader in the delivery of high bio-renewable content of conventional sheetfed inks between 40-77%, 39% for coldset, 28% heatset, 30-40% for publication gravure, while packaging liquid inks range from 5-20%.
- The Sun Chemical Dispenser Program being piloted in Canada has reduced spot colour ink inventories at packaging printers by about 20%, the costs of blended inks by 35-46%, and almost eliminates the risk of using the wrong spot colour.
- Future inks development will focus on performance improvements and product stewardship will continue to be important, especially in packaging.

## THERE IS A HIGHER BIO-DERIVED CONTENT FOR MOST INKS



The European Printing Inks Association (Eupia) is dedicated to informing the industry on best-use practices for health and safety regulations and the application of regulations for food, pharmaceutical, and toy packaging. The first guidelines to safely handle energy-curing inks and coatings were released in 1990 and have been regularly updated. In addition, there are recommendations on recycling, flammable liquids, cellulose nitrate printing inks, composting and renewable raw materials, and exclusion of dangerous raw materials. Eupia is working with other related international associations to achieve broader sustainability by combining environmental, social and economical criteria.

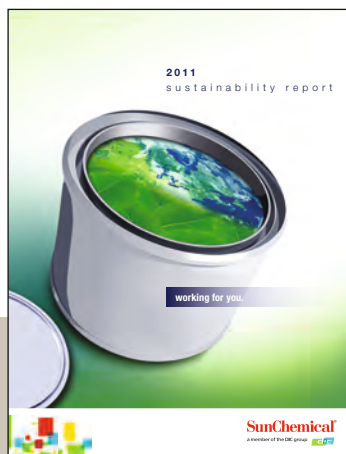
Electricity / Thermal Energy	-53%	➔
Equivalent Carbon Dioxide (CO2)	-30%	➔
Waste	-8%	➔
Water*	+25%	➔
Occupational Accidents	-29%	➔
Sales	0%	➔

Sun Chemical sustainability performance from 2005 to 2010 on data collected from approximately 170 Sun Chemical sites in over 25 countries.

\*Water increased due to incorrect calculation 2009 to 2010, actual water consumption declined slightly.

Source Sun Chemical.

The Sun Chemical Sustainability Report highlights eco-efficient products, services and projects.  
www.sunchemical.com



Sun Chemical is the world's foremost producer of inks, pigments and colour technology. The company is leading the industry in developing products to minimise the impact on the environment and maximise use of renewable resources.

# HIGH IMPACT PREPRESS TECHNOLOGIES

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New prepress technologies have radically improved prepress performance over the last 20 years to make it faster and more productive, with higher quality and lower environmental impact.

CTP RAPIDLY  
ELIMINATED  
FILM TO MAKE  
THE PROCESS  
SIMPLER,  
FASTER AND  
GREENER



Wind turbines at the Tilburg factory provides 20% of the site's electricity needs. Photo Fujifilm.

## 1992 — Analogue, film, chemistry-intensive

The offset prepress steps in 1992 were: phototypesetting > repro camera > scanner to film negative > film positive > plate making. Each step required cumbersome process control.

The high level of contact working required 3 m<sup>2</sup> of film for each 1 m<sup>2</sup> offset plate. Huge volumes of chemistry and water were used for film and photo paper developing (around 400 ml developer + 400 ml fixer per 1 m<sup>2</sup> film). Photo paper and repro film contain about 3 g silver/m<sup>2</sup> and developed film about 1 g. The high volume of silver in those liquids and films required special recycling.

Film processors were generally cleaned weekly, which was time consuming and created contaminated water. Many of the plate developers contained VOCs. The silicates used in them created sludge and crystallisation which led to short bath life, heavy cleaning and contaminated wastewater.

Printing companies required large archives to store films; and had to recycle large amounts of polyester waste from repro film and foils. Workflows were mainly manual and repetitive, consuming time and energy. Proofing using flat-bed presses that were slow and expensive.

The technology revolution began with Desk Top Publishing that made the complete production flow shorter; digital files were sent by ISDN for remote soft proofing; and new filmsetters directly output the final film. The next key step was the introduction of CTP (computer to plate) that rapidly eliminated film to make the process simpler, faster and greener. Accurate CTP plates also made press makeready faster with less waste.

## 2012 — Digital, film-free and low chemistry



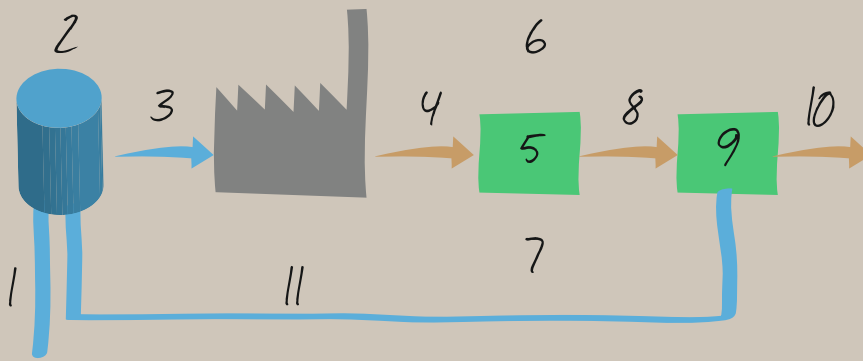
CTP is now the industry process standard and plate production has become fully automatic. JDF (job definition format) workflows control the complete production process from design to delivery and invoicing.

Faster platesetters minimise their total energy consumption and CO<sub>2</sub>e emissions. High output CTP reduces the number of lines from 3 to 2 for the same volume, and they require less energy per plate.

A single processor bath (like Fujifilm FLH-Z125) develops up to 8 000 m<sup>2</sup> plates (400% higher capacity than 1992), significantly reducing production and maintenance time and waste. Concentrated developer is diluted by the plate processor, lowering its transport weight and the number of containers needed. Water extraction systems can remove the water from the used developer and clean it to be reused for dilution and rinsing. Organic solvents have largely been phased out.

Plates developed on press (DoP) are increasingly being used to help eliminate the plate making chemistry process on the printers' side (like Fujifilm Brillia HD PRO-T).





## Waste water purification

Water purification of rinsing waste water begins with Membrane Bioreactor treatment. The micro organisms in the bioreactor reduce organic pollution, while adapted bacteria remove nitrogen components and convert them into harmless nitrogen gas. A membrane filter removes the residual sludge and the water is fed into the reverse osmosis unit to remove all salts and other dissolved materials. The purified waste water can now be re-used as process water so less groundwater needs be pumped to the surface.

- 1 Ground & Rain Water;
  - 2 Storage Tank;
  - 3 Process Water;
  - 4 Wastewater;
  - 5 MBR;
  - 6 N<sub>2</sub> Gas;
  - 7 Sludge;
  - 8 Organic Biofiltrate;
  - 9 Reverse Osmosis;
  - 10 Concentrate;
  - 11 Purified Wastewater.
- Source Fujifilm.

## Recycling

Fujifilm Japan collects used plates from its customers and, along with its factory waste, recycles the aluminium into new plates. This system conserves resources and ensures a very stable quality.

To make recycling easier for printers, standard paper has replaced plastic coated interleaf paper used to lubricate the knife during plate cutting. Modified packing designs reduce raw material usage. Most plate bundles are packed in completely recyclable PE- foil. Bulk shipping with up to 1 500 sheets (B1 size) on a packed pallet reduces printers' packaging waste and time.

## Sustainable manufacturing

Supplier manufacturing and logistics programmes are oriented to save resources and minimise waste. Some examples of Fujifilm's investment to improve performance include:

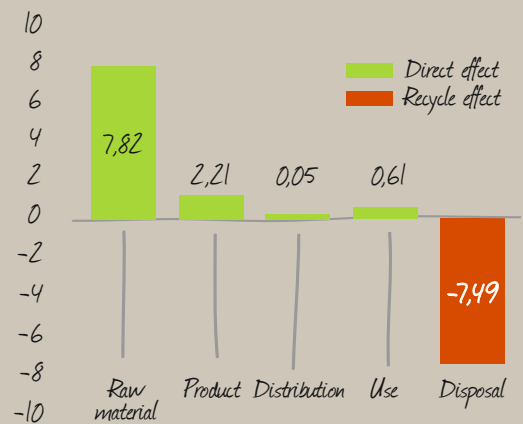
Local manufacturing of plates and chemistries that permits production of the same product with the same quality anywhere in the world to ensure short delivery routes that minimise transport energy and emissions.

Installing an afterburner for waste gases from a new plate production line. Steam from the co-generative thermal oxidizer is converted into electricity and hot water in a combined heat power plant and helps reduce CO<sub>2</sub> emissions by 5 500 tonnes per year.

Five wind turbines at the Fujifilm Tilburg factory provides 20% of the total electricity needs for the site. Their 10 MegaWatt capacity eliminates 12 000 tonnes of CO<sub>2</sub>/year.

The Fujifilm Sint-Niklaas plant producing photo and pressroom chemicals achieved zero waste emissions in 2000 by eliminating waste to landfill, or incineration without energy recovery. The plant's wastewater recycling system reduces city water use by 75% and well water by 66%. Sint-Niklaas has reduced its CO<sub>2</sub> emission per production volume by 20%.

The water purification technique adopted by Fujifilm is a combination of a Membrane Bioreactor (MBR) and reverse osmosis (RO). This treats waste water to allow its re-use as process water to reduce the volume of groundwater consumed.



This prepress carbon footprint example is of Japanese CTP plates. The highest CO<sub>2</sub> source is aluminium as a raw material because of its energy intensive manufacturing. However, the plate's CO<sub>2</sub> load is largely offset if the waste aluminium from the plate is recycled to produce 100% of the raw aluminium for a new plate. Source Fujifilm.

## 2020 — What can be expected in the future?

Continuing evolution. The universal availability of plate systems without processing chemistry — after exposure they are ready for printing without any other step. The elimination of washing/processing will enormously reduce chemistry.

Fujifilm is a leading manufacturer for the graphic arts industry, producing plates, pressroom chemistries, pigments, dyes and printing ink as well as workflow software solutions and inkjet printing equipment. A pro active green policy is an important pillar for Fujifilm to address the complete environmental aspects of its products while simultaneously making them leaner.

# SHEETFED PRINTING PRODUCTIVITY

Over the past 20 years sheetfed printing speeds have increased by around 50% to 18 000 sph and makeready waste has reduced from 500 sheets to around 50. Widespread process automation, perfecting presses and/or larger formats have further improved economic and environmental performance.

COOLING OF SUB-SYSTEMS PROVIDES MORE STABLE PRODUCTION AND FACILITATES WASTE HEAT RECOVERY

### Paper waste

Minimal makeready waste comes from rapid changeover systems with ink presetting, storage of air settings, improved sheet handling, and automated start of paper run at full speed. Rapid colour measurement and control avoids waste from out-of-tolerance printing.

### Process stability and efficiency

Ink unit and dampening system temperature controls provide higher process stability, reducing paper waste and facilitating alcohol reduction. Combined performance controlled components reduce energy consumption of cooling systems and pumps. Blowers with an optimised demand control system increase efficiency for suction air and blast to provide only the amount of air needed for the specific task.

### Energy & heat recovery

Sheetfed press mechanical drives use brushless variable speed DC motors to improve energy efficiency. Some presses now use direct drives to increase flexibility. Ink drying and curing systems are a major energy user and target for efficiency — see next page.

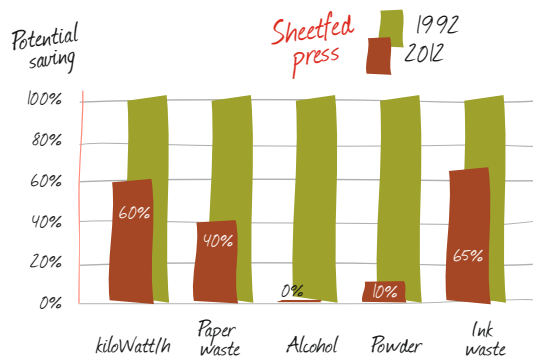
Cooling of combined sub-systems (ink, dampening, air supply, dryer, motors) provides more stable production conditions and facilitates waste heat management and recovery. Water-cooled units use significantly lower energy than air cooling because permanent air exchange, fans, air humidifiers, or heating 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 complementary water evaporation spray system can be used. In other cases, heat can be recovered for space and hot water heating. Low revolution screw type compressors generate higher specific power, and up to 94% of compressor heat can be recovered.

### Reducing emissions

Spray powder systems can minimise volumes used by increasing the number of spray nozzles both for a more homogeneous application and for targeted powdering, along with less airflow dispersal. Effective extraction can reduce powder exposure in ambient air and inside the press by up to 90%. Other emissions of heat, water, noise, ink mist and UV ozone can be reduced by using suitable consumables and technologies.

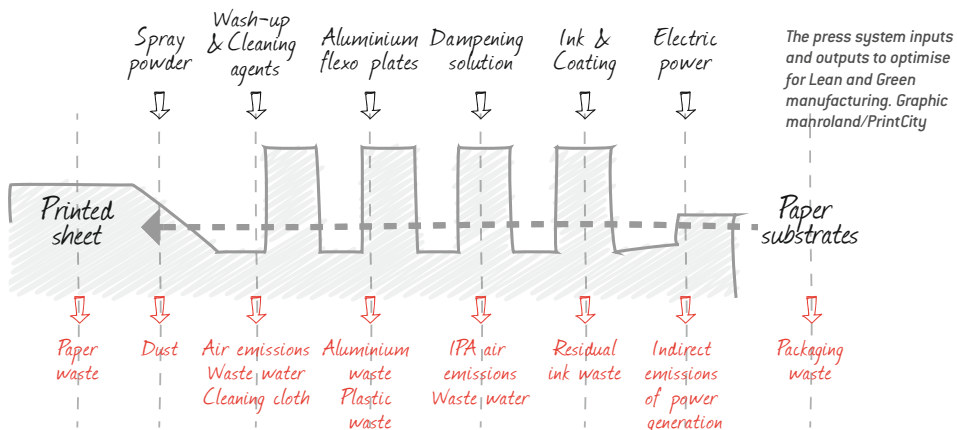
Dampening systems can now run with no, or low, isopropyl alcohol — this VOC contributes to the greenhouse effect, can be a health issue, and has strict usage requirements. Dampening filtration can reduce the frequency of changing the solution by up to 90% reducing waste water and chemical use. Waterless printing can entirely eliminate dampening solution along with its associated emissions and waste.

Central ink supply with cartridges can reduce ink waste by up to 65%, and requires less cleaning. Special ink fountain surface coating eliminates foils and reduces cleaning agent use by 30%.



Improved technologies over the past 20 years have delivered significant economic and environmental savings. Graphic manroland/PrintCity

manroland Sheetfed is a member of Langley Holdings PLC, a globally operating, multi-disciplined engineering group, specialising in capital equipment technologies. manroland Sheetfed is based in Offenbach, Germany. The technologies described here are available under the ROLAND Select, QuickChange, QuickStart, and ColorPilot options.



# ENERGY EFFICIENT SHEETFED DRYING

Electrical power used in drying technologies for dispersion coatings, UV inks and coatings can equal that needed to run the printing press. Therefore, developing energy efficient drying systems is a high priority.

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## Infrared and hot air drying (IR/HA)

Water based dispersion coatings are widely used in packaging and commercial printing because they provide good surface protection and enhancement, while allowing rapid post-press processing. Combined infrared and hot air drying (IR/HA) heats the coating to evaporate the water from it.

Heat recovery systems recycle hot exhaust air back to the dryer where it is mixed with fresh ambient air. This minimises the temperature difference between the input air and the required drying temperature. Up to 30% of heating energy can be recovered to provide a rapid return on investment. Insulated air ducts will reduce energy loss during distribution. However, hot air should ideally be generated close to the point of use and since 2002 it is possible to put heating elements inside the air nozzle. Further improvements are probable.

Pure IR dryers for conventional inks are now rarely used because of innovations in ink formulation.

## UV curing

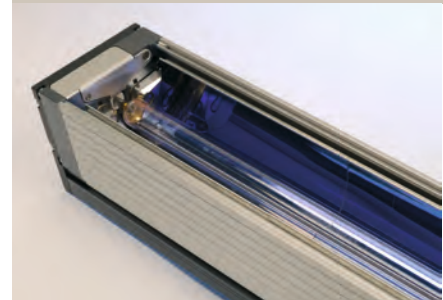
The correct UV dose is crucial to completely cure inks and coatings. Faster printing speeds mean that the required UV dose to the ink layer is delivered in a shorter time.

UV mercury medium pressure arc lamps were introduced in 1930 and continue to be the principle curing technique. Only around 30% of their electrical energy is converted into UV radiation, 10% is visible light and the remaining 60% needs to be extracted as heat. **The efficient conversion of electrical energy into UV radiation is essential and major improvements during the past 20 years include:**

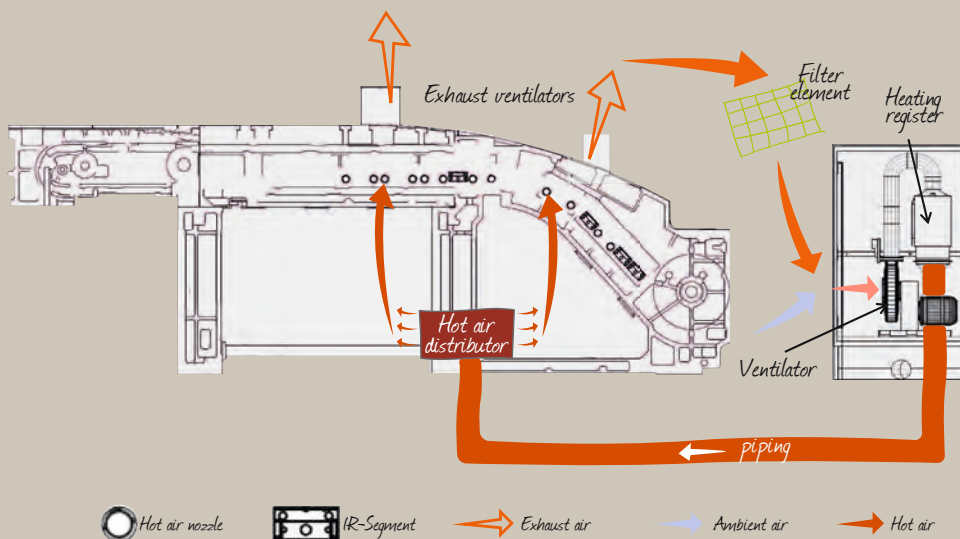
- Water cooled UV modules with effective heat recovery systems.
- Dichroic reflectors to improve UV radiation reflection and absorption of IR radiation.
- Adaptation of UV spectrums to improve curing of specific inks, such as opaque white.
- Optimisation of reflector geometries to improve UV dose yield.
- Electronic power supplies reduce energy use by 10% compared to traditional systems.

Light emitting diodes (LEDs) are a more recent alternative to generate UV radiation. Their widespread use will be linked to the availability of more affordable LEDs and compatible press consumables.

UP TO 30% OF HEATING ENERGY CAN BE RECOVERED



Energy minimised Light Guide UV module. Photo Eltosch.



Heat recovery principle in a modern sheetfed offset press. Source Eltosch.

Eltosch a member of Hönle Group, has been developing and manufacturing drying systems for the printing industry since 1967, initially for traditional inks and dispersion coatings then as a pioneer for UV curing for sheetfed offset. Eltosch is a global leader in this domain with over 10 000 installations worldwide.

# PROCESS COOLING & VENTILATION

26

## LOAD MANAGEMENT IS THE KEY INDICATOR FOR OPTIMISATION



Energy consumption profile open up saving potentials and a durable optimization of processes. Photo COFELY.

COFELY is the world's leading supplier of systems for the economical and ecological cooling and air-conditioning of presses and printing companies using primary and secondary energy in the most economic and efficient way possible. COFELY is part of GDF SUEZ Energy Services, which is the European leader for services in energy and environmental efficiency.

Increased press performance generally leads to increased energy use because higher speeds increase frictional losses exponentially, larger formats mean greater acceleration masses on the cylinders and ink rollers, while automation, coaters, and dryers also require extra energy. The heat released from equipment into the pressroom and the need for product quality also lead to the need for more air temperature and humidity control in the production facility.

This high energy consumption places strain on the costs of printing companies that will only get worse over the next 20 years, during which an increase of around 70% of the cost of energy is forecast. Therefore, the optimisation of energy costs is essential. This is only possible through targeted investment in solutions that reduce consumption and costs to deliver a significant ROI.

### Measure and analyse

The first step is to record and analyse the company's entire energy consumption profile. Load management is the key indicator for optimisation. Potential improvements come from two phases:

1. The initial analysis of the installed equipment and systems to provide recommendations for more efficient control, equipment or energy recovery that can deliver significant cost reductions.
2. Daily monitoring of energy and media streams to identify ongoing savings for continuous optimisation.

The new i.Cool energy efficiency solution has been adapted for the printing industry to offer a broad portfolio of solutions:

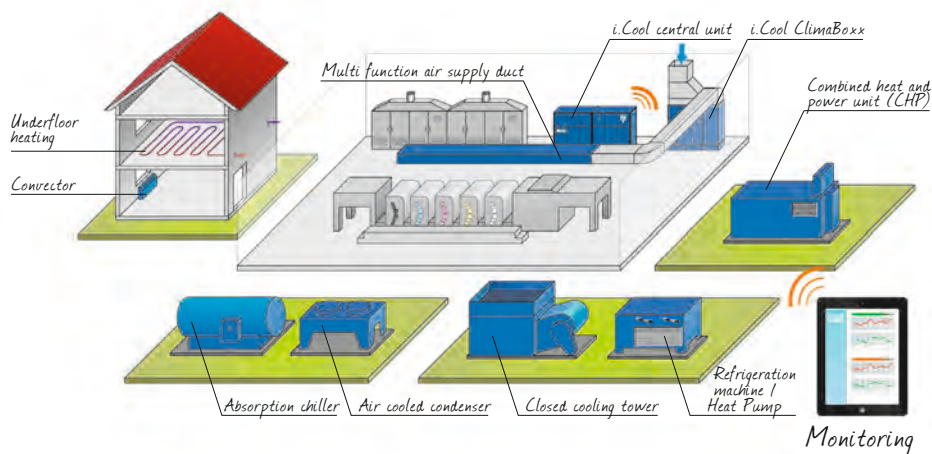
- Energy consultancy & Monitoring
- Energy recovery/Heat pumps/Absorption chillers/CHP

### Web offset

Web offset printing energy reduction was first introduced in 1981 by Cofely. The twin-chill concept (watercooled chiller and closed circuit cooling tower) reduced the running cost of watercooling systems by up to 70%. This system has been constantly improved and continues to be the best available technology. A new option for companies in climate zones where it is not possible to use cooling towers all year round (because of high wet bulb temperatures) is the i.Cool EcoTower that can reduce energy costs during long periods of the year. The system can also be retrofitted and generally offers an ROI of less than two years.

### Sheetfed and Digital

The i.Cool LeanAirCenter is designed for the high demands of sheetfed, packaging and digital printing. This modular ventilation concept offers minimal energy consumption for optimal climatic conditions for people, materials and machines. It features a draught-free air intake through a multi-function air supply duct and the air conditioning unit installed in a cabinet design makes large air-conditioning plants superfluous. Waste heat from the production process is used to warm up the cooler ambient air or, through a heat pump, to heat rooms.



The i.Cool energy efficiency solutions specifically adapted to the printing industry offer a broad solution portfolio. Source COFELY.



# DIGITAL DEVELOPMENTS

In 1992, the volume of digital printing was around 2%; it is now estimated to be about 20%. Part of the explanation of this growth is the inherent business and sustainability aspects of digital printing that minimise waste, not just during the printing process but right across the upstream value chain. Print on demand (PoD) and short run digital printing reduces unsold product returns, inventory, obsolescence, storage and transport costs.

## Books-on-demand

Digital printing provides a significant advantage over traditional printing because it allows publishers to produce short runs of books on demand for a moderate price, without the risk of unsold copies being stored in warehouses and eventually pulped. The reduction in unsold copies by PoD is an important contribution to reducing overall publishing waste. The Océ JetStream 1000 full-colour webfed digital inkjet production printer launched in early 2010 increased the ability of publishers to print short runs of books on demand.

## Green newspaper publishing

Leading the field in 'smart publishing', Océ established the Digital Newspaper Network (DNN) as a global network of high performing commercial printers providing short run digital production of newspaper at locations far from the publisher's home markets. Readers receive their newspapers on the day they are produced, rather than waiting for an airmail delivery, while the publisher avoids transport costs and emissions, and only prints the newspapers that are needed.

## Designed for low consumption

Some examples of Océ smarter design for reducing energy, waste and consumables include:

The Océ ColorStream 3500 with the lowest use of energy and ink in its class. This press features a unique drop-on-demand piezoelectric webfed inkjet printer that produces continuous good quality in the speed ramps up to production speed, and down to a full stop — for example for sample sheets or print quality inspection. This means that a press printing five million A4 pages/month, that stops on average once per paper roll, saves over 3.7 tonnes of paper over a seven-year lifetime.

Minimising warm-up times is a key sustainability factor. Radiant Fusing technology eliminates warm-up and the printer automatically goes into a low energy standby mode when not being used.

Océ has established its own set of technical standards stipulating maximum levels for energy consumption. These internal energy targets align with the latest ENERGY STAR® specifications. A 2009 study revealing that the CO<sub>2</sub> footprint for producing a remanufactured system is almost half that of a new one (because about 85% of the weight of the machine is reused) led Océ to introduce the Prémia Class of remanufactured products.

The DPDA (Digital Print Deinking Alliance) and INGEDE (Internationale Forschungsgemeinschaft Deinking-Technik) are investigating inkjet deinking to identify solutions for combined recovered paper streams containing conventional and digital printing.

## Outlook

Analogue and digital printing worlds co-exist and will co-evolve. Océ's philosophy is based on the most effective balance between what conventional and digital solutions can provide, and how both can be made more economical and ecologically sound. Digital variable printing provides the ideal method for personalised transaction and direct mail production; and PoD opens up new markets for print products that often do not exist for offset.

# PRINT ON DEMAND REDUCES RETURNS, INVENTORY, OBSOLESCENCE, STORAGE AND TRANSPORT



*The Océ ColorStream 3500 uses the least amount of energy and ink in its class. Photo Océ.*

**Océ is a member of the Canon Group of companies with headquarters in Tokyo, Japan. The group is global leader in digital printing. Océ enables its customers to manage their documents eco-efficiently and eco-effectively by offering innovative print and document management products and services for professional environments.**

# HIGH VOLUME WEB OFFSET PRINTING

Three trends make web offset printing massively more cost and environmentally efficient than 20 years ago: higher printing speed, larger format, and automation. The primary driver to use larger formats was the need to reduce total production costs.

The move to very large format offset presses began in the late 1990s with sheetfed offset, newspaper presses with 2211 mm web width, and High Volume Offset (HVO) heatset presses up to 1980 mm. In 2007, the first Ultra Wide Web Offset (UWWO) presses were delivered with 2060 mm wide web, followed by 2520 mm and 2860 mm 96-page presses in 2011.

AUTOMATION IS THE KEY TO HIGH PRODUCTIVITY WITH LOW WASTE



Webline Special Report N° 5 "Watch the Step to Wider Roll Widths" is a 36 page report on UltraWide Web Offset available from the industry's leading web offset suppliers — manroland, MEGTEC, Muller Martini, Procemex, Sun Chemical, Trelleborg, UPM, Böttcher, Fujifilm, Sonoco Alcore and Lüscher or order copies from [www.printcity.de/shop](http://www.printcity.de/shop) Source PrintCity Alliance.

manroland web systems GmbH is the world's largest web press manufacturer based in Augsburg, Germany. It is a division of L. Possehl & Co. mbH from Lübeck. The technologies described here are available under the autoprint, One-Touch, QuickStart, IROLOC, and Inline Control options.

## Automation

The key to high productivity with low waste is extensive automation. Critically, faster and wider presses require inline control systems to minimise changeover time and to maintain good colour in register. manroland's autoprint is a fully automated press One-Touch operating concept where the machine controls itself and the operator becomes the process supervisor.

The fully automated and standardised job changeover — including blanket washing, automatic plate changing and pre-inking — is carried out without any operator intervention. The patented QuickStart pre-inking operates automatically as the press accelerates to make sure that the right amount of ink is at the right place when impression goes on. Quicker saleable copy production means lower start-up waste.

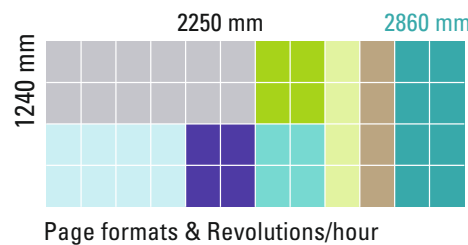
Inline control systems ensure constant print quality from the control of ink density, cut-off and colour register. InlineCutoff Control Dynamic plus ensures stable cut-off register during start-up, blanket washing and roll changing, ensuring product quality and minimising waste rates.

## Energy

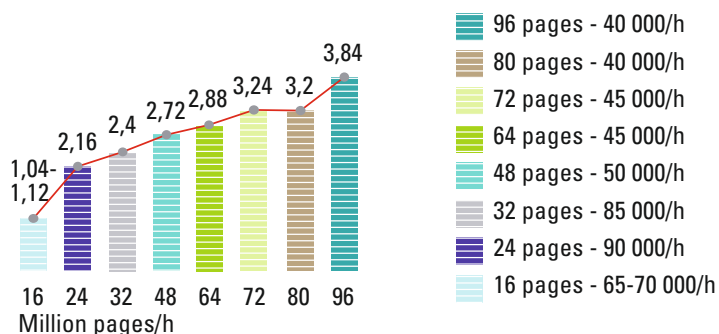
There is an almost linear relationship between the energy consumption per printed page and the press format size.

Direct motor drives in web offset provide 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 CO<sub>2</sub> emission.

The right selection of rubber rollers can decrease heat build-up, save energy and facilitate quality. A self-adjusting roller lock-up system automatically and dynamically adjusts the roller nips. Blankets can also play an important role in minimising energy in the printing unit, in some cases by up to 20% depending on its feeding and other characteristics. Heatset dryers have significantly reduced energy consumption by recycling energy from the oxidized process solvents — see next page.



## Long grain formats and production output



UWWO production output  
The comparative output of web offset formats in A4 pages per hour.  
Source manroland/PrintCity.

# HEATSET DRYING AND AIR POLLUTION CONTROL

Continuously rising energy prices and more stringent environmental requirements in combination with wider and faster webs require adapted technology for profitable operation of high volume offset heatset presses.

The system configuration (independent or integrated oxidizer) and oxidizing technology both have a significant impact on potential energy savings:

- Between 50 - 70% energy saving in the oxidizer achieved by replacing offline recuperative oxidizers with offline Regenerative Thermal Oxidation (RTO).
- Over 50% energy saving achieved by replacing independent recuperative oxidizers with integrated recuperative dryer-oxidizers. The integrated dryer-oxidizer is a closed-loop operation that recycles the energy contained in ink solvents during the drying process and transfers it to the oxidizer as energy for oxidation. The heat generated from oxidation is then transferred back to the dryer to reduce its gas consumption.

Other energy considerations when selecting dryer-oxidizers include the thermal efficiency and electrical consumption of the air bar system, use of frequency controlled process fans, exhaust reduction system, and low exhaust mass flow rate in stand-by.

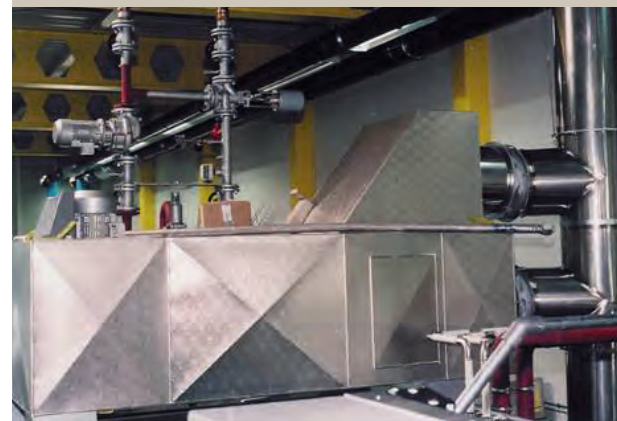
## Heat Exchanger

Most integrated recuperative dryer-oxidizers can be fitted with secondary heat exchangers to produce warm or hot water that integrate into existing central heating, absorption chilling or space heating systems to significantly reduce end user energy consumption.

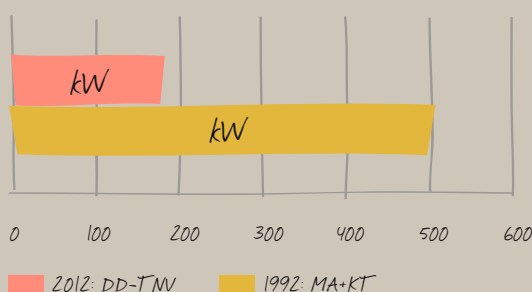
## Optimised drying

Optimised drying of paper reduces cost and improves quality because each paper has its own 'drying window'. Paper with a low internal strength reduces the window; high internal strength increases it. There are also temperature related quality risks to avoid, such as blistering and cracking if temperatures are too high or smearing if too low. Different types of paper have different drying requirements and the temperature zones in the dryer need to be adjusted accordingly. Another influence is optimised prepress to minimise ink laydown combined with densitometer or closed loop colour control to prevent over-inking.

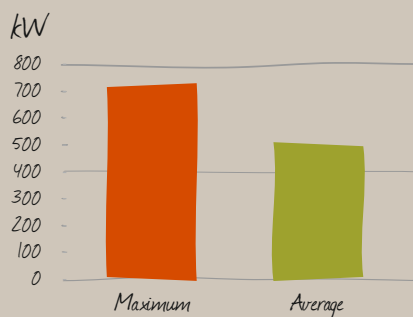
OVER 50% ENERGY SAVING WITH INTEGRATED RECUPERATIVE DRYER-OXIDIZERS



Dual-Dry TNV dryer-oxidizers can be equipped with Energy Recovery (ER) utilising an air/water-heat exchanger. These are compact and easy to install on new or existing press lines, have a low investment cost and a rapid ROI. Source MEGTEC.



Comparative energy consumption of dryer oxidizer combinations: 1992 independent dryer and recuperative oxidiser (MEGAIR+Katec) and in 2012 integrated dryer-oxidizer (Dual-Dry TNV). This represents around a 65% reduction in average energy consumption. The comparison is Dryer-oxidiser energy consumption for 100 000 16-page signatures 4/4 colour 1,5 gsm ink both sides on 60 gsm LWC for a 1992 Rotoman (40 000 cph and 630mm cut-off) and a 2012 Rotoman (60 000cph and 620mm cut-off). Source MEGTEC.



This chart shows the potential energy recoverable under the best maximum and average running conditions on a 72-page heatset press (1980 mm web width and 50 000 cph) with a Dual-Dry TNV dryer-oxidiser equipped with a 70/90 warm water heat exchanger. Source MEGTEC.

**MEGTEC Systems is the world's largest supplier of webline and environmental technologies for web offset printing (oxidisers, dryers and web handling systems) and also provides energy and efficiency consulting and machine upgrades.**

# DRIVING PRESS EFFICIENCY

The rising cost of electricity and concern for the environment drive the increasing popularity of energy efficient drive systems for industrial applications. In 2005, the EU Commission issued a framework directive (EuP) to ensure more efficient energy usage to reduce CO<sub>2</sub> emissions and counter the greenhouse gas effect.

ENERGY CAN ACCOUNT FOR UP TO 90% OF LIFE CYCLE OPERATIONAL EXPENSES

## Lifecycle costs

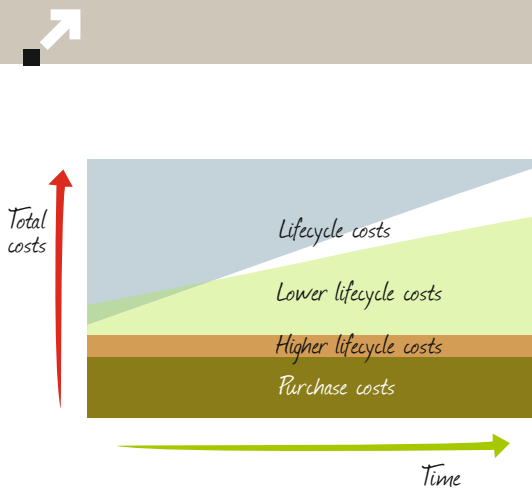
Energy costs can account for up to 90% of life cycle operational expenses and are the primary driver for electric drive development. The high energy efficiency of direct drives typically allows their higher cost to be recovered after just a few years and sometimes even months. Potential for energy efficiency and associated cost savings can only be fully exploited by adopting a system-wide approach. To ensure optimum energy usage, motors have to be precisely sized and operated at the ideal power/space ratio. This avoids the problem of excess energy usage and reduces the physical space required.

## Motors

Direct drives provide increased efficiency by eliminating the need for gears or belts for mechanical drive transmission purposes — this reduces the power loss from between 22 and 9% to about 4.5%. This means that a nominal 100 kW/h drive operating 6 000 hours a year requires 54 000 - 112 000 kW/h with a conventional drive concept but only 27 000 kW/h for direct drive concept. At 0.08 € / K kW/h this yields annual savings of 2 880 – 7 120 €. Synchronous motors combine high torques with low speeds. Water-cooled motors and frequency converters allow the waste heat dissipation to be reused for low temperature processes. The significantly reduced running noise often makes expensive noise suppression obsolete.

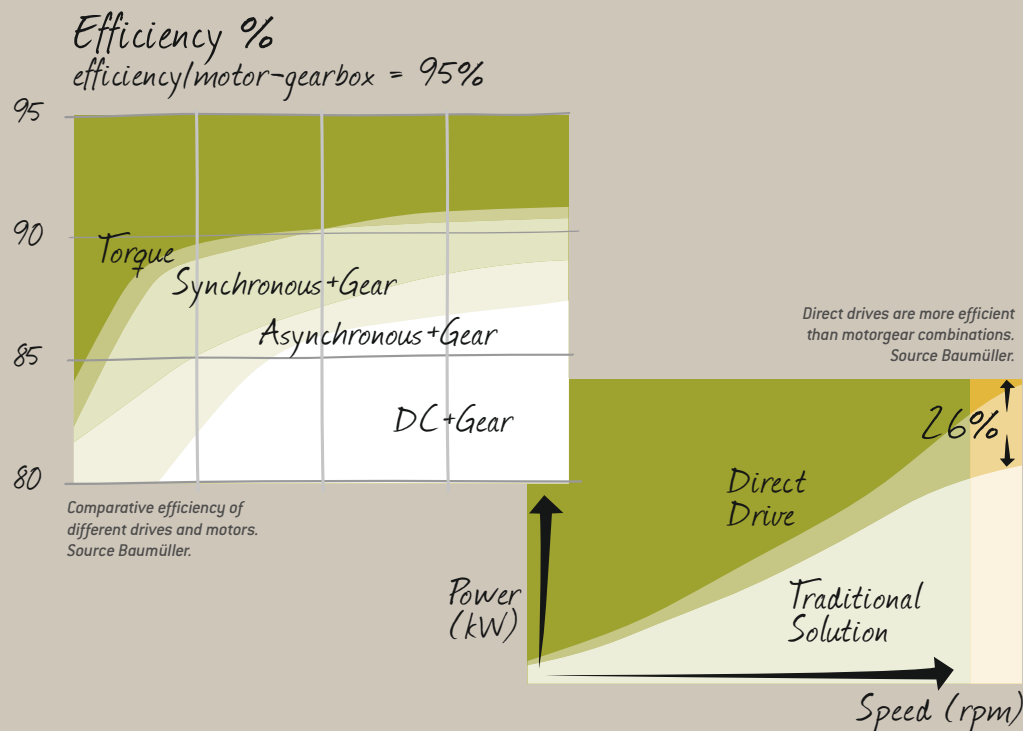
## Converters

Converters that feed energy back into the power system during the braking portion of the machine cycle have been available for over 20 years. The energy generated is recycled through a regenerative power system instead of being dumped as waste heat. A machine with approximately 50 kW/h regenerative and braking power operating 6 000 hours a year at 0.08 € / K kW/h provides annual savings of approximately 21 000 €.



Life cycle operational expenses and are the primary driver on electric drive development. Source Baumüller.

Baumüller is a leading automation partner to the printing industry, from sheet feed to job and label printing through to newspaper printing. The company supplies innovative and complete drive systems to printing press manufacturers all over the world, providing a single source for all automation needs that will meet and exceed the needs of the printing press throughout its entire life cycle.

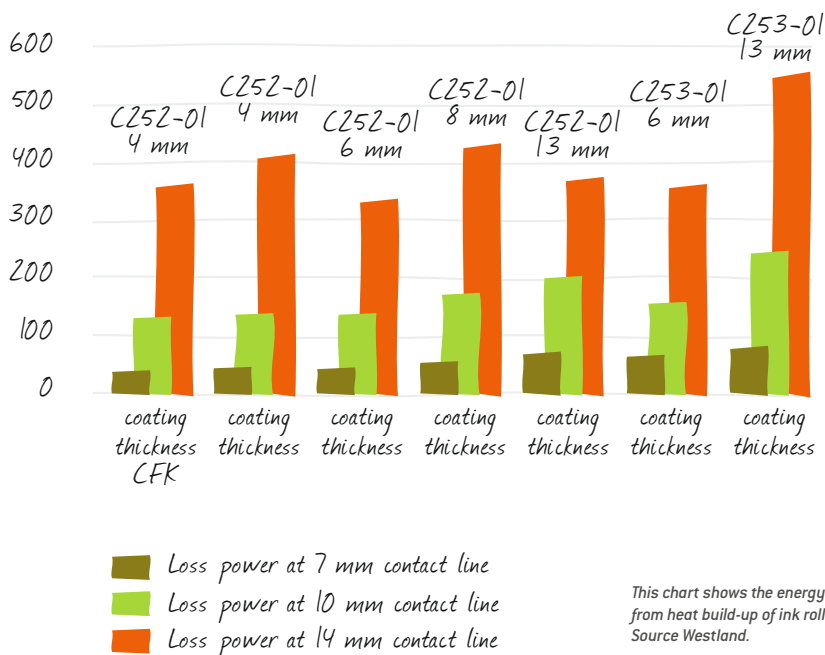


# PRINTING ROLLERS

The heat build-up from rubber rollers depends on the specific loss factor of the rubber material, the deformation speed, number of nips per revolution, adjustment of the roller nips and the thickness of the rubber layer. Heat build-up of a roller is limited by decreasing the loss factor in dependence of the increasing temperature and heat transfer to the press environment. There are also temperature related quality risks to avoid such as blistering and cracking if temperatures are too high or smearing if too low.

### 'Intelligent' transfer and forme rollers

A self-adjusting roller lock-up system automatically and dynamically adjusts the roller nips, significantly saving energy. The system also ensures high and consistent print quality, reduces roller maintenance cost by 65%, and extends the lifetime of rollers by up to 20%.



This chart shows the energy loss from heat build-up of ink rollers. Source Westland.

## TEMPERATURE AND HEAT TRANSFER TO THE PRESS ENVIRONMENT

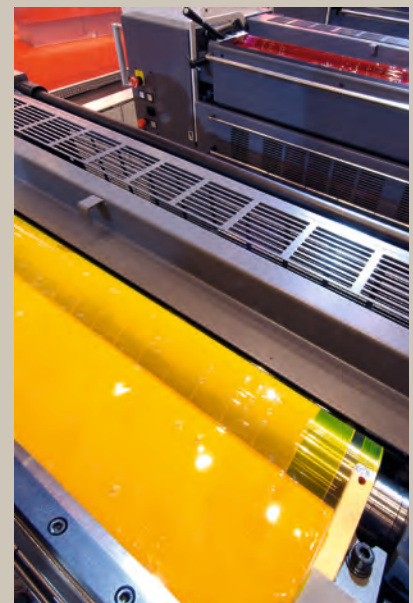


Photo Sun Chemical.

Westland Gummiwerke is a worldwide leading supplier of elastomer covered rollers and complete rollers for the graphic industry. Established in 1920, the company's rollers are standard equipment in many new printing presses and its customers include numerous printing companies all over the world. The basis of Westland's economic success is its coordinated manufacturing processes and intelligent logistics.



# RECYCLING COMPLETES THE PRO- CESS CHAIN

Recycling close the loop of a printing product's life cycle and is a key to sustainability, reduction of greenhouse gases and energy use. Recycling should be used where it gives lower environmental impacts than alternative recovery options while ensuring safety and product performance.

Some types of recovered material are also a valuable source of energy (incineration with energy recovery) at the end of their useful life as a material. Landfill of untreated organic waste is being reduced in all developed countries and recycling is a key meet the EC Landfill Directive goal to recover 65% of all biodegradable materials by 2016.



54% OF FIBRES  
IN NEW PAPER  
COMES FROM  
'URBAN FORESTS'



## Paper

Paper is the recycling leader in Europe. Its recovery rate has increased from 47% in 1995 to 72% in 2009. Overall, 54% of the fibres used in new paper and board products are sourced from the 'urban forest' of used paper products (the recycling rate is the ratio between the recycling and consumption of paper).

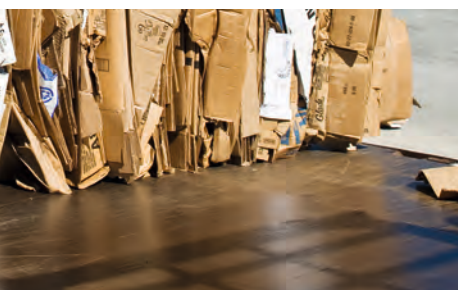
Pulping of recovered paper uses about 80% less electrical energy in recycling than virgin mechanical pulp (0.4 MWEh/tonne v. 2-2.5 MWEh/tonne) but requires more steam generated from fossil fuel. Recycled fibre has an important role to play in energy efficiency but it should be used in appropriate grades whilst ensuring that the fibre used meets the requirements of the end-paper quality required. Paper and board can be recycled up to 5-6 times before it loses its properties, at the end of life it can be used for energy production. The production of recycled paper requires continuous entry of virgin pulp into the fibre chain.

The European Declaration on Paper Recycling signatories includes the European Associations of the paper and printing industry, publishers of newspapers and magazines, as well as manufacturers of printing inks and adhesives. The goal is to improve the handling of recovered paper throughout the entire value chain. The 14 industry sectors in the European Recovered Paper Council (ERPC) are driving eco-design to make recovered paper a more heterogeneous stream that is more reliable and easier to recycle. The relevant parts of the paper value chain are introducing eco-design principles to inks and adhesives known to cause problems.

The use of more recovered pulp in grades other than newsprint requires improved de-inkability of printed paper products. INGEDE (Internationale Forschungsgemeinschaft Deinking-Technik) and DPDA (Digital Print Deinking Alliance) are investigating inkjet deinking to identify solutions for combined recovered paper streams containing conventional and digital printing.

## Other materials

- Cores for paper rolls manufactured by Europe's largest supplier, Sonoco Alcore, use 100% recycled fibre recovered from Old Corrugated Containers.
- Foil, the 2009 PIRA report "Repulpability of Foil Decorated Paper" concluded that both the hot and cold foil decorated printing it tested would cause no problems in recycling.
- Aluminium offset printing plates have a high recovery rate of around 99% and when recycled into other products consume only 10% of the energy for smelting virgin aluminium. Currently this CO<sub>2</sub> 'credit' is not expressed as part of the carbon footprint of offset plates. However, Fujifilm Japan has changed this because it collects used plates from its customers and recycles them into new aluminium plates. This system brings their plate's CO<sub>2</sub>e to almost zero and ensures a very stable quality.
- Plastics, wood and other materials also justify organised recycling.



*Sonoco Recycling collects Old Corrugated Containers to produce 100% of fibre used in its core manufacturing. In Europe, the company offers waste management services for used cores and scrap rolls collection, along with consulting to help customers develop programmes to reach their environmental goals. Photo Sonoco Alcore.*

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connection of competence



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