Lifetime analysis

Printers are feeling the pressure from their customers to reduce the carbon footprint of their own production, but how can they account for the environmental impact in manufacturing their printing presses?

The discipline of Life Cycle Assessment is coming to the printing industry, albeit slowly. It's a necessary step if the industry wants its environmental position to be judged on rational and impartial criteria rather than by the irrational and emotional belief that print is responsible for killing trees and destroying rain forests. But this means being able to account for the environmental impact of all the different elements used within a print factory.

This article is part of the Verdigris series of stories about understanding the environmental impact of print. The Verdigris project is supported by founder members Agfa Graphics, Canon Europe, Digital Dots, drupa, Fujifilm, HP, Kodak, Océ, Ricoh and Unity Publishing, and associate members Presstek, Xeikon and Strålfors.

Much good work has been done by the paper sector to demonstrate that paper is a renewable resource. There are a number of approved forest management and certification schemes that cover the wood that the paper is sourced from. In addition there are many recycled papers that have been proven to have the quality that designers and publishers demand.

Efforts are underway to reduce the energy requirement of production equipment. Many printers around the world have implemented environmental management systems and been certified under the ISO 14001 scheme. But although many printers are becoming more aware of their environmental responsibilities, and the carbon footprint of the industry is undoubtedly being managed downwards, it is still hard for printers to understand exactly what their carbon footprint is, which is essential if we are to make real progress.

A number of press manufacturers have launched schemes to help with this. KBA, for example, in collaboration with ClimatePartner, helps printers to calculate the carbon footprint of a particular job and then to engage with an offsetting scheme if required. Heidelberg has a similar scheme but in addition Heidelberg has integrated a carbon footprint calculator into Prinect Pressroom Manager. This calculates the 'real' carbon footprint of a job after that job has been printed. Other systems to calculate the carbon footprint of a printed job are in place.

But there is a problem in that there is a plethora of schemes and they do not always use the same methodology and rarely come up with the same figure for the carbon footprint. But if the industry is to embrace the strictures of an LCA programme then such calculations will have to become robust and almost de rigueur for first world printers. In Germany alone there are three organisations vying to offer carbon footprint analysis, each using a different means of calculation. Fortunately, ISO has now started working on a standard method for calculating the carbon footprint of print products.

"We are supporting the creation of just such a standard," says Karl Petersen, part of the team in Heidelberg's department of environment and chemistry now working on environment related issues as these have become more important to the press manufacturer and its customers. "Then we should be able to provide a carbon footprint for printed products based on a harmonised methodology helping to improve the awareness of the customer or the final consumer."

The big gap in all of these schemes comes in the shape of the printing press. The major press manufacturers are only just starting to think about the carbon footprint involved in building each press, yet this is something that printers will have to think about when shopping for a new press. The environmental impact of buying one machine rather than another, of buying new rather than secondhand, of investing in litho rather than digital, is not well understood.

Manufacturers have been able to claim that they have calculated the carbon footprint of a litho printing press and offset it through support for alternative power or forestation projects. But this is a strictly one-off measure that takes no account of the carbon footprint of the press once it is installed.

At the same time press manufacturers are working to cut the environmental impact of their manufacturing process through reducing energy consumption and better resource management in their factories and through process design improvements. These measures are bringing the overall impact of building a printing press down, but there is no accepted way of deciding what that impact is.

Life cycle assessment

Four years ago KBA declared that it had built a carbon neutral B1 press for a UK printer, Polar Press, as part of its drive to become an environmentally friendly company. Manroland will also offset the carbon emissions associated with the construction of a press should a customer want this, but the methodology used to determine the carbon level has not been published and will almost certainly have used figures relating to final construction that were within easy access.

To date only Heidelberg has engaged fully in this task, working with the Technical University of Darmstadt and with PE International to calculate the carbon footprint of a five-colour Speedmaster XL 105 with coater. Students and researchers at the university went further into the carbon impact of all the components that go into a printing press, covering not just the smelting of iron and casting of side frame and subsequent machining, but also tracking back on the creation of electronic components. In short they carried out a full Life Cycle Assessment for the press.

The result was a CO2e* figure of 220 tonnes as a cradle to gate figure for the press. Transportation and installation at a customer site will generate more, but that figure is outside Heidelberg's control and will in any case fluctuate according to the distance the press has to travel and any preparatory building work needed before the press can be installed.

However, the initial figure alone threw up some intriguing findings. "The result was more than interesting," Petersen says. "It showed that 46% of the overall carbon footprint comes from the material going in, that the foundry at Amstetten, which uses a huge amount of energy, was responsible for 24% and 20% comes from the machining and assembly processes at the main factory in Wiesloch. But what was surprising was that the carbon footprint of the electronic components have a larger carbon footprint than the steel."

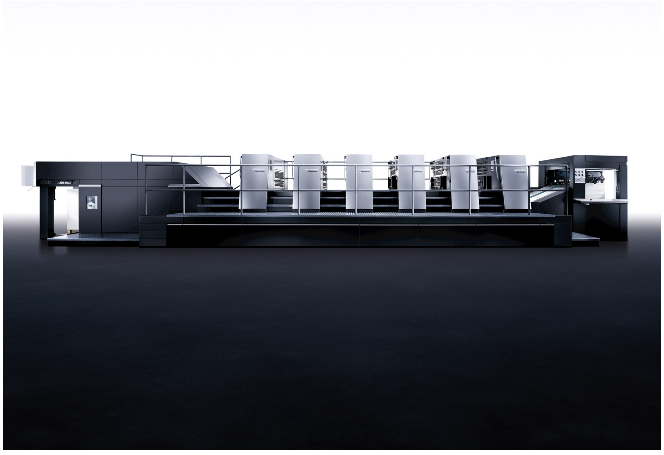
He continues: "A single kilo of electronics has a 40-fold greater impact than a kilo of steel because there are so many special metals involved in producing electronics and the manufacturing process for those electronic components is highly complicated and consumes a lot of energy. And those rare and special metals, although only small quantities are used, are harder to discover than iron and for electronics must be extremely pure. The result was quite interesting for us. We did not expect the electronics to have such a high impact compared to other material."

Heidelberg's Amstetten foundry sources more than 20% of its energy from renewable resources.

The work was carried out according to the existing ISO standards on life cycle assessment (ISO 14044) and followed the PAS 2050 guidelines on measuring the carbon footprint of a product. While Heidelberg has not done the research on other presses, the broad finding is expected to be consistent. This means that the carbon element derived from electronics on a highly automated

B2 press will be greater than for a B1 machine in relation to a tonne weight of the press because while the electronic controls will be similar, the press is smaller and therefore requires less steel.

It means too that a press that is largely manual in operation will have a lower initial carbon footprint than a sophisticated machine, though this will be more than outweighed in operation. And while the research



Heidelberg has worked with the Technical University of Darmstadt and PE International to calculate the carbon footprint of a five-colour Speedmaster XL 105 with coater.

was specific to Heidelberg's design and manufacturing process, the broad findings should also hold for other press manufacturers.

Equally the 220 tonnes figure is likely to change as both Heidelberg and its component suppliers improve the environmental impact of their manufacturing processes. As 51% of the carbon footprint derives from the production of the press in the Amstetten, Brandenburg and Wiesloch sites, process improvements can still be made.

Of Heidelberg's rivals, Komori's new factory in Tskuba has been designed to be as ecologically friendly as possible, using renewable energy, on site generation and making the most efficient use of other resources. Also in Japan, Sakurai has given over much of the roof area on its factory to solar panels for electricity generation. In Germany two of the three press manufacturers have ISO 14001 and are seeking ways to improve resource efficiency, which will in turn cut the carbon footprint of the final press.

Heidelberg's Amstetten foundry sources more than 20% of its energy from renewable resources, marking a huge improvement over exclusively coal generation according to Petersen. The current figure is 22.9% against the German average of 15.8%. The utility company providing energy to the Amstetten site is responsible for 299g CO2e for every kilowatt-hour while the general average is 506g/kWh.

Petersen adds: "At our other sites in Germany the figure is about 400g/kWh while in the US where we have a factory producing bindery equipment the figure is about 900g/kWh."

Energy consumption at the customer site is equally important in Heidelberg's plans. Any new development is assessed for an energy benefit as much as for a production or quality benefit. Using the synchronous sinusoidal main drive has a huge impact on reducing the energy needed to run the press. Heidelberg reckons that using sinusoidal motors improves energy efficiency by 30%.

Its latest DryStar dryers are positioned closer to the substrate, again with energy efficiency benefits. Petersen says that positioning the dryers 1cm closer will save 5% of the energy needed, while a 2cm difference will cut consumption by 10%. The new generation of the AirStar system delivering blast and suction air uses frequency-regulated turbo radial blowers which can be finely controlled and bring up to a 50% saving in energy for the same air supply.

But a greater impact still comes from cutting makeready waste. Heidelberg calculates that running the XL105 five colour press will generate a carbon footprint per year of around 290 tonnes CO2e. In that time it will print on paper with a CO2e of 4,300 tonnes. Therefore, cutting the amount of paper used through reducing makeready and waste in running will have a huge benefit on a printer's carbon footprint, let alone saving time and money. "We can reduce the carbon footprint through saving paper by

Karl Petersen, part of the team in Heidelberg's department of environment and chemistry.

250 tonnes CO2e," Petersen says. "This is more than the carbon footprint of the press itself, something else that we found astonishing."

Using Prinect and Inpress Control shaves waste from an average of 600 sheets to 200 sheets at set up. Over the year this mounts up to some 200 tonnes of paper for a printer running 24/7.

However, the drive to be able to calculate the carbon footprint of a printing press will go on. Heidelberg has extrapolated figures for other presses in its line up, but the full life cycle assessment has only been calculated for the one machine at present. Working on precise figures for all Heidelberg products is going to continue. Hopefully other manufacturers will carry out a similar assessment and release the figures for their customers to judge.

*Where 'e' stands for equivalent, so that a CO2e figure is a value for a given mixture of greenhouse gases that would have the same global warming impact of CO2.

Gareth Ward