

Strengths and ecological aspects of gravure printing

Gabriele Kirchmeier

Gravure is one of the oldest methods of printing. Compared to other technologies, such as offset and flexographic printing and the latest addition of digital printing, gravure has lost market share over recent years. One reason for this is the significantly changed market requirements that have emerged over the past 10 to 20 years. Above all, falling runs are supporting the move from gravure printing to competing methods. In addition, offset, flexographic and digital printing have used the opportunities resulting from the new requirements to better market their individual strengths.

When choosing a printing method, manufacturers of branded goods are now being influenced by another criterion – the ecological rating of production processes. Environmental impact has become an increasingly important argument for these manufacturers when it comes to selecting a suitable printing method. The European Roto-gravure Association (ERA) therefore commissioned a study to exami-

ne the strengths and ecological aspects of gravure printing.

Methodology and parameters of the study

Based on expert interviews, coupled with market and literature research, this study aims to examine the strengths and ecological aspects of gravure printing in more detail. In total, 20 specialists from 14 companies in the gravure printing industry were interviewed. The experts surveyed cover the entire gravure printing supply chain – from the prepress stage, including cylinder manufacture (electroplating, surface treatment, engraving), right through to print production.

This study sheds light on three topic areas:

- Strengths of gravure printing
 - Ecological aspects of gravure printing
 - Developments and innovations
- The ERA consciously decided not to make direct comparisons between gravure printing and flexographic printing or another printing method. Each method has its own specific advantages and disadvantages. The primary focus was on the qualitative aspects. Quantitative comparisons of the individual areas

with other printing methods have not been drawn.

Strengths of gravure printing

It is widely agreed that gravure printing is superior to other printing methods in terms of the quality of print reproduction and the consistency of the printing quality during the entire run. Gravure printing also outshines every other method in its ability to produce follow-up runs that are as identical as possible to the first one.

Gravure printing leading the way in printing quality

The obvious strengths, such as the extremely consistent run stability and the outstanding printing quality, are often mentioned in passing in discussions about gravure printing. Yet such arguments are particularly important when comparing this printing method with others.

Gravure printing achieves a unique and brilliant print quality. No other method can deliver such high-end quality, which is why gravure printing is so popular among manufacturers of branded goods and trading companies (own brands).

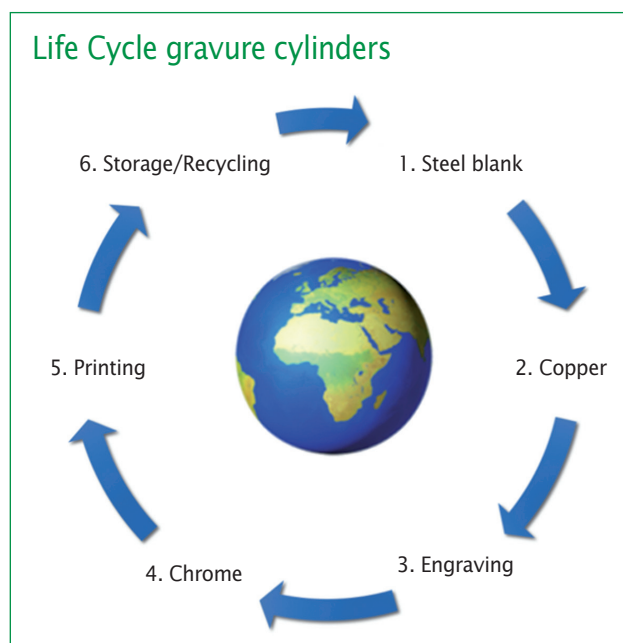
But what exactly provides this distinct quality?

- Brilliant color reproduction
- True contone
- Soft vignettes
- Consistent quality
- High reproducibility
- Very high ink densities
- Maximum screen resolutions

Above all, the combination of the finest screens and areas with high densities on a printing cylinder is an unbeatable benefit of gravure printing. True contone printing makes it possible to achieve brilliant color reproduction.

Gravure cylinders last a lifetime

Another advantage to gravure printing is the printing cylinder. The technologies used for gravure cylinder manufacture are well engi-



Source: Gabriele Kirchmeier



Finished gravure cylinders are ready for printing

neered, can be controlled precisely and are fully automated. Once the gravure cylinder is finished, it is virtually indestructible. Solid and robust, it remains stable in the face of large batch sizes and multiple re-prints.

This was always the major benefit of gravure printing when very long print runs were still very much the norm, but as demand for shorter runs increases, this aspect has lost some of its appeal.

The automated and standardized production of gravure cylinders is one of a kind, leads to greater efficiency and speeds up the time-to-market.

Moreover, the use of fully automatic production lines has significantly reduced the once high costs associated with gravure cylinders.

The low tolerances in the entire production process ensure a high reproducibility of the cylinder and thus of the print image, too.

Gravure printing is a simple method

Gravure printing is a very straightforward method compared with offset and flexographic printing. The uncomplicated configuration

of the inking units makes operating the gravure printing press a relatively easy task. The series press design of gravure printing presses offers printers the opportunity to retrofit individual inking units, embossing stations or coating units.

This advantage was put to good effect when it became obligatory in the tobacco industry to print picture warnings on packaging. Up to that point, cigarette packaging had been primarily printed using spot colors and lacquers. Due to the picture warnings, however, the “CMYK” color set also had to be printed. Additional inking units were required for this, which thanks to their series press design could be integrated into gravure printing presses.

Gravure printing offers an extended range of applications

In gravure printing, ultra-thick layers can be transferred that play a key role when it comes to lacquers and coatings. Ultra-thick layers are particularly important for achieving high white opacities or when applying cold-seal layers. What’s more, the application of large quantities is useful in the development of special lacquers and coatings.

Applying special media also plays an important role in the implementation of printed electronics. The transfer of ultra-thick layers is particularly necessary for this innovative area of printing.

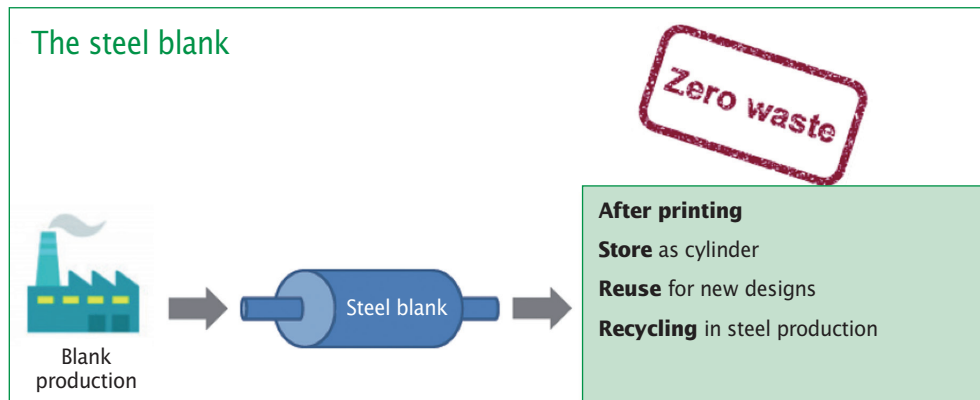
The ecological aspects of gravure printing

The ecological aspects of gravure printing can be shown in clear detail using the life cycle of a gravure cylinder. When examining the individual raw materials used in the production cycle, the method offers an impressively high recycling rate. It is therefore helpful to take a closer look at the materials used:

1. Steel blanks

Steel blanks are supplied made-to-measure by the manufacturer and go through the entire gravure printing process. Following print production, the finished cylinder with the steel core is placed into storage for the next print production. If the cylinder is no longer utilized in the printing process, the blank can be used for a new design. In principle, the cycle can be repeated as often as required because steel blanks

“Gravure printing also outshines every other method in its ability to produce follow-up runs that are as identical as possible to the first one.”



Turning

The chrome, together with the engraving copper layer, is mechanically turned.

Ballard skin

This procedure is primarily used in illustration gravure. The ballard skin, which consists of engraving copper and a chrome layer, is removed from the cylinder and put to further use by the recycler. Materials that can no longer be used are recycled and incorporated into steel production by metal foundries, for example.

Dechroming

The cylinder is dechromed in an acid bath, neutralized and then put to further use.

→ *In each of these procedures, no toxic waste is generated and all residues can be processed further.*

4. Printing

The printing process involves other reusable raw materials and substances.

Printing material

Due to the series press design, the web length of the printing material in a gravure printing press exceeds that of material in a central cylinder flexographic printing press. This results in more waste in the gravure printing process. Leading manufacturers have, however, managed to shorten web lengths considerably using their latest generation of machines. Particularly thanks to an improved and more efficient drying technology, the dryer section has been successfully shortened, which, in turn, reduces web length significantly.

Ink

Residual ink left over after an order is printed is not usually disposed of, but rather reused in the dye kitchen for formulating colors.

Solvent

Gravure inks contain a high proportion of solvent. Gravure print shops have their own processing systems for recovering solvent and these allow the solvent to be used up to seven or eight times in the cycle.

suffer practically no wear and tear. If, however, the steel core is damaged or the circumference of the blank no longer matches the product portfolio, the steel blank is taken out of circulation and recycled in the steel industry.

→ *No waste is generated throughout the entire material cycle for steel.*

2. Copper

The metals used, which include copper, have a very high level of purity. They are reintroduced into the material cycle and reused. The copper dust generated during engraving or the copper chips that build up when removing the material on the surface through turning can be melted and put to further use. After print production, it is possible to remove the engraving copper layer through turning so that the cylinder with the base copper layer is available for new orders. The engraving copper layer

removed through turning is also recycled.

→ *No waste is generated throughout the entire material cycle for copper.*

3. Chrome

Gravure cylinders are chromium-plated to protect the engraved copper surface from chemical and mechanical influences. In addition to this, the ink transfer behavior of chrome is outstanding. "Electroplating" chrome is liquid and toxic for the environment in this state. This is a well-known fact, which is why the processing of chrome in gravure electroplating is performed under strictly controlled conditions in closed systems. The metallic hard chrome layer applied to the cylinder by means of electroplating is nothing to worry about at all. If the cylinder is no longer required after print production, the chrome layer is removed. There are three different ways of doing this:

Fully automated production line for gravure cylinders



5. Recycling / deinking

One major advantage of gravure printing compared to other methods is the deinking. Paper printed using solvent-based inks can be re-conditioned more easily and gives recycled paper a whiter color. Paper produced in a gravure printing system is very popular among paper mills for this reason.

Looking at the material cycle, it becomes readily apparent that gravure printing offers clear advantages for the environment. Virtually all raw materials deployed can be reused or recycled. Unlike other procedures, the production of printing cylinders does not involve any plastic. In addition to this, gravure printing does not require any materials such as block adhesive tape, blankets and the like.

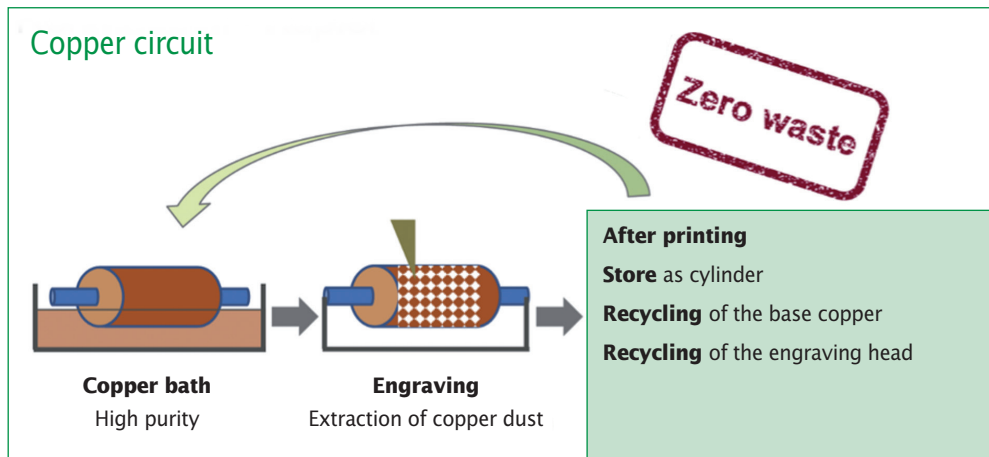
All parts of the metallic gravure cylinder can be reused, which is a key aspect of gravure printing's impressive environmental performance and at the same time compensates for the high energy requirements of electrolytic baths. The entire service life of a gravure cylinder paints a very positive picture that reflects the concept of sustainability.

Developments and innovation

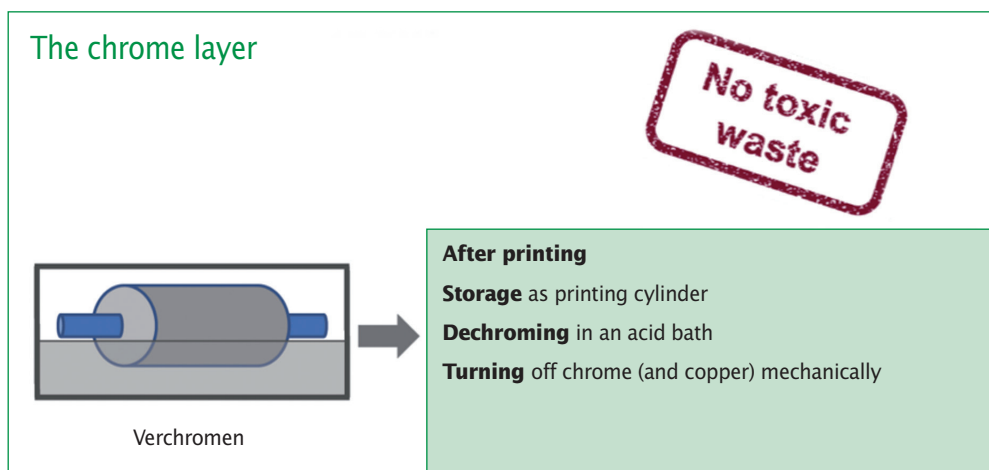
Gravure printing is a reliable, straightforward method that can produce first-class quality without significant outlay. High-end quality is and has always been a unique selling point of gravure printing. Other methods of printing have taken decades to get close to this standard of quality, but have ultimately failed to achieve it.

Since gravure printing has consistently stood for top printing quality, people are often under the impression that no developments or innovations take place. In fact, quite the opposite is true. The problem is that a rather cautious approach is taken to announcing gravure printing innovations externally. The following points give just a taste of current projects and topics in the gravure printing industry:

- Digital quality control in copper
- Alternative cylinder materials
- Further optimizations of electromechanical engraving
- Optimization and innovations in



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- direct laser engraving
- Standardized color sequence (printing with a set color palette)
- Eliminating proof printing
- Ink savings
- Special applications
 - Prismatic effects
 - Implementing security features
 - Microtext
 - Protection against forgery
 - Use and development of 3D coatings
 - Haptic, soft-touch and structured lacquers
- Water-based inks
- Eco-friendly substrates

Gravure printing can create products that can only be achieved with significant outlay in other processes, if at all. Products relating to printed electronics, medicine, pharmaceuticals and OLEDs can be implemented using this printing technology. This particularly applies to applications that require large volumes of ink or large pigments to be transferred.

Conclusion

High-end quality has always been an outstanding feature of gravure printing. The other methods of printing are particularly suited to product areas in which economic reasons make it impossible to take advantage of gravure's strengths.

The question as to which printing method is more cost-effective, better or faster cannot be answered out of context, but rather solely based on concrete scenarios. It is, however, generally true that almost no waste is generated in the gravure printing production cycle and the process has a very high recycling rate.

And this doesn't refer to "thermal recycling", during which waste is simply incinerated. Gravure printing involves genuine recycling, with the substances and raw materials being reused.

For reasons that are easy to understand, its environmental impact is therefore classed as very low. Gravure is a resource-friendly and sustainable method of printing.

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