WRAP’s vision is a world without waste, where resources are used sustainably.

We work with businesses and individuals to help them reap the benefits of reducing waste, develop sustainable products and use resources in an efficient way.

Find out more at [www.wrap.org.uk](http://www.wrap.org.uk)
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1.0 Introduction

The purpose of this guide is to raise awareness and understanding of the print processes in common use and how they work. More specifically, it deals with litho printing on paper and card for leaflets and posters and touches on screen-print and digital printing where print numbers are small or different materials need to be printed. Section 2 provides a basic insight into paper and print finishing, section 3 an explanation of print processes.

2.0 Paper and Print Finishing

A very important part of the design process is selecting the paper on which you will be printing. It is essential that consideration is given to the paper type, its weight and suitability for what you are trying to achieve.

There are a vast number of types of paper available at differing recycled contents, weights, coating and whether to use rolls or sheets amongst other factors. Finishing is the term applied to any process after the paper is printed. The main issues involved in paper selection and finishing are summarised below.

2.1 Recycled Content

Recycling is necessary to provide an alternative to landfilling of paper waste. The procurement of recycled content paper is part of the Government’s sustainability policy and is part of many private companies’ Corporate Social Responsibility (CSR) agendas. Many local authorities have integrated ‘buy recycled’ procurement policies.

WRAP recommends you stipulate a minimum of 50% recycled content, where recycled content includes pre and post consumer waste but excludes mill broke. Virgin pulp should come from a sustainable source.

Use a recycled paper, which looks recycled only if you want that effect – otherwise go for a recycled paper with a bright white coated finish as it shows the colours better. Settle on one type of paper for all leaflets as it will show your colours more consistently. Discuss this with your designer or printer, as they will have experience of the options.

Several procurement guides are also available through WRAP these include:

- Specifying recycled content in office paper and publications;
- Specifying recycled content in business process services for your organisation; and
- Specifying recycled content in tissue paper in your organisation.

2.2 Paper weights and printability

Paper and card is made in many different weights, which are specified as "grams per square metre of paper" noted as gsm, g/m² or gm². Specific types of documents will require different weights. For example:

- Lightweight for flyers and leaflets say 130gsm although 170gsm will give a quality feel with little additional cost and not suffer from show through;
- Card for leaflets with a return postcard say 230 gsm (a minimum requirement from the Post Office); and
- Laminated on both sides for a recycling calendar or bin hanger, say 350–400gsm that may be delivered via the recycling boxes and may get wet (note only use lamination when necessary as the paper cannot then be recycled).

'Show through' is the ability of the paper to stop show-through of text or images from the other side – this is dependent on the amount of filler in the paper and its weight amongst other factors. It also depends on what is called the strike-through of the ink (how far the ink is absorbed into the paper) or hold-out (the paper’s capacity to keep ink on the surface). So even though a paper may be thicker or heavier it may show through more if it is more absorbent. A minimum weight for leaflets should be considered as 130 gsm, which will ensure only a nominal amount of show-through of print from the other side.

To keep a consistent look in a project or campaign the same paper should be used throughout if possible.
The less absorbent a paper the better it will reproduce half tones and colours as the ink tends to sit on the surface of the paper much more. The type of paper and the finish will affect the way the colours reproduce.

When printing on heavier weights of paper such as 200 gsm and above it is preferable to crease the leaflet where it is to be folded prior to folding. Heavier papers tend to crack on the fold and the white of the paper will show through the colour of the print giving and untidy edge. This does not happen on lighter papers, folding is carried out without creasing. Creasing is normally a separate additional process, which adds to the overall cost.

2.3 Paper Coatings

The finish on paper can be specified – usually gloss, silk/eggshell and matt. This is created in the manufacturing process. After the paper is made and coated it is passed through rollers called calendars which can either impart a texture or make the paper smooth and glossy. Glossy paper is rolled at higher pressures to create a glossy finish and as a result is thinner for the same weight.

During printing, gloss paper tends to dry quicker and does not require so much drying time before it can be handled and trimmed. Silk and matt papers tend to get a coating in line on either a separate coating unit or by using one of the spare plates. This allows quicker handling and turn around. Some printers make a charge for this coating and others do not – hence a quote for a print run on gloss paper may be cheaper than a quote for silk or matt.

Take care when addressing or personalising printed leaflets. Addresses are normally printed using inkjet printers and the ink will not dry properly and smudge if it is printed on leaflets which have had a coating applied during the printing process. Make sure you stipulate to the printer that the area where the address will be printed, by the mail house for example, must not have coating applied. They will create a plate, which will apply coating to the whole leaflet other than the area that will take the address – this may incur an additional charge.

2.4 Folding, Finishing and Perforating

Leaflets can be designed in different formats and sizes. They can be small and simple, flat double sided or folded in two to create a four page booklet. More pages will require folding in a concertina type fold or produced as booklets where there are numerous pages.

For folded multi page leaflets the limit of the number of pages will be dictated by how practicable they will be to use and the size of the paper that they will be printed on – an 8 page A5 folded leaflet is probably as large as you should go. Take care with this type of leaflet and make sure you plan out carefully what content you would like on each page and the way they will fold; it is worth making a mock up to see how it will work. Speak to your designer and/or printer, if you are dealing with them directly, about the way you want it folding; some printers may not be able to fold it the way you want it and will have to make special arrangements. If you are mailing out this type of leaflet in an envelope, the stuffing machine may need a leading edge (one single folded edge) to be able to insert the leaflet into an envelope; speak to your mail house about this before you commit to the way it is designed, printed and folded.

Booklets can be a good solution for leaflets of 8 pages or more; they are generally stapled at the spine. Please remember that booklets are produced in multiples of four pages and it is also worth making a mock up to see how it will work and what information appears on each two page spread. For booklets with a larger number of pages it is always a nice feature to print the cover on a slightly heavier weight of paper. Beyond about 70 pages, for larger publications such as waste strategies, it is preferable to use what is called ‘perfect binding’ to create a glued spine to the document (like in good quality magazines); your designer or printer will advise on this.

Perforations are useful so that householders can easily detach return cards or calendars. They can be easily added on folds in leaflets. On a heavier weight of paper, which needs creasing before folding (see 2.2 above) perforation will simply replace the creasing process on a fold and will usually not incur additional cost; on lighter weight paper this becomes an extra process and will cost more. If you want to create a perforation across a page, this is likely to require a die to be made especially for the purpose (as in 2.5 below for die cut leaflets) at additional cost; keeping perforations to folds is generally the most economical solution.
2.5 Die Cutting and Laminating

Die cutting leaflets into shapes of recyclable materials or recycling containers can make a bigger visual impact than a plain rectangular leaflet. For example, consider die cutting your leaflet to help it stand out from others when using the Royal Mail Door-to-Door advertising delivery service. Die cutting is not a complicated process but the designer will take more time in designing the leaflet and the printer will have to make a cutter (not expensive) to cut to shape the leaflets he has printed. It is always worth getting a quote, as the finished result can be worthwhile.

Laminating leaflets on both sides is an effective way of giving them a degree of water resistance if you are producing a leaflet that will be left in a recycling box or a die cut hanger shaped leaflet hung on a bin handle by the collection crews. The disadvantage of laminating is that the leaflet should not be put in the recycling collection when the householder has finished with it.

2.6 Going to Print

In the case of printed material it is usually better to let the designer deliver the complete job from design to delivered print. They will be responsible for delivering the right quantity and quality of print to you at the right time.

They will take responsibility for:

- Providing the artwork to the printer in the right format – there are various options which can throw up their own problems which they can fix but you are unlikely to be able to unless you are expert in the industry standard software;
- Making sure the proofs from the printer closely match the final pdf you signed off and nothing has shifted or changed form. These are usually digitally printed on colour corrected printers or for expensive and high quality work ‘wet proofs’ can be specified; and
- Checking the final print for reproduction and consistency.

If you decide to arrange printing yourself be prepared to take on these points.

It is also best to get the designer to liaise directly with media organisations such as newspapers, billboard companies and deliver the artwork direct to solve any problems which may occur e.g. sizes, colours.

3.0 Print Processes

The purpose of this section of the guide is to give guidance on some of the print processes in common use and how they work, including litho, screen-print and digital printing. It contains an explanation of colour and paper sizes and how this impacts on the economics of printing.

3.1 Types of Process

Printing for relatively small quantities is usually conducted using one of three common printing processes:

- Offset lithography – litho;
- Screenprint; and
- Digital.

Litho would be normally used for print runs over 1000 copies – the other two processes tend to be more economical when for smaller quantities. Litho is also by far the most common printing process for this type of work and will be covered in greatest detail.

Print runs in excess of 100,000 copies are likely to favour Web Off-Set printing, which is not covered in this document.
3.2 Litho Printing

Litho printing is probably the most common type of printing. It relies on the transfer of ink from plates (which are made digitally from the design artwork) to the paper via a rubber blanket or roller (hence the term offset). This protects the plate during the printing process by giving it a consistent surface to transfer the ink too.

The machines or presses which do the printing come in different formats depending on whether they are fed from paper on a roll (newspapers) or sheet fed. The similarity though is that the inks are transferred by plates housed in a series of identical units. To allow full colour reproduction, presses with multiple plates/units are required and they are usually made in 4 – 7 unit formats. Each unit houses one plate and is used to print one colour.

The entire colour spectrum can be reproduced reasonably well by just using four colours:

- C - Cyan
- M - Magenta
- Y - Yellow
- K – Black

This is known as the CMYK or four colour process. There are other processes such as Hexachrome which utilises six different colours to simulate more accurately the colour spectrum but this one in particular is used for high quality print work.

If there are colour photographs to reproduce a four plate press will be required. For two colour work a two plate press can be used. Two colour printing can be very effective and will be slightly lower cost as there are fewer plates to make and a two unit press can be used.

Colours will be reproduced reasonably accurately but there may be some inconsistency from one piece of work to another. If an accurate colour reproduction is required, for example where there is a corporate colour that needs to be reproduced exactly, it will be necessary to print using an ink specially mixed to the required colour rather than expecting the CMYK blend to reproduce it exactly each time.

For a job with colour photographs and a specific colour requirement a five plate press will be required. If there is a need for special colours or finishes presses with more plates are needed. Special finishes can include: metallic finishes, high gloss UV varnishes, coatings, etc.

The international standard for colours is the PANTONE matching system that allows consistent reproduction of colours. So a specific colour can be specified for each print with a guarantee that the colour will be consistent from one job to the next. There are books of swatches available for colour matching and checking.

For four colour printing there is no need to specify a PANTONE as the printer will simply use the CMYK colours to reproduce the range. If there is a specific colour in addition to this it will need to be specified, for example PANTONE 376 is the Recycle Now lime green. See the WRAP Material Streams Overview on the Recycle Now Partners site for all the PANTONES used for identifying different recycling material streams. [http://www2.wrap.org.uk/downloads/Material_Streams_Oversvew_SEPT10.c5d16948.10560.pdf](http://www2.wrap.org.uk/downloads/Material_Streams_Oversvew_SEPT10.c5d16948.10560.pdf)

Remember that the colour will change if the ink is printed on different types of paper.

Be aware that colours will look different when they are printed on different types of paper, whether this is on coated or uncoated printing papers, photocopy paper or in newspapers or magazines. They can also look different on different computer screens as well, especially if they are of low quality and have not been colour corrected.

In contrast to four colour printing a one or two colour print job will need to have the PANTONE colours specified as there is no separation to CMYK. A two colour job can be printed by separating the two colours into CMYK but then the economics are lost because it becomes a four colour job.
Artwork to Press for Litho Printing

The industry standard design software programmes are Adobe Creative Suite (which includes InDesign, Photoshop and Illustrator) or QuarkXPress on which single to multiple page documents can be produced. The designer supplies artwork usually as a press ready PDF.

The printer receives the file and using specialist software, separates the colours in the artwork to CMYK. This gives four colour separations which are then used to produce printing plates – this is in most cases a computer controlled automated process.

The artwork is laid out electronically to fit the size of paper which the press uses. This is normally B3 or B2 which is similar to A3 and A2 but with an extra margin to allow for trimming and an area for the press to grip during the printing process.

Laying out allows the printer to make economies not only in paper but also in the number of plates they have to produce - the term for this laying out is called imposition. In the simplest example by fitting the artwork for a four page A5 leaflet on one side of B3 (finished 4 x A5) means that they only have to produce one set of plates and not two. The leaflets are printed on one side of the sheet and the stack is turned over, reversed and the back of the paper printed. This is very useful to know because if the printer has a choice of a B2 press they can print 2 A5 4 page leaflets using only one set of plates – this can save as much as £500 in producing new plates and setting the machine.

Usually the printing is carried out on machines where the plates are in line – yellow, magenta, cyan and black are printed in turn and the paper passes from one colour unit to the next automatically. The paper may be coated at the end (depending on the type of paper used) and allowed to dry.

Printed material is usually trimmed to size and packed in boxes in types, which can be easily handled. The printer usually arranges delivery as required.

3.3 Screenprint

Screenprint is used for short run work and can be used for printing on a variety of materials including: paper, cloth, glass, t-shirts, circuit boards, CDs, posters, stickers and reusable bags. It is a non impact printing process and can be used to print on delicate materials.

Screenprinting is a simple and direct way of delivering ink through a stencil, which is mounted on a screen that protects the stencil and maintains registration. It is usually associated with simple prints/posters and has its origins in craft work and is still undertaken in a manual way. It has also been developed in a way, which bears comparison with litho printing where a number of screens are made from a computer file. These are then used with different colour inks to produce similar effects to litho (but not to the same quality).

3.4 Digital Printing

There are a number of different techniques, which fall under the term digital but they all share the same benefit that print is produced direct from a computer design file. There is no making up of print plates or

The paper choice is more limited and the paper is normally produced specially for the process
stencils and the print is made directly, all colours being applied simultaneously – or apparently so. The most familiar type of digital printer is an inkjet or colour laser type printer, which is very similar to those types connected to most PCs.

There are great advantages to this type of printing for small runs as it is easy to customise print, address it individually and print only what is required in the knowledge it can be changed easily for the next print run which will be no more expensive because there are no new plates to make.

The advantage of digital printing is that every print costs the same whether it is the first or the thousandth; the disadvantage is that it is somewhat more expensive than litho which becomes cheaper as more copies are printed. A breakeven point occurs somewhere between 500 and 1000 copies – below that digital is cheaper; above it digital becomes more expensive as the price of litho reduces.

Common uses would be printing any short run work, posters, and printing on a variety of material such as vinyl which can be used to produce banners, lorry livery, stickers, etc.

3.5 Printing Processes – Pros and Cons

Litho

- Advantages – extremely flexible and cost effective for most jobs and will print on a wide range of stock
- Disadvantages – higher set up costs than digital

Screenprint

- Advantages – non impact and prints on any kind of substrate and can be used to print brilliant saturated colours
- Disadvantages – small print runs only and not recommended for four colour work and small type

Digital

- Advantages – cost effective for short runs, print can be personalised and very quick turn around
- Disadvantages – expensive compared to litho on long runs, a more limited range of recycled content papers

4.0 Additional Support

For further support and information contact WRAP's helpline 0845 600 0323 or email RNartwork@wrap.org.uk.

WRAP also runs a Recycle Now Design workshop. For more details contact RNartwork@wrap.org.uk.
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