

Printing

With paperboard you can use all available printing techniques. You achieve at least the same high-class graphical presentation as when using high-quality paper. Paperboard's good printability and high print quality, together with its many different finishing options and superior finishing results, are many good reasons to make paperboard your material of choice.

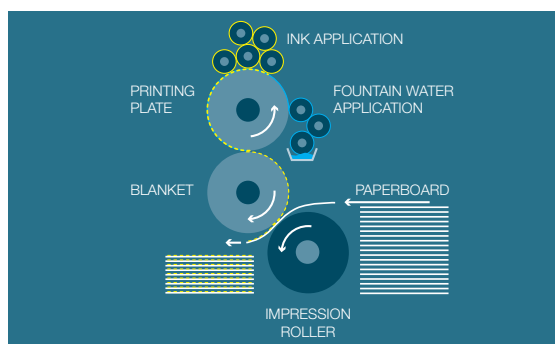
When you print paperboard there are a few things to keep in mind – things that are not always obvious if you are used to paper. This chapter will highlight some of them. Stiffness and bulk – the favourable thickness/grammage-relationship – are the most significant characteristics which make paperboard superior in many respects. However, the effects can come as a surprise if you are not used to working with paperboard. Another main difference to consider is the multi-ply construction of paperboard.



There are many good reasons to make paperboard your favourite choice.

Offset lithography

Offset lithography is a method – or rather a set of methods – often used to print paperboard. It provides very high print quality and is commercially attractive for a wide range of run lengths. The printing process involves a complex interaction between the ink, fountain solution, blanket, paperboard characteristics, and drying mechanisms, together with the pressure, temperature, and press speed. Thin paperboard can be printed on the same type of presses that are used for printing paper. However, the best way to print thicker or stiffer paperboard is in a press suitable for thicker boards. In this type of press the rollers and sheet transport systems are designed for thicker and stiffer substrates. With their double-size impression cylinders and specially adapted sheet guidance systems these presses are well suited for thicker or stiffer substrates.



The principle of offset lithography.



If a considerably thicker substrate is printed on an ordinary press without changes to the blanket and plate packing, the thicker substrate adds to the diameter of the impression cylinder, making it appear larger than the diameter of the blanket cylinder. As a result, the blanket cylinder and the impression cylinder will have different circumference speeds, creating stress on the paperboard. If the ink is too tacky the paperboard will stick to the blanket longer in the printing nip and be released from the blanket at a greater release angle. A greater release angle causes greater forces on the sheet. This might lead to linting or picking and, in extreme cases, possibly also delamination.

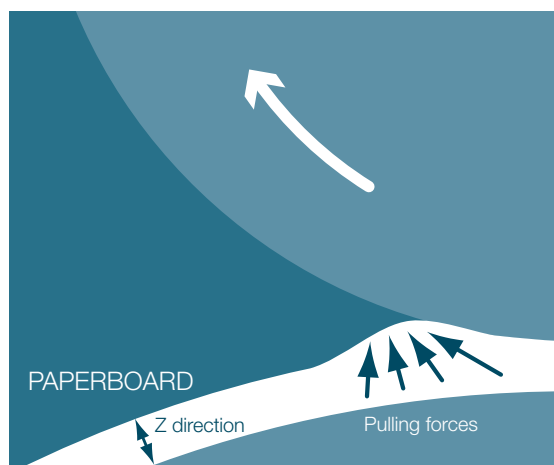
Paperboard handling in offset printing

The multi-ply construction of paperboard has several major advantages over a single-ply paperboard but needs to be handled somewhat differently. To avoid problems when printing paperboard, there are a few factors to consider.

Delamination

The main risk with multi-ply paperboard is delamination. If the paperboard is handled too roughly, the different layers in the multi-ply construction could separate from each other. To avoid this problem please keep in mind the following few points:

- Do not apply higher pressure than necessary between the blanket cylinder and the impression cylinder.
- Do not use significantly tackier inks than normal. Spot colours are known to be tackier than the Euroscale inks.
- Be careful when the press is cold. Start it up slowly to get the ink viscosity right before running it at full speed (the Monday morning effect).
- Reduce the press speed if necessary. Slowing down the press will reduce the force acting on the paperboard.
- Use quick release blankets. This will reduce the force on the board.
- Avoid manual cutting of the sheets. If the cuts are not 100% correct they could induce stresses in the sheets that in turn could cause the different layers to separate from each other.



The forces inflicted on the paperboard after the printing nip are a combination of pull in the Z direction and shear.



Delamination may be avoided if you know how to handle the paperboard.

High ink tack

Ink tack that is too high may cause delamination. If the ink vehicle penetrates very quickly into a highly absorbent substrate, the tack build-up of the ink may be high. If it is too high, the substrate may delaminate when leaving the printing nip. Adding suitable gel or varnish to the tacky ink is a way to slow the ink setting and prevent delamination (request recommendations from your ink supplier).

Blistering

One very special defect – though a very rare one – is the blistering that might occur when IR drying with the IR lamps set at maximum. Too much heat may cause the moisture in the paperboard to turn into steam inside the paperboard layers. Since the steam has a larger volume than the original moisture, it will cause blisters on the paperboard. This is why paperboard in general is not suited for heat-set offset applications.

Anti set-off spray powder

Spray powder is recommended to reduce the risk of set-off. However, to avoid problems in later production steps we advise you to always minimise the use of spray powder. Please consult with the people responsible for the subsequent steps before increasing spray powder amount or particle size significantly.

There are many suppliers of spray powder and a number of powder types with several modifications to the particles. The main particle categories are calcium based, sugar based, and starch based. Starch based particles may also come in a modified form microencapsulated in silicone.

Paperboard type does not have much influence on the choice of particle origin. However, we do not recommend the use of highly abrasive, large particles when using our most glossy products, since this may cause micro-scratches on the printed surface.

Paperboard properties do influence the choice of granular diameter. Ranging from the very fine 15 µm particle to the very coarse 70 µm particle, the choice mainly depends on ink and varnish coverage, substrate surface smoothness, and delivery pile pressure. For our products that are fully coated on both sides with a very light ink coverage or if there is a low delivery stack, you may go down as far as between 25 and 30 µm particles. To ensure low set-off when working with products that have a lightly coated or uncoated reverse side, or a fully varnished surface, or when there is a large sheet size or high delivery pile, the particle size (or quantity) should be increased.



Please consult with the people responsible for the subsequent steps before increasing spray powder amount or particle size significantly.

Alternative offset printing techniques

There are a number of alternative offset lithographic printing techniques. We will briefly describe the UV offset, waterless offset and hybrid offset processes.

UV offset printing

UV offset printing means using inks that cure (dry) by exposure to ultraviolet light rather than by oxidation and absorption like conventional inks. The press has powerful UV lamps mounted in it, and the inks contain a chemical compound (a photo-initiator) that triggers a chain reaction when exposed to the UV light. This reaction changes the structure of the ink film from fluid to solid in just a split second. In other words, there is very little absorption of ink into the substrate.

The biggest advantage of UV offset is that the inks dry immediately after being exposed to the UV light. The printed sheets can be handled directly after being printed. The inks also have excellent stability on press and excellent gloss.

A common problem, however, is poor adhesion of the printed ink film due to its shrinking during curing, in some cases to a point where it is a problem in post-press handling. It is important not to use more energy than needed to cure the ink. The strong UV lamps can also cause the substrate to yellow somewhat; Solid Bleached Board is less sensitive to this than other boards.

Waterless offset printing

In waterless offset printing the plates are different from the conventional offset plate. The non-imaging areas are held ink free by the specific surface tension of the plate and not with the aid of water. Aside from this, there is no fundamental difference between conventional offset and waterless offset.

However, since the fountain water plays a big role in the conventional offset process, a waterless system must be composed of different or modified components (inks, additives, and press). It is possible to print dry by mounting waterless printing plates in a conventional offset press and not using the dampening units. However, to be 100% successful it is desirable to have better control of the process. The press should be equipped with water-cooled rollers in order to keep the temperature of the press at the right level. This is important because the inks are very temperature sensitive and will drop in viscosity with increasing temperature.

Waterless offset means faster make-ready. An often reported advantage is also lower dot gain and sharper dots. This enables the use of finer screen rulings than on a conventional offset press. Some printers also report shorter drying times, since there is no water emulsified with the ink.

All paperboards are well suited to waterless offset printing and will give excellent print quality. However, there are some things to note and understand about this printing method and how it should be set up when working with multi-ply paperboard.



All Invercote grades are well suited for waterless offset printing and will give excellent print quality. However, there are a few things to note about the inks used.

The main area to focus on is the inks. For waterless offset they are normally formulated to have higher viscosity and higher working tack than conventional inks. Since there is no water emulsified with the ink it will not decrease as much in tack as a conventional ink on press. This could mean a higher working tack than desired. The ink will also tack up much more quickly than an emulsified ink during a press stop. Even at shorter standstills it may be necessary to spray the rollers with a stay-open compound to keep the ink from tacking up. If the operator is not aware of these factors and does not take appropriate steps to control them, high ink tack may cause delamination.

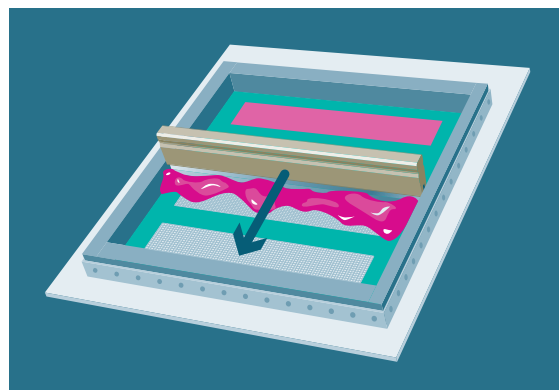
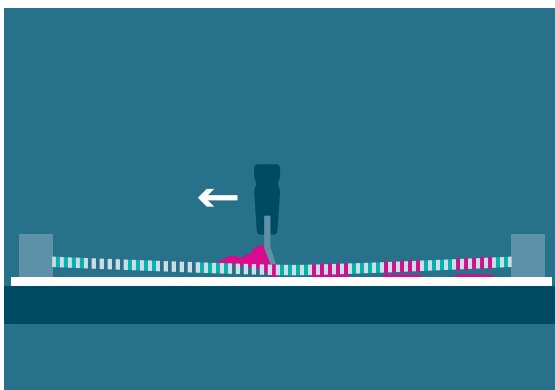
Hybrid offset presses

Hybrid offset presses are offset presses with additional equipment using other techniques, like flexo or digital printing.

- Offset and flexo: This is an offset press equipped with a flexo unit at the end. The flexo unit is often used for applying water-based varnish but can also be used for special inks. One example of this usage is to print a special spot colour with fluorescent ink. Another example is printing metallic inks. These benefit greatly from being applied in a flexo unit because the flexo technique allows the pigment particles to be larger than in offset ink. The larger particle size increases the metallic shine.
- Offset and digital: Offset presses can also have digital printing equipment mounted. Nowadays there are offset presses with inkjet units for printing very simple designs, e.g. bar codes or dates. In the future it is likely that these hybrids will become increasingly popular. When the speed and quality of digital printing techniques have increased, combinations of offset and digital presses will be further developed. This will make it possible to combine true individualisation of each print with the high and consistent quality of offset printing.

Screen printing

There are two different screen printing methods: the flat bed method and the rotation method, of which the former is more common for printing graphic paperboard. Screen printing is very suitable for substrates that are too stiff to be printed on other presses. Some screen presses are also capable of printing much larger sheets than normal presses. These factors make screen printing ideal for producing large paperboard displays.



The principle of screen printing.

Paperboard has some clear advantages in screen printing. A substrate with low amounts of dust and debris is important in all printing methods, but in screen printing it will have more direct effects on the production economy and perhaps also indirect effects on the print quality. Spots in the printed image from loose fibres would eventually force you to stop the press to clean it. As a result you lose production time and the mesh may also become clogged with partly dried ink, distorting the hues and image details.