



The world of casting papers

When one uses the term 'release papers', most people would probably struggle to think of examples. This is despite the fact that they form a facet of everyday life in both industrial and personal environments in the form of self-adhesive labels, adhesive tapes, bakery paper, insulation material, etc.

The total world market for all types of release paper is extensive and is estimated at more than 1 million tonnes. Casting papers is a small, but very important niche segment of this market, totalling approximately 50,000 tonnes worldwide.

But, what is a 'casting paper'? A casting paper is a speciality release coated paper used in the transfer coating process to produce artificial leather or coated fabric.

History

Leather can be regarded as a by-product of the meat industry. Ignoring exotics such as ostrich, snake and reptiles, etc, the majority of leather is produced from cow/calf, goat/kid, sheep and pig skin. After World War I, due to a perceived shortage of natural leather and increasing consumer affluence, an artificial product was developed using nitrocellulose but this had the disadvantage of drying out and cracking.

The development of polyvinyl chloride (PVC) after World War II led to significant developments in the coated fabric market. Initially, products were manufactured by coating the PVC directly on to the fabric web. However, due to the constraints of the types of fabric that could be coated and the rigidity and feel of the final coated material, end use applications were limited.

With advancing development of both coating resins and substrate fabrics, the transfer coating process was introduced whereby liquid PVC or synthetic resin was first coated on to a carrier web or casting paper followed by lamination to the fabric and final curing of the material using a drying oven.

Transfer process

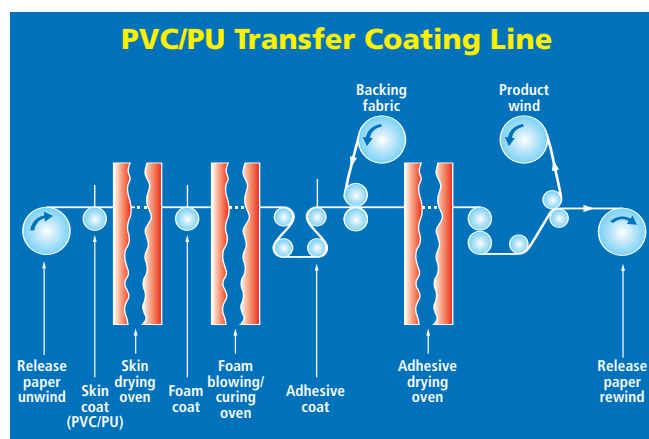
The basic process involves the build-up of several layers of liquid plastic on a moving web of release paper via a succession of heating and cooling stations. There are five main coated material types:

- PVC (polyvinyl chloride)
- PU (polyurethane)
- Semi-PU (PU skin + PVC backing)
- Split Leather
- Technical Products

After lamination to the backing fabric and stripping of the coated fabric material from the paper at the end of the process, each material is wound into separate rolls. Apart from specific, unique product applications, the release paper is normally reused several times.

Casting paper types

Casting papers are produced in both plain (flat) or ➤



embossed (surface-textured) versions in a range of gloss levels. There are several different types of casting paper, each involving different production processes—conventional coated paper with a stearate or silicone coating, resin coated papers or extrusion coated products with a plastic film. Key physical properties are as follows:

Specific release characteristics — the release level of the paper must be matched to the specific resin formulations and processing conditions to avoid problems with 'pre-release' or 'hard release', both of which can lead to deformation of the coated fabric.

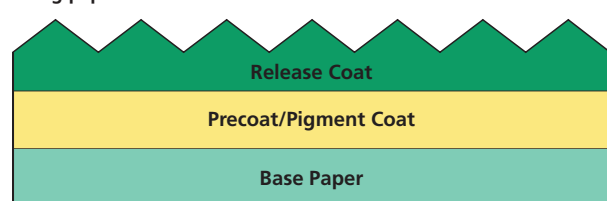
High strength and temperature resistance — the paper must withstand high temperatures (up to 220–240°C) and high tensions on each pass through the coating line. The base stock must therefore be capable of withstanding these conditions and this is normally achieved through the use of selected wood pulps and controlled chemical manufacturing to avoid heat degradation.

These wood pulps normally come from cooler and more temperate climates offering slower tree growth and longer cellulose fibres. Typical sources of supply are Russia, Scandinavia or the USA and Canada. A combination of softwood (long fibre length) and hardwood (short fibre length) is used to provide the optimum base sheet characteristics of appearance (formation) and strength. Acidic chemicals are avoided during manufacture to prevent degradation of the cellulose fibres.

Consistent gloss and surface characteristics — the resultant coated fabric surface mirrors the release paper surface and it is critical that the paper is consistent in terms of surface finish and/or emboss design from order to order, roll to roll. This is controlled by the accuracy of the paper coating formulations and the subsequent processing conditions, which can vary widely depending on the type of casting paper to be produced.

The most common types involve the coating of the base paper with two or three layers of differing constructions. The initial coating(s) cover the base paper fibre pattern and provide a smooth, closed surface on which to lay down the release coat.

Casting paper construction



The construction of these tends to be based on pigments such as kaolin and chalk with a starch and/or synthetic latex binder. The release coat itself is based on a film-forming polymer with a silicone or stearate release agent. Other types of release paper use either polymer extrusion coating or radiation curable resin coating.

Re-use factors

The number of times a casting paper can be reused is always an emotive customer issue and the standard response from the paper manufacturer is 'A minimum of one pass'!

The reasons for this reply come from the numerous factors affecting re-use and which are not always under the control of the paper supplier. There are many such factors which fall under the control of the leathercloth producer and which can affect the potential re-use for instance:

- Customer coating formulation, type of resin, plasticisers, solvents
- Coating formulation consistency and freedom from contamination
- Process conditions regarding temperature and throughput speed
- Tension control throughout the casting line
- Stripping point design including support for paper and product, angle of release, etc
- Machine cleanliness and damage from dirty, damaged or stationary rolls
- Length of individual production runs, splitting of paper rolls or running of rolls through the line uncoated
- Elimination of static electricity to avoid paper surface damage
- Join manufacture (splicing)
- Paper reel-up conditions and edge guide equipment
- Paper inspection and re-reeling
- Roll storage after use, including physical handling and environment factors such as humidity and temperature

Although, generally, the cost of the paper is relatively small compared to the cost of the coated material, a combination of good process control conditions and housekeeping can help to maximise paper re-use.

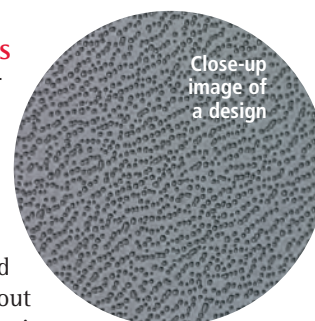
Footwear design requirements

In general, synthetic footwear material is produced using embossed paper. The greatest end use application is ladies' and sports shoes. The requirements for these applications are similar since the majority of synthetic material is used directly from the paper surface without subsequent post-finishing. The designs used tend to be of the kid and calf type with small repeat patterns and good hair cell definition, which is maintained during the lasting of the shoes.

Surface design is a key aspect of producing a successful casting paper as it directly influences the final appearance of the finished synthetic upper material. It is imperative to have a small repeat and preferably non-directional pattern, which will allow upper cutting in bulk (mattress cutting) of no more than 1-1½ sq. foot. Great attention is also required in terms of the high definition of actual pattern details such as shape and sharpness of hair follicles, veins and overall final finish, as each section of the market has its own requirements dictated by real leather trends.

Ladies shoes

Ladies shoe manufacturers are a major consumer, with a ➤



WORLD FOOTWEAR

TECHNOLOGY

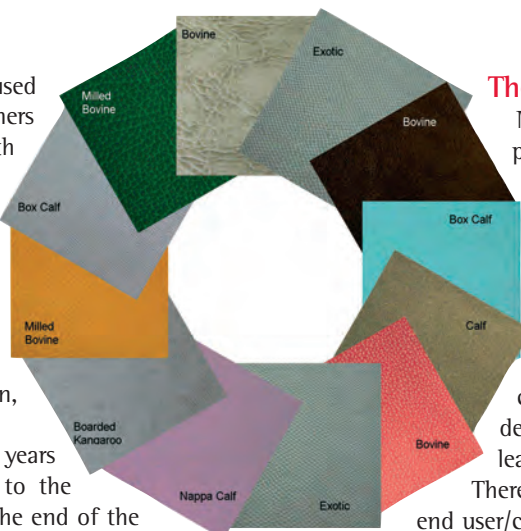
significant proportion of the material used bearing the appearance of classic leathers such as fine smooth kids and calf, with an increasing demand for more busy veined patterns in fashion for boot shafts, all with a semi gloss finish. This category also includes a large volume of plain high gloss or patent finishes as well as exotic patterns such as crocodile, snake, ostrich, lizard, fish skins and textile patterns such as linen, canvas and silk.

The life of each design may last for years if successful, just requiring changes to the colour range or the post finishing at the end of the coater line. As there is no special requirement for heavy-duty uppers in ladies shoes, woven PU coagulated fabrics (PUCFs) of 0.9-1.0 mm are used with particular attention being paid to the feel, which can be very soft to rigid according to the final application.

Sports shoes

The fashion sport shoe market is focused on high value trade marks such as adidas, Nike, Reebok, Puma and others, which use expensive, abrasion-resistant coagulated micro fibre polyester backings. A significant proportion has sporty leather patterns with a rather smooth and soft look, full of veins and visible hair cells, often milled and always with semi-matt finish. If successful, they can become classics and be used for decades.

The remainder is split into technical or geometric patterns such as brushed aluminium, carbonium fibres, circles, squares, metallic mesh, etc. They are always full of reflective effects to catch the eye and are used as trimmings with real leather or PU leather. High gloss finish and metallic effects are called for but their life is extremely short, lasting for two seasons (1½ years) at most.



The challenge

Meeting the requirements of fashionable patterns, detail and exact gloss, is a great challenge for the casting paper manufacturer. He must first obtain such features on a steel embossing roll and then overcome the difficulty of retaining these features on the embossed paper.

Today's engraving technology certainly does not fulfil the increasing demand of perfection driven by the original leather and the use of silicone moulds.

There is an increasing expectation from the end user/converter for synthetic products to match the very fine grain and hair cell detail that is visible on original leather or silicone moulded products. Therefore, the requirements subsequently placed on the manufacturer of the engraved roll are becoming more and more demanding in terms of the precision required.

Significant technological advances have been made in recent years in moving away from the traditional method of producing embossing rolls by mill and die engraving. This was also heavily dependent on the craft and experience of the actual engraver—a skill that is gradually disappearing. Modern methods involve laser design scanning, computer manipulation and laser cutting or acid etching to enhance the obtainable design detail.

Having said this, it has to be remembered that the engraving is still performed on a very hard steel roll and must ultimately represent a soft skin surface. In addition to the high risk of technical failure, there is the additional risk of failure in the market due to the fashion variability and the frantic timing imposed by its seasonality. The market for casting papers is also extremely competitive.

All details and images courtesy of Arjo Wiggins Casting Papers

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