



Profile: Porvair

Addressing the footwear sector

During the late 1960s, Porvair used technology based on polyurethane to create a new material at 2.0-3.0 mm for use in shoe uppers. During the 1970s these poromerics were the company's key area of business, and turned out particularly well in the military sectors where military leathers - officers' shoes, belts, gun holsters - became big business, both in the USA and in Europe.

Developments in the late 1970s enabled extrusion of the PU to form a water vapour permeable membrane at 0.4 mm. This could be finished, thus creating a foil as a combined finish and "grain" layer that could be laminated to splits using a system developed by the company. By 1982, this technology - branded Permair - was fully established with a core of five tanners strategically placed around the world who were using their splits to create the new product.

This foil was seen as high performance, waterproof, water vapour permeable, and easy care; it never dried out or cracked as the PU and film were produced under stringent conditions on site. This business grew in areas where leathers were traditionally used, but also moved into areas covered by the original poromerics. Consequently, when the poromerics production line reached the end of its manufacturing life it was not replaced; the focus for development and investment was firmly on foil manufacture and applications.

The original core of Permair licensee tanners has now increased to around 40 located in every significant shoe manufacturing region in the world.

Business mainly develops through tanners rather than laminators as tanners have much greater flexibility and control via changes in retannages.

The manufacture of permeable foils

Polymers manufactured on site are first blended with pure salt of specific particle size, then pumped to polyester holding tanks adjacent to the foil-forming



Precise tension is applied to the base-foil as it is wound into a roll.

equipment. Essentially, a film of the resin/salt blend is formed on a moving conveyor using a doctor blade and roller mechanism. Pigments are introduced to the blend prior to offer to provide a foil base colour, and the volume applied ensures that the thickness of the final film is to specification.

After the film has been cast, subsequent processing gradually coagulates the polyurethane at the same time as washing out the salt. This gives rise to a voided, micro-porous structure.

All of the solvent is recovered using a

fractionating column for reuse. Similarly, all the salt is recovered, dried and reused. After drying, the film is wound into rolls, precise tension being applied via needle brushes for uniformity within the crease free rolls.

Finishing the foils

Foil finishing techniques are significantly different from leather finishing. The finish is created on textured release paper that feeds from a roll into a Matex coating and drying system. The emboss in the paper replicates the final print on the foil. Deeper prints demand greater cover and determine the amount of finish offered, hence the degree of pigmentation in the



Separation of the foil after finishing from the textured release paper.



Panel 1

New technology for the automotive sector

After extensive market research, followed by considerable investment, it is now possible to extrude a durable foil that after lamination forms a permeable film of 0.13mm. Laminate can now fall within the criteria for leather as opposed to coated leather.

This new product is being launched within a year. In the meantime a number of serious automotive manufacturers are involved with the application of this new product.

appearance of the final film. Very fine embosses carry lighter coats, and might be compared with light assisted finishes.

The first coat applied to the paper eventually becomes the topcoat on the finished foil, so, for example, if a clouding coat is needed this would be the first coat applied to the paper. After the first cabinet drying, one or two intermediate coats would be applied to the paper as it moved through the unit. The base foil is then offered to the still wet finish, which also acts as the adhesive, bonding the finish to the base foil. On completion, the finished foil is separated from the release paper and wound onto a roll.

All air from the drying units is extracted and passed through a heat exchanger. There is no external venting of air, so that any residual solvent can be recovered and reused. The release paper is rewound onto a roll for reuse. Finally, the edges of the foil are trimmed as it passes through an inspection frame, before winding into "sister" rolls of convenient size in preparation for customer dispatch.

Specialist footwear applications

The high scuff resistance, easy care and comfort made possible by combinations of split and foil technologies are ideally suited for specialised areas. In the United Kingdom, for instance, Marks and Spencer, British Home Stores, Stead and Simpson, Matalan and Tesco, the major retailers for "Back to School" wear, have recognised these properties as appropriate for this sector. Other areas where the working day is long and the environment difficult - black working boots, footwear for the police, service industries and the military - are also considered prime areas for application. 



Storage of foils. 18 different base foils/textures are held in stock.

Panel 2

The CPS Color tinting system formulates colour for Permair finishing

An essential ingredient of Permair production is precise and repeatable colouring. Traditional manual methods of colour determination were no longer adequate to satisfy tight colour control as the human eye cannot see colour differences of less than $\Delta 0.5$ on many shades, along with the disadvantages of batch variation, time consuming mixing and matching, corrections and waste of colorants. Porvair has dealt with the problem by installing



Custom designed colorant storage unit

a CPS Color package, making an investment of some £600,000, to achieve fast, accurate, repeatable and economic matching of customers' colour specifications.

The package consists of two computer matching and dispensing units. One located in the laboratory is dimensioned for development purposes and the other is a full-scale production unit. The integrated CPS Color system provides colour matching hardware, software and volumetric dispensing equipment as well as a range of colorants. A colour sample is read by the spectrometer. After the data is transmitted to the computer, the CPS Color programme calculates the formulation taking into account match and metamerism, one of five types of grain emboss as selected, and the cost of ingredients. Normally three to five close formulations are proposed by the programme and a colour experienced operator selects the optimum one, at the same time considering the cost of the mixed product. The computer stores the formulation and in the process, over period of use, learns about the requirements, producing increasingly precise formulations. The selected formulation is sent to the dispensing unit, either by computer command or by a barcode provided on the printout showing the details of the formulation.

The dispensing unit stores a range of 14 colorants specifically developed for Permair finishing by CPS Color. The range is restricted to Porvair and colour, colour strength, shear stability, aeration, grinding and colour drift are precisely controlled. Three bulk colorants are separately stored in large canisters. The colorants are agitated and automatically circulated at specified intervals to ensure consistency. Programme controlled electronic valves open to allow the precisely measured amount of colorant to be dispensed into the mixing container. No further correction is necessary and the formulated finish goes directly to production.

An important economic factor in the production of the colour is the saving in overmake compared with manual preparations as it is quite simple to produce further quantities in precisely the same shade to make up any shortfall.