



# Improving the quality and performance of shoe upper leathers

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The quality and available style range of shoes made almost anywhere in the world has been steadily improving over many years. As with most mass produced articles, footwear manufacturing costs have been driven down by the use of automation. However, when consumers buy leather footwear, quality is often at the top of their requirements. The price range is wide and varied and the old adage "you only get what you pay for" is often the deciding factor at the time of purchase. For the shoe manufacturer to produce a high quality product, not only is robust construction important, but also the use of good quality components. And quality shoe upper leather is essential for all types of footwear—from sandals, through shoes and boots to leather sports shoes and trainers. For the tanner who produces the shoe upper leather, there is little profit to be made from converting either high quality or expensive raw material into ordinary finished leather, or low quality raw material into low quality finished leather.

Add to this the fact that in all parts of the world statistics show that the quality of raw material (hides and skins) is deteriorating in terms of grain selection. This poses a major challenge for the leather industry. If tanners are to produce and sell consistently attractive and high performance shoe upper leathers, and at the same time make a profit, then the surface quality of the raw material which is purchased has to be maintained and even improved wherever possible. Upgrading is the name of the game. And fashionable aesthetics and appearance, and sound performance are the result.

## Why upgrade shoe upper leather?

The shortage of good quality raw material may tempt tanners into producing mediocre quality finished leather.

Why is that? It's possibly simpler. It's potentially cheaper. However, because of fierce competition there is likely to be less profit and certainly any footwear made from mediocre quality upper leather will be sold at more competitive prices. In this situation it is much less likely to be an economically viable business opportunity. So the shoe upper leather tanner is left with little choice but to upgrade the leather during the finishing processes to add value and performance to the finished product.

Producing high quality shoe upper leather by upgrading can only be achieved through care and attention to the selection of wet end, dyeing and finishing products, and the machinery and equipment used in the tannery. However, it takes more than this

if the demands of today's customers are to be met. There are other fundamental factors which influence the production of such leather.

Processes have to be developed that are simple to formulate and apply. Formulations and application procedures are best written down and recorded for future use if consistent results are to be achieved. These procedures must include quality checkpoints at the critical stages of manufacture both as a means of process quality control and of recording data for future reference. They are also important in being able to track and respond to any potential criticism from customers or consumers relating to the performance and comfort of the resulting footwear.

These quality controls need not be complicated and should begin early in the process. All tanneries should carry out weight and yield checks on hides as purchased. Simple pH checks, water temperature and chemical penetration tests are also quick and easy to carry out. They become meaningful when pre-set tolerance limits are established to measure and control performance.

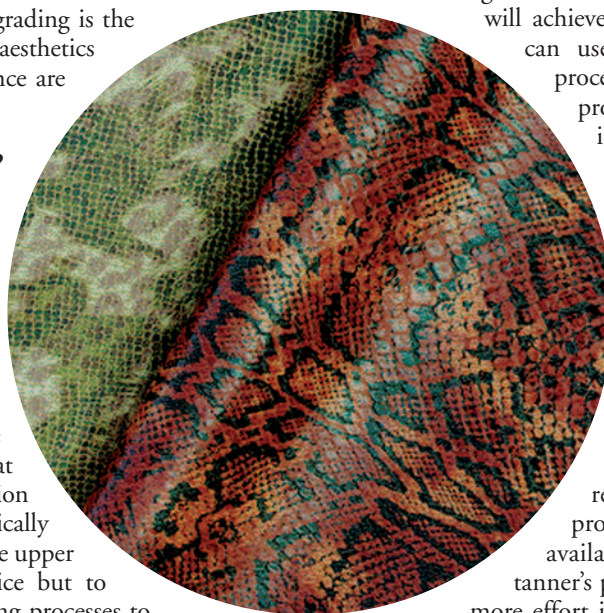
Process details need to be fully understood by the tannery operatives when upgrading techniques are used and this requires a high level of employee awareness training.

Given that these measures have been put into place and management methods have been established which will achieve their full implementation, tanners can use their technical skills to design process and application methods. New products and technical systems can be introduced, aimed at improving the final selection of finished leathers still further.

## How to upgrade

Upgrading is a continual process starting with the choice of raw material and continuing through to the finished product.

There is a preconception within the leather industry that low quality raw material, being relatively low in price, must be processed using the cheapest products available. This is far from true. The tanner's philosophy must be to aim to invest more effort into the selection of processing and finishing products. In this situation, the final result will be a more attractive, saleable shoe upper leather with improved performance characteristics that enable the footwear manufacturer to improve the quality and looks that sustain the reputation of the manufacturer's brand name. This will





potentially result in footwear that can be sold at a higher price and with a greater profit margin for both the footwear manufacturer and tanner.

A little extra thought and investment applied in the careful selection of processing chemicals and finishing formulations can result directly in producing added value finished shoe upper leather. This can offer the footwear manufacturer a more competitive market position and also benefits the tanner.

The techniques to support the potential upgrading fall into five categories although these can overlap and by so doing can be combined to give the best results.

#### PHYSICAL METHODS

These are used to physically hide or obliterate any defects in the leather.

*High coverage finishes:* Opaque, dull resins can be formulated in base coats in combination with soft fillers that maintain a natural appearance and a high degree of flexibility in the dried films. Choosing resins with low transparency of the dried film will improve the ability of the film to hide defects. Because only a thin film is needed, there is no need to apply heavy coats to uniform the surface of the leather. Natural full grain leather for footwear can be produced without the risk of overloading sensitive grain.

*Stucco type fillers:* These fillers may be applied to full or corrected grain leather either by hand over the damaged areas using a spatula or knife, or by using specially designed rollers on a roller coating machine. Small scars and scratches are physically filled with Stucco material and the surface becomes more uniform through filling and hiding growth creases and scar damaged tissue. After application, the leather is normally rebuffed and finished using conventional base coats. Care is needed when using this technique because other problems such as poor lasting properties and low flex may result when the application or formulation are not carefully controlled.

*Impregnation:* Modern impregnators can be used to improve grain tightening and selection of both corrected and full grain shoe upper leathers, including heavy vegetable tanned and retanned types. Fine particle size acrylic resins are able to achieve excellent grain tightening and can be polished to give a smooth, sealed grain. They are designed to penetrate between the grain and the corium fibres, supporting them and effectively glueing them together. High quality, calf-like grain is now possible with minimal firming of the leather.

#### CHEMICAL METHODS

A chemical reaction or effect is used to obtain a degree of upgrading.

*Cationic charged products:* When carefully formulated, these products provide an excellent base sealer coat or complete system having an opposite surface charge to a conventional anionic

sealer coat. The opposing charges result in more uniform distribution of the sealer coat and enable uniform deposition of the finish over damaged areas such as scuffed and rubbed grain. Since the finish does not sink into the damaged areas, the defects are sealed and obscured.

Softness in the handle of the crust leather is also enhanced and the surface feel created by cationic waxes can be felt through to the surface of the finished leather and results in a very natural appearance and handle to the finished leather.

*Foam finishing:* When using this technique, both the chemistry of the system and the formulation of the products are important.

The foam finish mix is mechanically generated using a special pump to control its "dilution" with air, not water, prior to application. This means less wetting of the crust and resulting in a soft, flexible dried film. The resulting foamed finished mix does not penetrate deeply into the surface of the leather and because of this it helps to retain the softness of the crust. The foamed finish mix contains trapped air bubbles that cause it to be higher in viscosity than conventional finishes when applied at the same solids content and by the same method.

Full and corrected grain leathers finished using foam technology cover particularly well and have a natural appearance. The finish provides good embossing properties and excellent print retention, scuff resistance and flexibility. The most common application for footwear is on heavily buffed leathers.

#### MECHANICAL METHODS

Machinery is used to alter the surface structure of the leather and hide, or even remove defects.

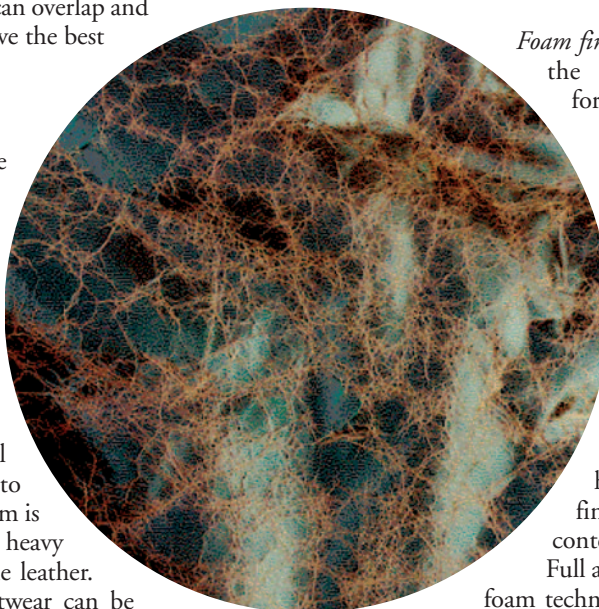
*Buffing:* This is one of the most fundamental examples of mechanically upgrading leather. Even a light buffing using 400, 500 or 600 paper, followed by the application of a cationic or soft anionic sealer coat can provide substantial improvement in grain surface uniformity. When subsequently polished prior to applying the finish, the resulting leather may appear as though it has not been buffed.

Obviously deeper buffing using coarser paper will minimise surface scratches and blemishes to a greater extent. However, a heavier finishing coat needs to be applied to fill and uniform the surface.

*Embossing:* Embossing is not always used to its full effect. Good quality sandblasted plates and calf grain plates are essential tools that can be used to good advantage.

Experienced technicians will combine embossing with other techniques, such as dry milling to relax the print or effect, or spraying to develop effects and to improve the aniline look of the leather. Hand antiquing will further camouflage and upgrade, helping to produce a more natural grain pattern.

When making embossed leathers, the finish must 'mould' well under heat and pressure to give good, smooth pull-up and print retention. ►





## IMPROVING THE QUALITY AND PERFORMANCE OF SHOE UPPER LEATHERS

Finished leather on which the print relaxes on stretching or lasting is undesirable. New generation resins formulated into base coats provide excellent plate release and print definition to maximise upgrading.

**Polishing:** Following a spray coat of soft polyurethane resin combined with casein binders and waxes to seal a full grain leather and help fill in small scars and defects, polishing the surface holds up subsequent finish coats and helps to avoid swelling of the grain by over wetting. Polishing also has a beneficial effect on the smoothness of the grain of the leather and helps to retain the soft handle. The choice of a polishing roller made of stone, cotton or felt is determined by the type of crust leather being processed. Firmer leathers, as used in footwear, tend to require the harder surface of stone to enable closing of the grain surface.

**Roller coating:** Highly concentrated, covering mixes can be applied quickly and cleanly to low quality leathers by roller coating. Both full and corrected grain leather can benefit from this method of application. Very uniform, high quality results can be achieved by carefully combining other techniques such as embossing and rotogravure effects.

Product selection and careful formulation of the finish is important. Optimum viscosity needs to be achieved and maintained to produce a consistent result. The use of butadiene resins is not recommended because they do not, in general, offer sufficient mechanical stability for roller coating. Most modern roller coating machines are supplied with an optional spreading device to facilitate use on soft and lightweight leathers.

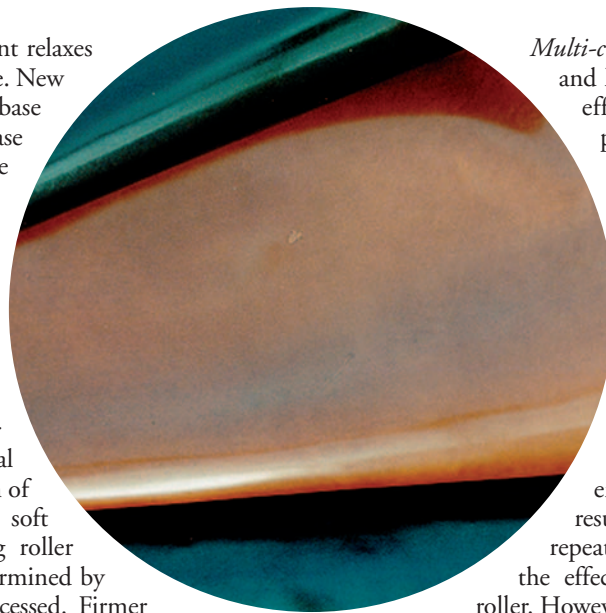
Reverse roller coating is also of particular benefit when used for finishing white leathers for sports and ladies shoes. It drastically reduces both the number of coats applied and the risk of surface contamination during the finishing process.

**Synchrone roller coating:** Also known as direct forward coating, its use can be particularly beneficial for lightweight, soft full grain side leather. It facilitates the application of a viscous, soft, concentrated finish coating that does not firm the leather, covers the defects and seals damaged grain. The machine may also be used for gravure printing and tipping by using different designs of engraved rollers that produce a galaxy of surface designs that disguise surface defects and add fashion appeal.

### OPTICAL METHODS

A pattern is created in which a defect is not covered but camouflaged, distracting the eye from the damaged area.

**Fashion effects:** Effects such as Florentine rub-off or brush-off are still fashionable today on full and corrected grain. Oil pull-up creates dark antiques and crush effects that will upgrade cutting value provided the oil or wax chosen does not darken and exaggerate surface defects. Hot melt waxes can help to disguise defective grain and the use of a "Maquillage" pigmented pull-up effect can be used to provide a uniform coverage and fashion content.



**Multi-coloured effects:** Tipping, rotogravure and hand applications can be used to great effect when applied on top of a pigmented base coat or embossed design or even directly onto the surface of the grain. The effect should be over-finished with clear coats to provide surface protection. The eye of an experienced colour matcher is needed to create different colour combinations that produce subtle and attractive patterns rather than those that are bold and artificial.

Tipping may be applied on either embossed or milled leather for the best results. Rotogravure application is more repeatable than random hand applications as the effect is achieved by using an engraved roller. However, it may appear more "artificial" than those of hand finishing in the finished shoe.

**Semi-aniline:** Traditionally, semi-aniline is a pigmented base coat followed by a dyed or pigmented top coat. The effect can be manipulated by using dyes and pigments in the base coat or by using subtle colour development to achieve expensive aniline looks with good covering properties. A good eye for colour and careful colour matching is the key to making elegant semi-aniline leathers that enhance footwear uppers.

**Dry milling:** The smoother and higher the gloss, the more light is reflected making defects and damage easier to see. Dry milling breaks up the surface of the leather and alters the reflective angle, helping to disguise faults.

**Shoe dressings:** This essential group of products is designed to be applied in the shoe factory and will enhance the looks and protect the finished footwear. Sponge application of an antique cream or a polishing operation on finished shoes will add to the value and attractiveness and will help to fill or hide scratches and scars. Coloured stains applied to the cut raw edges of the shoe components can add value to the finished product as can complementary colours applied to sole units.

### PERFORMANCE

Making high performance leather which meets physical criteria adds value and can set it apart from low-priced competition.

**Scuff resistance:** Children's shoes and sports footwear are typical applications that require leather to be hard wearing and have good scuff resistance. Selected polyurethane resins for base coat applications provide good adhesion and scuff resistance. The latest generation of cross-linked, water-based top coats will provide optimal wear resistance.

**Water repellence:** Leathers that are water repellent, and even waterproof, are very much in demand for footwear. Selected products are needed for the finishing formulation for use on these leathers to ensure good adhesion without destroying the water repellent properties created in the wet end process. A primer coat is usually applied to the leather prior to subsequent finishing coats to ensure that adequate adhesion is achieved.



Many types of finishing product such as penetrators, surfactants and levelling agents, are unsuitable for application to water repellent leathers because they will destroy the properties of the leather.

*Washable and dry cleanable:* Leather that can be washed is becoming increasingly popular for sports shoes as well as high quality fashion garment leathers. Careful selection of dyes and fatliquors is important to avoid the risk of finishes bleeding from one material to another; there are a number of polyurethane and acrylic base and top coat products that will meet these requirements.

### Avoid pitfalls and create success

These techniques, if used carefully, can help to upgrade and add fashion and value to all types of raw material. Unfortunately, there remain some procedures that are common practice in some tanneries today that have a negative effect on upgrading and, therefore, on profits.

- The use of poor quality pigments that are unable to hide defects, need additional application coats and run the risk of bleeding of colour are still being used
- Poor handling of leather in production due to inadequate training of machine operatives causes damage and tends to downgrade the leather
- Smooth plating at too high a pressure and temperature

causes leather to become loose and firm, and can accentuate veins

- Uneven dyeing means more pigmented finish has to be applied to level-out
- Poor colour matching during drum dyeing can result in a crust leather shade too distant from that which is required by the customer. Worse still, it can give the wrong tone, creating shading or under toning that may be evident when the leather is completely finished
- The wrong selection of products and formulation of finishing systems can lead to low physical performance, poor finish break and loose or plastic appearance that may appear under-filled or over-finished.

All these problems are undesirable when used in the preparation of shoe upper leathers destined for use in quality footwear. However, the use of upgrading techniques that have been undertaken carefully, thought through, and tested with the aim of producing a consistent quality finished product, gives the footwear manufacturer the opportunity of producing quality products. These provide instant sales appeal and the added value leads to improved profitability. Having said this, the tanner and the footwear manufacturer must work closely together. They need to develop a clear understanding of each other's requirements, particularly in respect of colours, effects, aesthetics, performance and production methods. Obvious but often overlooked. ⚙️



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