5 Finishing

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FINISH - WASTE LIQUIDS AND SPRAY

The object of finishing leather is to improve its serviceability by protecting it from damage by water, soil and mechanical action. At the same time, it is also improving the cutting area. It should be seen that finishing adds value by improving the surface appearance so much that the leather becomes so attractive to look at, and to feel, that any of the surface defects below the finish cannot be seen or considered by the buyer, or the ultimate user of the leather product. Experience and an appreciation of colour effects are needed to achieve the desired results. The technician often has to be able to develop a finished look to match a competitive sample in a short time.
Finishing can modify the shade, gloss and handle of the leather, improve its physical properties such as its light and rub fastness, and hide any defects or irregular appearance. It is applied to corrected grain leathers and splits in order to imitate full grain leathers and often used to obtain fashion effects on all leathers. The lowest grades of leather need the most finishing work, compared with the minimum amount of finishing for the best grades. At the same time, the best grades sell at the highest price and the lowest grades at the lowest price. With such a difference in the finishing costs for these extremes of sales prices, it can be seen that the top quality traditionally has a much higher profit margin than the bottom quality. Aniline leather is considered the top quality because the finish does not cover any of the surface full grain. Originally, it referred to leather without any finish, which had been drum dyed with aniline dyestuffs and this was the only colouring it received. It should now mean that there are no covering pigments used in the finishing films; therefore, the leather has to be almost without defects. Most finishes for a classic appearance on leather have some covering property, but try to produce the aniline effect by incorporating dyestuffs at some stage. The shortage of high quality raw material means that a lot of progress has been made to upgrade the lower grades, by improving the cutting value and surface appearance. The section on upgrading shows some possibilities.

All the individual operations are options according to the finished article and the quality of the crust to be finished. Normally, there are several layers of finish applied and the constitution varies between the different coats - base coats, top coats and pigmented coats. Adhesion to the leather and inter-coat adhesion is essential in wet and dry conditions. The flexibility of films has to match the flexibility of the leather. For example, there is difference in leather for garment, glove, shoe or upholstery. The lower films in a finish are more flexible with good adhesion to the base, compared with the upper films, which provide the protective surface by

being harder. The top coat needs to be the most resistant to damage. The film properties are built up progressively in the finish, with different formulations for base, intermediate and top coats.

The table gives a general scheme for better full grain grades with more pigment being used to cover problem areas, assisted by some printing (embossing) with hair-cell to give an even grain appearance. Corrected leathers have more finish coats and need attention to impregnate and seal the buffed surface.

Finish steps	**1**	**2**	**3**	**4**	**5**	**6**	**Total Steps**
Grade							
High	Stain	Top					2
↓	Stain	Polish	Top				3
↓	Stain	Printed	Basecoat	Aniline Effect	Top		5
Lowest	Stain	Printed	Basecoat	Spray to cover	Aniline Effect	Top	6

There is a large variety of finish formulations, which are mainly water based. There are different colouring materials, including inorganic and organic pigments, dyestuffs and waxes, feel modifiers, matting agents, fillers, polymers of all types, casein, dispersing agents, plasticisers, diluents. These are applied to the leather in several coats; starting with higher rates such as 20 grams per square foot, and ending lighter as 5 grams.

Care had to be taken in handling the leather so that the surface is kept as flat as possible during all the finish operations. Creases and folds reduce the finish effect and certainly lose value in the finished leather.

APPLICATION

Hand padding and spraying have been almost replaced by roller and curtain coaters and spraying machines in all medium and large productions. There are exceptions for special leathers, developments and samples. The costs of finishing small batches are high if the large amount of finish needed to prime the machines has to be eventually discarded. Controls on spraying machines reduce waste and there is increased importance to reduce and control toxic emissions from spray exhaust to prevent atmospheric pollution. Conveyor drying and stacking machines are linked into the finishing lines.

UPGRADING

This includes the following possibilities:

- a) A complete film, with embossing or grain pattern, transferred from a previously coated release papers. Ideal for splits and gives high abrasion resistance with a good appearance. They can be used from shoes to leathergoods and smaller parts of car upholstery.
- b) Laminated film, glued to splits. Used for sport shoes and a wide range of fashion effects. A major use is for leathergoods and belts.
- c) High coverage finishes. A thin film with reduced transparency gives a natural appearance and can be used on full grain without the risk of overloading a sensitive grain.
- d) Stucco fillers. These are a type of plaster and are applied by hand, or roller coater after impregnation and re-buffing. The surface becomes more even as the small scars and scratches are physically filled. After application, leather is re-buffed and finished conventionally. Needs care to avoid poor lasting and low flex resistance.
- e) Cationic products can give good base sealing because they are the opposite charge to the subsequent normal anionic finishes. It prevents absorption and seals defects.
- f) Foam finishing. The foam is produced in a finishing mixture by a special pump and applied from roller coaters. As the foam does not penetrate deeply, it maintains the softness of the leather. The trapped air results in a thicker film, compared with a film of equivalent solids content from a roller coater. Consequently, it covers well and has a natural appearance. It also embosses well with good print retention and flexibility. The most common use is on splits and heavily buffed leathers.
- g) Fine buffing, polishing, the use of sandblast and hair cell grain embossing plates below the finish, all are disguising the basic problem areas.
- h) Roller coaters are an important finishing machine, with an increasing variety of uses as both the mechanical performance and the finish formulations are developed in different directions. The leather has to be flat, and firm, enough to pass through the rollers without damage. Concentrated finishes can be applied cleanly to low quality leathers. Like curtain coaters, the viscosity needs to be regulated and polymer emulsions need to be mechanically stable.
- i) Reverse roller coating is especially good for white leathers because less coats are needed and it is easier to keep the leather clean. Finishing white leather otherwise is a difficult.
- j) Synchro-roller coating, also known as direct forward coating, is for soft full grain side or on sheep nappa. It applies a thick soft film, which does not firm the leather but does cover defects and seal damaged grain.
- k) Gravure printing by engraved rollers and the surface tipping of embossed or milled leather produces unique surface designs and disguises defects.
- l) Fashion effects such as rub off, oily pull up, semi-aniline (transparent coloured films on a covering base film) and other optical effects are all used to distract the eye from the

defective area.

- m) Dry milling breaks up the surface appearance and hides the defects underneath.
- n) Finishes with special properties command a special price, and needs a specific approach. The special property becomes more critical than some natural defects. Such leathers would include scuff resistant, water repellent, washable and dry cleanable finishes.

BUFF - DRY TANNED WASTE DUST

The object is to obtain a more even surface for finishing on low quality leather, where the grain has defects, which cannot be covered uniformly. The grain surface is buffed off by a fast revolving cylinder, covered with abrasive paper. This reveals an even surface with a suitable base for heavier finishing coats. Buffing papers are graded by the size of the grit, so that 80-100 are very rough, and would only be used for the start of producing a suede nap appearance. 150-220 grits are finer and suitable to start buffing a corrected grain leather. Finer papers are 280,320 and 360. A buffing sequence is normally at least 2 different grades on the grain- say 220 and 320. Buffing too deep gives too much absorbency and penetration of the finish, which makes the grain open and the surface unable to be filled by the finish. The final buffed surface has to have even absorption, so it is often necessary to buff the thinner belly areas with a separate cut, with a small width machine or feeding in a different direction towards it. Normal buffing is done from butt to shoulder, but it is also done in both directions. The flesh side of full and corrected grain is often buffed as required.
Buffing cylinders revolve at about 1000 rpm and the machines have to be connected to efficient dust extraction systems.
The type of retannage affects the buffing properties, in that there has to surface filling of the grain to allow the degree of buffing. Vegetable or replacement syntans are preferred.

DUST REMOVAL

After each buffing operation, the leather passes on the conveyor of an air-blast de-dusting machine underneath a thin jet of compressed air which clears the dust by blowing it into the attached extraction system. It is important that the surface is absolutely clean, and free of dust, for proper finishing and appearance.

IMPREGNATE

This operation is an option and has the object to reduce the looseness of the leather structure by making it tighter and firmer, and to improve the selection. It is used on leather which will not be suitable as full grain, and has been buffed. This buffing needs to be done so that the whole surface has an even absorption. If leather is given a relatively heavy finish coat, the

appearance is often unsatisfactory because it does not look natural and has a poor break. To avoid this, corrected grain leathers are sometimes impregnated with penetrating dispersions. These must penetrate deeply and stick the looser layers of the structure together. About 20-30 grams of mixture are applied per square foot, which has to be done by curtain coater, roller machine or airless spray. After standing overnight to allow maximum penetration, the leather is dried flat, preferably on a lower temperature vacuum machine. The surface is then either polished, if it is full grain, or rebuffed, if corrected, with a fine 400 grit paper and de-dusted. The result is a smooth sealed surface ready for further finishing.

DYE STAIN

Spray staining with liquid dye solutions is done to colour the surface of un-dyed leather and to level drum dyed shades. It is used for all grades of leather.

POLISH

This is done with a fast revolving cylinder made stone, felt or resin roller and used on all types of hides and skins. It flattens the grain and softens the leather, with applications before, and between finishing coats.

BASE COAT

This is the first and the most important coat of finish because it has to provide the adhesion of the whole film to the actual leather. The composition is formulated to meet this priority. The polymers used are soft and flexible. The formulation will usually include some covering pigments and fillers, to hide as many defects as possible.

PIGMENT COAT

This is considered to be a main covering coat due to its pigment proportion at 100-150 grams per litre. It can be applied by pad, roller or spray. Later coats have reduced pigment levels to improve the natural appearance. Organic pigments are more natural than inorganic and can be used at 25 grams per litre, without affecting the transparent look. It should always look as natural as possible.

CONTRAST COAT

This transparent coloured coat contains dyestuffs, which is slightly darker and contrasts with the colour of the covering base coat. The effect of this colour contrast is to appear as an aniline finish, with the clear dyed film disguising the pigmented look below it.

TOP COAT

The final coat has to protect the coloured film below and is important for the fastness properties of the film. It determines the final look and handle of the finish. Traditionally, it may be in solvent or low-solvent solution. Special cross-linking systems to cross-link acrylics and urethane films are now used to achieve the same properties without solvent emission being a problem.

PRESS

Pressing and ironing are intermediate and final operations in building up the finish film. The straight through heated rollers are preferable for productivity and maintaining leather softness. The hydraulic ram presses use heavier pressure to compress the fibre structure, and are essential for obtaining an effective embossing print.

GLAZE

Classic glazed kid is made by the original design machine with a glazing jack, usually of glass, which rubs the leather surface with a reciprocating action. The heat and pressure produced give a deep glaze effect, due to the protein binders and dyes, and gives a true aniline appearance. The machine principle is unchanged for many years and needs skilled operators. Although, there are safety concerns in the handling of the leathers, it does produce a unique appearance. The wet fastness is a problem. A rotary ironing machine gives the nearest alternative effect, and does not need the same amount of skill for operation. It is also used for hides.

DRY DRUM (MILL) AND TOGGLE

This option of a fast revolving (20 rpm) dry drum is increasingly used to produce very soft leather with a relaxed surface appearance. It could be for upholstery, garments, or casual shoes. There are degrees of development, with dust extraction needed to clean any fibres from the atmosphere, and moisturising spray injection. It can be done on crust leather without finish, split, suede or on finished leather, provided the finish film will withstand the mechanical action. Several hours running of the drum is often needed. The leather has to be toggled afterwards to restore the flat surface and the area.

FINAL SORT, SOMETIMES WITH TRIM - DRY TANNED WASTE

Here is the final quality check and assessment of the leather value, sorting into different grades. There is a limited amount of light trimming, where this improves the selection and

allows an upgrade. This is another skilled operation and determines the financial balance of each production lot and the impression it makes on the customer. Any leather which does not meet the standard required has to be dealt with separately; in a different grade, reworked or rejected.

MEASURE

The area of the sorted leathers is measured, usually electronically on a horizontal conveyor. The accuracy of the machine needs to be checked on a daily basis with a template. The individual area of each piece can be stamped on it, together with a suitable code to identify the production lot and permit it to be traced.

PACK

It is important to maintain the finished appearance in packing so that the leather can arrive in the customer's warehouse looking as attractive as it did when it was sorted in the tannery. It can be difficult to achieve this when there is a lot of handling in shipment. This normally means that some finished leather, sensitive to damage, is rolled with the grain surface on outside of the roll; others are placed grain to grain. Smaller skins are folded. The outermost piece is covered with a protective wrapper, which is then fixed tightly with a non-damaging tape or chord. It is important that the leathers are held tight to prevent any possible movement in travel. If feasible, small leathers are packed flat onto small pallets. It is important that any packing for individual rolls is permeable to avoid moisture being trapped during the time of shipment. Cartons provide the best protection against the handling in transit, with several rolls or bundles in each carton. A container shipment with cartons of leather packed by the tannery is ideal. It is essential that there should be no risk of damage from the weather. Wet, cold and heat all affect finishes and leathers.

DESPATCH FOR SHIPMENT

The documents for shipment need to show all information to conform to the original order and the production schedule of the tannery, to allow tracing and form the basis of future orders. These details also allow the tannery to check the financial contribution made by this production lot.