LEATHER NATURALLY

MODERN COW **LEATHER PROCESSING** – Version 1.1

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WHAT IS A TANNERY?

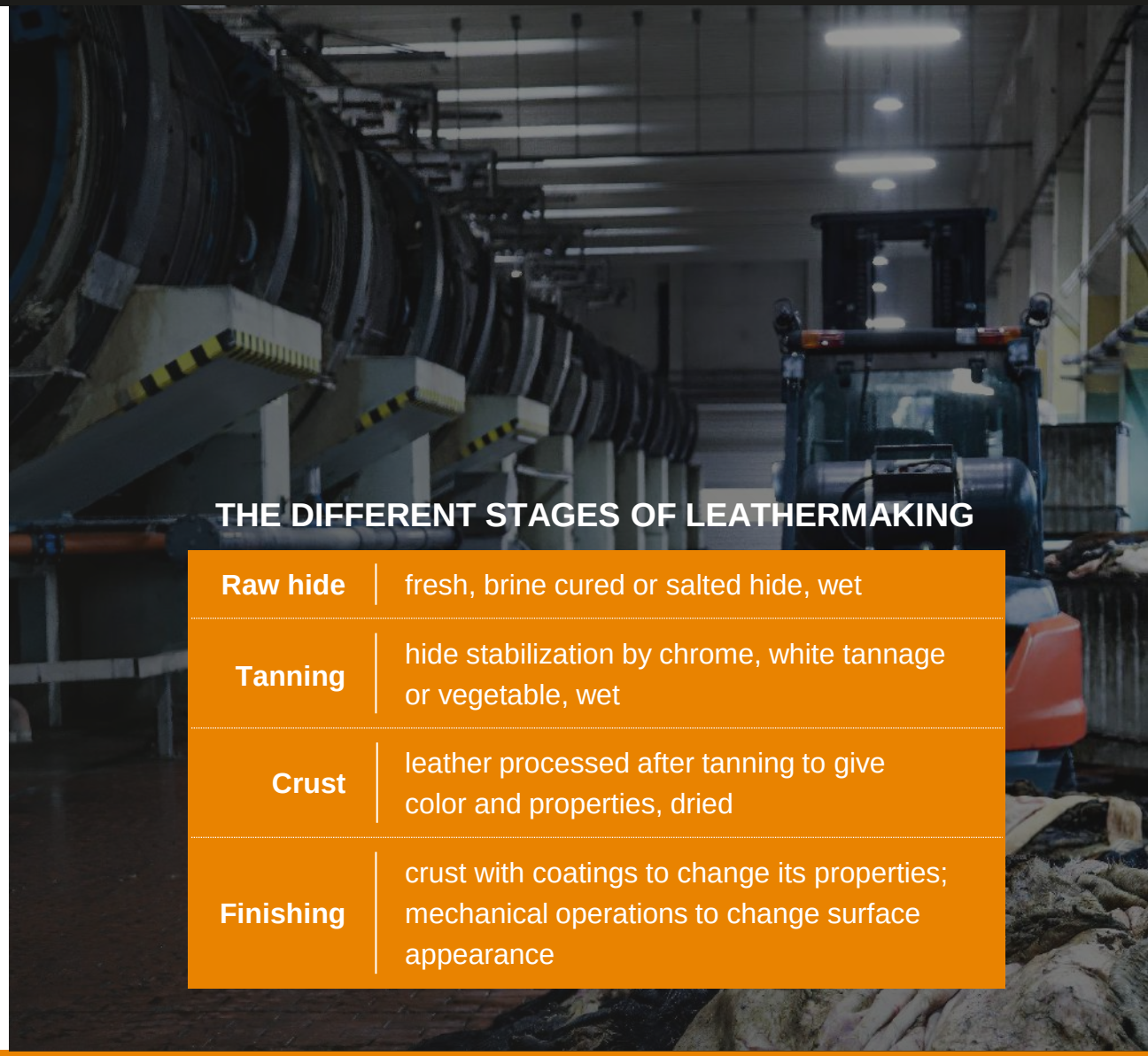
Tanneries are leather processing units that comprise chemical and mechanical processes alongside waste treatment.

Tanneries can be classified by size

- **small:** up to 500 hides/day
- **medium:** 500 to 2,000 hides/day
- **large:** more than 2,000 hides/day

Types of tannery

Complete	from raw to finishing
Tanning	from raw to tanning (also called blueing; can also be white tanning and vegetable)
Wet End	from tanned leather to crust (or to finishing)
Finishing	from crust to finishing



THE DIFFERENT STAGES OF LEATHERMAKING

Raw hide	fresh, brine cured or salted hide, wet
Tanning	hide stabilization by chrome, white tannage or vegetable, wet
Crust	leather processed after tanning to give color and properties, dried
Finishing	crust with coatings to change its properties; mechanical operations to change surface appearance

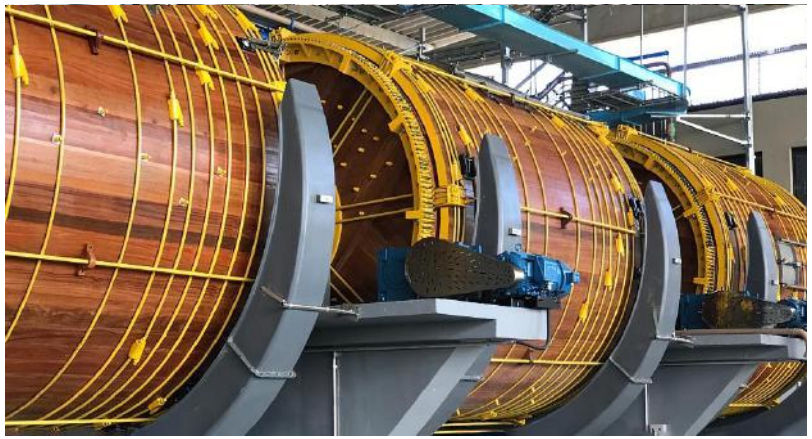
TYPE OF WORK CARRIED OUT IN A TANNERY

- **Leather processing –** conversion of hides into leather, grading, packaging and shipping
- **Product development –** new colors and leathers; fashion items and new products
- **Process optimization –** time, water, energy, chemicals and waste reduction
- **Environmental control** for liquid, solids, air
- **Safety of** equipment and of workers
- **Chemical hygiene plan**, proper chemical handling, including safety audits
- Physical and chemical **testing of leathers**
- **Maintenance of the equipment –** keeping it safe and functional
- **Production flow management –** optimization of time and resources
- **Quality control** of incoming raw materials, processes and finished products

MAIN PROCESSING EQUIPMENT

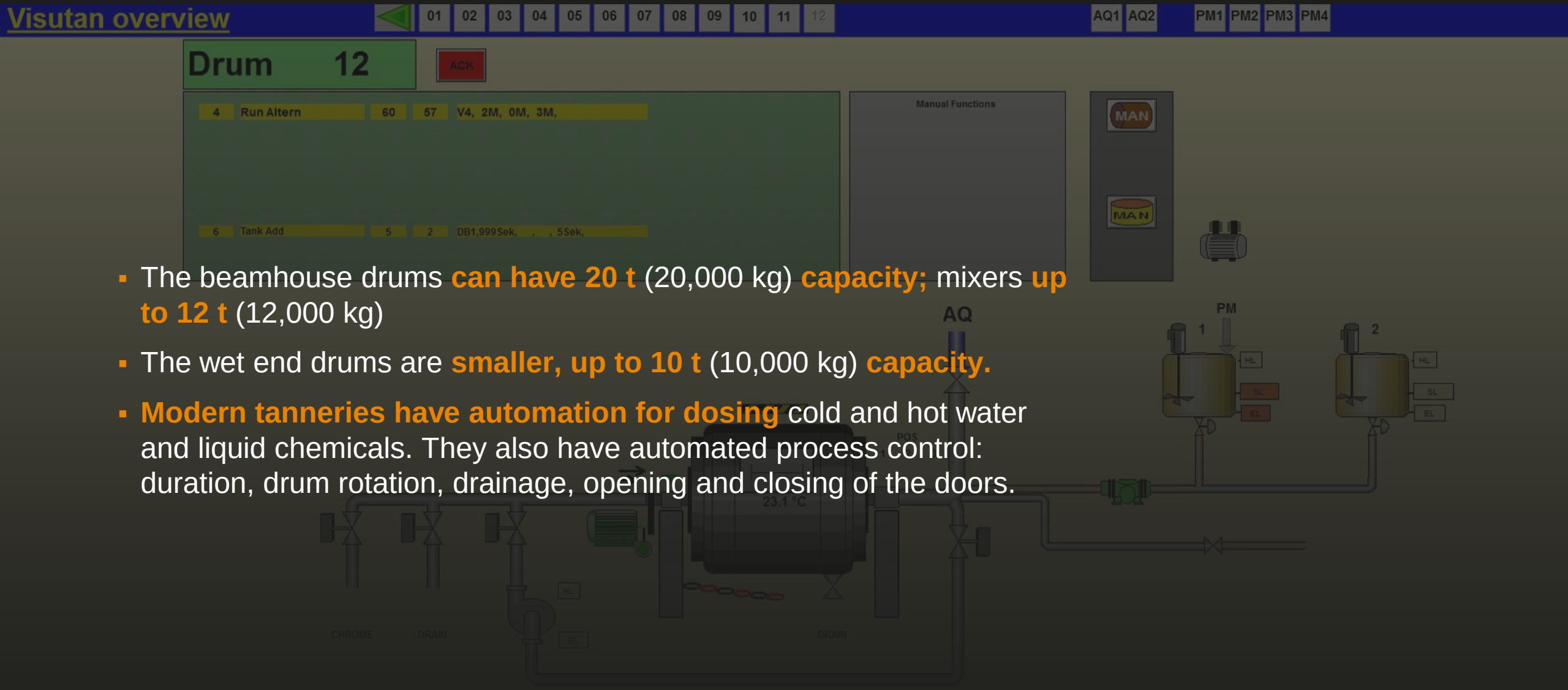
Each stage of the process that takes raw hide to crust is **done in batches. Wood and polypropylene drums** offer the mechanical action needed for the chemicals to react with the hides or leathers. **Mixers** (‘Canbar®’) **can be used in the beamhouse**

DRUMS



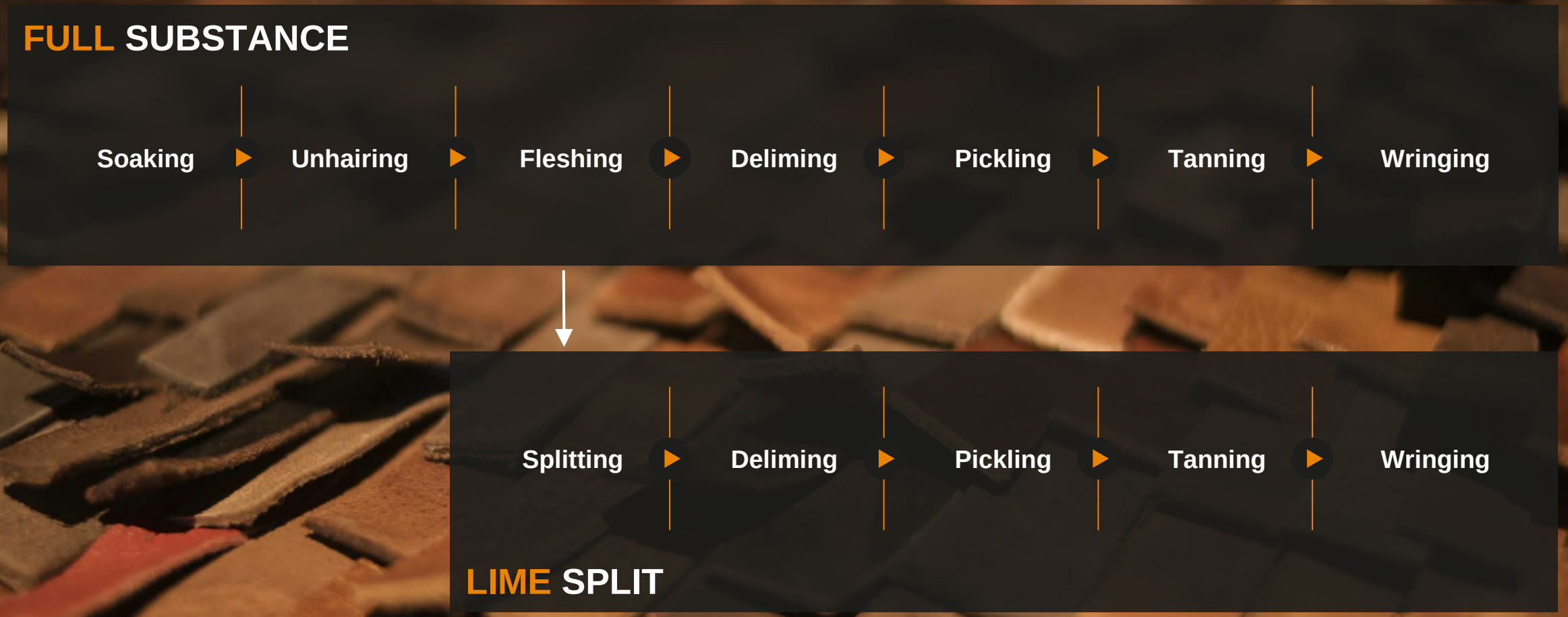
MIXER

MAIN PROCESSING EQUIPMENT
– continued



- The beamhouse drums **can have 20 t** (20,000 kg) **capacity;** mixers **up to 12 t** (12,000 kg)
- The wet end drums are **smaller, up to 10 t** (10,000 kg) **capacity.**
- **Modern tanneries have automation for dosing** cold and hot water and liquid chemicals. They also have automated process control: duration, drum rotation, drainage, opening and closing of the doors.

TYPICAL BEAMHOUSE (RAW TO TANNING) DIAGRAM



TYPICAL BEAMHOUSE (RAW TO TANNING) PROCESS

Soaking	▪ Hides are cleaned to remove dirt, some fatty materials and soluble proteins
Unhairing	▪ This procedure removes the hair and epidermis. Also called ‘Unhairing and Liming’ because lime is used
Fleshing	▪ Mechanical process to remove the endodermis and fat from the inner part of the hide. Mostly fully automated
Deliming	▪ Chemical process to remove the alkalinity and lime. Enzymes are added for softening (bating)
Pickling	▪ Salt, organic salts and acids are added to prepare the hide for tanning
Tanning	▪ Chrome, vegetable and synthetic tanning agents (eg, glutaraldehyde) are added to convert the hide to leather
Set out	▪ Automated mechanical process that removes water and adjusts leather to 50% - 60% moisture

BEAMHOUSE MACHINERY

FLESHING MACHINE

This removes the endodermis and fatty material of the hide, preparing it for the next steps.

SPLITTING MACHINE

Equipment used to split the hide into a top part (grain side) and a bottom part (flesh split). This step is either carried out after fleshing (as in the photo), or after tanning.

TYPICAL CHEMICALS USED IN THE BEAMHOUSE (RAW TO TANNING) PROCESS

Soaking	▪ Soda ash, magnesium oxide, enzymes, bactericides, wetting agents and emulsifiers
Unhairing	▪ Sodium sulfide, sodium sulfhydrate, lime, enzymes, degreasers, emulsifiers, penetrants
Fleshing	▪ Mechanical process only
Deliming	▪ Ammonium sulfate or chloride, organic acids, carbon dioxide, acid salts, degreasers and enzymes
Pickling	▪ Common salt, organic acids, sulfuric acid
Tanning	▪ Mostly chrome (III) sulfate, tannins, syntans and glutaraldehyde. Fungicides are added here to protect leather against mold
Set out	▪ Mechanical process to adjust leather moisture to 50% - 60%

MAIN TYPES OF TANNAGE AND WHAT THEY DO

Tannage is essential for stabilizing the hides. After the first and main tannage the leathers can then be re-tanned with other chemicals **to change their properties.** Chrome leathers are commonly **re-tanned with vegetable extracts**

VEGETABLE

This is the **oldest method of tanning,** dating back more than 2000 years. It uses **only natural plant extracts.** These leathers are **light brown in color** and dense, making them suitable for shoe uppers and soles, belts, handbags, watch bands, and leather goods. **They keep their shape very well** and age beautifully.

CHROME

Was developed in the 1900s. **The process uses chrome (III) salts** and produces leathers of a blue color that **can be dyed to a range of other colors. Produces soft to medium temper leathers**. Can be used for a variety of articles from garments, upholstery, shoes, handbags, to other leather goods. It is the **most common tannage,** accounting for about 80% of leather produced. The intermediate product of the leather **is called 'wet blue'.**

WHITE (chrome-free)

Most white tannage is made using a **synthetic product called glutaraldehyde**. It produces a leather that has a **light-yellow coloration.** This leather **needs to be processed further with other chemicals** like vegetable extracts, syntans, acrylics to give a **final level of finish and performance.**

CHROME TANNAGE

Chrome tannage **uses mostly** chrome (III) sulfate – the **worldwide industry standard** is a soluble green powder that contains 26% Cr_2O_3. Leather made with chrome has a distinct blue color and it **is called ‘wet blue’ during the wet stage**. Wet blue leathers can be packed wet and **stored for long periods of time, up to six months**. It is a widely traded valuable global commodity. A container can hold about 800 wet blue leathers (USA).

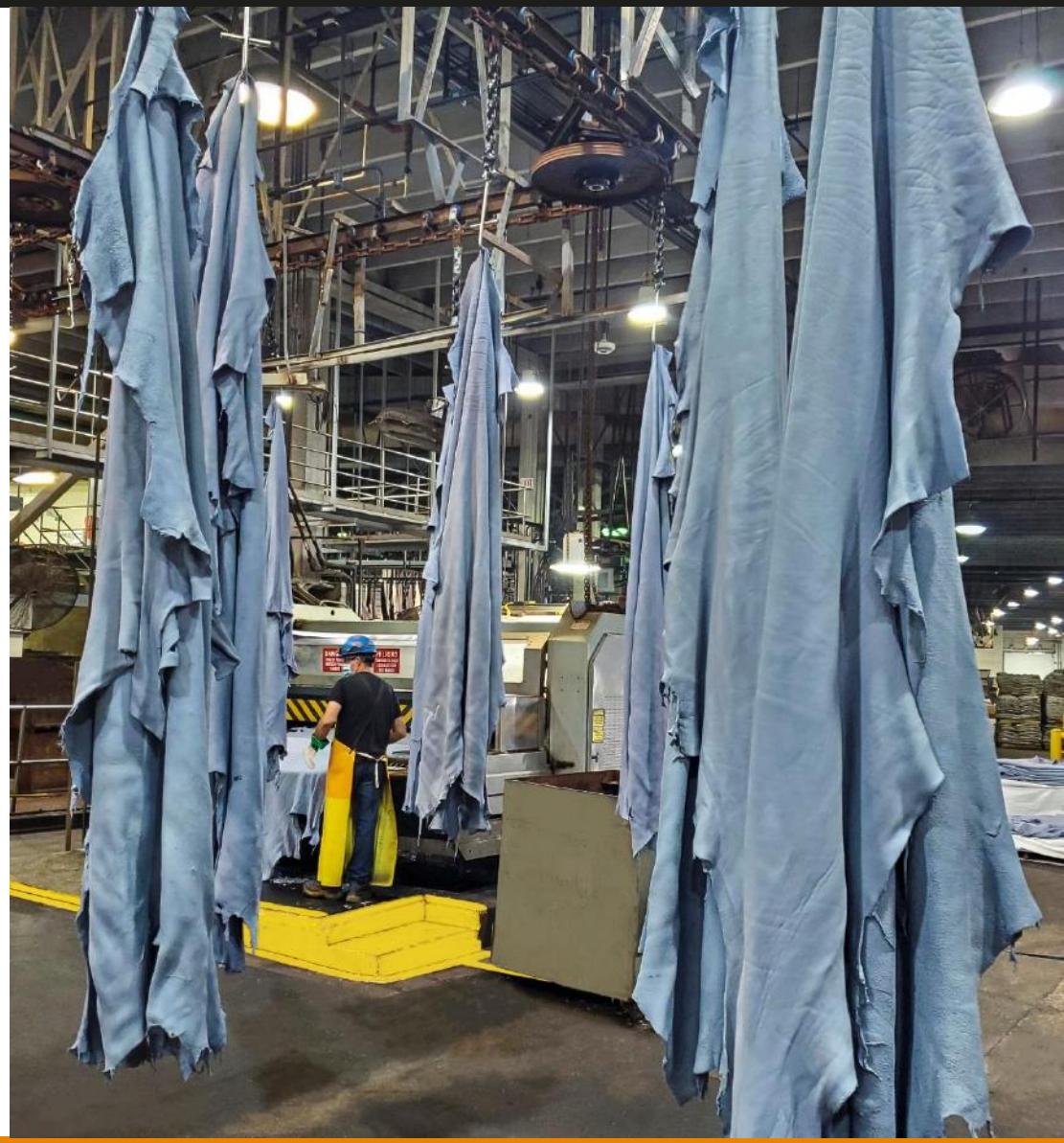
Chrome leathers **need to be stored wet**, at about 60% moisture. If it dries out it cannot be re-wetted for successful use. **Storage is important** to keep the leathers at a uniform level of moisture to **avoid staining and a dried-out surface** that will have different properties.

CHROME TANNAGE: STEP BY STEP

After liming, hides (full thickness or lime split) **are treated with chemicals** to remove the lime (deliming process), then **treated for six to eight hours with a salt + acid solution** called pickle to prepare them for tannage. Usually 6% chrome (III) sulfate is then **added for the tannage that takes eight to 12 hours.** An alkaline product is added during tanning to **increase the pH to about 3.8.** This increase in pH along with process temperature increase (up to 48°C) **will complete the tanning reaction**, optimizing the chrome fixation and reducing the **amount of chrome in the effluent.** After tanning, the chrome solution is usually **recycled to minimize waste.** The total tanning process takes 20 to 24 hours. The chrome tannage itself is **relatively simple;** the challenge is to be **uniform from batch to batch.**

When the tanning process is complete, a few pieces of leather are **removed from the batch** and put in boiling water for three minutes – **the shrinkage temperature test** that will determine if the tannage has been completed correctly. The leather should not shrink **more than 5%.** The pH is usually **between 3.6 and 3.8;** the color remains blue.

When the tanning is complete, the wet blue is dumped from the drum or mixer and **put in boxes or on a chain** that will **bring it directly to the wringer.** The wringer is a press felt machine that will **squeeze the excess water** out of the wet blue, leaving it with about 60% moisture. The leather will be flat and light blue in color, **ready for further processing or packaging.**



WET BLUE LEATHER CHARACTERISTICS

- Can be made **with lime split hides or full thickness hides**
- Can be **split after wet blue.** Grain side and split can be **sold separated**
- Can be **sold by piece** (based on type) **or by area** (m^2 or ft^2)
- It is graded after production. See our section on grading
- Sold as a **whole piece or as sides** (halves)
- **Downgraded** by natural defects, barbed wire cuts, wrinkles, fine hair, color, being misshapen, machine damage, grain damage, pigmentation
- Leather needs to be **treated with fungicide** to avoid mold growth that **will cause staining**
- **Proper packaging and storage conditions** are important to maintain the quality of the product to **avoid stains and drying**
- Typical sizes are **from 3.5 m^2 to 5 m^2 (38 ft^2 to 54 ft^2)**

VEGETABLE TANNAGE – THE ORIGINAL PROCESS

Vegetable tannage is the oldest commercial method of making leather.
Vegetable-tanned leather items have been discovered that date back 4,000 years.
Only natural plant-derived materials, extracts called 'tannins', are used for the tannage: roots, leaves, fruits, bark, wood and seeds.

The chemical components from the plant extracts are **called 'tannins'**, **natural complex chemicals** whose main function is **plant protection**. Common black tea *(Camellia sinensis)* contains tannins too; if you **use enough, it can produce leather!**

Today the majority of vegetable tannins are **extracted from cultivated plants.**

Each tannin extract has **is own properties of color, reactivity, softness, fullness, penetration, etc,** and it is usual to use them in blends to **achieve the leather properties required.**

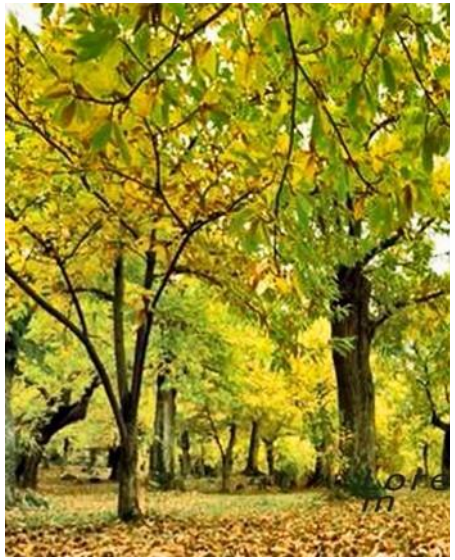
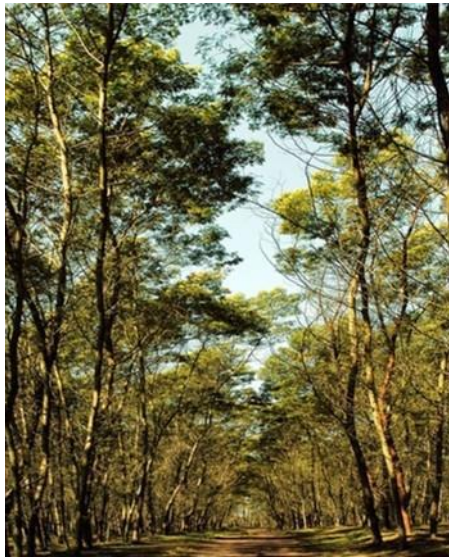
For **industrial production,** the plants are ground, and the tannins are **extracted by hot water at low pressure, concentrated and then converted into powder** (spray dried). Tara pods are **dried and ground only.** Factories are very modern and use raw materials from sustainable sources.

Typically, **the tannins react slowly with the hides** at a pH above 5. They are fixed to the hide at lower pHs of around 3.5.

For a full tannage, **about 30% of powdered tannin** (from quebracho, chestnut or wattle) is needed.

Tannins can be used as the main tanning and also the retanning agent, as we will discuss later in the Retanning slides.

MAIN SOURCES OF VEGETABLE EXTRACTS

	Chestnut *Castanea sativa*	**Mimosa** *Acacia mearnsii*	**Quebracho** *Schinopsis lorentzii*	**Tara** *Caesalpinia spinosa*
				
Plant part used	Wood	Bark	Wood	Pods
Countries	Italy (and across Europe)	Brazil, South Africa	Argentina, Bolivia, Paraguay	Peru and Bolivia

TRADITIONAL VEGETABLE TANNING IN TANKS

The oldest tanning system is these days mostly used for full thickness hides. The process consists of a **series of tanks that start with a low concentration of tannins, gradually increasing to higher concentrations.**

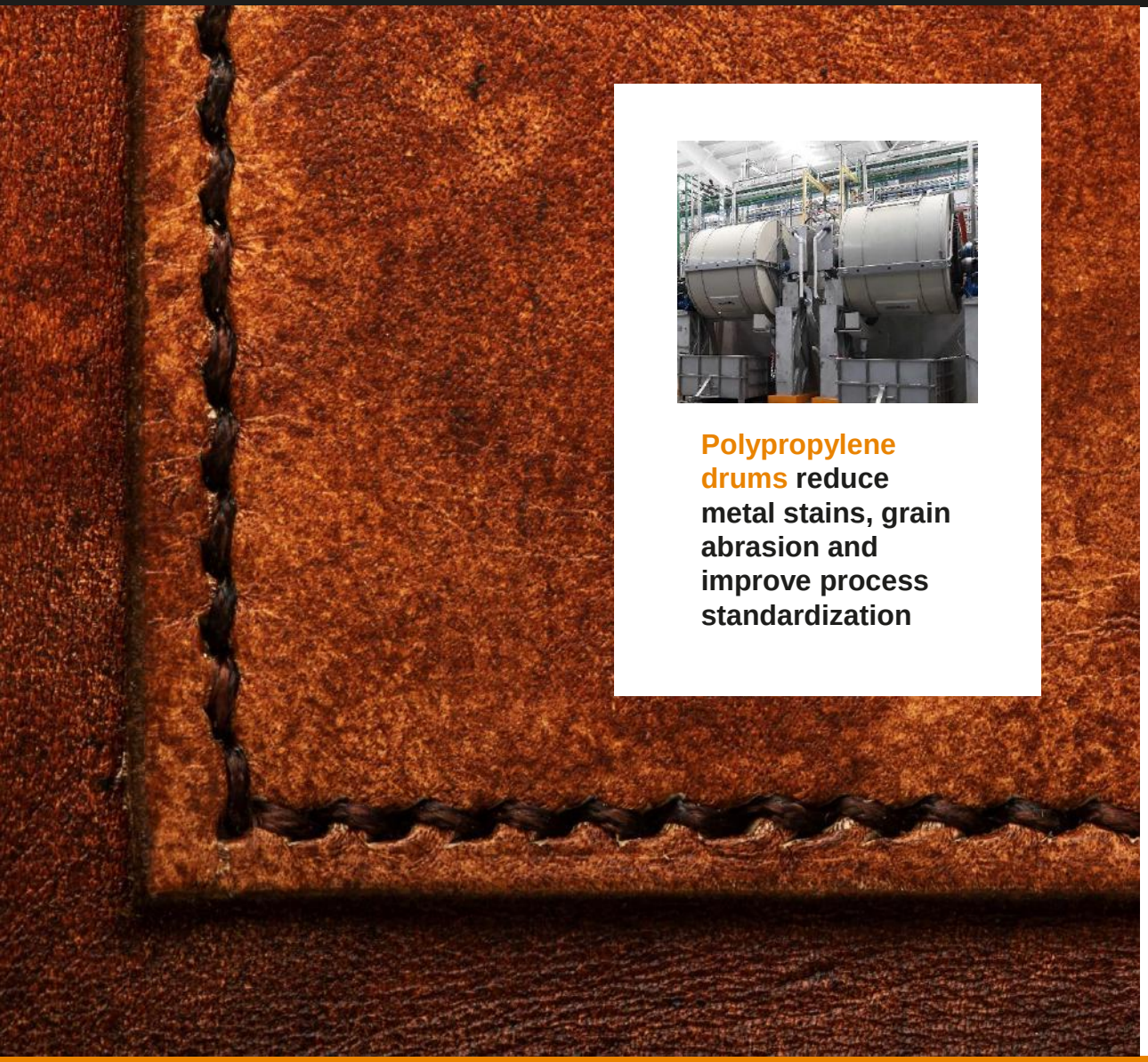
The hides are hung by the backbone to a rack (other parts of the hide can also be used for hanging them up, such as the croupon or shoulders). This **rack of hides is transferred daily** on a monorail **from one tank to the next**, which always has a higher tannin concentration. A tannery can have up to 100 tanks. Every day new hides are put in the first tanks, and leather is taken out of the last tanks. The **process from first to last tank can take between 20 to 30 days.**

Upon completion, the **leathers are washed and lubricated** with natural oils to increase their softness. If leathers are being made into shoe soles, then chemicals are added to increase density, water resistance and flexibility.

This system is still used in Italy and other parts of the world to produce the **finest leathers**. It's a process that needs daily adjustments of the tannin concentration and its pH, seemingly simple but requiring much expertise and analytical work.

Very little waste is generated by this process.

MODERN VEGETABLE TANNAGE



Polypropylene drums reduce metal stains, grain abrasion and improve process standardization

After unhairing and fleshing, sometimes splitting in full or sides, the hides are transferred to a wooden or polypropylene drum. **The first phase of this process is deliming to lower the pH and remove the lime, followed by pickling and conditioning,** that reduces the affinity of the tannins to the hide.

Tannage starts by creating a slow reaction between the tannins and the hide. This reaction allows the augmented penetration and fixation of the tannins. This process can take 24 hours for thin leathers and up to four days for sole leather. The **tanning needs to be slow** to avoid drastic reactions that can be detrimental to the finished quality.

While the tannins can be a mixture of quebracho, chestnut and wattle, other **auxiliary chemicals** such as syntans are usually used, too. This process is faster than tanks, and also yields good quality leathers.

Technology is evolving. Today, vegetable leathers can be very soft, lightweight and high performing

CHARACTERISTICS OF VEGETABLE-TANNED LEATHERS

The manufacture of vegetable-tanned leathers is more complex than for chrome leather

The **leathers produced using vegetables are usually heavier and firmer** than chrome leathers. The reaction of the vegetable extracts to the hide must be very well controlled in order to produce the proper penetration and fixation of the tannins. If the reaction of the tannins with the hide is too quick it will induce a shrunken effect in the hide, making resulting leathers non-uniform and with a pebble effect.

The tannins react with metals creating colored compounds, dyes, that are often impossible to remove. Tanneries must be well managed to avoid staining. **Drying vegetable leathers is also an art** and most of the time natural drying is used as force-dried leathers tend to break when folded. Vegetable leathers can be dyed in light colors after re-tan with syntans and are excellent used for shoes, boots, leather goods, embossing, engraving, bookbinding, saddlery and crafts.

WET WHITE TANNAGE
(chrome-free)

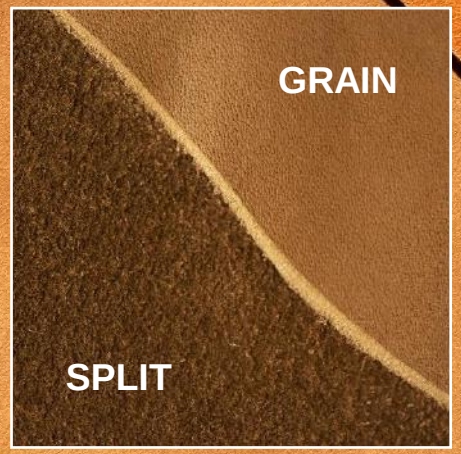
These are **alternative tannages to chrome and vegetable**. The main chemical used is glutaraldehyde; others are aluminum, zirconium, triazines, aluminum silicates and syntan-vegetable. **Metal-free leathers as defined in EN 15987** are required to have **less than 1000 ppm total metals** (Cr, Al, Ti, Zr and Fe). The main objective of this tannage is to achieve enough thermal stability to be able to shave the leather. It is not a true tannage, and the process **needs completing with a heavy re-tannage.** These leathers are **more expensive than chrome-tanned examples.** In terms of waste and recycling this tannage has the advantage since there are no risks of waste converting into chrome (VI), while chrome is not a renewable material.

The main use of wet white is in the automotive industry, where leathers can be used in parts of the car that require thermal stability, mainly for dashboards and seats

DIFFERENT TANNAGE PROPERTIES

	CHROME	VEGETABLE	WET WHITE
Color of the intermediate	Blue	Light brown	Light yellow
Lightfastness	Excellent	Good/Fair	Good
Temper (softness)	Soft to medium	Medium to firm	Medium
Print retention	Poor	Excellent	Good
Versatility	Excellent	Good	Good
Waterproofness	Possible	Fair	Fair
Elongation	Good	Fair	Fair
Mechanical properties	Excellent	Excellent	Good
Soil resistance	Excellent	Good	Good
Washability	Yes	No	No

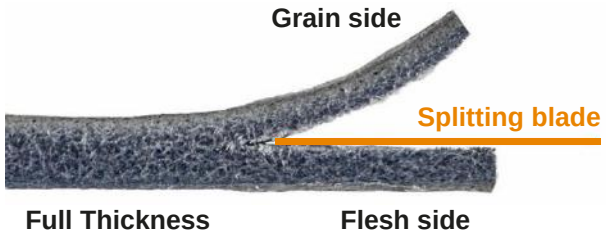
HOW DO WE MAKE LEATHER SO THIN?



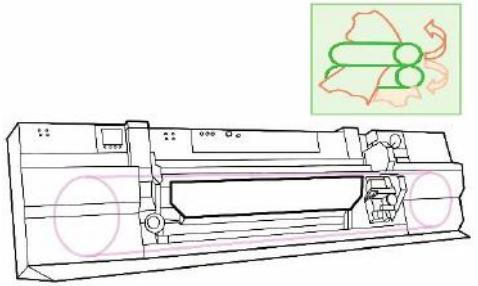
The hide (or leather) in the wet stage can be split horizontally after hair removal or tanning **by a large ‘splitting machine’** making two uniform slices.

The **top side** is called **‘grain side’** and the **bottom part** is called **‘split’ or ‘flesh side’**. The grain side is the most used, to make **full grain leathers**. The flesh side can be finished or used as **suede leather.**

Diagram of leather splitting



Splitting machine



MEASURING THICKNESS

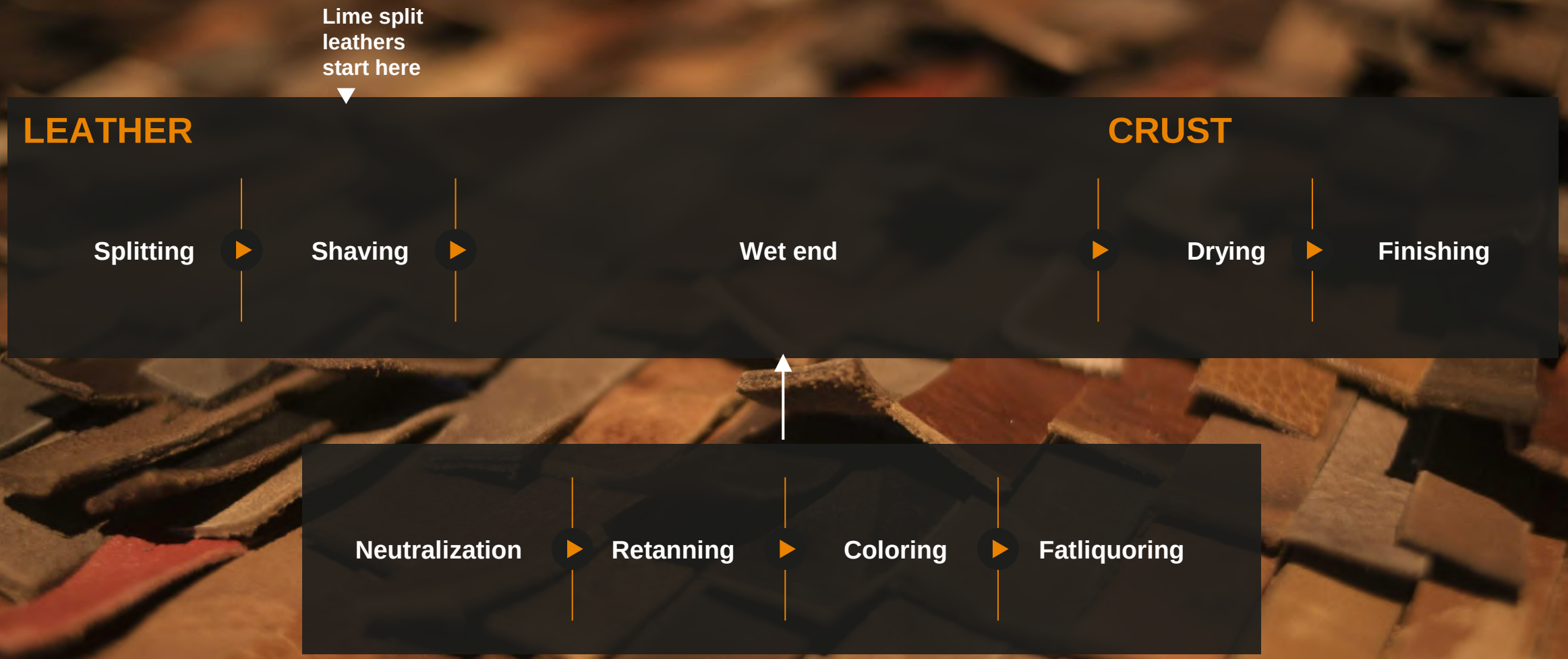
The millimeter (mm) is the most common thickness unit for leather.
Leather thicknesses usually have a range of 0.2 mm, for example:
1.1 to 1.3 mm, 1.2-1.4 mm; 1.4-1.6 mm; 1.6-1.8 mm; 1.8-2.0 mm, and so on.

The splitting process reduces the thickness. The shaving machine is used to uniformize leather thickness at the wet blue, vegetable or wet white (as in our photo) stage. Manual or automated thickness meters are used. They can be used as stand-alone instruments or be wireless or cloud-connected devices.

EXAMPLE OF OTHER LEATHER THICKNESS UNITS

LETTER	OUNCE	INCHES	MILLIMETERS
	1	1/64”	0.40
LL	2	1/32”	0.80
LM	3	3/64”	1.20
HM	4	1/16”	1.60
HH	5	5/64”	2.00
HHH	6	3/32”	2.40

TYPICAL FLOW DIAGRAM OF WET END



PROCESS FROM WET END TO FINISHING

Splitting	▪ Mechanical operation to slice the leather into grain and split parts
Shaving	▪ Mechanical operation to uniformize the thickness of the leather
Neutralization	▪ Chemical step to reduce the leather acidity in preparation for retanning
Retanning	▪ Natural and synthetic chemicals are added to improve/add leather properties
Dyeing	▪ Dyes are added to give color to the leather
Fatliquoring	▪ Oils and waxes are added for softening and lubrication
Drying	▪ Natural or forced drying, these days using advanced machinery
Finishing	▪ This is the process of converting the crust leather to finished leather

WET END PROCESSES

Wet end operations are **chemical and physical processes** that convert the wet blue (or wet white or vegetable) to crust, which is the dried leather. The typical steps are listed, and **chemicals need to be properly selected and balanced** to achieve the desired properties such as color, temper, elasticity, water repellency and softness; preparing leather for finishing

WASHING

With water, **degreaser and acid to uniformize the pH**, moisture and remove salts and natural fat. **Prepares the leather for the next steps.**

NEUTRALIZATION (Deacidification)

Made with alkaline salts and water to increase the leather pH and prepare for subsequent steps.

RETANNING

Chemicals are added to bond to the leather structure **to give properties of fullness, shape, color uniformity, temper, softness and stand.** Phenolic, naphthalene, melamine condensate products are widely used (syntans), as well as acrylic solutions, natural vegetable extracts, polymers and biopolymers. Metal salts of chromium III, aluminum and zirconium can be used too.

DYEING

Dyes are added to give color and color uniformity to the leather. The dyes used are **mostly acid dyes and metal complex dyes.** Proper selection of dyes is an art, made by a professional called the **Color Matcher.** The dyeing can be superficial or struck through.

WET END – continued

FATLIQUORING

Oil emulsions are added to **improve the softness and mechanical properties of the leather.** It is very common to use a mixture of different products to **achieve the properties required.** Shoe upper leathers may have **from 6% to 15% of solvent extractable materials** (oils); **upholstery leathers may have 20%.** The oils can be of **vegetable origin** (soy, rice, cotton, canola, coconut, etc.), **animal** (fish, tallow, lard) or **synthetic** (oil based and chemically modified). New polymeric materials have the **properties of both retanning and fatliquoring,** and their use is increasing.

DRYING

Drying is **one of the most important physical steps** in leather production. The leather after wet end carries **almost 100% of its weight in water** and needs to be **reduced to 12-14%,** which is the typical moisture in crust and finished product. The drying starts with **setting out the leather,** a mechanical operation where **leather is squeezed** through rolls and a rotating blade to **reduce moisture and stretch the leather** before drying. The most common **methods of drying** are: air, toggling, vacuum, low temperature drying, tunnel. The slow process of air drying **makes the leather softer and very natural. New technologies have been developed** to improve the efficiency and uniformity of drying.

CHEMICALS COMMONLY USED IN THE WET END

Neutralization	▪ Organic and inorganic alkaline salts
Retanning	▪ Vegetable tannins, phenolic, naphtalenic and melamine resins, acrylic resins, biopolymers, fillers
Dyeing	▪ Mostly acid and metal complex dyes, synthetic
Fatliquoring	▪ Natural and synthetic oils and waxes. They are mostly chemically modified (sulfonation) so they can be emulsified in water

THE CHANGING APPEARANCE OF LEATHER
as it goes through the wet end

WASHING

Cleans the tanned leather intermediate (wet white, wet blue), uniformizes the moisture and pH, removes some natural fats and salts

NEUTRALIZATION

Reduces the leather's acidity and prepares it for retanning: **1 to 3% of chemicals are added here.**

Percentages are based on the shaved weight of the leather

RETANNING

A combination of retanning chemicals is added to **transform the leather's properties.** Typically, 10 to 30% chemicals are added at this stage

COLORING

Dyes are used **to give color.** Usually a **mixture of dyes** is used to **give the color.** A typical amount is from 0.5 to 4%

FATLIQUORING

Mixtures of **natural and/or synthetic oils and waxes** are added to **soften the leather.** Usually, the amount is between 6 and 20%

WET END MACHINERY

SET OUT

Wrings excess moisture from wet leather, reducing it to 50-60% and preparing the leather for splitting (Photo: vegetable leather).

SPLITTING

This machine is used to divide the leather into two layers, to separate the grain from the split (not used if leather is lime split).

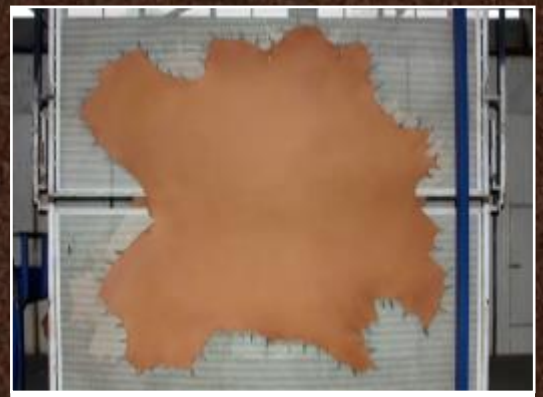
SHAVING

This makes the leather thickness uniform by shaving any excess away on the flesh side.

SAMMYING

The machine opens the leather after wet end processes and removes excess moisture, preparing it for the drying stages.

TYPICAL LEATHER DRYING METHODS



TOGGLE

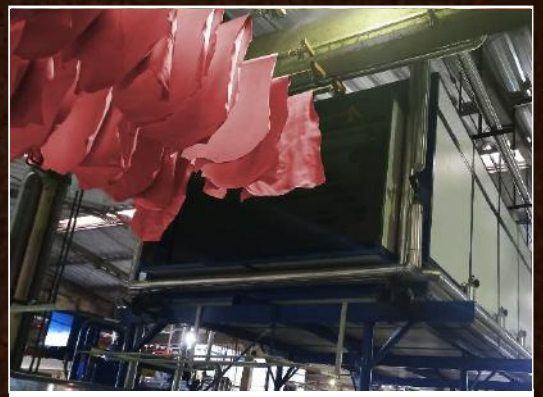
Leather is hooked in a perforated screen that stretches to increase area. The screens are put on an oven for uniform drying

AIR DRYING

Leathers are hung on moving racks below the tannery roof, providing the most natural form of drying

VACUUM DRYER

Leather is stretched over a hot plate in a vacuum chamber and the water vapor is sucked out



OVEN DRYING

Leathers are hung up on racks as they are for air drying, and these racks go inside a hot air tunnel for forced – and quick – drying

TYPICAL FINISHING FLOW DIAGRAMS (UPHOLSTERY, SHOES AND LEATHER GOODS)

CORRECTED GRAIN FINISHED

Softening ▶ Buffing ▶ Basecoat ▶ Middle coat ▶ Topcoat ▶ Emboss ▶ Dry mill ▶ Toggle

FULL GRAIN FINISHED

Softening ▶ Basecoat ▶ Middle coat ▶ Topcoat ▶ Plate ▶ Dry mill ▶ Toggle

FULL GRAIN SEMI-ANILINE FINISHED

Softening ▶ Aniline coat ▶ Middle coat ▶ Topcoat ▶ Plate

CHEMICALS COMMONLY USED FOR FINISHING

Auxiliaries	▪ Surfactants, oil and wax emulsions, solvents, silicones. In some leathers. Oils and waxes can be used alone, without binders
Fillers	▪ Clays, silicas, organic polymer particles for filling or dulling
Pigments	▪ Organic and inorganic pigment dispersions, finely ground
Dyes	▪ Metal complex dye solutions
Binders	▪ Acrylic and PU (polyurethane) emulsions producing soft to hard films, natural proteins (eg, casein) and modified natural cellulose

FINISHING

THE MAIN STEPS

BUFFING (Sanding)

Like wood, leather can be sanded with different grades of sandpaper t**o create different superficial textures.** The degree of buffing can be minimal with fine paper **to reduce surface imperfections or deep,** where a strong buffing with coarse paper produces a nap effect, found in nubucks and suede.

OILING AND WAXING

Oils and waxes can be **applied alone or combined.** It is usual to apply it **hot to one or both sides of the leather using a roll coater.** The oils and waxes can add softness, color, feel, pull up effect and waterproofness to the leather. Oiled or waxed leathers can also take film forming treatments as an additional coating.

Here we have a **great variety of mechanical and chemical steps** applied to the crust to make the leather ready for use. Finishing is a **blend of artistry, chemistry and great skill.** The process adds protection, color, gloss, texture, feel and appearance to the leather

FINISHING
– continued

COATINGS

Leathers can have one or multiple coatings, depending on the properties required. **Most of the time the coatings are film forming;** typically, leathers have a pigmented base coat and intermediate coat and a transparent topcoat. **Oil and wax** coatings are not film forming.

Coatings are applied by spray, roll coaters and paper transfer and are mostly water based.

Most of the finishes are made with binders (acrylic or PU emulsions); these can be soft, medium hard and hard. Protection is built up in layers, starting with **soft coats for elasticity** and ending up with **a final hard topcoat**.

THE BASIC COATING COMPONENTS ARE WATER-BASED

Film-forming products

Binders: acrylic and polyurethane water emulsions

Pigments

Very finely ground colored solid particles

Inerts

Fillers and dullers used to modify the film, particularly the gloss

Softening agents

Oils and/or wax emulsions that soften the film and improve its elasticity

Feel modifiers

Additives that enhance the leathers' haptic properties

FINISHING
– continued

Dyes

Change the color of the leather, improving uniformity

Crosslinkers

Additives that react with the film forming products increasing the physical properties of the films

Solvents

Most of the coatings are made with water, but small amounts of solvent can be added to promote adhesion, penetration and compatibility

MECHANICAL OPERATIONS

These operations are part of the finishing process, and their **aim is to improve surface properties.** They can help produce a very smooth or a deep textured leather. **Typical processes are plating and embossing;** these are carried out either continuously with a roll plater or individually using a plating machine.

MILLING

Leathers can be further softened by putting them to be tumbled in **a dry drum.** Water and chemicals can be **added to create additional effects.**

STAKING

During this stage, the **leather moves through a continuous machine that has moving pins.** As these pins go up and down, they pummel and press the leather, so it is softened and flattened. The pressure applied through the pins can be **adjusted for each type of leather.**

COATINGS APPLICATION EQUIPMENT – SPRAYS

SPRAY MACHINES

Water- and solvent-based finishes are sprayed on to the surface of the leather, then dried. Machines are designed for high throughput while minimizing energy use and emissions.

Spray machines can be assembled in tandem with driers to maximize their efficiency, versatility and productivity.

SPRAY GUNS

High tech devices that work together with sophisticated sensors to read the leather's shape correctly and trigger the guns to go on/off, minimizing waste and optimizing uniformity.

Systems may have up to 24 guns. They need to be calibrated and cleaned to maintain their performance.

COATINGS APPLICATION EQUIPMENT – ROLL COATERS

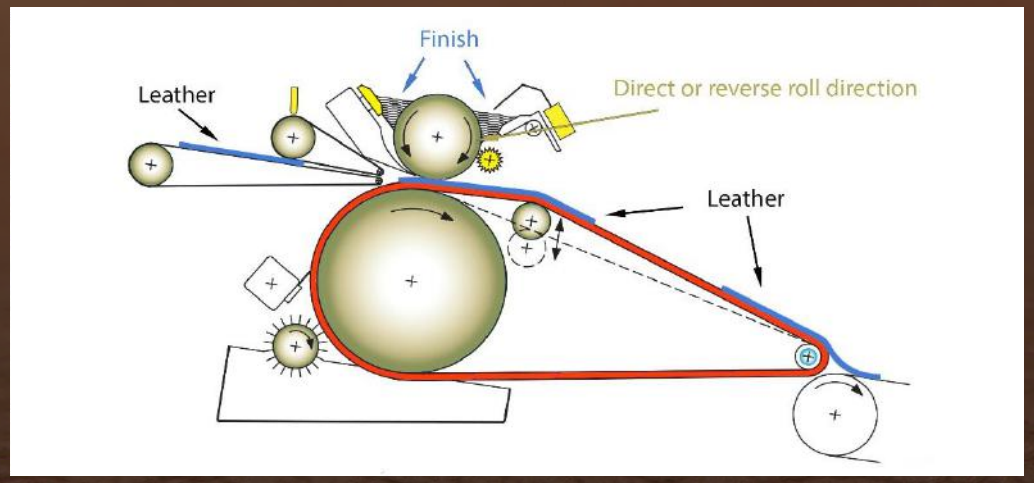
ROLL COATERS

Water-based finishes, melted waxes and oils are applied through engraved rolls with designs that allow light or heavy deposition. Waxes and oils can be heated to speed up absorption and improve distribution uniformity.

Two full size roll coaters working in tandem. Operators can feed in two sides or one full-sized leather at a time.

ENGRAVED ROLLS

Engraved rolls are engineered to produce a uniform finish distribution on the leather and to minimize waste. Depending on the roll, it's possible to engrave from light to heavy finish depositions. Finish effects are also possible with design rolls.

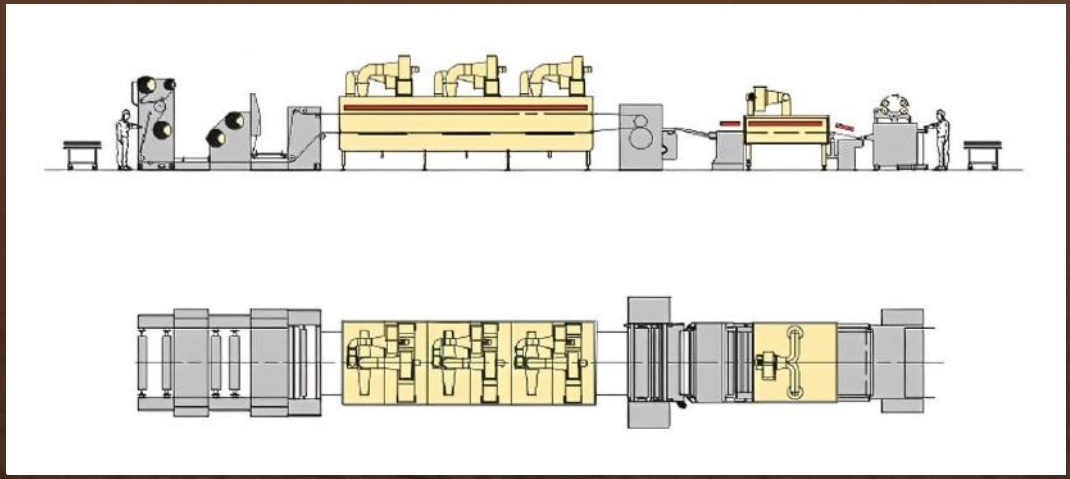


Rolls can run in reverse for heavier depositions or directly for lighter depositions or effects.

COATINGS APPLICATION EQUIPMENT – PAPER TRANSFER MACHINES

PAPER TRANSFER MACHINES

An adhesive is roll coated to the leather; a release paper is roll coated with finish. The leather is pressed to the coated release paper to transfer the finish. After drying the leather is peeled off the paper release, leaving the finish in place.



This method produces uniform leathers with excellent mechanical properties, with little waste and low labor input.

RELEASE PAPER

Release paper can be smooth or textured to simulate leather or additional effects. The leather can be released from the paper manually or automatically. For re-use, the finish is removed mechanically from the areas without leather.

The release papers can be used 20 to 40 times in this rapidly advancing technology.

OTHER FINISHING MACHINES

STAKING *(Molisa™)*

Softens the leather by moving the leather continuously through vibrating pins.

MILLING

Is another way to soften the leather by tumbling it in dry drums. Water and chemicals can be added to produce further effects on the leather.

BUFFING

Is the superficial sanding of the leather to uniformize the surface, reduce defects and create effects.

EMBOSSING OR PLATING

Is used to smooth the leather, or create textures by embossing it. Deep embossing effects are possible with this machine.

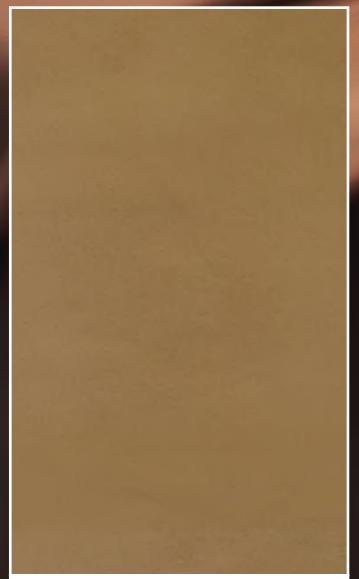
ROLL PRESS

Is a continuous machine that smooths the leather surface and can create light textures, gloss or embossing.

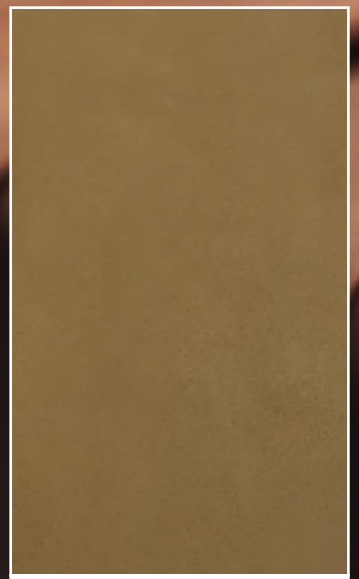
MEASURING MACHINE

Is an electronic device that measures the area of each piece and stamps the measurement on the back of the leather.

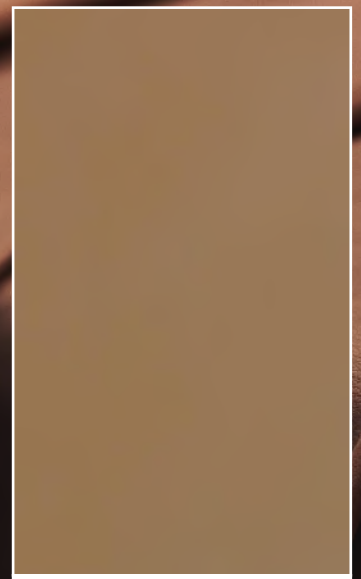
HOW DIFFERENT STAGES OF FINISHING APPEAR
from crust to topcoat



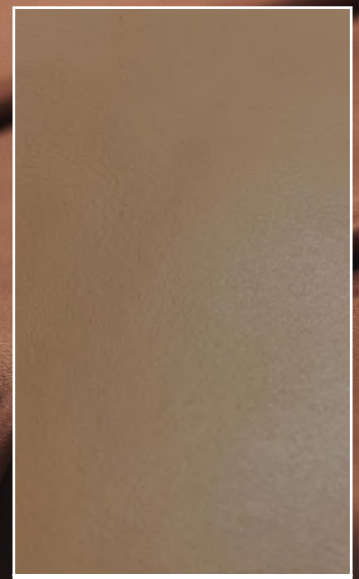
CRUST AFTER SANDING



DYE STAIN



SEALER COAT



BASECOAT

EMBOSSING

GLOSSY TOPCOAT

TYPES OF FINISHES

DIFFERENCE BETWEEN DYE AND PIGMENT

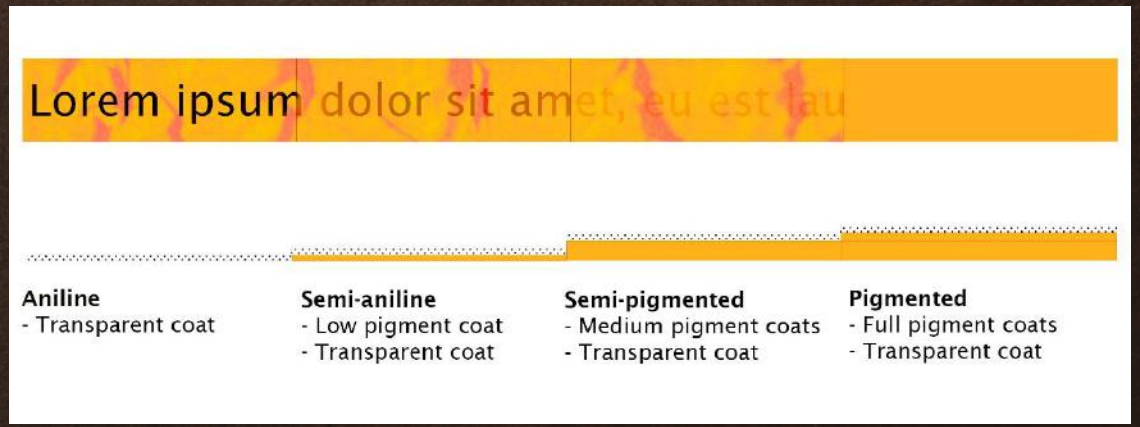
Lorem DYE

(soluble in water or solvent, transparent)

Ip m PIGMENT

(insoluble particles dispersed in water, non-transparent)

BASIC TYPES OF FINISHES (REPRESENTATION)



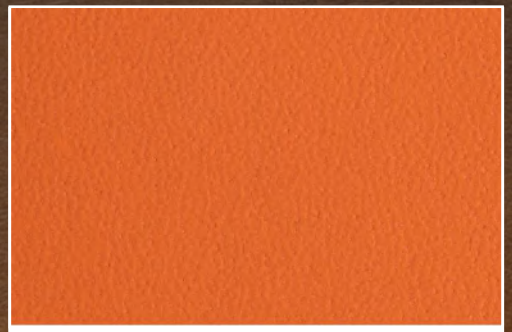
THE MAIN FINISHED LEATHER TYPES

ANILINE

These leathers require the best grades and are the most expensive. They look very natural; dyes can be applied alone or with a transparent finish that may include oil and waxes. In the best examples all leather pores are visible. This leather type must not be sanded

SEMI-ANILINE

Small amounts of pigments are added to the coating, reducing the transparency and uniformizing the leather to improving the cutting yield. These leathers are still high value and can be used in very expensive leather articles. The leather pores are still visible



SEMI-PIGMENTED

More pigments are added to the coatings to improve the uniformity. The leather pores are less visible, and quality is still high

PIGMENTED

Additional pigment coats are applied to the leather and pores are not visible. Stamps can give effects to simulate pores or other textures. These leathers have much better cutting yield and are still valuable. Many automotive leathers come from this category

Note: Crust type and quality, thickness, finish and mechanical operations dictate the price of the finished product. All these types can produce outstanding quality, high value leathers

EMBOSSING EFFECTS
– creating textures

THANK YOU FOR YOUR ATTENTION