

ecodefating

LIFE PROJECT – ECODEFATTING LIFE13 ENV/IT/00470

“Environmentally friendly natural products instead of chemical products in the degreasing phase of the tanning cycle”

DELIVERABLE - ACTION C.6 Report on quality monitoring of ECODEFATTING leather products



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2. List of abbreviations, acronyms and symbols

°C	Celsius degree
pH	Hydrogenionic concentration
%	percentage
K	1000
milli-	10⁻³
mm	millimetre(s)
N	Newton
N/mm ²	Newton per square millimeter

3. Introduction

This report concerns with an overview of leather goods manufacturing, linking the quality of the leather material with the characteristics of some of the production lines. Generally, leather goods prevail in clothing and accessories, that range from the “pret a porter” area to that of big leather firms: therefore, the leather market is accessible to any type of customer paying attention either at the price of purchase, or at the quality of the material or both. Anyhow, the general requirements for good organoleptic properties such as touch and grain firmness, as well as good physical properties, impact on leather goods manufacturing: particularly, when the flat surface of the leather has to be adapted to mechanical dies. In the Ecodefatting project, leather from bovine hides was the main material used to accomplish bags and wallets. Leather from sheep and pig skin was mainly employed in the manufacture of different type of shoes.

4. The importance of defatting in hide/skin processing

In the majority of cases when bovine and equine hides are to be processed, salt cured raw hides are purchased from slaughterhouses. The defatting is normally carried out in the delimiting stage, where the defatting product (or formulation) is employed at high pH value of the defatting bath, to better extract and emulsify the fat content from the protein matrix of the hides. These become smooth and soft and also, possess a percentage of water, which can be adjusted according to the desired type of final leather. At this stage an experienced tanner is capable of recognizing already a good hide material from that inefficiently processed. In this particular case, the defatting operation can be performed again, until tanner’s judgement allows the material to progress further. Then tanners usually treat the hides with a pickling composition and a pre-tanning agent, to assure the stability in the medium term. Also, this procedure allows tanner to refine the hides-almost-leathers through fleshing and bring them up to the desired thickness with specifically engineered cutting machines. This operation is convenient, since it allows to maximize the use of the tanning agent in the subsequent step, without wasting any precious product for tanning as in the case of the reasonably priced extracts from Quebracho, Chestnut and Acacia trees. Obviously, if defatting were not up to tanner expectations, the tanning procedure would give out poor quality leather: not only in terms of unsatisfactory physical properties, but also in terms of bad appearance. In this case, the most common issues are related to fatty spews (white, crystalline coating or light film) fat stains (oily dark-coloured irregular stains occurring in particular for sheep and lamb leather) fat grooves (parallel strips of from the back towards the flanks of sheep leather) and fat soaps (heavy staining due to the reaction of natural fat react with salts of metal elements).

Formulation EDF20 proved efficient at semi- and pre-industrial level, also on different types of hides and skins and in different percentages of use. The material from every work demonstration was carried forward to the final leather product, involving the final stages of fatliquoring and dyeing, to obtain a marketable product (**Figure 4.1**).

Figure 4.1 a) and b) equine leather; c) bovine leather; d) sheep and lamb leather



None of the above drawbacks were recorded for organoleptic properties and appearance of the material. Also, the physical properties were in line with the expectations and assured the accomplishment of the final leather goods, as acknowledged by the skilled people in the art of leather goods manufacturing (**Table 4.1** and **Table 4.2**).

Table 4.1 Characterization of leathers after vegetable tanning

		Bovine		Equine		
		EDF20	Commercial	EDF20	Commercial	
UNI EN ISO 2589:2006	Average thickness (mm)	1.7	2.5	1.9	2.0	
UNI EN ISO 3380:2006	Shrinkage temperature (°C)	75	74	75	75	
UNI EN ISO 3376:2012	Traction (N/mm ²)					
		Parallel	18.9	14	22.4	22.4
		Perpendicular	34.2	12.6	34.3	25.3
	Distension (%)					
		Parallel	58	50	69	43
		Perpendicular	49	49	40	39
UNI 11308:2008 ISO-3379:1976	Cracking					
		Distension (mm)	8.5	6.9	7.5	8.2
		Load (N)	786	570	731	464
	Breaking					
		Distension (mm)	8.5	7.6	7.8	7.4
		Load (N)	786	665	774	652
UNI EN ISO 5402-1:2012	Dry (50K) Wet (20K)	Parallel Perpendicular	pass	pass	pass	pass

Table 4.2 Characterization of leathers after chrome tanning

Leather type	EDF20	Tear strength (N)	Tensile strength (N/mm ²)	Elongation at break (%)
Sheep-skin	2	61.1	15.4	65.0
	3	59.4	15.9	63.0
	4	62.5	16.3	67.0
	5	63.0	15.7	71.0
Pig-skin	4	63.0	9.7	41.0
	6	65.0	8.2	46.0
<i>Recommended values</i>		<i>> 30.0</i>	<i>> 8.0</i>	<i>40.0 – 85.0</i>
Cow-hide	4	86.0	24.5	75.0
	6	81.5	22.5	72.5
Calf hide	4	92,9	24,3	76,0
<i>Recommended values</i>		<i>> 50</i>	<i>> 15</i>	<i>40.0 – 85.0</i>

5. Leather goods production

5.1. Bags and wallets

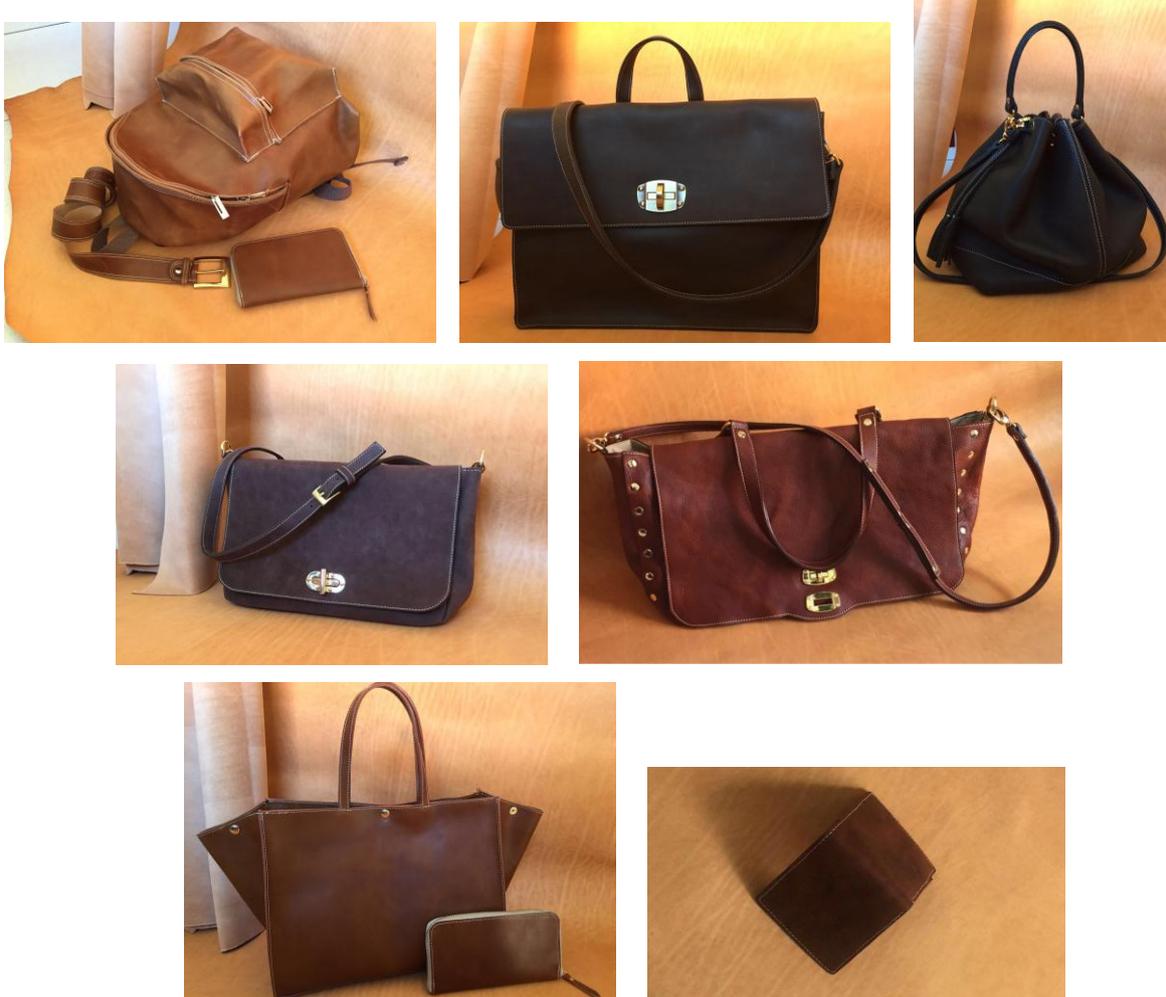
Cutting and sewing are the two most prominent activities and the operator should be allowed to handle good quality material, to minimize the leather waste, which cannot be recovered for further products. During cutting, the knife should split the material in a tidy fashion. This allows the refinement of the cut edge and avoids the formation of rips, that may appear due to unwanted rubbing or scratching actions. The operator should feel a hard material when the knife goes deep into the leather thickness, which results too soft and with a tendency to behave like a gum in the case of poor tanning, in turn from a poor defatting. Accordingly, the sewing is even more critical, since the operation is done mechanically with little manual control by the operator (**Figure 5.1.1**).

Figure 5.1.1 Manufacturing: cutting and sewing



The importance of the physical properties is reflected by the different types of models: not only in terms of shape, but also in terms of the applied refining, which comes up after the dyeing phase (**Figure 5.1.2**).

Figure 5.1.2 Bags and wallets



5.2. Shoes

The technical validation of the leathers defatted with a combination of products derived from natural sources was also achieved in the manufacture of footwear. A Spanish footwear company used the leather from sheep and pig skin processing, to manufacture different styles of footwear. After that, several meetings were held with footwear companies, to collect information about the performance of these leathers in the production of footwear.

The main issues, that may be caused by the use of this type of defatting products, could be associated to the wrong joining of the leather upper to the sole. The joining operation can be carried out by injection, vulcanisation, cementing or sewing, the latter being the least risky one. Four different footwear types were produced: injected outer soles, vulcanized sole, glued soles and stitched soles (**Figure 5.2.1**).

Figure 5.2.1 Shoes with injected sole.



Shoes with vulcanized soles.



Shoes with glued soles.



Shoes with stitched soles.



Inescop has been in contact with the footwear company, to receive feedback, identify strong/weak points in the production of shoes when using hides defatted with EDF20 and highlight potential problems or positive consequences. This was aimed to collect information in the different stages of the footwear manufacturing process. More specifically, this was aimed to identify possible differences between the use of this defatting product and other commercial products of synthetic origin, along with any subsequent modifications in the production process. The results of these manufacturing tests and the appearance of the footwear goods proved the satisfaction of the company, using the leather from hide processing with EDF20 to obtain these shoe prototypes. Likewise, the manufacturing process was carried out without any particular concern or necessity to modify any particular procedure. No differences were observed in the processes or in the final appearance of the models produced (**Figure 5.2.2** and **Figure 5.2.3**).

Figure 5.2.2 Shoe making: stitching and sewing



Figure 5.2.3 Shoe making: sample ready for injection, vulcanized, glued or sewing



A particular note was drawn up for the models coming from the vulcanization, since the leather material was not affected by the high temperature procedure (120-135°C) which allowed the joining between leather and rubber. Although the shrink temperature of the leather was around 90°C, the short time required for vulcanization and the limited area of the leather subjected to it were not critical for the overall quality of the material (Figure 5.2.4).

Figure 5.2.4 Shoe making: vulcanization and vulcanized shoe



Similar considerations applied for the glued model, although the leather was resistant to the chemical nature of the glue formulation. In this case the good level of flexibility as demonstrated by the relative validation test in dry and wet condition assured the consistency of the leather grain and therefore, the firmness of the material (Figure 5.2.5).

Figure 5.2.5 Shoe making: brushing and gluing



6. Conclusions

The production of leather goods with different types of hides defatted with EDF20 showed that the manufacturing processes could be carried out as usual and no differences were observed during the work operation of leather specimen assembling. The hides performed well throughout the various process stages and the final appearance of the models and articles resembles the quality of the leather specimens obtained in the tanneries. The goods manufactured proved the satisfaction of the companies. According to manufacturers' experience, the leather materials were compatible with the cutting, sewing, stitching, gluing and vulcanizing operations. Therefore, it can be said that the products obtained so far and shown in this report, are ready for the market.