“LAYMAN” RELEASE REPORT

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“Demonstration plant for the recycling of fat produced by processes of degreasing skins”
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Introduction

In the production of sheepskin to obtain leather for the manufacture of clothing (overcoats, jackets, trousers, etc.) of leather, suede and “double face” (skin with the natural wool turned to the inside), the tanning industry carries out one operation which is perhaps the most delicate of the whole process, the degreasing of the skin.

In fact, the sheepskin has two kinds of fat:

**: Lanolin or wool fat, which is really a wax that makes the wool waterproof, and is found in the outer side of the animal’s skin and protects it from rain and other elements. It has been known for a long time that lanolin is used for creating cosmetics.**

**: Natural fat, which is found on the inside of the animal skin and protects it from cold. This natural fat, as opposed to lanolin, is not used, and becomes part of the effluent from the tanneries.**

The operation of degreasing the skins in tanneries is done in two stages (in reality we can speak of two degreasings in the tanning process):

1st Degreasing.- At the beginning of the process the skins are put in a drum with water and become moistened. Then the degreasing is carried out with tensio-actives which emulsify the fat with the water. Often petroleum is used together with the tensio-actives, which helps in the extraction of the fat from the skin, the resultant mixture (fat + petroleum) being emulsified with water by the tensio-active. This first degreasing extracts the greater part of the fat from the skins and, as has been said, it goes into the effluent. However, some of the fat remains and later there has to be a second degreasing in which practically 98% of the natural fat is removed from the skins.

2nd Degreasing.- After the first degreasing, the skin goes through the normal tanning process until it reaches dyeing, and after this, when the skins are in “crust”, the second degreasing takes place. The skins in “crust” are placed in a “dry” fat extraction machine using perchloroethylene and trichloroethylene. Again the resulting mixture (natural fat + perchloroethylene or trichloroethylene) goes to form part of the effluent of the tannery.
The residue resulting from the separation of the fat in these types of effluent has to be sent to an authorised treatment plant, which means a considerable cost to the tanner, since the amounts of residue generated are substantial.

Reach of the project

With this project it has been tried and make-ready of a demonstration process for the recycling of the natural sheepskin fat generated in the operations of degreasing in certain tanning industries.

The actions necessary for the implementation and validation of this demonstration process of recycling natural sheep fat are, essentially:

- The definitive make-ready of a technology of sulphatation, developed by INQUIMICA itself, which permits the consistent obtaining of sulphonated fish oil with an SO$_3$ index of 6% to be used as a vehicle of absorption of the recyclable fats.
- A study of the composition of samples of natural grease coming from various tanning industries, in order to determine the optimum regulation conditions.
- Trial of the products in which this natural grease can be used, establishing the appropriate percentages of use and formulating the various types of lubricants.
- Application trials of the products obtained on skins, to evaluate their qualitative parameters.
- Design and scale of the stages of the industrial fat recycling process.
- Implementation, adjustment and make-ready of the demonstration plant.

This natural grease, which currently constitutes a problem residue in industrial tanneries and must be made inert by an authorised treatment plant, could thus be revalued by using it as an raw material in the manufacture of lubricating products for the skins, in partial replacement of high-cost raw materials such as fish oils.

The application of these products in the tanning sector, which is itself the sector generating this problem residue, would allow the cycle to be totally “closed”.

This initiative will enable the partial replacement of an expensive raw material, fish oil, the market price of which is located on average at 630 Euros/Tm in the formulation of lubricants for tanning, through which the financial return of the project will also be guaranteed.

Inquimica tries to recycle in the mid term of around 2500 Tm/year of natural sheepskin fat coming from tanning industries.
NORMAL AND RECYLED RAW MATERIALS

Technology

INQUIMICA S.A. is a company working mainly in the manufacture of chemical products of application in the tanning sector. Therefore, we are aware of the problem caused for our tanning customers by the elimination of the accumulated natural fats.

Again, given that our process uses raw materials such as fish oils, which are nothing other than natural fats, we considered the possibility of using this residue of natural sheep fat as a raw material in the manufacture of chemical products for the skins sector (shoes, leather goods, etc.)

The use of natural sheep fat in the formulation of lubricants for tanning, partially replacing sulphonated fish oil, will be possible thanks to INQUIMICA having developed an innovative process of sulphatation of this oil which allows an $\text{SO}_3$ index fixed at 6% to be obtained, while with the conventional process this index does not exceed 4%.

This parameter indicates the emulsion capacity of the product, in this case the capacity to absorb recyclable fat.

As the market accepts without problems a final product with an index of 3%, using as a vehicle sulphated fish oil with an index of 6%, the natural sheepskin fat could be incorporated at 50% in the formulation, that is, the final lubricant would be constituted ½ by fish oil at 6% and ½ by fat recovered from the tanning industries, besides the other minority components such as antibacterial and fungicides.

Again, the obtaining of sulphonated fish oil with an index of 6% has been possible due to the development of a complex process technology. It is sufficient to consider that the sulphuric attack on the fish oil (with a proportion of 30%-40% of the former over the latter) is an exothermic reaction which requires strict control over the cooling conditions. At the same time, the washing of this oil and separation of the excess of unreacted acid meant the development of specific techniques. In the same way, special processes had to be developed for regulation of the pH during the neutralisation of the oil. We are not aware of other companies having achieved the completion of a similar process, in which natural sheep fat can be used as a fraction in the composition of lubricants for tanning.

**PRODUCT ENDED NORMAL AND RECYCLED RAW MATERIALS**
Conclusions

INQUIMICA has available an industrial process for the recycling of natural sheep fat waste, replacing 50% of raw materials, and with a resulting product which can be applied to the lubrication of hide.

This industrial process is made up of systems for homogenising fats, sulphatation, oxidation, sulphitation and mixing, together with the necessary accumulation and dosage equipment (for the fat to be recycled, for the intermediate product and for the final product with recycled fat incorporated). It is based on stainless steel reactors that are highly resistant to corrosion, and also on a refrigeration system adapted to control the high temperature exothermic reactions that develop, together with the electrical and hydraulic equipment and automation and control systems,

INQUIMICA also has two suppliers of this sub-product who provide it with this material on a regular and continuous basis, and it is about to sign new contracts with other suppliers of fat for recycling.

The final product has begun to be supplied to countries such as India, and in the case of materials of a higher quality, such as the oils of Justo Gatius, S.A., it will even be possible to supply products for much more highly valued markets.

Evidently, as things progress, more highly valued applications and those with a greater added value will be sought.
CONPARISON LEATHER DEALT WITH TRADITIONAL PRODUCT AND THE BY-PRODUCT

Dermolan Sil

Dermolan VII

Sulfoderma M-55

Sulfoderma BIS
Ostrich leather processed with Sulfoderma BIS y Dermolan VII.