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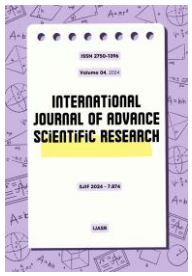

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Research Article

OPPORTUNITIES FOR LOCALIZING PRODUCTS USED IN THE LEATHER DEGREASING PROCESS

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Abstract

The article describes the features of the process of degreasing the skin and the drugs used, as well as the impact of this process on the quality of the skin. In particular, in research work, gasoline was used for the first time in the degreasing process, preliminary results were obtained, and the feasibility of using gasoline in the degreasing composition was determined.

Keywords

Skin, fat, surfactant, degreasing process, gasoline, kerosene, hair, leather fabric.

Introduction

Although leather and fur production has existed for a long time, the chemistry and technology of leather and fur have developed very slowly, as the processes of leather processing are complex (Figure 1), and the essence of some processes has not yet been fully explained. Furthermore, the fact that leather is composed of protein substances and that various chemicals and complex compounds are used in chemical processing is also among the reasons for this.

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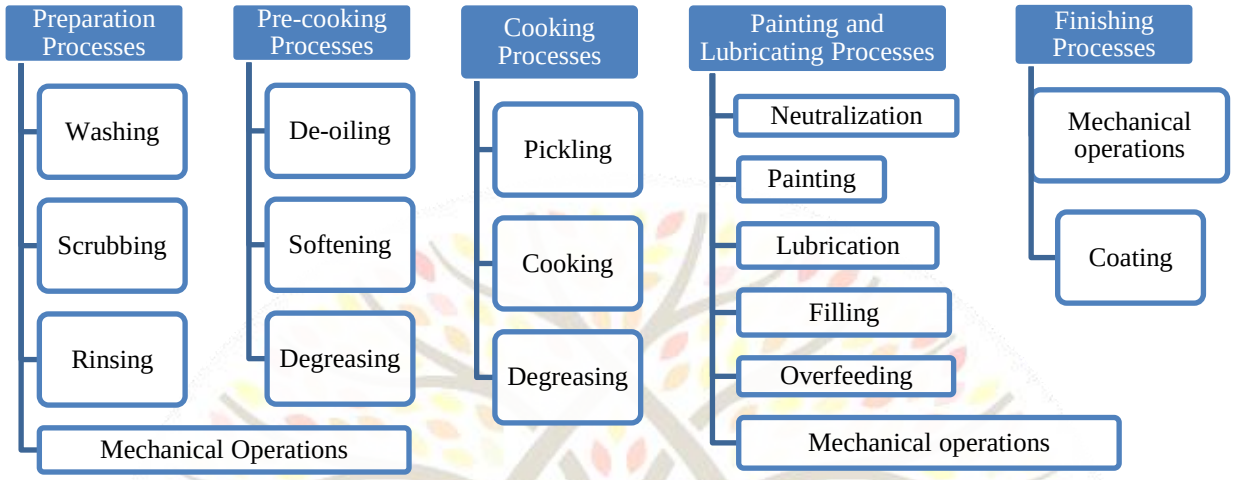

Figure 1. Schematic illustration of leather processing

The leather industry primarily contributes significantly to the economic development of developing countries, as finished leather is used as raw material to produce a wide range of consumer products, such as bags, leather goods, footwear, and clothing.

Degreasing is a preparatory process carried out for animal hides with high levels of fat during leather processing. The degreasing process is applied to hides from ruminant animals, pigskins, and fur-bearing animals.

The need for the degreasing process is related to the high amount of fatty substances in the leather. The fat located on the hair surface has strong hydrophobic properties in terms of its chemical nature, and it is intended to protect the hair from any external influences. In washing processes, only the fat from the hair coating is removed, whereas in the degreasing process, the focus is also on the fats present in the composition of the leather fibers. The significance of these processes is that if degreasing is not carried out, processing fatty leathers can take a long time. Moreover, this process is closely related to the final quality of the finished product.

Based on practical experiments, it is expected that after the degreasing process, the fat content in the leather should be reduced to about 5%【2】. However, achieving this result is more challenging due to the fats being located in the granular layer. Therefore, various methods of degreasing are used, including solvent-based degreasing and emulsified degreasing. Solvent-based degreasing (using white spirit, kerosene, freon, tetrachloroethylene, etc.) ensures a high

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degree of fat removal, guarantees the non-shedding of hair, reduces the process duration, and eliminates the need for additional operations (such as pressing).

The emulsification method is one of the most widely used techniques in the leather and fur industry. In this method, primarily anionic and non-ionic surfactants with degreasing properties are used. While surfactants are soft and safe chemical alternatives for degreasing, they are generally considered less effective compared to other methods.

The researcher [3] studied the effect of the fat content in sheep, cattle, and pig skins on adhesion and wettability. Based on this, a multi-component degreasing composition was selected. This multi-component composition consists of non-ionic and anionic surface-active substances (SAS). Additionally, the research also utilized Lipex enzyme.

The effectiveness of the processes depends on the use of degreasing reagents that ensure the optimal removal of fat substances from the leather, which helps in carrying out subsequent processes efficiently [4]. As a result, this leads to an improvement in the quality of leather and fur products.

The invention [5] is related to compositions used for removing fats from selected substrates, such as leather, fur, leather goods, and other intermediate products in the leather and fur industry. The compositions include: a) a fatty phase, b) at least one surface-active substance, c) an aqueous phase, and d) other optional auxiliary substances and additives. The interfacial tension between the fatty phase and the aqueous phase ranges from 1 mN/m to 5 mN/m, and the temperature range is from 15°C to 45°C, with a surface tension of up to 10^-9 mN/m.

Furthermore, the method for removing fats from the specified substrates involves using compositions in accordance with the invention, which include degreasing agents containing alcohol alkoxylates. The D polydispersity of the alcohol alkoxylates, whether individual or in mixtures, has been determined. The substrates are selected from a group consisting of leather, fur, leather goods, and other intermediate products in leather and fur production, and these are treated with the mentioned alcohol alkoxylates.

The subsequent invention [6] presents a degreasing agent for leather, along with its preparation and application method. The degreasing agent consists of a group of isomeric alcohol block polyesters, which may include one, two, three, or more types. The degreasing agent has a good penetrating and emulsifying effect, and it effectively reduces the fat content in the leather fabric. This agent is considered an effective means for degreasing cattle, sheep, and pig skins.

Another invention [7] is related to the wet degreasing process, in which a mixture of ethoxylated products (E), emulsifying degreasing agents (D), and, if necessary, an oxy-alcohol (A) with the formula CnH(2n+1)-CH2OH (I) can be used for leather, semi-finished leather goods, and leather. In this case, the value of (A) contains a

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mixture of positional isomers for at least one component, and the fraction of the primary linear component in (A) includes a normal primary CnH(2n+i)-alkyl radical. The composition contains 25 to 70% of (A) by weight, with an average degree of ethoxylation of (E) ranging from 5 to 12. If the products (E) are also propoxylated, at least one additional non-ionic emulsifier is present, and the average degree of ethoxylation exceeds the average degree of propoxylation. This composition (F) includes at least two saturated aliphatic alcohols or a mixture of at least one ethoxylated and optionally propoxylated product (B), along with emulsified degreasing compositions (D), including mixtures (E) and products (F), and optionally one or more additives in formulation (C).

One of the effective degreasing agents is surface-active substances. Russian manufacturers play a leading role in the production of surface-active substances for the fur industry. Currently, agents that consist of special additives providing complex properties during preparation processes, including antiseptics, are also used in ready-made compositions. This is especially important in the degreasing and wetting processes of sheep skins, which have a high fat content.

During the degreasing stage, additional requirements are imposed on the surface-active substances, including the effective separation of fat compounds from processed leather fibers and leather fabrics, and preventing the re-deposition of these fat compounds onto the leather. This means dispersing the fats and ensuring they remain in solution. Additionally, when selecting and working with surface-active substances, their properties [8], such as foaming, resistance to salts and acids, ability to emulsify lipids, and biodegradability, must be taken into account.

In the research work, the processing of non-traditional types of raw fur involved the reprocessing of waste with an alkaline agent, from which protein hydrolysate was obtained. This protein hydrolysate was applied in the preparation processes of fur-bearing sheep skins, including wetting and degreasing processes [9]. The use of this protein hydrolysate significantly reduced the toxicity level of wastewater, while maintaining the quality of semi-finished fur products, and allowed the degreasing of fur-bearing sheep skins using a bacterial suspension with the desired characteristics, without compromising the specified properties.

Based on the above, the technological parameters of the degreasing process, the degreasing agents used, and the application of kerosene and surface-active substances in the process, as well as the fact that most chemical reagents are imported products, were thoroughly studied in the production of lining leather from sheep skins.

In the research, in order to localize the agents used in the degreasing process, the possibilities of utilizing gasoline, which is often discarded as a by-product in gas cylinders, were explored.

Gasoline is a liquid gas condensate that accumulates in the cylinder as a by-product during the evaporation of propane-butane. If the gasoline is not periodically removed from the

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cylinder, the maximum volume of gas that can be added to the cylinder steadily decreases. This condensate, formed in the gas cylinder, consists of propane, butane, or their mixture, which forms as a liquid under certain conditions. It is usually a transparent liquid, but its color can range from straw yellow to reddish-brown depending on the depth of extraction and the presence of petroleum mixtures.

In the initial research, the gasoline obtained was used for sheep skins, considered raw leather that had undergone preparatory processes. In most cases, the degreasing process, instead of using kerosene and surface-active substances, was conducted with the participation of gasoline.

The study investigated the impact of the degreasing process on the quality of leather semi-finished products and finished leather (see Figure 2).

a) *b)* *c)*

a) Before Wet Blue Drying Process:; b) After Wet Blue Drying Process: c) Finished Leather Samples:

Figure 2. Effect of Degreasing Process on Finished Leather Quality

As seen in Figure 2, using gasoline alone in the degreasing process does not achieve complete degreasing of the semi-finished product, resulting in stains, which lead to uneven coloring of the final product.

To improve the degreasing effectiveness of gasoline, the next stage of the research focuses on developing degreasing compositions with gasoline, and scientific studies on obtaining finished leather continue.

In conclusion, the development of degreasing compositions based on gasoline and the optimization of degreasing parameters offer the potential to eliminate the use of expensive kerosene in the degreasing process. This approach also expands the possibilities of

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utilizing gasoline and localizing degreasing agents.

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