Eco-Efficient Wool Dry Scouring With Total By Products Recovery

LAYMAN REPORT

LEITAT Technological Center member of TECNIO
managing your technologies

RMT
RECUPERACION DE MATERIALES TEXTILES S.A.

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1. Background

Wool Water Scouring - The Problem

The merino wool contains around 50% grease and dirt. This is usually discharged as an emulsion in waste water during scouring.

Wool Fibre	40 - 80 %
Suint	3 - 12 %
Wool wax / Wool grease	6 - 20 %
Dirt (mineral matter)	5 - 20 %
Vegetable matter	5 - 15 %

Wool Water Scouring rejects large quantities of wastewater. The treatments of these highly pollutant wool scour effluents are expensive and require high capital and operating costs. Furthermore, they are low-efficient and consequently, the treated effluents are problematic.

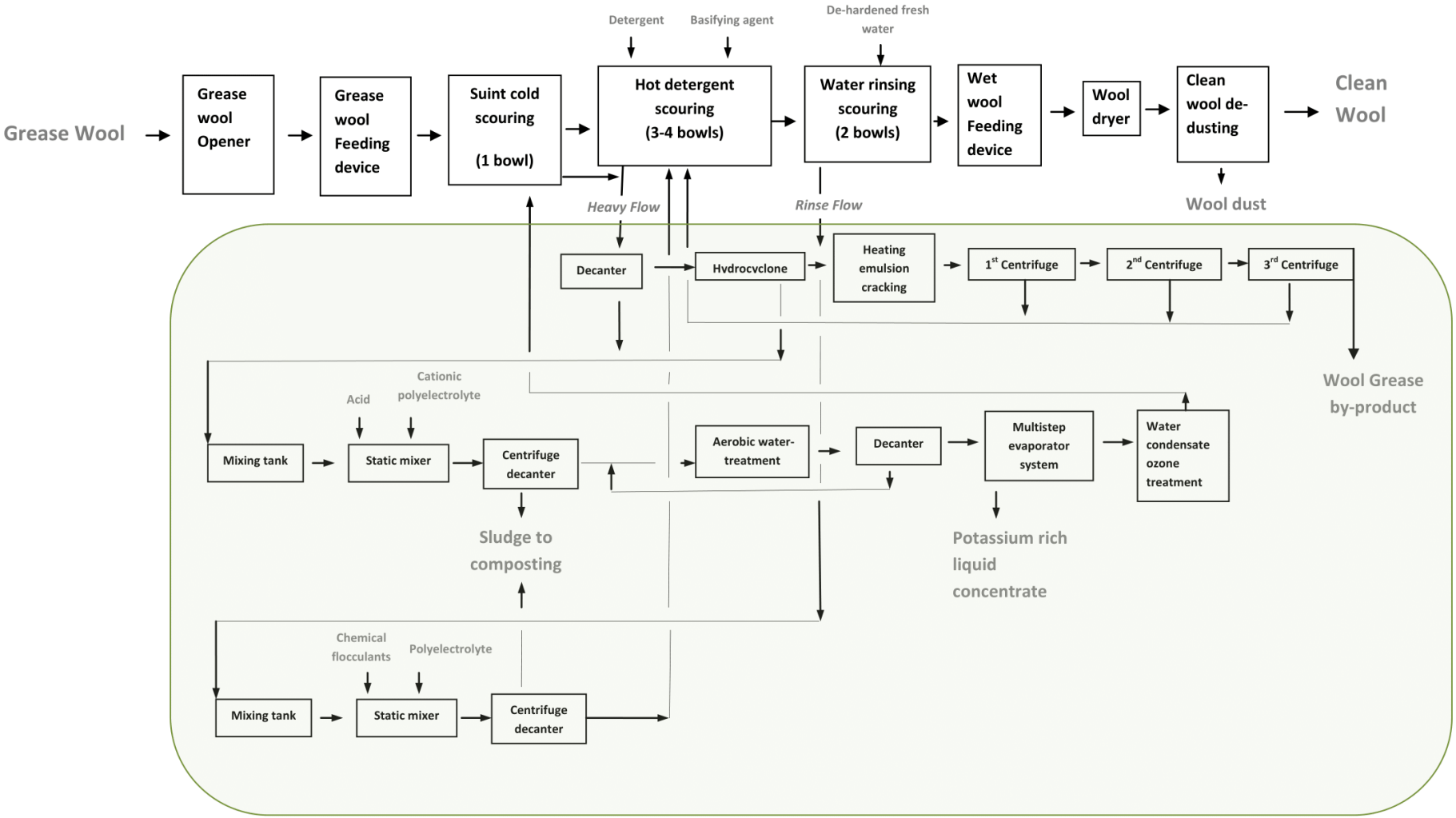
Most European wool scourers could not afford the costs of the waste water treatments required by these wool scouring effluents to accomplish with the discharge limits to rivers or public sewers. Wool scourers did not have other viable alternatives to scour wool and they closed progressively. As a consequence, most European wool traders cannot find wool scouring companies at local level and they sell the greasy wool to other countries were is scoured. The greasy wool is scoured in countries where the scouring costs are lower due to a less strict environmental legislation.

Complexity of the Wastewater Treatment Plant required

Enviroloop™ System developed by ANDAR, is currently the state of the art on wool scouring.

As it can be seen in the green area the waste water treatment of Enviroloop is much more complex than the wool scouring stage.

Conventional Wool Water Scouring Process Lay-out including waste treatment operations [1]



[1] Based on Enviroloop modular environmental management approach of Andar (Olive colour area)

2. The Project

WDS Concept Approach

When greasy wool is degreased with solvent and over-dried, it liberates easily the non-fibre material as a fine dust. Taking advantage of this fact, the **Wool Dry Scouring (WDS)** achieve:

- The full recovery of wool grease (lanoline)
- The recovery of suint, dirt and vegetable matter directly as a solid material (wool dust)

The WDS project focuses on demonstrating a **new technology to scour wool** using solvent in order to replace the conventional water scouring and make the process technically and economically feasible in Europe. The major challenge lies in the extraction of the grease with solvents. A new solvent scouring process is required to overcome the issues that arose from previous historical approaches: loss of whiteness and softness in wool, non-soluble solids effluent containing both dirt and solvent, low yield of lanoline recovery, solvent emissions, and difficulties in recovering the solvent imbibed in wool fibre. The previous approaches tried to replicate the water scouring system using solvent instead of water (bowls, rolling press, convective drying, etc.)

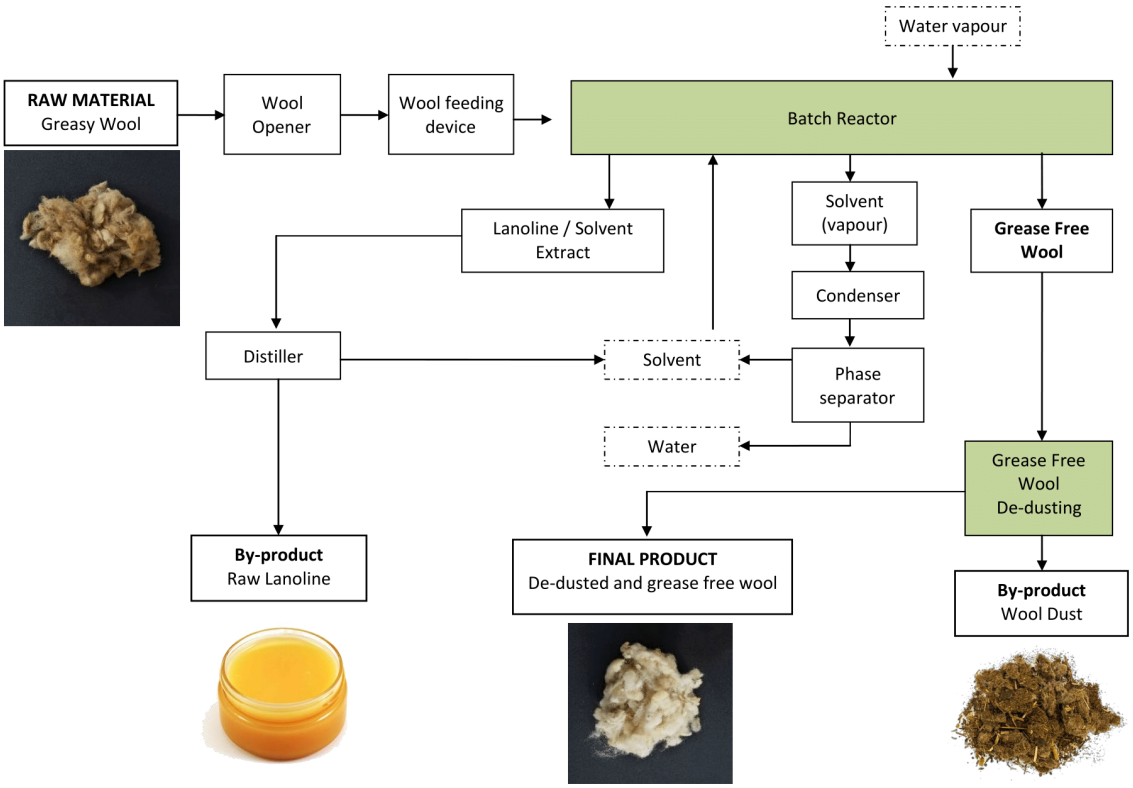
In order to fulfil with the research and technological innovation required in the project, WDS gathered a specialized consortium: LEITAT and CSIC as research centres, RMT as industrial partner and Tavares as a scouring plant.

The Wool scouring process involves the following sub-phases: greasy wool opening, solid liquid extraction, drying, de-dusting and water rinsing.

WDS objectives

- Wool Dry Scouring project focuses on demonstrating a new technology to scour wool with total by-products recovery using solvent in a closed-loop system to replace the conventional wool water scouring.
- High recovery efficiency of greasy wool components: clean wool fibre, wool grease (lanolin) and dirt (wool dust).
- Demonstration of technical feasibility of the innovative technology to scour wool and recover the valuable by-products (wool grease and wool dust).
- Demonstration of economical feasibility in comparison to the conventional water scouring.
- Reduction of environmental impacts: reduction of water consumption, chemicals and energy. Reduction of wastewater effluents, wastewater with reduced waste load.

WDS Process Layout



3. Target Markets

The Wool Dry Scouring is a friendly process that focuses on a wide range of potential target markets:

- Sheep farming associations
- Wool scouring companies
- Wool manufacturers and designers
- Wool textile federations
- Fertilizers manufacturers
- Lanolin manufacturers
- European engineering companies
- Wool research centres and the European scientific community
- Waste managers consultants
- Public bodies

WDS can enhance the competitiveness of the wool sector thanks to selling by-products (wool grease and wool dust) and reducing the scouring costs (reduction of water, energy and chemicals consumption, wastewater treatments and land disposal).

WDS Protoype

Firstly, a pre-prototype was designed and built to perform the WDS process. The equipment allowed to perform a sequential discontinuous process and helped to identify technological risks that were mainly related to the following issues:

1. Presence of high content of non-filterable dust in the greasy extract.
2. The degreased wool retains a significant amount of imbibed solvent.

New adjustments were considered necessary in the final design to overcome the identified issues and achieve a greater efficiency in wool scouring.

Finally, the prototype has been designed, built up and started up successfully. Currently, the capacity of the reactor has been increased in order to treat greater amounts of wool. The reactor guarantees that the whole process is airtight and the solvent is fully recovered.

4. Results & Conclusions

Industrial and Economic Impacts

⇧ Wool: whiter, cleaner, smoother, fibre entanglement free, lower grease content

⇧ 95% Wool Grease recovery ⟶ Lanoline

⇧ ≈ 100% Wool Dust recovery ⟶ Fertilizers

⇩ 75% Water consumption

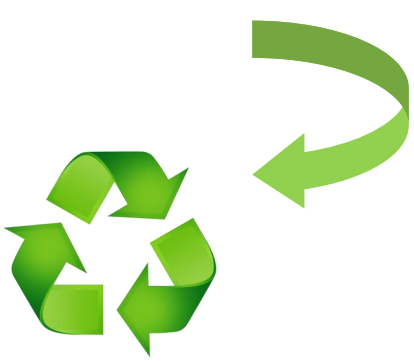
⇩ 30% Energy Consumption

Environmental Impacts

96kg of CO_2 eq. Per functional unit (500 kg greasy wool)

75% Wastewater effluents (Rinsing water)

75% Chemical oxygen demand (COD)
75% Detergents and chemicals



Using rinsing water evaporators

Towards zero waste

Socio-economic benefits

The costs of the WDS process were compared to the costs of the conventional wool water scouring in Europe. The economical assessment proved that the WDS is economically viable in Europe.

- Large social benefits will flow from reducing the water consumption and improving the quality of the water resources (reduction of the volume of treated effluent being discharged and reduction of the pollution in the discharges).
- Workers in the mills would benefit from working in a safer environment with reduced smells.
- Communities outside the wool-processing plants would have a better living environment and farming communities would benefit from access to a source of organic fertilizer. There would be also a larger source of wool grease in Europe, which once purified is used for cosmetic and pharma sectors added value products.

WDS

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www.life-wds.eu

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