FACULTY OF ENGINEERING IN APPLIED SCIENCES

TEXTILE ENGINEERING CAREER

TECHNICAL REPORT

## 1. INTRODUCTION

The main objective of the project is to slow down the download time of the batteries used in portable electronic devices through the use of non-woven wool.

* Wool is a natural fiber obtained of the sheep, through a process called shearing. Used in the textile industry for making products such as bags, gloves, blankets, felts, among others.

* The wool is distinguished by having the following characteristics:

• A very versatile and complex chemical structure and an excellent and complex physical structure whose surface is composed of scales.

•High capacity to absorb moisture and repel water or liquid on its surface.

• Durability despite the low strength fibers.

• Natural ondulacion or "crimp" in the fibers.

• High resistance to fire and excellent insulation to cold and heat.

• Increased comfort due to the aeration in the tissues.

• Resistance to dirt and easy cleaning.

• Low static electricity generation.<

• High elasticity and recovery capacity.

• Good looks and retention of forms of clothing.

• Excellent "fallen", soft and "touch" in woven fabrics.

• Ability to be felted.

• Absorption of odours or toxic chemical filtration.

### 1.1 BACKGROUND.

Wool fiber acts as an excellent thermal insulator, allowing very well retain the heat of the human body, that protects from the outside environment. Its great bulk that derives its curly and his resilience, wool items contain a large amount of air, which is considered as a thermal insulator, which represents the beginning of the present investigation, garments made with this fiber protects both cold and heat and

temperature changes. The ability to absorb moisture and generate heat when moving from a warm another cold and wet environment, its high insulating capacity, its low thermal conductivity and low weight of wool garments make these warm and comfortable cold, because the body is kept warm and dry. Heat conductivity and power insulation are not the same even if the terms are related. The insulation value depends on the amount of air squeezed inside and on its surface. In this, real pinched or trapped air heat conductivity is important even more than of the same fibres. The trapped air is not a conductor of heat.

We have seen that wool traps water inside its fibers, but the property of trapped air, by a similar physical mechanism is also important.

The ability of thermal insulation of the cold is mainly due to the volume that the curl of wool produced in one piece and what allows you to trap the air within its fibrillar structure. Wool garments are more warm in winter and cooler in summer due to the thermal insulation, along with the properties of water absorption

Garments, the volume of tissue makes it difficult for the heat exchange between one and the other side.

Articles made of wool fibers, due to its porosity and the fact that by nature wool fibers remain apart (they repel one another), approximately 80% of the volume of fabric is air. This stays in close contact with the surface of the fiber and prevents the loss of heat from the body keeping you warm.

Even when wool is wet, resilience remains, so trapped insulating air remains, therefore, the user of a wet wool garment is cooled suddenly.

Not only the repellency of fiber to fiber and the resilience of fibers, but also the type of thread, tissue and finish are factors that influence the heat conductivity.

## 1.2. GENERAL OBJECTIVE.

* Delay time of discharge of batteries used in portable electronic devices.

* Get to know depth, physical properties, chemical, biological natural wool fiber.

* Collect information about non-wovens, methods and techniques for obtaining.

To describe types of existing batteries, characteristics, properties, uses, and classification.

* Be evidence on which to base the theory regarding the investigation being carried out.

* Develop a detailed cost analysis of implies making a case based on non-woven of wool and the cost benefit that represents each.

### 1.3. SCOPE

The proposed project intends to perform various tests using a simple manufacture kits in a workshop, allowing only results in each device, with different load, and above all with different characteristics of non-woven.

The work includes a full analysis on the fundamental properties of fiberglass wool, textiles, batteries and concrete with several trials to inform the research.

### 1.4. JUSTIFICATION

The present research project aims to in one way or another diminish environmental pollution, which occurs due to the batteries, at the same time provide a solution to the big problem that by using technology to most of us commonly has happened, to the downloads of our cellphones, our laptops (inappropriate) batteries, cameras, etc, and any other electronic equipment that works with rechargeable batteries, usually wearing in very little time, in effect here is also important to emphasize that life will always have loads on batteries limit (useful life) specific to each of them; It would be ideal to increase battery discharge time in our portable electronic devices, considering in particular the use of natural products just to ensure no pollution of the environment.

The focus of this project is in the use of natural fibres (wool) for the manufacture of useful accessories in technological products of everyday use, with the strong intention to improve the quality of life of those who use them, community in general and the environment.

## 2. DEVELOPMENT AND RESULTS

### 2.1 METHODOLOGY

The methods and techniques that I use include:

**DEDUCTIVE METHOD**

I operate from here to establish a precise inquiry regarding the properties of wool fiber, and so does substantiate the research proposal with true and proven results.

**EXPERIMENTAL METHOD**

Experimentation will allow to obtain physical parameters with the presentation of actual numeric data.

**ANALYTICAL METHOD**

Several comparisons and tests were carried out with different samples

depending on the need that you want to meet.

**DIRECT OBSERVATION**

Based on the application of the non-woven of wool, using portable electronic equipment.

**STATISTICIAN**

Based on the data obtained in the different portable electronic devices, after an analysis of the type of battery that has the same, results scheme to optimize them better.

**CHAPTER 1. THEORETICAL FOUNDATION.**

The current sheep fleece wool producers are all of the species ovis aries, descendants of the mouflon and other races of primitive Asian bovids. It is a ruminant ungulado. The male animal is called RAM and have horns, usually curved; the female does not have them, except in a few species. They live in herds (with some caveats), in the care of man since the stone age and throughout its long history of domestic animal has been subjected to successive hybridizations, crossing different breeds in search of improving production of wool or meat, according to the purpose of exploitation, and better adaptation to the climates of their breeding. Interestingly, it is the first animal of which is known that it has been cloned.

Wool refers exclusively to the fiber obtained from the sheep, for this reason speaking as to the origin of the sheep.

**WOOL**

Wool is a natural fiber obtained of the sheep, through a process called shearing. Used in the textile industry for making products such as bags, gloves, blankets, felts, among others.

**STRUCTURE**

Wool fiber is formed by the cuticle or bark and the cortex, in particular type of fibers can be bone marrow. The crust is the layer that surrounds the fiber, constituting 10% It is formed by cells in the form of flakes or shingles, overlapping each other. The cortex makes up 90% of the fiber and is composed of cells elongate, parallel to the axis of the fiber (cortical cells).

**CHAPTER 2. NON-WOVENS.**

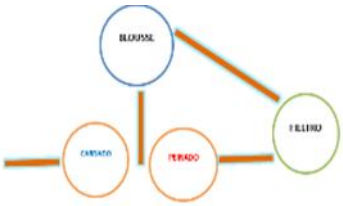
Non-wovens (in English: "nonwovens" ") are a type of fabrics produced by forming a network with fibers that are attached by mechanical, thermal or chemical procedures, but without being woven. In this sense, these materials are defined by their negative; i.e., which are not.

## OBTAINING

This process is well under the microscope. When we handle the wool with water, the fibers of wool open and become entangled together. This effect occurs because the fibers of wool are covered in the manner of Texas by epidermis flakes. Under the impact of the water and the movement, the fibres open and engage with other fibres.

For the processing of felt we need moisture. Water makes open epidermis flakes. However, if we use too much water, the fibers float and not can be joined. The felt is best if using hot water (of approximately 60 degrees Celsius).

The process is much better if we use steam. Wool fibers have to be moved in all directions so that they can join well.



## CHAPTER 3. BATTERIES

A battery is an electrochemical device that stores energy in chemical form. When connected to an electrical circuit, the chemical energy is transformed into electrical energy. All batteries are similar in their construction and are composed of a number of electrochemical cells.

## PRINCIPLE OF OPERATION

The operating principle of an accumulator is essentially based on a reversible process called redox (also known as redox), a process in which one of the components is oxidized (losing electrons) and the other is reduced (gains electrons); that is, a process whose components are not consumed or lost, but changing its oxidation state, and that in turn may return to its original state in appropriate circumstances.

LITHIUM-ION BATTERIES

Lithium-ion battery, also known as Li-Ion battery, is a device designed for storage of electrical energy that is used as the electrolyte, a salt of lithium seeking necessary ions for reversible electrochemical reaction that takes place between the cathode and the anode.

The properties of Li-ion batteries, as the lightness of its components, its high energy capacity and resistance to discharge, the absence of memory effect, or its ability to operate with a high number of cycles of regeneration, have allowed the design of lightweight batteries, of small size and varied forms, with high performance, specially adapted for applications in the consumer electronics

industry. Their life cycle is between 500-600 cycles of loading and unloading. However it offers a capacity equivalent and more reliable giving an energy density higher and more constant than Ni/Cd / Ni/MH batteries.

## CHAPTER 4. PORTABLE ELECTRONIC DEVICES

We call any device which can be easily transported as an essential tool for executives on the move or for anyone else who requires use notebooks.

Exist a variability of these teams in the market in the market, and apparently to solve the daily life of each of us, the most prominent devices are, cell phones, computers and cameras, among others.

## CHAPTER 5. EXPERIMENTATION AND TESTING.

Non-wovens enable new applications of wool beyond textiles intended purely for making garments or others, reducing production costs by avoiding the spinning process which considerably increases the value of the products.

For these non-woven production can use low quality wool, prior to spinning process residues, and in this way generate innovative products increased value from the first link in the chain. Therefore the non-woven (felt) taken for object of this research.

### TESTS

The use of the following measuring equipment has been necessary for the results:

MULTIMETER

THERMOMETER

STOPWATCH

OTHER

It has had to carry out welding of conductor wire strands in order to perform the measurements of some of the devices of internal mode to the outside and get more accurate data.

## CHAPTER 6. TESTS PERFORMED.

It has performed a number of tests that are classified by each team, each thickness of felt used, and load aplicad each.

Tables displayed below shows consumption average voltages for example: for device cell 0.40 volts in the case of tests conducted without use of non-woven in the device, and 0.24 volts for the tests that were performed with the use of non-woven, using different types of cargo, as well as the calculation of percentage consumed battery that this value

representseasy to deduce results by applying a simple rule of three follows.

Taking totals for voltages of the tests carried out without the use of nonwoven for cellular device there have voltages: 0.44, 0.56, 0.65, 0.36, 0.44, 0.19 0.20, which as a result average gives us: 0,405, transformed to percentage taking into account that the available voltage in the battery for each portable device generally is equal to 1.2 volts which in this case regard it as 100% usable battery as well, the percentage of voltage consumed in an hour by the cellular device is of 33.33%. Similarly is comes with the results of the tests carried out with the use of non-woven, and for each device. From there then get the following data: 0.24 0.33 0.43, 0.22, 0.25, 0.11, 0.12, these data the average is equal to 0.24 volts, then representing 20% of battery consumed by our device in an hour.

## CHAPTER 7. COST ANALYSIS.

It is necessary to expose a detailed study in relation to the cost of production to approximate that you have each of the cases for the application to the different existing portable electronic devices today, likewise we will succeed in determining the feasibility of its use with a micro in terms of prices of our cases compared compared with the cost of investment generated in the acquisition of a new battery, it is necessary in this part to consider the advantages and disadvantages that this entails considering factors such as the economic and technology primarily.

## ATTEMPT OF PROJECT

The present study of costs has several purposes to meet as they are:

Giving back to the current social demands: as technology becomes increasingly demanding, propose alternatives that benefit to users or consumers.

PROVIDE

Solutions optimal to the problem: finding possible proposals that generate changes in society.

PROFITABILITY: Generate an additional benefit to potential users on the investment or effort.

## CONCLUSIONS

In this research three portable electronic devices has been tested and is resulting in a ratio of duration of the overall percentage of the 47.64% increase of time in relation to the normal time of the battery on each device.

* The curly natural fibers and the power of recovery of its shape once stretched, gives wool its great ability to retain still dry air between its fibers, which makes it a great thermal insulator.

* The property of thermal insulation which has wool fiber prevents the discharge of the battery of the portable electronic device in approximately 47% for low temperature.

* Wool has the advantage of being one of the natural fibers with the ability to form non-woven from its structure, both by domestic media as industrial through a relatively simple technology.

* This research has managed to demonstrate the great potential that have non-woven within the textile industry, and in particular that which is made with fiberglass wool, from the versatility in its applications.

* Non-wovens enable new applications beyond wool textiles for clothing, reducing the production costs by avoiding the spinning process which considerably increases the value of the products.

* Particular was chosen as the material to investigate, one of the least explored formats of the fiber: the noils. It's a byproduct of the hairstyle, low quality and therefore not suitable for spinning, nor for the production of fabrics, so open another panorama towards new applications in the industry clearly textile company at national level.

* The use of the non-woven of wool does not affect the normal operation of portable electronic devices, since it keeps the temperature of the device at a stable level, is say neither cold nor hot, rather acts as a regulatory agent in temperature, temperature increases tends downward and temperatures low tends to normalize.

* Lithium ion batteries have a lifetime maximum of up to five years, and at least 2 years, the use of the non-woven wool applied in portable electronic devices ensures lengthen the lifetime of the 47% of the normal time. (4mm thickness of felt).

* The use of elaborate boxes with not wool fabric helps prevent damage from load static (poor conductor of electricity) and falls, as well also battery discharge by low temperatures.

* The cases already in practice have a secured market, since they cover a need associated with the maintenance of a considerable value product such as our portable electronic devices. Cases for electronics design guarantees certain functionalities such as: extends the cycle

life of the device, battery, avoiding damage by static charges, also provides electronic protection against falls, by cushioning properties which has wool fiber.

In the present investigation was tested every one of our portable electronic devices with 3 different thickness of nonwoven, and concludes that he is achieved by slow:

a. greater thickness (4 mm) felt used, the greater the time achieved slow battery consumption.

b. to lower thickness (2mm) felt used, the lower the time achieved slow battery consumption.

c. to greater thickness (4mm) felt used, the greater the number of bags of air formed inside it which allows the detachment of heat and power to the outside is to perform more slowly is becomes more time than normal.

d. to lower thickness (2mm) felt used, the lower the number of bags of air formed inside it allowing detachment of heat and power to the outside is performed more quickly that is made in less than normal.

The cost of direct raw material for making a case for every portable electronic device, will vary according to each of these, for the cell have a cost of $0.28; for the SMARPHONE $0.41; for IPAD, $0.23, the cost differs from each due to the size of the device, because more size, more raw material is required.

Direct labor costs are lower than the costs of direct raw material in the manufacture of boxes for each device. Thus also the costs of basic services differ for each of these devices.

Total costs for each device is different since used different amounts of raw material, labor, and basic services for the preparation of cases, being the cost for the IPAD with $0.39, i.e. costs are not excessive which would that be can be implemented a project for its manufacture.

The cost benefit that he is obtained with the use of non woven in our devices is quite considerable since that every battery that replace annually of a cellular device will save $ 2.84, in the case of the Smartphone this cost-benefit increases to $ 12.46, the same happens with the Ipad where there is a saving for each battery that will replace. Aware that the use of these devices now is general, we could easily infer that the savings that can be obtained would be $ million in the year.

In relation to the results and numerical data obtained in the investigation,

obtained the following data (refer to attached table); distributed to each case. It is the number of users at national level of cell phones is in around 11.412.997, from which it is concluded that the cost benefit earned annually in the case of this cell phone between USD $ 32.412.911.4. Concluding that the use of felt boxes in our portable electronic devices, would represent an enormous saving of divisive import of batteries that are annually made to our country.

ECOMMENDATIONS

The present study represents a great contribution to future research, since the results that have been obtained are positive so it is recommended the early implementation of the study to the production of cases for cell phones and laptop computers, which are the most used in our environment, which would represent a major contribution by the large amount of scrap batteries that would reducenot to mention the impact in terms of costs is concerned.

This research project seeks to generate knowledge basic conditions to achieve an implementation at the local level, the implementation underway of a workshop dedicated to design cases for cell phones and laptops, becoming so pioneers in this effort, at the same time meet fully the Mission of the University technique North to form a productive professionals creative, and critics committed to social change and the preservation of the environment.

Numerous examples of products in felt relieved at the international level show the existence of a consolidated market, in which ECODESIGN appears as an increasingly important competitiveness factor. Therefore the cases of woolen fabric would not be interesting to a new market and untapped niche.

It would be interesting to not leaving aside the cases for digital cameras, although its construction is rather complex since their physical presentation is not allowed to use any kind of cover over it, why leave the concern for the person who wants to design the case for this device.

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