VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELGAUM – 590 014

KSCST SPONSORED PROJECT
PROJECT REPORT ON

"DESIGN AND DEVELOPMENT OF NATURAL PLANT FIBRE EXTRACTING MACHINE"

PROJECT REFERENCE NO.:40S_BE_0375

BAPUJI INSTITUTE OF ENGINEERING AND TECHNOLOGY DAVANGERE - 577 004, KARNATAKA

DEPARTMENT OF TEXTILE TECHNOLOGY

Submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY
IN
TEXTILE TECHNOLOGY

Project Associates

1.GANESH R	**4BD13TX006**
2.LAVANYA V	**4BD13TX010**
3.SHUBHA B.V	**4BD14TX414**

Project guide

Dr. K. MURUGESH BABU
M.Tech., Ph.D., EMBA, MIE, MISTE
Head of the Department

CONTENTS

INTRODUCTION

Textile industry has various untapped resource for the production of fibres, one such resource is natural plants. Natural plant stems/stalks/leaves fibers have been in use extensively in fast decade for production of Handicraft, Ropes etc. The huge availability of a natural plant stems/stalks/leaves is very tempting to use it for garment purpose. Natural plant stems/stalks/leaves is a waste after the fruit is harvested so its availability is huge. The primitive methods for extraction of natural plant stems/stalks/leaves fibers are hand scraping, hand retting. Next machines were developed where the low quality fibres with more damages were produced. Hence fibres were not used in large quantity.

In this project work, the potential application of natural plant stems/stalks/leaves fibers extractor has been investigated. Natural plant stems/stalks/leaves is used for extraction of fibres. For this purpose, fruit harvested natural plant stems/stalks/leaves is taken. Extraction is carried out using the newly developed natural plant fibre extracting machine which was designed and fabricated to ensure the extraction of better quality fibres. The new design and development of such an extractor incorporates thermostat and spring load mechanisms to optimize the required temperature and pressure respectively to enhance fibres properties.

The fibres extracted showed moderate to good fibre properties such as strength, fineness, fastness. Fibres may be used for apparel production such as shirts, ladies/children dress materials etc. Fibres can also be used for composite application (natural fibre reinforced composites for automobile, building construction, furniture etc). Fibres are suitable for blending with other fibres such as cotton, polyester, viscose etc. for high quality fancy textile fabrics.

The machine developed was ideal for obtaining high quality fibres. Further, it can also be used for extraction of Agave family plants fibres. The machine developed is a low cost and high output machine very much suited for small scale industries.

OBJECTIVES

- To design and develop a suitable machine for extracting fibres from plants.
- To extract Natural fibres such as Sisal, Banana and Pineapple from their original plants.
- To study the processability of the machine to successfully extract the fibres without damaging their essential properties.
- To investigate the structure and properties of extracted fibres.
- To analyse the suitability of the extracted fibres for various applications.

METHODOLOGY

It is simple machine consisting of single roller which rolls on fixed support. The roller is provided with horizontal stainless steel blades with blunt edges. Generally, 27 blades are used. 2hp motor is used to provide input power to machine. The machine reduces labor work and increases fiber production by 20-25 times as compared to manual process. In this process, natural plant stems/stalks/leaves are crushed between two drum rollers. Due to crushing the pulpy part is removed and fiber is obtained.

Our next task was to give some framework such that moveable roller can be manually operated. For this purpose spring load mechanism was used.

Working principle of machine:

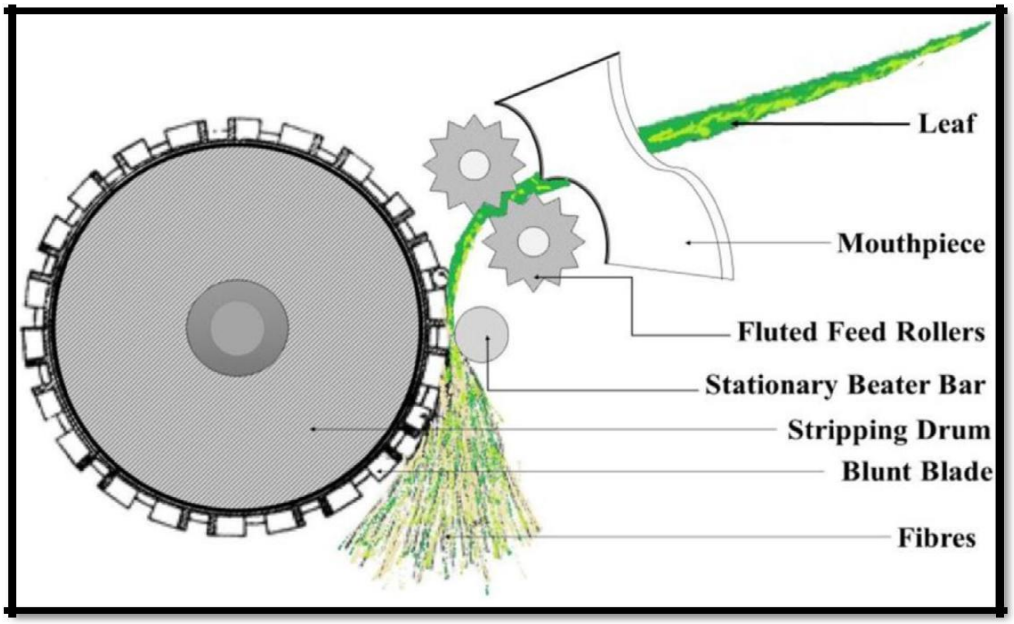

Figure 3.7 Working principle

The raw material i.e. plant stems/stalks/leaves are fed to the blade drum by the feeding device. The high-speed spinning blade drum and fixed blades break the raw material and separate the fibers and residue. Suitable settings are maintained in the machine to retain the essential properties of the extracted fibres.

Technical Specifications of the Machine:

1. Speed of the machine : 720 to 1440 rpm
2. Motor used : 3phase DC Motor & Electric Motor.
3. Provision for application of pressure: Spring loaded system.
4. Extractor drum Roller used : Mild roller with diameter of 140 mm
5. Other Roller used : Mild steel roller with diameter of 40 mm
6. Power supply : 240 volts.
7. Squeeze system : 2 Rollers made of 40 mm diameter.
8. Drive system : belt drive system.
10. Base frame used : This is made out of mild steel.

RESULTS AND DISCUSSION

Different tests were conducted on natural plant stems/stalks/leaves fibers for various parameters like Dye Uptake, Wash Fastness, Strength, Fineness, Moisture Absorption and Microscopic study. The results obtained have been tabulated and discussed in this chapter.

Properties of Banana, Sisal and Pineapple Fibers:

Properties	Banana fiber	Sisal fiber	Pineapple fiber
Density (KG/M^3)	1350	1450	1300
Flexural modulus (GPa)	4	13.5	3.8
Tensile strength (MPa)	56	67	2.8
Youngs modulus (GPa)	3.5	3.7	3.2
Elongation at break (%)	2.6	2.4	2-6
Cellulose (%)	62	68	78
Hemi cellulose (%)	18	15	9-45
Lignin (%)	5	10	4-7
Moisture content (%)	11	8	9

CONCLUSION

- ✓ The project work carried out has resulted in a miniature machine for natural plant fibre extraction.
- ✓ The concept is a novel idea for extraction of natural fibres by semi-automatic method.
- ✓ The machine designed and fabricated yields in soft results.
- ✓ The fibres exhibits good fastness properties.
- ✓ The fibres produced on this machine have better characteristics and can be used for various applications.
- ✓ The machine is very user-friendly product which can be operated by even an unskilled operator.
- ✓ The machine is an ideal fibre extractor for small and medium scale industrial sectors.
- ✓ The machine gives low cost but high-quality fibre, and will be a suitable machine for fibre processing companies.

SCOPE FOR FUTURE WORK

- It can be modified for other fibres such as bamboo.
- Microprocessor controllers can be used to vary the speed.
- Feed sensors can be used to vary the gap between feed rollers according to the fibre thickness.
- Positive drive systems may be anchored for all rollers.
- Pneumatic pressure systems can be adopted to ensure better control over pressure for quality fibre extraction.
- Dye uptake has to be extensively studied.
- The structure of fibres may be studied using FTIR and X-ray techniques.