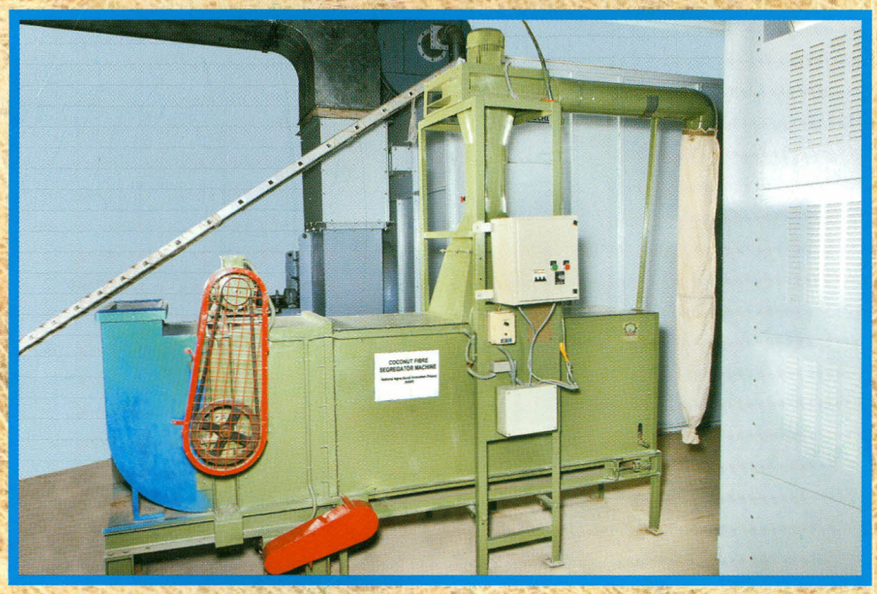
CIRCOT Leaflet No. 66

COCONUT FIBRE SEGREGATOR

A NOVEL MACHINE DEVELOPED FOR VALUE ADDITION TO COCONUT FIBRES



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Coconut cultivation is basically done for nut production, but its fibre and pith also generate good income for farmers. It is noteworthy that the trend in export of coconut fibre has registered a large jump since 2006 from 1,553 to 73,075 tones in 2010, and in value term from Rs. 196 lakhs to Rs. 9,742 lakhs. The CGAR works out about 164%. Similar trend exists for curled coconut fibre and coir pith. To continue this upward growth in coconut fibre export, it is necessary to improve the quality of fibre and segregate it into grades for tailored applications. This will realize better price for the fibre, and enable value addition to end-products.

Under the scope of a sub-project (component 2) of the National Agricultural Innovation Project (NAIP), and based on an innovative concept, a novel coconut fibre segregator machine for producing coconut fibres into various quality grades with high outturn has been developed by CIRCOT.

NAIP Development

Coconut fibre is obtained from the outer layer (exocarp) of the fruit. The exocarp consists of an outer skin (epicarp) and fibrous zone (mesocarp). The mesocarp is composed of fibre bundles embedded in fibrous connecting tissues, known as pith. Typically, a husk contains about 30% of fibre by weight.

Traditionally, coconut fibre is disintegrated and extracted from the coconut husk by mechanical means to produce 'bulk' coconut fibres. This bulk coconut fibre is not subjected to any further processes for refinement in its quality. The extracted bulk is a mixture of coarser as well as finer fibres with varied qualities in terms of length, fineness, maturity and strength. Presently this bulk is used as it is in product preparation, thereby limiting the application areas. Non-availability of machines for enabling segregation of coconut fibre has resulted in lack of quality fibre, and related value addition to the raw material and the end-products in the coconut fibre industry. Therefore, it was thought that the segregation of coconut fibres into fine, medium and coarse categories will help produce arrays of improved products,

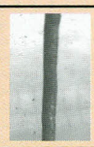
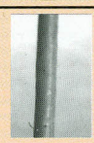
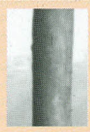
even in high application areas of technical textiles.

The developed machine can efficiently segregate coconut fibres into fine, medium and coarse quality grades. These different quality grades can be used selectively according to the product need or blended with other fibres for making innovative and value added products.

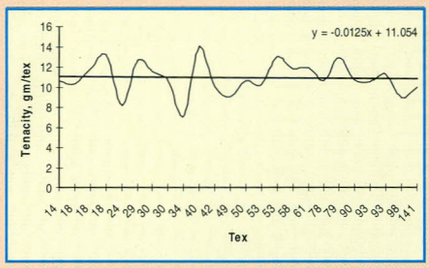
Fig. 1 : Fibre Feeding to the Machine

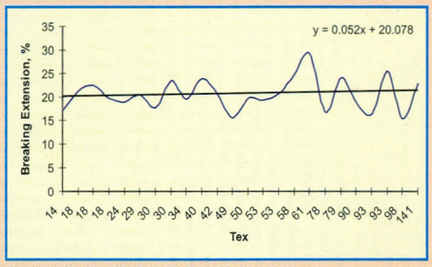
Gradation of Coconut Fibres Based on Fineness

The objective of the newly designed fibre segregation machine is to segregate fibres based on fineness gradation. This requires preparation of a protocol based on fibre fineness. At CIRCOT, a number of coconut fibre varieties were studied under an Image Analyzer. Based on the study, the fibres are objectively graded as follows:

Fibre grades	Representative image	Fibre fineness (microns)
Fine		Below 250 µ
Medium		250-350 µ
Coarse		Above 350 µ

Tensile Strength Vs Fineness of Coconut





- Breaking tenacity: 9-13 g/tex
- Breaking extension: 15-25%

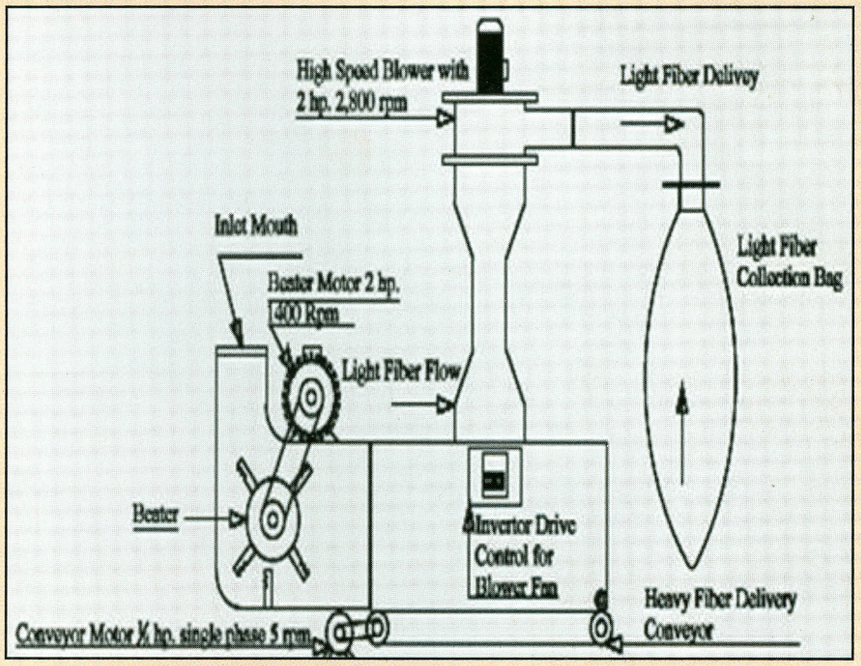
USPs of Coconut fibre:

- Eco-friendly, Biodegradable and Renewable source
- Abundant availability in India and relatively cheaper
- Good resistance to microbial attack
- Exhibits fire resistance
- High water holding capacity
- High porosity

Highly suitable for Technical Textile applications

Operation of the Machine

The schematic design of the machine is shown in the Figure below. Initially, fibre opener of the machine disintegrates the bulk coconut fibres effectively. The opened fibres are then subjected to air-drag in the dumb-bell shaped suction duct. The air-vortex created by the suction impeller is further intensified by the purposive design and geometric shape of the suction duct. Coupled with the gravitational force, this results in separation of predetermined quality of fine fibres. The fine fibres are then sucked from the blower and collected in the intending collection bag. The coarser fibres get trapped in the cyclone created inside the chamber before being collected as an uniform web on a moving conveyor belt and are taken out of the machine. The coarser fibres thus collected can be reprocessed to get a medium variety.



Schematic diagram

Specifications of the Machine

Sr. No.	Particular	Specification
1	Beater motor HP	2
2	Beater speed, rpm	1400
3	Conveyor motor HP	0.5
4	Conveyor speed, rpm	5
5	Blower motor HP	2
6	Blower speed, rpm	2800
7	Total power (HP)	4.5
8	Capacity (kg/hour)	30

Fig. 2 : Coarse Fibres Collected on Conveyor Belt

Fig. 3 : Different Grades of Fibres

Fig. 4 : Unsegregated and Segregated Fibres

Fig. 5 : Fine Fibre Collection

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Machine designed and developed by CIRCOT-NAIP (C-2)

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NAIP (C-2) Sub-project title: A Value Chain for Coconut Fibre and its Byproducts: Manufacture of Diversified Products of Higher Value and Better Marketability to Enhance the Economic Returns of Farmers.