

A Review paper on Structure Modification in Banana Fiber Extraction Machine

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Abstract: -Banana is well known fruit crop in India. In fact India is leading producer of this banana crop. In current scenario in India numbers of local machines are available to extract fibre from banana which is great by product of banana. But quality obtained from that local machine is not impressive. This paper presents new concept of structure of banana extraction machine which will overcome the all disadvantages of current local machine. This paper explains new model of machine, it's working. It also explains advantages over local machine. This study identifies that quality of production due to new machine structure will improve as it is overcoming shortcomings like breakage in fibers, knot formation, and discontinuities in to the length of fibers.

Keywords: banana fiber, existing machine, problem identification, conceptual design.

INTRODUCTION

The Banana fiber project creates a lot of employment opportunities in urban and rural sectors as a wealth from waste concept Banana fiber is eco friendly and biodegradable comparing to all other synthetic fibers. Fiber is extracted from the leaf sheath or pseudo stem of the banana plant the use of "Banana" fiber for textile and other purpose as natural material is a new concept for India. In the recent past, banana fibre had a very limited application and was primarily used for making items like ropes, mats and some other composite materials. With the increasing environmental awareness and growing importance of unfriendly fabrics, banana fibre has also been recognized for all its good qualities and now its application is increasing in other fields too such as apparel garments and home furnishings. However, considerable research work has been done by textile research organizations including BITRA, CITRA, KVIC (Khaki Village Industry Corporation) and NRCB (National Research Centre for Banana-Trichy) and it has been found that banana fiber can be a very promising source of natural fiber in the coming period.

Table.No1:- Properties of Banana Fiber Shown

Table 1: Physical/Chemical and Tensile Properties of some lignocellulosic fibers used for biocomposites. [Adopted from Ref. 3, 8, 10].						
Fiber	Dimensions L(mm)/D(µm)	α-Cellulose (%)	Lignin (%)	Young's Modulus (GPa)	Ultimate Tensile Strength (MPa)	Elongation at Break (%)
Sugarcane Bagasse	10-300/10-34	32-44	19-24	17.9 ^a -27.1	222	1.1
Banana	300-900 /12-30	60-65	5-10	27-32	700-800	2.5-3.7
Jute	120/25-30	59-71	11.8- 12.9	10-30	400-800	1.5-1.8
Ramie	900-1200 / 20-80	80-85	0.5	44	500-870	1.2
Curauá Wet	35/7-10	70.7-73.6	7.5-11.1	30-80 ^b 10.5	1250-3000 ^b 439-495 (MOR) ^c	4.5-6 ^b 1.3
Curauá Dry				27.1 34-96 ^d	117 (MOR) ^c /495 87-310 ^d	1.3-3.2 4.4-9 ^d
Sisal	900/8-50	60-67	8-12	17-22	530-630	3.64-5.12
Coir	20-150/10-50	43.77	45	6	220	23.9-51.4
Luffa- cylindrica	25-60 (Diameter)	62	11.2	-	-	-

a – Calculated; b - Diameter: 30-60m; Test length- 20mm and Strain rate-5mm/min;
c- MOR: Modulus of Rupture. d – Diameter range 26-64 µm

CHEMICAL COMPOSITION OF BANANA FIBRE

Parameters	Banana	Jute (<i>Corchorus capsularis</i>)	Jute (<i>Corchorus olitorius</i>)
Major constituents (%)			
α-Cellulose	61.5	61.0	60.7
Pentosan	14.9	—	15.6
Uronic anhydride	5.3	15.9	5.9
Acetyl content	2.8	2.9	3.5
Lignin content	9.7	13.2	12.5



Fig no.1 shown final banana fibers product

APPLICATION

- Banana fiber has great potentialities for paper making specially demand of handmade papers.
- Some countries it is used for making currency paper.
- Banana fiber has recognized for apparels and home furnishings.
- Composite material of banana fiber is used in building boards and fire resistance boards.
- Polypropylene reinforced with banana fiber is used by automobile companies for making under floor protection panels in luxurious cars like Mercedes.
- Banana fiber mostly used in making handicrafts and home decorative.

EXISTING MACHINE

Major component of machine are rotating roller, stationary roller, feeding gear mechanism, motors, and belt is provided for transfer of motion and torque and whole system is supported by frame. But in present machines there are knot formation and breaking of fibers this problem overcome our conceptual design of machine. Impurities in the rolled fibers such as Pigments, broken fibers, coating of cellulose etc. were removed manually by means of comb. Fibers produced are not of uniform, more Wastages of fibers, More costly machine, less production, poor fiber quality, more Time consuming and also major drawback of these types of existing machine complete psedostem not to be used to extract fiber, before extraction first separate thin sizes slices from psedostem in this area more labor required. unnecessary delay of process and directly effect on production spatially in rainy season there are shortages of labor. We are survey manufacturer, dealer and customer they are get interesting to overcome these problem.



Fig no.3 shown horizontal blades weld on roller

BASIC OPERATION

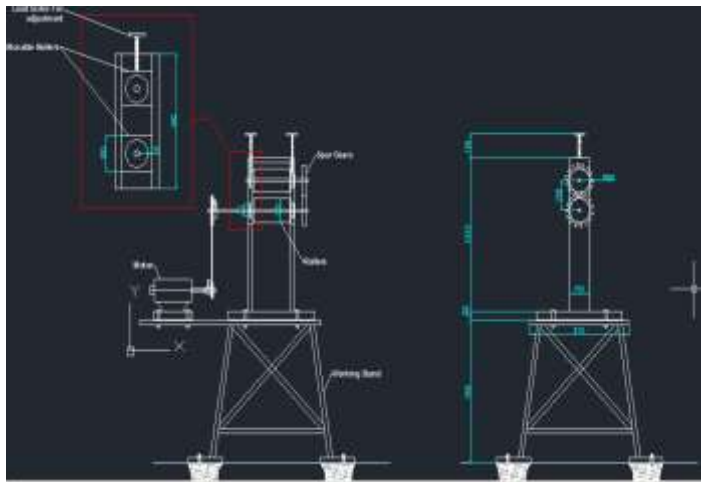


Fig No.2 Existing Model of Banana Fiber Extraction Machine

In mostly existing machines on weld horizontal blades on rollers having blunt edges which are used to scrap the pulpy material from leaf and separate the fiber, some machine use single roller arrange blunt blade on its circumference. In this design fibers are breakages and knot formation by horizontal blade.

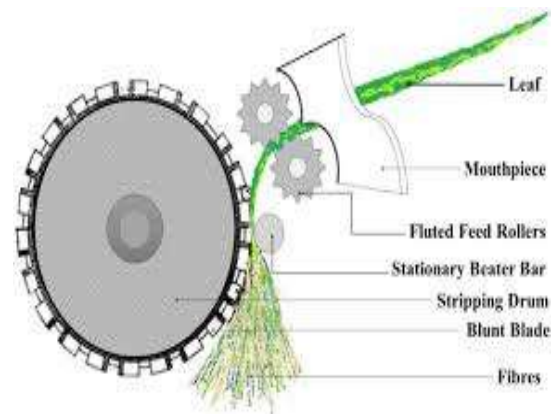


Fig no.4 shown basic operation of banana fiber

In basic operation psedostem leaf push manually through fluted feed rollers then come in contact of revolving roller having blunt blade on its circumference, which scrap the pulpy material from leaf between stationary beater bar.

CONCEPTUAL DESIGN

In our design we use three sets of rotating rollers with clearance adjustor, feeding inclined hopper and 3 hp motor which is mounted on top of machine to avoid falling of pulpy liquid base material on it, between three roller sets we can set the clearance 30, 20 and 10 mm, between them supporters are provided for coming out fibers and in place of feeding inclined hopper is provided. A complete psedostem feed between rollers first roller teeth such that first squish the all pulpy material from psedostem and outlet through 10mm drilled hole on separators, having 80mm length and get stored into the bottom chamber then remaining parts of psedostem enter into second roller after removing entire pulpy part lastly enter into third roller which are completely extracted fiber from psedostem these are comes out from dummy roller. In our new developed design there are no need of separating slices from psedostem complete psedostem use for fiber extraction result increase of

production and quality of fibers improved than previous existing machines

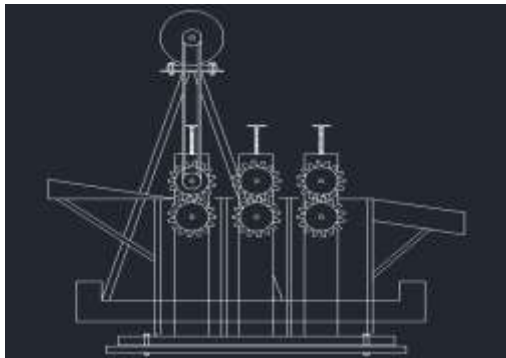


Fig. No.5 Conceptual Design Of Banana Fiber Extracting Machine

Knurled roller

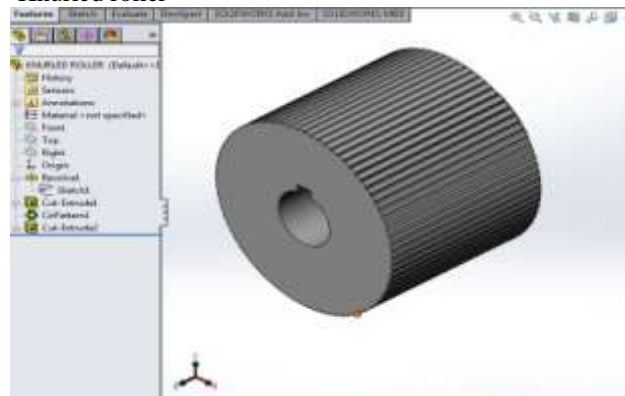


Fig no.7 shown knurled design on roller

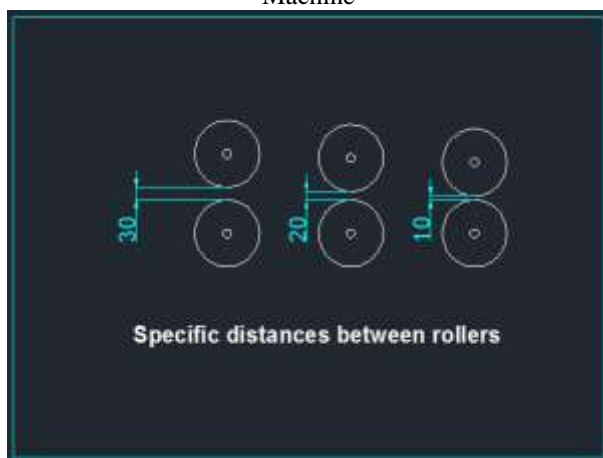


Fig No.7 Specific Distance Between Roller Sets.



Fig No.6 Filter Tray Supporting Plate Design

SELECTION AND DESIGN

Roller – Roller applies necessary squeezing force on pseudo stem of banana separating the pulp, leaving only the fibre. Type of the roller used mainly affect the quality of fibre. When compared other fiber extraction machines, the three rollers set could separate a good quality fiber from complete pseudostem of banana plant. There is no need to separate strip from it We use 300mm length and 160 mm diameter rollers for large size of pseudostem to extract fibers. Three rollers are to be set different clearance. For complete extraction of fibers all rollers are knurled on their surfaces for good extraction between rollers a 80mm length supports plates are provided which having 10mm diameter holes for pulp and liquid extractions

CONCLUSION

The new banana fiber extraction machine useful for mass production and good quality of fiber. This machine will increase productivity and fulfill demand of textile industries Simple structure and easy disassembling will be another advantage. The more labor problem spatially in rainy season can be solved by this kind of design. The factors affecting quality of fibers are three roller sets in different distance clearances and there knurl design on their circumferences, using three hp motor for high torque and power which is fitted on overhead of the machine, different clearance angle between rollers, Affect the production quantity of fiber. By choosing these factors, Minimize the manual work to remove slices of pseudostem complete pseudostem can be used to extract fibers result production of fiber can be increased. By the application hopper and dummy sliding roller for removing fiber from machine save the machine power from to drive conveyor belt. The upper mounting of motor avoid the falling of pulpy liquid base waste material on it.

LITERATURE REVIEW

1	D. SARAVANA BAVANA AND G. C. MOHAN KUMAR	2011	CONCEPTUAL DESIGN FEATURES AND ECO-METHODS FOR THE EXTRACTION OF NATURAL FIBERS IN THE MATERIALISTIC EARTH	design features along with fabricated decorticator to extract the natural fibers from the resources in an eco-naturalistic mechanical manner. Conceptual novel design is been carried out and its features are discussed. This design of extracting natural fiber is done by manually-hand operated method
2	DR. S. K. DEY & DR. K. K. SATAPATHY		A COMBINED TECHNOLOGY PACKAGE FOR EXTRACTION OF PINEAPPLE LEAF FIBRE-AN AGROWASTE, UTILIZATION OF BIOMASS AND FOR APPLICATION IN TEXTILES.	complete package for extraction of PALF and utilization of the residual biomass debris from the pineapple leaf scratching machine for vermicomposting which is economically viable and remunerative for the pineapple cultivators. The fiber is coarser and stronger than cotton.
3	Bandi sruthi & Chand Badshah	2013	ENERGY CONSERVATION DRIVES FOR EFFICIENT EXTRACTION AND UTILIZATION OF BANANA FIBRE	There appears to be good scope of profitable use of this fibre in textile and paper industries on commercial scale. Not only this, but number of high value products like carpets, coasters bags and different types of handicrafts can also be developed from banana pseudostem.
4	KISHAN NAIK1, R P SWAMY2, PREMKUMAR NAIK3 ACHINE	2014	DESIGN AND FABRICATION OF ARECA FIBER EXTRACTION MACHINE	This paper focused on fabrication of areca fiber extraction machine. This is basically removing fiber from areca husk. The areca husk is outer cover of areca nut which consists of fiber. These fibers are being extracted manually. This has several problems such has time consuming, low

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