Volume 2, Issue 10 October 2016 ISSN NO: 2454 - 7514

North Asian International Research Journal Consortium

North Asian International Research Journal

Of

Science, Engineering and Information Technology

IRJIF IMPACT FACTOR: 3.821

NAIRJC JOURNAL PUBLICATION

North Asian International Research Journal Consortium

Welcome to NAIRJC

ISSN NO: 2454 -7514

North Asian International Research Journal of Science, Engineering & Information Technology is a research journal, published monthly in English, Hindi. All research papers submitted to the journal will be double-blind peer reviewed referred by members of the editorial board. Readers will include investigator in Universities, Research Institutes Government and Industry with research interest in the general subjects

Editorial Board

Address: -North Asian International Research Journal Consortium (NAIRJC) 221 Gangoo, Pulwama, Jammu and Kashmir, India - 192301, Cell: 09086405302, 09906662570, Ph. No: 01933-212815,
Email: nairjc5@gmail.com, nairjc@nairjc.com, info@nairjc.com Website: www.nairjc.com

IRJIF IMPACT FACTOR: 3.821

A Review paper on Design and development of particle board Machine using agriculture waste

AKSHAY M. MASKE[1] N.P.AWATE.[2]

1 DEPARTMENT OF MECHNICAL ENGINEERING, GHRCE, NAGPURE, MH, INDIA

2 ASSISTANT PROFESSOR AT MECHANICAL ENGINEERING, GHRCE, NAGPURE, MH, INDIA

Abstract

The rapidly changing economic and environmental needs of society are putting ever-increasing pressures on the forest industry to "do more with less". In practical terms this means, increasing the conversion and efficient use of wood fiber resources, producing more fiber on a shrinking land base, using environmentally friendly processes and technologies considering the use of non-wood lingo-cellulosic fibers for industrial products. One of the ways the forest industry has responded to the global challenges in fiber utilization and processing efficiency was through the accelerated development of composites. Now a day's particle boards are made from most of the agricultural waste like rice husk, coconut husk, saw dust, bamboo fibres, etc. But in this paper we are focused to make particle board by using cotton stack. Cotton stack is one of the major agricultural wastes. The main advantage is availability and cheaper price. Better quality of particle board can be fabricated .This can prove an alternate material for plywood. This can add employment to rural areas

Keywords - agricultural waste, cotton stalk, design and development machine of particle board

INTRODUCTION

Waste disposal can be considered as the final disposition of unwanted products or materials having no further value or use. Waste management, on the other hand, implies some ability to systematically manipulate waste materials up to an environmentally sound disposal. The final solution to most problems of waste management undoubtedly lies in recycling, thereby giving them value and thus effectively preventing them from becoming true wastes

PROCESS

Step 1- Raw Material (Bagasse, Sawdust etc) Drying in sun light or using dryer machine.
Step 2- Raw Material Grinding or crushing (If oversize)
Step 3- Raw Material Screening (For face layer)
Step 4- Raw Material(Screened raw material) mixing with resin and wax(For Face layer)

Step 5- Raw Material(Unscreened raw material) mixing with resin and firming agent (For Core layer)
Step 6- Mat Formation:- 1- Aluminium or Steel Plate

Constituents of Cotton Plant Stalk of Different Species

Species	Holo-Cellulose	Lignin	Ash
1. G. arboretum	67.3	25.8	7.O
2. G. herbaceum	69.1	28.1	8.3
3. G. hirsutum	70.0	27.1	6.7
4. G. barbadense	69.2	28.2	8.1
5. Desi Hybrids	67.3	27.6	6.8
Mean Value	69.1	27.0	7.1
Range of values	67.3 to 70.0	24.3to28.2	5.9 to 8.3

Properties of Hard boards

Properties	Cotton Stalk	BIS Specification
Thickness (mm)	6.0	3-8
Density (gm/cc)	1.0	0.8-1.2
Bursting Strength (kg/cm2)	340	300
Water Absorption (%)	50	40
Tensile Strength (kg/cm2)	68.0	----

DIFFERENT TYPES OF SMALL MILLING MACHINES

Hammer mills

A hammer mill is used for the crush the material like agricultural waste up to very small particle it consists of cylinder with a horizontal shaft that drives a rotor with several rows of free-swinging hammers. The hammers rotate inside a perforated metal screen through which the particle is drawn. The hammers are driven by two or four sets of V Section belts between the engine and the mill. The hammers spin at high speed, usually between 1000 and 1500 revolutions per minute to achieve a hammer-tip speed of about 40m/second. The design of hammer mill was based on the process of allow strong and durable material object. Hammer bit any material that's obstructing its way during operation. In this breakages' of material so reduction is size of particle. The enclosed chamber is known as crushing chamber. The engineering properties and some other parameters are the main factors considered before design of the machine

PLATE MILLS

When cotton stalks are introduced into the centre of the mill, the plates shear the stalk between them. One of the plates rotates and the stalks revolve, working their way to the outer edge of the plate before dropping by gravity into a holding sack below. The stalk lodge in the rotating plate and are sheared by the grooves in the opposing plate. As the stalks move to the edges of the plates, the grooves become shallower and reduce the size of the stalks. The design of plate mills a very old and developed only for stone mills its not suitable for a crushing agricultural waste. The diameter of the plate is normally 150-250 mm. Plates are aligned in both a vertical and horizontal direction but horizontal alignment is more suitable when the mill is run by a diesel engine or motor. Plate mills can run as fast as possible but normally at about 2 000– 3 000 revolutions/minute, as overheating of the plates limits the speed of the mill.

COMPARISON OF MILLING MACHINES

Product considerations

A new mill should take. Traditional crops and cooking methods are deeply entrenched in most societies, and there is little desire for initiating change. A hammer mill grinds anything brittle including straw, mineral ores and dried roots. Any produce to be ground should flow easily when milled. Very soft produce reduces the throughput of a mill and tends to block up the screens so that the mill eventually ceases to function. On the other hand, plate mills are a little more versatile. Any fresh or partially dried fruit or vegetables may be ground in plate mills, provided that the product responds to gravity. Plate mills can operate at a lower speed than a hammer mill and can be turned by hand (where small enough), by animals, wind, water or any other variable speed source. The material to be milled may be soft or hard. Water may be added to cereals but the product must then be processed quickly in order to prevent fermentation.

Technical considerations

Plate mills have a power requirement that ranges between two and 0.5-12 kw is while hammer mills generally demand more power and 2–50kW is sufficient. As a rule of thumb, about 1 kW can mill 25–30 kg of produce per hour Machines and spares for hammer mills are often made locally at very lower prices than imported parts. Some components, such as screens, are rarely made locally and need to be imported, especially those of a very fine size. Plate mills of 0.5 kW are usually made for grinding soft fruits and vegetables, and the plates can be made from locally produced steel. Plate mills are not popular for agricultural waste milling as they have to be manufactured from chilled cast iron, so hammer mill is best for crushing dry cotton stalk

Screening

The screening technique is the separation method which helps to produce very efficient fine particle it can be improvement by vibration and linear screener. The screening process performance can be affected by various

parameters such size fractions of feed and feed rate and intensity of vibration the performance can be assessed by screening efficiency screening efficiency is defined as the undersized particle brought on the screening and discharged oversized product in constant to the original amount undersize particle in the feed stream particle size is the most important factor among others it affects screening technology directly the particle size can be summarize original size. Which particle is larger than screen opening undersized particle this is smaller than the screen opening

TYPES OF RESIN

Urea-formaldehyde

Urea formaldehyde is based resins which can be directly mixed with additives called scavengers, which bind with the urea formaldehyde to reduce emissions. Melamine and hexamine are the most common added scavengers. Alternatively, the board may be treated after pressing with a scavenger such as anhydrous ammonia or various solid ammonium compounds**.**4 Scavengers can reduce formaldehyde emissions by 2 to 8 times, but cannot eliminate it. Signi! Cant quality control is required in manufacturing to maintain these reductions in mass production of the! Nished product. Furthermore, while reducing the rate of emission of formaldehyde from composite wood and providing short term improvements, it is not clear if scavengers extend the time over which the formaldehyde emits from the board. As there is no threshold below which formaldehyde has no carcinogenic e# ECT, this analysis does not focus on the
Scavenger alternative**.**

Phenol-formaldehyde

Phenol formaldehyde resins (PF) is obtained by the reaction of phenol or substituted phenol with formaldehyde. Phenolic resins have been mainly used in the production of circuit boards but have been largely replaced with epoxy and fibreglass cloth, as with fire-resistant FR-4 circuit board materials.phenol formaldehyde is synthetic polymer. Phenol formaldehyde resins are better known, however, for the production of molded products including billiard balls, laboratory countertops, and as coatings and adhesives. In the form of Bakelite, they are the earliest commercial synthetic resin.phenolic plastic are strong hard and very inexpensive .which has well electrical resistant. When heat and pressure is applied during the process of particle board Phenolic resin-impregnated paper or cloth can be laminated into numerous products

Hot pressing

Hot pressing is the important part of particle board. hot pressing is the high pressure and high temperature with low rate metallurgical process forming powder or powder compact 180 degree is enough to creep process for making particle board hard and good this is achieve by simultaneous application of pressure and temperature hot pressing is used for compress the particle board it is mainly used to fabricate hard and brittle material .for making the particle board 2 bar pressure and 180 degree temperature for 3 min is required

Scope

- The technology has the potential to provide alternative material to the plywood &conventional wood through use of naturally available waste raw materials, thus, can benefit the Village Industries sector. According to inputs received during the primary survey, the technology has not been adopted by the Village Industries entrepreneurs. Concerted efforts are required for adoption of this technology by the Village Industries sector.

Advantages

Additional income to farmers

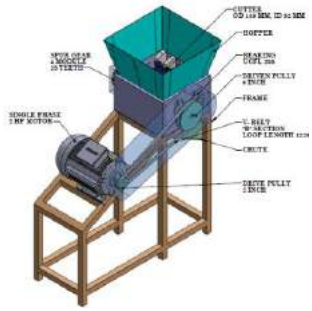
A new material for composite board industry

Avenues for setting up rural industry

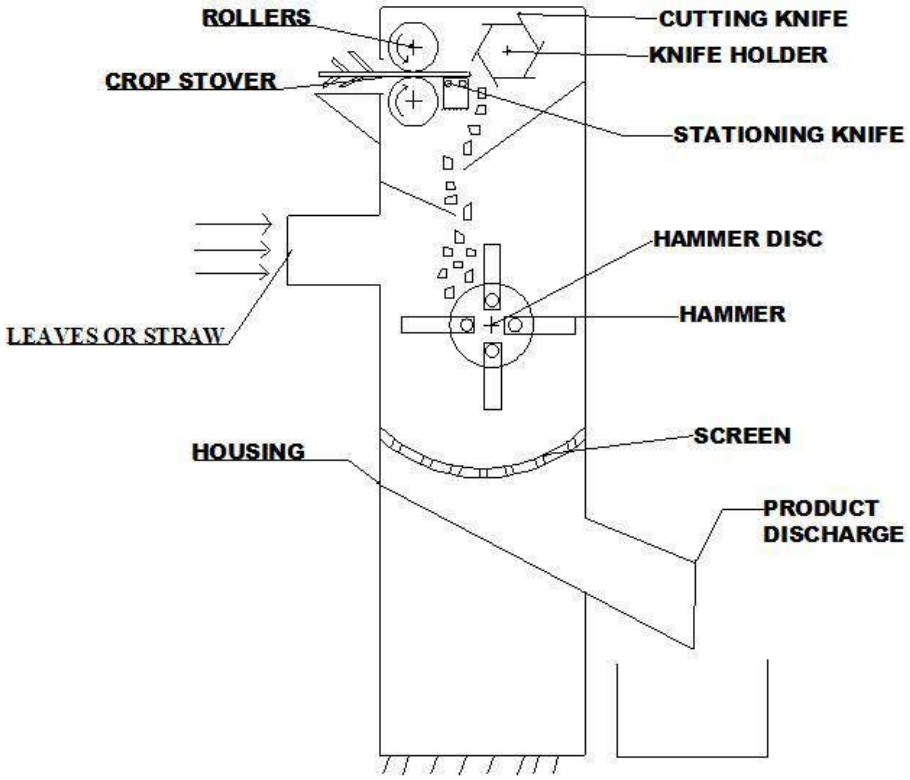
Employment opportunities for rural youth

Conservation of forest resources

Existing machine for crushing cotton stalk



This is the agricultural shredder machine in this agricultural waste crush more than 10mm in this single rotor is used to crush the agricultural waste and feeding so that's why we chose the hammer mill in machine for crushing the agricultural waste .in this shredder machine problem was occur during the feeding of raw material so this drawback overcome in new develop machine by using attach the roller feeder and cutter knife is used to cut the stalk of small particle and after that hammer mill is used to crush the stalk unto 1mm particles



New developed cotton stalk crushing machine

LITERATURE SURVEY

CIRCOT Process

A method has been standardised at CIRCOT to prepare hard boards from cotton plant stalks. The process comprises chipping of cotton plant stalks, conversion of chips into thermo-mechanical pulp under high temperature and pressure in a thermo-mechanical pulpier, mat formation and then pressing of mat in a hydraulic press by a three step pressure cycle to get hard boards. These boards possess all the desirable properties specified by the Bureau of Indian Standards. The process is eco-friendly as no chemical4s are used either during pulping or pressing. It is the lignin present in the raw material that acts as the binder. The boards could be subjected to oil tempering using cashew nut shell liquid or linseed oil to improve their properties. The process involves dipping of hard boards in oil for a specific period and then drying in an oven at 1500C for different periods depending upon the end use. On evaluation, It was found that the boards possess better strength and water resistant properties and are useful in specialised industrial applications.

CONCLUSION

In this paper, we discussed design development of particle board machine using agricultural waste cotton stack. This will provide improved quality particle board and eliminates problem of agricultural waste. This will provide employment in rural areas. Cheaper and good quality of particle board can be manufactured

REFERENCES

[1] Meinel, A.: Zur Geschichte der Siebtechnik: Siebklassierung vom 20. Jh. v. Chr. bis zum Anfang des 20. Jh. n. Chr., Aufbereitungstechnik 49 (2008) Nr. 7, S. 6–27

[2] Meinel, A. und Schubert, H.: Über einige Zusammenhänge der Einzelkorndynamik und der stochastischen Siebtheorie bei Stößelschwingsiebmaschinen, Aufbereitungstechnik (1972) Nr. 7, S. 408–415

[3] Meinel, A.: Klassierung auf Stößelschwingsiebmaschinen, Freiberger Forschungshefte A 537 (1974) S. 9–116

[4] Meinel, A.: Zur Fein-, Mittel- und Grobkornklassierung auf Wurfsiebmaschinen, Aufbereitungstechnik 39 (1998) Nr. 7, S. 317–332

[5] Meinel, A.: Zur Theorie und Praxis des Siebbodeneinsatzes in der Wurfsiebung, Aufbereitungstechnik 46 (2005) Nr. 7, S. 4–22

[6] Meinel, A.: Zur Rolle und Optimierung der Siebboden- und Siebgutbewegung auf Wurfsiebmaschinen, Aufbereitungstechnik 46 (2004) Nr. 7, S. 42–62

[7] Schubert, H. und Meinel, A.: Entwicklungsstand auf dem Gebiete der Wurfsiebung, Bergakademie 20 (1968) H. 8, S. 481–487

[8] Schubert, H.: Aufbereitung fester mineralischer Rohstoffe, Bd. I, 4. Auflage Dt. Verlag für Grundstoffindustrie, Leipzig 1989,S. 226–272

[9] Meinel, A.: Konstruktionsprinzipien und -elemente zur Realisierung der Siebbodenfunktionen bei Wurfsiebmaschinen, Aufbereitungstechnik 47 (2006) Nr. 7, S. 4–27

[10] Gärtner, H.: Hochgeschwindigkeitssiebung im Fein- und Feinstkornbereich, Aufbereitungstechnik 41 (2000) Nr. 7, S. 336–339

Publish Research Article

Dear Sir/Mam,

We invite unpublished Research Paper,Summary of Research Project,Theses,Books and Book Review for publication.

Address:- North Asian International Research Journal Consortium (NAIRJC)
221, Gangoo Pulwama - 192301
Jammu & Kashmir, India
Cell: 09086405302, 09906662570,
Ph No: 01933212815
Email:- nairjc5@gmail.com, nairjc@nairjc.com , info@nairjc.com
Website: www.nairjc.com