International Journal of Technical Research and Applications e-ISSN: 2320-8163,
www.ijtra.com Volume 5, Issue 4, (July-August) 2017), PP. 27-32

COIR BASED MATCH STICKS AND A METHOD FOR MANUFACTURING THE SAME

[1] Ramalingam Muthupalani Balakumaran ,[2] Selvan Jeeva
Government College Of Technology (Gct)
balakumaran26694@gmail.com

Abstract— A method and process for achieving Eco Friendly match sticks, using Coir obtained from Coconut fibre is discussed. It can be a very much progressive and forward step taken to check the occurrence of Ecological disaster due to felling and cutting down of trees for softwood requirements for manufacture of matchsticks. The Coconut Coir is a a very conventional source and rich in fibre content. The match sticks are obtained by treatment of Coconut coir with appropriate quantities of Epoxy Resin, and later fabricated into a thread form and splined. Later, the splined sticks are coated with wax. It can be observed that Coconut coir never shrinks or cracks or produces crust and is ideally suited for manufacture of match sticks and contributes immensely to the preservation of Ecology and saves trees from indiscriminately felled for the purpose of making match sticks.

Keywords— match sticks, Coir, manufacture of matchsticks.

I. FIELD OF WORK

This work is related to production / manufacturing of matchsticks. Further, this work is particularly related to the Eco friendly method of making of matchsticks. Still further, this work involves in the utilization of Coconut Coir, which is now widely used in industries like mattresses, upholstery, bedding etc. Furthermore this work finds a new application for Coir obtained from Coconut which is more Eco friendly and is just a bye product of Coconut tree and is not involved in felling / cutting down of trees which are otherwise, required to be done to obtain the raw material for making of match sticks.

II. BACKGROUND OF WORK

The art of making fire for human usage has been a fascinating study ever since the origin of mankind. Man, since his origins, found out the uses of controlled fire for performing various tasks including cooking, achieving light (luminescence) to keep away from darkness and a host of other operations performed by him in day to day life. It can be seen that man, in his primitive days, used heat obtained by frictional force between two hard surfaces when rubbed against each other like Stones, quartz etc and created fire. The fire thus created was focused on fuel / inflammable materials and used for burning.

Since, then, there has been a great progress achieved in the making of materials for creation of fire as and when required. Among those inventions, the match stick along with the match box with the match sticks packed snugly inside a handy match box has been one of the most popular inventions in this field. Though there are other modes of creation of fire like using igniting materials, inside a lighter and creating fire, due to various factors like cost, efficacy of operation, safety and fool proof methods, the match box along with match sticks still remains the safest utility for creating ignition for mankind for various routine purposes in day to day life.

It can be seen that the match stick, and along with the match box, called as ‘Safety Matches and ‘Safety Match Box’ commercially, essentially has a wooden stick of predetermined length and thickness and in its head, has White Phosporus, Sulphur and potassium chlorate etc as its principal ingredient, along with other materials and a match box essentially has a set of match sticks say 50 or 60 like that. When, fire is to be created, the match stick has to be taken out and striked gently against the sides of the match box, which contains a strip, based of red phosphorus and other ingredients including abrasive materials and the friction thus created ignites the head of the match stick. The match stick, which is made up of soft wood sustains the fire created and continues to burn for some time, (in seconds) until the created fire is focused on an inflammable material for continued burning.

Given this scenario, It can be observed that soft wood like pine wood etc, is being predominantly used for production of match sticks. In India, as it can be seen that Match industry is large and there is a constant requirement for match sticks throughout the year along all the seasons. This industry is largely in small scale and only few big Corporate players are involved in match stick / boxes making industry.

A large number of Indian tree species have been found suitable for use in the match industry. Among the most important Indian matchwoods are Semul (Bombax ceiba, also known as Indian cottonwood) which is good for boxes as well as splints, Indian aspen (Evodia roxburghiana) and white mutty (Ailanthus malabarica), both suitable for high quality splints. It is easier to find good match wood then box wood. While 29 species have been identified as suitable for match wood, only a few are acceptable for making high quality boxes. Of these only semul is commercially available on a sufficiently large scale. But supplies of semul are being

steadily depleted in spite of government efforts to raise plantations. Semul requires a forty to fifty year rotation to grow large enough to produce quality veneer which further exacerbates the supply problem. In response, a number of substitute woods of poorer quality are being used, particularly by the cottage sector. For instance, the wood of the rubber tree (Hevea brazilensis) from plantations in Kerala is now being used for boxes.

It can be seen and it is well and clearly evident, that wood resources have been constantly in decline over the years and indiscriminate usage of wood by cutting down of trees in large extent causes enormous damage to an Ecologically fragile country like India and is resulting problems of larger magnitude like depletion of rainfall, increase in global warming etc.

Hence, it can be seen that the pressing need of the hour is developing a material for matchstick which is not involved in the usage of soft wood and thus reduce the felling of trees and saving the valuable forests of the country.

Already there have been attempts to replace the usage of soft wood for making of match sticks, like using wax paper matchsticks, in which the paper roll is loaded in the thread forming machine and after that wax coating is given and thread is formed. The thread is splined and the stick head is given.

But the manufacture of wax paper matchsticks too has inherent problems and hence, a newer material, which is a byproduct of a biological material and thus a Bio mass which can be utilized for manufacture of match sticks is to be employed for its multifarious benefits.

III. OBJECT OF THE WORK

It is a Principal object of the invention to provide a new material which can be usefully employed for manufacture of match sticks employed in the safety matches industry especially in India. It is yet another object of the invention to utilize the Bio mass obtained from a biological material without destroying the trees for obtaining of soft wood for making of match sticks. Further it is another object of the work to reduce and prevent the indiscriminate felling of trees in forests for the manufacture of match sticks. Still it is an object of the work to judiciously use the bio mass materials for making of match sticks and thus help in the preservation of Eco system and maintaining the forest wealth of the country intact which would result in host of gainful benefits.

IV. DETAILED DESCRIPTION OF THE WORK

A. Proposed Modus Operandi for achieving 'Eco friendly matchsticks'

The proposed work can be understood by comparing with the ordinary matchsticks. The process involved in manufacturing the coir matchsticks is similar to manufacturing ordinary wax paper matchsticks. It is essential to understand the manufacturing of ordinary wax paper matchsticks so that the coir matchsticks can be understood. In manufacturing the wax paper matchsticks the paper roll is loaded in the thread forming machine and after that wax coating is given and thread is formed. The thread is splined and the stick head is given. Likewise the coconut coir is cleaned and treated with epoxy resin and after that it is formed into a thread and wax coated. The waxed thread is splined and thread is given.

V. CLEANING OF THE COIR FIBRES :-

The coconut coir is cleaned in order to remove coir dust from coir fiber to get the white coir. The coconut coir is first soaked in water for more than one day to remove the impurities from coir fiber. The coconut fiber is loaded in coir fiber processing machine to remove coir dust from coir fiber to get the pure white coir fiber.

VI. COIR THREAD

The coir fiber is made into a stiff thread using epoxy resin. The coir fiber is treated with epoxy resin for fiber bond which provides the fiber matrix reinforcement between each fiber. The epoxy resin adds to the burning property of coir. The coir fiber is made into a thread by a machine which is used to make coir fiber threads of different thickness. The coir fibers after treated with epoxy resin is made into 2mm thick thread using the coir thread making machine. The coir thread is allowed to dry so that epoxy resin dries and improves the bond strength between the fibers and makes the coir thread stiff.

VII. WAX POLISHING

The coir thread is wax coated to slow down the burning rate of coir matchsticks and to burn at a consistent rate. The thread is loaded in a wheel in the matchstick manufacturing machine. The wax is melted and kept in molten state in a steel chamber. The thread is passed through the steel chamber and coated with wax.

VIII. CUTTING

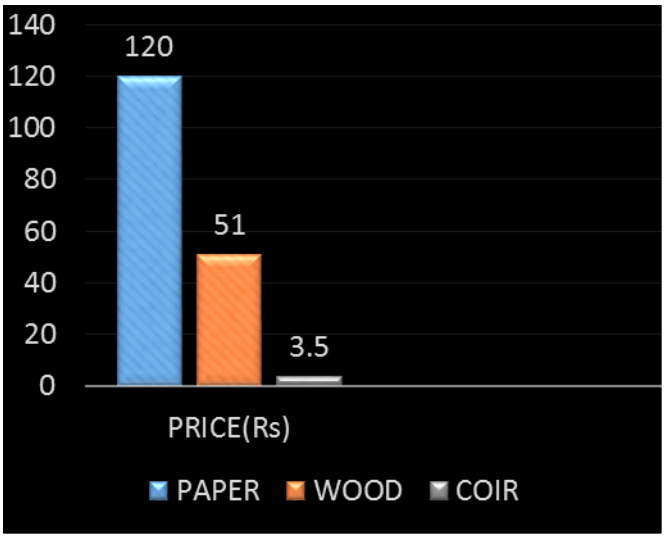
The coir thread in wheel is splined into sticks of 30mm in length using the cutting machine. The coir threads are arranged parallel to each other and each are cut at the same time during the downward stroke of the blade and the coir threads advance for the next cut during the upward stroke of the blade and the splined matchsticks are holdup in position in a tray.

IX. STICK HEAD

The tip of the sticks contained in the tray is dipped in a thick solution made up of phosphorous and sulphur mixed up with water contained in a basin to give the stick head. The stick head is allowed to dry to make the stick gets adhered to the body of the stick.

X. COMPARISON

The coir matchsticks are way better than ordinary matchsticks if we consider the manufacturing cost, burning rate and consistency of the burning. When manufacturing the wax paper and wooden matchsticks the cost of raw materials is comparatively higher than manufacturing coir matchsticks. The time taken for manufacturing coir matchsticks is lesser than the ordinary matchsticks.



Hence, it can be clearly inferred that due to the rising prices of wood and paper and to produce environmentally friendly matchsticks the proposed idea can be of great help to produce less expensive matchsticks and can be manufactured economically. The proposed idea contributes greatly to reduce the deforestation levels and the paper being used to manufacture matchsticks.

REFERENCES

[1] Freitag D. R.. Soil randomly reinforced with fibres. Journal of Geotechnical Engineering, ASCE, 1986, 112, 8: 823–826. CrossRef

[2] Gray D. H., Al Refeai T.. Behaviour of fabric versus fibre reinforced soil. Journal of Geotechnical Engineering, ASCE, 1986, 112, 8:804–820. CrossRef

[3] Gray D. H., Ohashi H.. Mechanics of fibre reinforcement in sand. Journal of Geotechnical Engineering, ASCE, 1983, 109, 3: 335–353. CrossRef

[4] Ranjan Gopal, Vasan R. M., Charan H. D.. Probabilistic analysis of randomly distributed fibre reinforced soil. Journal of Geotechnical Engineering, ASCE, 1996, 122, 6: 419–426. CrossRef

[5] Kudo M., Ochiai H., Omine K.. Mechanical properties of short fibres mixture stabilized volcanic cohesive soil. 2001, Proceedings of the International Conference on Earth Reinforcement, Fukuoka, Japan, 73–76.

[6] Leflaive E.. Soils reinforced with continuous yarns, 1985, 3, Proceedings of the 11th International Conference on Soil Mechanics and Foundation Engineering, San Francisco, 1787–1790.

[7] Li G. X., Jie Y. X., Jie G. Z.. Study on the critical height of fibre reinforced slope by centrifuge test, 2001, Proceedings of the International Conference on Earth Reinforcement, Fukuoka, Japan, 239–241.

[8] Maher M. H., Gray D. H.. Static response of sand reinforced with randomly distributed fibres. Journal of Geotechnical Engineering, ASCE, 1990, 116, 11: 1661–1677. CrossRef

[9] Maher M. H., Ho Y. C.. Mechanical properties of kaolinitic fibre soil composite. Journal of Geotechnical Engineering, ASCE, 1994, 120, 8:1381–1392. CrossRef

[10] Michalowski R. L., Coermark J.. Triaxial compression on sand reinforced with fibres. Journal of Geotechnical and Geoenvironmental Engineering, ASCE, 2003, 129, 2: 125–136. CrossRef

[11] Miki H., Mochimaru K., Mori K., Kumada T., Tajima K.. Erosion resistance properties of fiber reinforced soil. 1996, Proceedings of the International Symposium on Earth Reinforcement, Kyushu, 107–110.

[12] Rao G. V., Balan K.. Coir Geotextiles: Emerging Trends, 2000, Kerala State Coir Corporation Ltd, Alappuzha: 192.

[13] Wahab R. M., Heckel G. B., Al-Qurna H. H.. Total and effective strength parameters of compacted fibre reinforced soils. 1997,Proceedings of the 14th International Conference on Soil Mechanics and Foundation Engineering, Hamburg, Germany, 423–426.

[14] Zornberg J. G.. Discrete framework for limit equilibrium analysis of fibre-reinforced soil. Géotechnique, 2002, 52, 8: 593604 .