

Upcycling of Waste Papers and Napkins into Wooden Based Products

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Abstract - In Our Country India, the major cause of wastage is of occupying the waste of used Diapers & Solid papers. From a long period we are usually recycling them to make an Eco- friendly environment. But we should also be noted that Recycling takes high upfront capital costs & products from recycled waste are not much durable. The energy consumption is more and with effect the pollution is illimitable. So can we replace this process by an idea that we can use the same waste products and reform these to a new solid product which is having different physical properties as from the original materials. Yes, and we generated an idea of Upcycling the same waste papers and Napkins into wooden based products. Since the wooden products are having much demand in the market for our construction and aesthetic purposes but on the other side due to continuous deforestation, the supply is Very low & much costly. Hence the Upcycling process can serve a much rising demand of wooden products & ultimately can serve the environment towards a sustainable journey by saving the intimated culture of deforestation. The Upcycling process of waste papers & Napkins does not demand much initial maintenance cost and is feasible to any labor. With such a benefit this process can give a much needed employment to the youth and can be a part of Make in India Initiative.

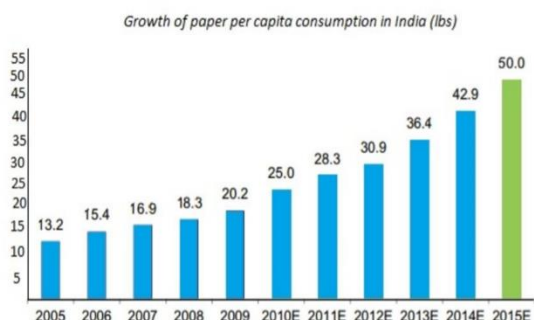
Index Terms - Footing, Upcycling, Recycling, Footprint, Milling, Laminating, Corrugated.

INTRODUCTION

From 2010 to 2050, the global Utilization of pulp and paper is expected to be double. The same will be the Quantity of paper waste. An increased production of paper will also add further to the pressure on the world's forestry that are already in a critical state - and constantly getting it bad to bone. From 2000 to 2017, a total of 378 million hectares of forest were lost throughout the world (in all forest types combined). This loss represents an almost 12 %

decrease in tree cover since 2000. In today's electronic age, people are starting to consider going paperless. But there's still a long way to go before we lose our dependence on this very versatile human product. From our newspapers to our paper wrappings, paper is present everywhere and most of them are ending up in our landfills creating a lurch amount of paper waste. There was a time when paper was a rare and precious material. Now it fills our planet. It was initially invented as a tool for communication, but today, paper is used more for packaging. As per research, With all the paper we waste every year, we can build a 14 ft. high wall of paper from New York to California! The landfill volume is also increased as the waste which goes out to landfill is paper itself and makes our no. 1 waste product. As the volume of landfill increases, more and more area is needed for waste containment. Wastes often need to be burned, causing air pollution. Paper contains most toxins that penetrate in the soil from open and covered landfills and where it causes ecological damage. As paper decomposes in the soil it produces methane, which is a powerful greenhouse gas and disturbs the balance of Nature. Due to all this threat of environmental consequences a process is already employed to undergo a certain technique to make reuse of the same waste papers which is known as Recycling. The average ratio of a recycled paper contains up to 20% virgin pulp, 60% pre-consumer waste, and only 12% post-consumer waste which has to be bleached and de-inked prior to the process ("Waste"). Even, the process of de-inking and bleaching poses a potential threat to the environment. Furthermore, the production of recycling causes paper to deteriorate. First, the cellulose fibres which give the paper its strength are shortened, making the recycled paper dense, stiff, less opaque, less durable and low resistant to tearing. Second, the impurities in

the ink produce a less lustrous white paper (Pena). If the same paper is recycled again and again, these problems will increase for every cycle, and worse, the ratio of virgin pulp from trees also increases.



Sources: Deloitte Paper Industry 2012, media reports

In addition, the number of cycles that paper can go through is limited by the fact that it has to support its own weight during the manufacturing process, otherwise it tears and production time is wasted. And only by adding virgin pulp can double its durability. This is will again cause serious problems. Although recycling is still believed to be an acceptable process of minimizing paper consumption, that is, 90% virgin pulp paper, the rest of the waste that is added provides little to the overall prevention of its adverse effect on the environment.

The Mentioned graph is the reference for the Growth of paper per capita consumption in India which clearly depicts the upcoming needs & which will ultimately lead the environmental crises.

The Napkins or Diapers on the other hand are used by over a population of 300 million menstruating women in India, assuming 39% women use sanitary pads regularly at an average of 9 pads a month, about 220 tonnes of sanitary pad/ Napkin waste would be generated daily! Every month, around 375 million women and adolescent girls across India use sanitary products and generate menstrual waste, and the number is growing with each passing day. Every year India produces 9700 tonnes of sanitary wastage, which is about 92% as heavy as the Eiffel Tower. One sanitary pad could take from 400 to 900 years to putrefy as the plastic used is not bio-degradable, and can lead to health and environmental threat*. Like the Known French structure, our sanitary “footprint” will far outlive our own lives, and remain for the generations to come. It is becoming a known

knowledge that our pads will spend the next hundreds of years breaking down in landfills or oceans. Unknown to many, from the landfills and the oceans, the Napkins make return in the form of micro plastics and chemicals. In this way, hidden from sight, we find them in our homes, food, air & water. At the end of the day, the destination of disposable pads is in our own bodies. Sanitary waste is a problem because of the “ingredients” in disposable pads. Conventional pads are 95% plastic; even the “fabric” top layer is a plastic woven sheet. Add to that the packaging, plastic wings and adhesives, super absorbent (plastic) polymer gels, and each pad is the equivalent of four plastic bags.

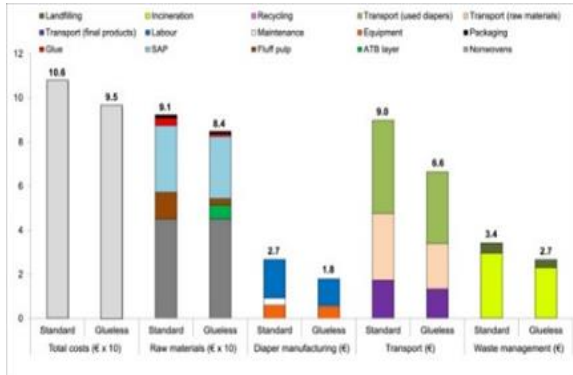
*Source: NDTV Report Feb 28/2018 (Menstrual Hygiene, Waste Management).

Characteristics	Frequency	Percentage
At school		
Dust bin	14	43.8
Do not change	18	56.3
At home		
Dust bin	25	78.1
Bury	2	6.3
Burn	5	15.6

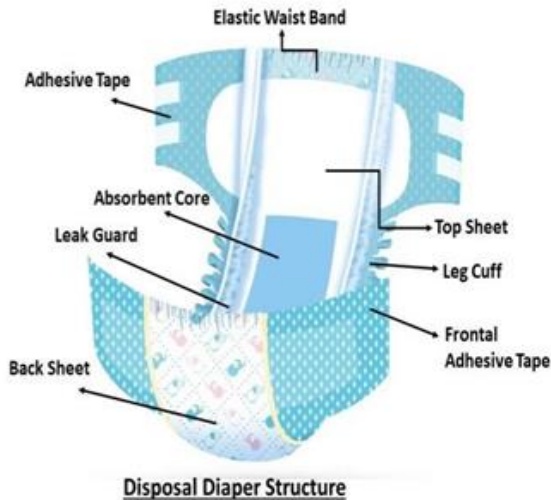
Disposal of used Sanitary pads by girls while at school or at home. (Source: ResearchGate.net).

Disposable diaper used by kids is the 3rd largest consumer item in landfills, and represent 35% of non-biodegradable waste. The only other items that remain at the amount of disposables in landfills are newspapers, beverage and food containers. Even though it may seem as if an individual child doesn’t contribute much to those numbers, each baby wearing disposable diapers creates about 2400 pounds of garbage over the course of 2 years. That’s literally a ton of toxic waste. It takes hundreds of years for disposable diapers of kids to putrefy when being exposed to sunlight and air. Since diapers are dumped into landfills, covered by soil and not being exposed to sun or air at all, nobody knows how many hundreds or even thousands of years they could be around. An average diaper weighs between 1.5 and 2.0 ounces and is primarily made of cellulose, polypropylene, polyethylene and a super absorbent polymer, as well as minor amounts of tapes, elastics and adhesive materials. Demand for diapers is growing steadily across India on account of their benefits for babies. The diaper market in India reached a value of US\$ 1.27 Billion in 2020*. On a geographical front, the market has been categorized into Maharashtra, Delhi NCR, Tamil Nadu,

Karnataka, Gujarat and Others. Amongst them, Maharashtra currently represents the leading market for kid diapers in India, holding the majority of the market share. In the three active years of a baby’s life in which the parents use disposable diapers, they spend over Rs 70,000 on them. Meanwhile, the plastic waste created by the diapers will drop some jaws. Consider that the average baby goes through at least eight to ten diaper changes every day for the first few months. This amounts to approximately 550-600 diapers in three months.



Disposable baby Diapers eco efficiency & life cycle

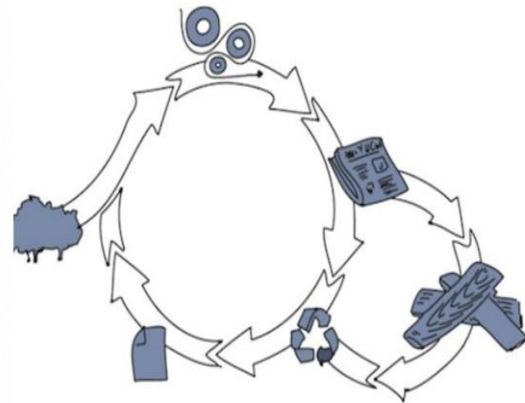


* Source: IMARC Group

WHY UPCYCLING OF WASTE PAPERS & NAPKINS

upcycling is a process in which putrefied or discarded items are repurposed to make them valuable, useful, or simply aesthetically pleasing (“Upcycle”). It is essentially the “reuse” in “reduce, reuse, and recycle” of discarded products. It’s a form of recycling, also known as creative reuse, that adds

value and new purpose to old materials. When someone upcycles, he or she is taking a product or material that would typically be thrown away and turning it into something new & useful. Upcycling is appealing to everyone depending on the need. Because it does not require any complex process, upcycling discarded products can come from salvaging through dumps, rummaging through thrift stores, reusing packages, to reusing paper products. “Upcycling” is different from “Recycling” because it uses less energy to create a new item (“What”). It benefits the environment by promoting “reuse” of paper over discarding, and most significantly, opposes overconsumption of paper products.



Upcycling will encourage design schools to think of new and innovative ways to use discarded paper. The upcycling campaign will create awareness among students on the importance of extending the life and adding value to used paper and products. And also, develop valuable ways of designing interior related products. The concepts of upcycling and recycling are often used interchangeably, but they represent different things. Upcycling is when you give a new use to a product or material instead of throwing it away; recycling is when the material is broken down and then processed into a new substance. Paper is mostly seen as a destination for wood, as opposed to a step in a larger process.

We have usually seen making of paper from wood but, despite the obvious negative effects of cutting down our natural source of oxygen, we’re also left with metric tons of paper waste generated daily. In fact, paper accounts for 28% of our landfill waste, and this waste goes completely unnoticed. But with a little ingenuity, we can turn the traditional production

technique on its head: a material that goes from wood to paper and from paper right back into wood.

Waste Napkins & Diapers on the other hand if being recycled will take plenty of chemical process & a much cost technique to make fully decomposed. Since the diaper consist of four different materials to be used, in which a plastic layer is present at the top as back sheeting and at the interior surface. This plastic layer create a lot more disturbance when disposed in the surrounding as it releases the chemicals & disturb the surrounding. During the Upcycling process, the plastic back sheeting of Diapers is used as a adhesive material to glue the papers & form a strong wood material.

LITERATURE REVIEW

A- Paper use in India

Paper is the most useable material for magazines, newspaper, book, and packaging material which circulates around many industries. A significant amount of wastage of paper comes from the office, home, or school where paper necessitates the work a person does. With the economic development of the Industrial Revolution, and even the electronic revolution, despite the myth of the “paperless” institutions, the demand for paper is still dramatic. Even underneath its revenues and jobs which the paper industry produces, the harmful effects of making paper from trees was not intended, yet still, the demand for paper is not decreasing. The consequences does not stop as with the increasing demand of paper, the more environmental impacts of pollution we are facing.

The paper which is thrown out as a waste should be stored and sent to recycle so that it does not create such alterations & further more The Newspapers & cardboard waste should be stacked & Upcycled to form new products which will fill the equal demand of much needed wooden products.

B-Impact of Diapers & Napkins

Disposable diapers & napkins may seem more convenient but their environmental effect is unimaginable because almost 93 per cent of nappies are buried or being dump into landfills and not exposed to sun or air at all, thereby the harmful chemicals that are present in these diapers get

subsequently diffused into the environment. Disposable diapers are made from synthetic materials (non-recyclable polyethylene plastic) which are non-biodegradable in nature. Besides the accumulation of waste, disposable diapers contain many harmful substances. Some of the toxic substances present in them and their effect on living beings are: Tributyltin, Dioxins, Adhesives, Volatile Organic Compounds, Plastics/polymers etc.

Plastic contribute a major part in diapers which is utmost responsible for the degradation of soil & health around. This part of plastic is present at the top of Diapers as a back sheeting & on the interior surface. With proper filtering technique, this plastic material can be taken out and can be used as a adhesive material in Upcycling of papers to solid wooden products. With this process, the diaper will be upcycled to a new product of much greater value & the remaining part does not create a much hindrance in outside environment.

C-Recycle, Reduce and Re-use

Recycling one ton of paper can save 20 trees, 7,600 gallons of water, 395 gallons of oil, 3.5 cubic yards of landfill space and 4,500 kilowatts of energy. Recycling paper and cardboard preserve space in landfills for trash that cannot be recycled and saving space in landfills reduces the need to build more landfills. Recycling paper reduces methane and carbon dioxide in the atmosphere. When paper decomposes anaerobically in dumping ground, it produces the gas methane. Methane, a highly potent greenhouse gas, together with carbon dioxide contribute to global climate change. Trees absorb carbon dioxide and when they are cut down to make paper products, more carbon dioxide is released than being absorbed. Processing wood to make paper pulp using fossil fuel-based energy releases additional carbon dioxide. Recycling paper breaks the not ending deforestation of trees. Each ton of recycled paper saves about 20 trees. Recycled paper serves as an environment friendly resource for paper industries or mills, saving costs and energy. However, paper can only be recycled five to six times before the paper fibres become too weak. Material consisting of short fibres can be composted, burned for energy or used as landfill. On the other side, paper mills use toxic compounds such as toluene, methanol and formaldehyde which pollute the air & make it toxic to

breathe. Furthermore the paper being recycled time & time produce a dull surface & is not preferred in market.

D-Upcycling

Upcycling is the process of taking something that's essentially waste and moving it up the consumer-goods chain. In this process the disposable or discarded items are Repurposed to make them valuable, useful, or simply aesthetically pleasing.

The waste papers & Napkins can be upcycled with special technique to make the wooden products which can serve the much needed demand of Market & prevent forests from deforestation. Hundreds of newspaper sheets are combined on one another, bonded around a tube using environmental-friendly glue with the diaper/ Napkin back sheeting and then dried. They then form of large round logs which, when cut into planks, produce a surprising effect. Newspaper Wood presents the different layers of newspaper, evoking the aesthetic poetry of a tree's growth rings. It is reminiscent of the organic aesthetics seen in real wood. Sometimes used without being planed, sometimes applied in thin flexible layers, the material can be worked in just the same way as conventional wood. The Upcycling process of waste papers & Napkins does not demand much initial Maintenance cost and is feasible to any labour. With such a benefit this process can give a much Needed employment to the youth and can be a part of Make in India Initiative.

IMPLEMENTATION

The Upcycled waste papers & Napkins can be reformed into wooden based products which can ultimately be used in interior designs like Table Tops, Chairs, Door panels, wall panelling, staircase Railing, wardrobe panels, roof panelling, corrugated paper light and most for the aesthetic appearance. The Schools & Colleges are likely the hub for generation of waste papers which will create a cheaper demand for the raw materials. On the other side households & schools occupy a much percentage of Diapers & Napkins in the Dustbin or outside, so it will be readily available without involving any cost to purchase.



Since the wooden products are having much demand in the market for our construction and aesthetic purposes but on the other side due to continuous deforestation, the supply is Very low & much costly. Hence the Upcycling process can serve a much rising demand of wooden products & ultimately can serve the environment towards a sustainable journey by preventing the intimated culture of deforestation. Upcycled wastepaper & Napkin Planks which resemble the shape of wood and the chairs which are made of same upcycled material.








RESULT


The Few products are taken which are actually prepared by Upcycling of waste paper

& Napkins by Undergoing few process as underlined:

1. Collect the paper and waste Diapers
2. Laminate the paper Log
3. Milling The Paper Log (Making Straight cuts to give desired shape)
4. Finishing The Outer Surface.

The product developed is achieving a good compressive strength to resist the normal load. As combining and rolling a maximum quantity of papers and back sheeting of Diapers will give Compressive strength to section, so it can be replaced in Places of the interior usable products.

Photo of Product	What is the purpose and function of this product?	What types of paper isUsed	How much of the paper that is used came from the waste in school? At home? Other sources?
	<p>To make things (such as: Papers, pens, envelopes, Memos, etc.) organized.</p>	<p>Mostly scratch papers, photocopied papers, used illustration boards and Back Sheet of Diapers</p>	<p>70% photocopy papers from school 30% scratch papers from Home & 20% Diaper back sheet</p>
	<p>A side table that is helpful for everyday use out of the scrap materials that we mostly ignore.</p>	<p>utilized the wasted papers form punchers and binder machines, tissue roll cartons, excess paper tapes, and old carton boxes along with Diaper back sheet.</p>	<p>25% At school 40% At home 35% Outside(shops)</p>
	<p>This product serves as a wall panel and at the same time may be used as a wall divider or partition and a surface cladding.</p>	<p>Utilized paper taken from various stores & house, illustration board from previous plates, & table napkins from various fast food chains .</p>	<p>10% came from the school 80% from our houses and 10% from various fast food chains.</p>
	<p>This product is primarily made for seating and design purpose.</p>	<p>used recycled bond paper, tracing paper and old magazines for the product. Along with back sheet of Napkins.</p>	<p>40% of paper that came from school 60% of paper came from our houses</p>
	<p>Task lighting</p>	<p>Illustration Board, Bristol Board, and Tracing Paper along with Napkin back sheet for adhesiveness.</p>	<p>30% illustration board and the Bristol board 60% of tracing paper came from our own home.</p>

	<p>Upcycled Product is an office divider or partition. It is placed in between cubicles and can also be used as design in the reception area or lounge area of the office. It also serves as a board for posting papers/notes/memos etc.</p>	<p>Upcycled Product mainly uses Tracing Paper. It is placed as a panel or as a cover of the divider. It works like a frosted glass so that it will give a bit of privacy to a certain area where the divider is located.</p>	<p>The tracing paper used in the product is 100% waste in school</p>
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CONCLUSION

Upcycling by its name mean greater value and quality from the original one. Thus upcycling of waste papers and Diapers will not only make our surrounding clean but also helps in increasing the economic growth of the village. It will provide employment to a lot of people .Since its raw material is easily available in the surrounding, it is easy to setup a industry to manufacture the product. Moreover from the above mentioned products which are manufactured by Upcycling of same waste of paper & Napkin, these are fulfilling the needs of much demanding aesthetic & wooden based products which are utilised by readily available raw materials like paper board, Tracing paper, illustration board, Napkin or diaper back sheet etc. in much feasible percentage.

The products are having a much-required strength & hence can replace most of the wooden based products while giving a little break to non-ending deforestation and set a goal for sustainability.

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