DESIGN THINKING FOR RE-PURPOSING USED PACKAGING TIMBER

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Abstract
Timber and wood based materials like plywood have been used for packaging from a long time. As a normal practice the used packaging timber in India is used for repacking, as firewood and low-end interior decoration purpose. Sustainable eco-efficient repurposing of used packaging timber forms the basis for ‘DESIGN THINKING FOR RE-PURPOSING USED PACKAGING TIMBER’.

Used packaging timber from industries and warehouses is obtained by scrap dealers and sorted according to material, size, quality and quantity. The scrap dealers remove nails and screws and the material is sold in retail by weight to the user.

Design Circle, Bangalore, India have been re-purposing used packaging timber and plywood from 2004 onwards. The packaging timber from scrap dealers is processed further to suit different product categories like toys, educational products, lifestyle accessories, physiotherapy products, play and furniture using regular woodworking techniques. Value addition to the material is done by glue lamination transforming the packaging timber into solid timber sections with expensive feel and look. The constrained availability of the raw material calls for design of low quantity and high quality production.

The paper presents product examples for different sections of the pyramid, designed and executed at design circle, Bangalore. The paper points the constraints, fresh avenues, sustainable practices in raw material procurement and in product design. The paper emphasizes the importance of re-purposing of a renewable, sustainable, material like timber after serving its originally intended purpose.
Keywords
Eco-efficient, Re-purposing, Value-addition, Educational, Design-led

1. Introduction
Packaging Timber and wood based packaging materials like plywood and chipboard have been re-used for a long time. The paper looks at packaging timber as a material, its properties, strengths and weaknesses. The paper also highlights the possibilities of design-led thinking for value-addition, re-purposing and contextualizing of packaging timber and wood based packaging material particularly plywood after its originally intended purpose.

High quality raw materials like timber and plywood that can be reclaimed and reused into various product categories are explored to create a positive and meaningful socio-economic impact. Timber and wood based packaging materials have been reused for a long time for low end interior decoration, packaging, firewood and miscellaneous uses. The paper explains in simple terms, the quality of the raw material and the various possibilities it can be put to, than the way it is currently used.

Being an unorganized sector, constant and easy availability of raw materials is one of the major hurdles for repurposing of timber and wood based packaging materials.

With unpredictable supply and availability of raw material, an opportunity and challenge arises for out of box thinking, use of specific and varied production techniques which provides opportunities for a designer craftsman approach or skilled labor intensive socially, environmentally and economically sustainable employment generator.

Design Circle, Bangalore, India- a design led production unit have been repurposing timber and packaging plywood from the year 2004 till date. With a design entrepreneur approach, value addition at various stages has been tried to avail and obtain a wider impact in the form of various product categories and contexts. Product examples in different categories for varied uses have been cited to support and effectively explain the essence of the paper.

2 Timber and wood-based packaging material
The definitions of re-use and re-purpose have to be defined and understood before proceeding into further detail. Re-use of product or a material is the activity which lengthens or increases its life and productivity beyond its intended time frame. Re-purpose of a product or material is the activity which lengthens or increases its life and productivity beyond its intended timeframe and originally intended purpose. The concept of re-use and re-purpose has been a way of life in the traditionally agrarian society of India. What is new is the need for re-use and re-purpose due to the blatant consumerist attitude of today’s society, especially in the big cities. Timber and wood-based packaging materials like plywood and
chipboard have been used for a long time. The paper concentrates on solid timber and packaging plywood for further elaborations. Plywood because of its strength and durability is used for packaging mainly hardware, machinery and machine parts. The quality of the packaging material shipped from the European and North American countries is of a high quality and appearance. Long established forestry practices, manufacturing processes, quality control, and easy availability of raw material for the wood working industry are some of the predominant reasons for the high quality packaging timber and plywood originating from Europe and North American countries.

The used packaging plywood is collected by scrap dealers from various sources. Scrap dealers in the city of Bangalore trade in various categories of scrap which include solid wood, timber based materials like plywood, chip board, particle board, block board etc, ferrous metals like mild steel, stainless steel etc, non-ferrous metals like copper, aluminum etc, electronics and various plastics to name a few. Solid wood scarp comes mainly from demolished building sites and solid wood sections used for packaging obtained from the factories, warehouses and various installations including construction sites, software parks etc.

Timber and wood based scrap materials including packaging plywood mentioned above are sourced mainly from factories, warehouses, demolished buildings, dismantled furniture from offices, residences etc. The automobile and its ancillary industries are one of the major sources for timber and packaging plywood due to the frequency of imports. The packaging timber (figure-1) and plywood laden with fixtures like nails, screws, clamps, hinges etc are picked up by scrap dealers, who then transports the scrap to the shops in various parts of the city. The plywood at this stage is still unusable because of the presence of nails and screws, and also due to the presence of damaged pieces that needs to be removed. Solid sections of timber in packaging are mainly used for the supporting structure and skeletal framework of the packing crate. Plywood and other wood based packing materials are used mainly as the enclosing structure. The thickness of the timber sections and plywood depends on various factors like size of the packaging, the product contained in the package, type of material handling equipment to be used etc.
The hardware used in the packaging which includes screws, nails and metal clamps of various shapes and sizes, are removed and sorted. Nails, hinges, clamps and screws that can be reused are sorted to be sold separately and the rest is sold by weight as metal scrap for recycling. The removal of the nails and screws is done with minimal infrastructure in terms of the space and the tools used. Hand tools like hammer, crowbar and pincers are used to remove the nails and screws (figure-2). The economic status of most of the shop owners are above the average Indian upper middle class, whereas most of the employees are from the lower and lower middle class strata of the society. Most of the employees are self trained on the job. The scrap dealing shops are situated in densely populated slums due to availability of commercial space (figure-3) for lower rentals. The removal and cleaning is done within the shop premise which is about 15 to 100 sqm in area or in front of the shop.

According to Victor Papanek (1995)
“Scarcity of materials for many third world countries has made recycling a necessity and a way of life for generations”.

Figure-1 timber and plywood with nails and fixtures
Figure-2 removal of nails and screws from packaging timber
2.1 Design-led thinking and value addition

The paper looks at design-led thinking leading to value addition to timber and packaging plywood. Design-led thinking uses design and value-addition at every stage of the product life cycle which includes

- Selecting of the timber and plywood during purchase at the scrap yard
- The product category and the product
- Production method and techniques
- Obtaining specific shapes and sizes from available thicknesses from the scrap yard
- Value addition in terms of finishes
- Value addition in terms of packaging

Proper selection and sorting of timber and plywood at the scrap yard leads to the following advantages like

- Minimal wastage due to elimination of defective stock and unwanted sizes
- Identifying and getting design insights after looking at a particular size, thickness, color and grain pattern of a particular piece
- When the final size of the product component is known, rough sizing of the raw material can be done at the scrap yard. When rough sizing of the component is done in the scrap yard, transportation cost can be minimized due to the lesser volume occupied compared to the original sheet size
• Sorting and removal of defective pieces reduces the overall cost of the raw material at source. The defective pieces add to the cost of the raw material since the packaging plywood is sold by the scrap dealers by weight and not by area, which is in the case of new material purchased from the retail market.

• Since availability of the raw material in the scrap yard is unpredictable, optimal use of the available sizes and thickness plays a vital role. Selecting the right thickness and size can eliminate fabricating of custom thickness when not necessary. This further minimizes the use of various glues, fabrication man-hours, curing time and the power consumed.

High quality raw materials like timber and plywood that can be re-claimed and re-used into various product categories are explored to create a positive and meaningful socio-economic impact. The solid timber sections used for packaging, apart from being cured and processed initially get weathered and further cured during the long journey. This improves the quality of timber to a great extent. The down side of the process is the damage caused to the timber sections due to the handling of the package. The selected packaging plywood available from the scrap yard is of a high quality, which can be explained with reference to the color, thickness and absence of core gaps.

1. Color: The color of the plywood available mostly uses Pinewood which is light yellow or cream colored. This allows the plywood to lend itself to various wood stains and finishes. The plywood when finished without any stains, the prominent natural grain of Pinewood is highlighted and makes the finished piece visually attractive.

2. Thickness: The plywood in the scrap yard is always available in constant thickness of 6mm, 8mm, 12mm and 18mm. This constant thickness gives a design constraint and challenge which aids in obtaining variety in product category and range.

3. Minimal or no Core gaps: Core gap, as the name suggests is a gap which occurs in the core of the plywood. This core gap occurs if there is a gap between layers of ply or in the same layer due to substandard quality regulations during the making of plywood. The presence of core gaps gives rise to difficulty in finishing the plywood, reduces the strength of the plywood and gives an unpleasant visual appearance.

The packaging plywood from the scrap yard, specially the plywood from Europe and North America has little or no core gaps. These qualities of the raw material allow a variety of possible techniques and production methods to obtain a wide range of products. With all the above qualities if the raw material were to be purchased fresh from the market, it would make the product development process unviable in terms of cost. This very aspect of re-using a high quality raw material that is available at a comparatively lower cost can be utilized for creating a positive socio economic and environmentally sustainable impact. This
can be achieved through encouraging designer and/or craftsman entrepreneurs and setting up low-technology, high-skill, and labor intensive training and production units.

2.2 Designer and/or craftsman entrepreneurs:
The plywood from the scrap yard can be selectively chosen and repurposed by individual designers and craftsmen in their studios or production units. One of the main advantages of the designs or prototypes being developed in this manner is the low initial investments in raw material, tooling and infrastructure. The products created can be highly individualistic one-off lifestyle products or can be developed as a prototype design. These designs can be developed, tested, revised and then they can be selectively used for volume production in low-technology, high-skill labor intensive production units. In a country like India there are vast resources of traditional craft skills that can be adapted for contemporary applications. This can be done by keeping intact and incorporating the traditional techniques, motifs, patterns, graphics, forms and finishes with the new material and designs. The traditional master craftsmen can undergo short-term training/exchange programs which can include procuring and handling of raw material, updated tools, and production techniques, marketing and distribution networking etc.

2.3 Low-technology, high-skill labor intensive production units
Prototypes or designs developed by individual designers and craftsmen can be produced in volumes depending on the availability of raw materials and skilled labor. This scenario creates employment opportunities for more people. This scenario further creates and necessitates the setting up of training and research centers to create a knowledge and resource bank of people with certain skill sets. The craftsmen trained from these research centers can spread their knowledge in regular schools and colleges, achieving some prominent objectives which are

- Sensitizing students about re-use and re-purposing in particular and environmental sustainability in general
- Providing and improving hands-on working skills of students
- Sensitizing about different vocations and the need for vocational education

Research and development facilities for using or reusing similar materials including metals, plastics etc obtained from ‘scrap’ thereby contributing towards a major responsibility of material management, economic and environmental sustainability. Vast craft based resources of India can be utilized, adapted, sustained and assure continuity of traditional knowledge.

The packaging plywood from the scrap yard, though a high quality material, comes with its own set of problems and limitations. Some of them are
• Being an unorganized sector, the availability of the raw material is unevenly distributed amongst many dealers.
• The uneven economic condition of these dealers plays an important part in the highly unreliable availability of the quantity and quality of raw material.
• Due to the unorganized retailing, quality is sacrificed by including substandard and damaged material. This causes loss for the buyer because the raw material is sold by weight and not by area.
• Being a packaging material transit wear and tear results in high wastage.
• The cost, constant supply and availability of packaging plywood in the scrap yard totally depends on the quantity of imports of machinery and machinery parts.
• The quality of the plywood also depends on important factors like the value of the product being packaged - a low cost and less fragile product may not use high quality plywood, origin of the imports - plywood packaging from Europe and North America were found to be usually superior to the plywood packaging from China or other Asian countries.

As with any recycling or ‘scrap’ industry in India, packaging plywood has been reused from a long time. Enquires with the scrap dealers and customers in the scrap yard reveal some of the uses that the plywood from the scrap yard is used. Low-end Interior decoration purposes of small shops, restaurants, footpath shops, push carts, low-end furniture components etc, form some of the applications. With the packaging plywood it is important to understand the possibilities, qualities and limitations of the material. By so understanding the material has to be put into better value-added use than what it is being put into now.

“Many environmental improvements arise from an improvement in efficiency. This concept, known as ‘eco-efficiency’, is very popular because getting a job done using less energy means there is often a cost saving as well as an environmental benefit. And materials efficiency makes obvious sense for business, as it means you can use the same chunk of stuff to more people” (Edwin Datschefski, 2001)

The very shortcomings of unpredictable supply and availability of the raw material i.e. repurposed packaging plywood, gives rise to opportunities and challenges. They include out-of-box thinking to use varied and specific production approaches. At Design Circle, Bangalore, the design-led entrepreneurs have been using packaging plywood from the year 2004- till date. Design has been used as the main differentiator. Value addition at various stages of the product development process has been used to avail and obtain wider impact. The result of this approach is varied product categories and product variations have been cited to support and effectively explain the paper.
Before we go on with further to the product categories some thoughts of Victor Papanek from his book ‘The Green Imperative’ have been quoted to emphasize the importance of designers to having an ecological world view that could change design and design led thinking

“There will be a greater emphasis on quality, permanence and craftsmanship in designed products, as people and designers come to understand that obsolescence or bad workmanship waste natural resources that can’t be replaced, and contribute to shortages on global scale. The style of the future will be based on products that age gracefully, and will be timeless than the quickly changing fads, trends and fashions of the late 20th Century”. (Victor Papanek, 1995)

It important to note the emphasis given for quality, permanence and craftsmanship in designed products. Well executed products in repurposed packaging plywood, address these very issues towards an environmentally and economically sustainable scenario.

About the designers intent and the intended use of the object that can yield spiritual value, according to Victor Papanek (1995)

- “When our designs are succinct statements of purpose, easy to understand, use, maintain and repair, long lasting, recyclable and benign to the environment, we INFORM
- If we design with harmony and balance in mind, working for the good of the weaker members of our society, we REFORM
- Being willing to face the consequences of our design interventions, and accepting our social and moral responsibilities, we give FORM.[4]

With re-using and re-purposing any material resource natural or man-made addresses the above mentioned INFORM, REFORM and FORM in a simple and effective way.

3 Products

The product categories used to effectively explain the essence of the paper are listed under educational products, architectural accessories, lifestyle accessories and fitness products. An individual product example has been selected and explained by naming the product category, production technique and method, advantages of using the production techniques, the intended users of the product and similar products examples made or under development.

3.1 Educational products- Tangram pieces

The traditional Chinese puzzle of Tangram (figure-4) pieces forms a square of size 230mm x 230mm. These are made using small pieces of 6mm or 8mm plywood that are cut on a table
saw and sanded to size. Styrene, foam board or 4mm plywood templates are used for marking and cross checking the individual pieces. The main advantage of the process is minimal wastage of the raw material and repetition of components. This allows the pieces to be made in low-technology, high-skill labor intensive production units. The intended users of this product include school children of ages 3yrs and above, adults and elderly. The product can be differentiated by colors, finishes and packaging to position to varied users. The product can be produced in multiple locations with minimal infrastructure. The primary process of cutting work can be done in common working facility (figure-5) which has precise machinery like the Altendorf and Felder table saws. The sanding and sizing can be done in one room workshops where the pieces can be collected by a common finishing facility. This ensures uniform and controlled finishing with respect to the type of finishing material, process and color.

Some traditional games from different cultures and countries have been adapted and prototyped within the constraints of the material and the processes. This approach helps in
educating people about games of different cultures and regions. This also helps in popularizing the games which have no restrictions of intellectual property rights and also allows variety, customization and localization as per the people or community that needs to be served. Some of the products are Tangram (Chinese), the Game of UR (Sumerian), Tigers and Goats (Indian), Chinese Spiel etc. Similar products that are under development include teaching aids for language, math and art education.

3.2 Architectural accessories - door handles
Plywood of various thicknesses is laminated under pressure with clamps to obtain the required size and thickness. Styrene, foam board or 4mm plywood templates are used for marking and cross checking the individual pieces. Table saw, jig saw, fret saw, disc and belt sanders are some of the machines used for making these products. After the sections are cut to size and shape, metal inserts are fixed in the plywood for fixing on the door with bolts. The products include customized (figure-6) one-off products to volume production items(figure-7) that can be distributed and retailed.

The products can be used in the building industry, manufacture of furniture etc. Architectural accessories can be put into production in one of the two categories described earlier. The studio production involves products that have custom shapes, sizes and finishes. In this method repetition of components or products is not a criterion. Templates and fixtures made for the purpose if re-used add to the cost-effectiveness of the product due to time and resources saved in avoiding repetition of tasks. The door handles produced in this method
can be used for main door handles where people prefer a high level of customization and individuality in the product.

Figure-7 door handles for volume production

The product with simple and repetitive shapes can be produced in multiple locations with minimal infrastructure because the primary cutting work can be done in common working facility. The sanding and sizing can be done in one room workshops where the pieces can be collected by a common finishing facility. This ensures uniform and controlled finishing with respect to the type of finishing material, process and color

3.3 Lifestyle accessories

Tea Coasters, Vases and other table top accessories are made using 6mm or 8mm thick plywood which is cut on a table saw/ fret saw to shape and size. Timber frame is fixed as per design to the plywood and finished with wood stains and screen printing. Low tech production method where variety can be achieved with shapes, finishes and printing techniques are adopted. Corporate gifting is one of the main user groups. These products serve an important dual role in the corporate social responsibility (CSR) of corporate- large and small. On one hand corporate can spend the earmarked budgets for branding and have a minimal carbon footprint by buying and using re-purposed products. The product, with simple and repetitive shapes can be produced in multiple locations with minimal infrastructure because most of the primary operations like cutting and sizing work can be done in common working facility. The sanding and sizing can be done in one room workshops where the pieces can be collected by a common finishing facility. Finishing facilities which include screen printing, hand painting, lacquering etc can be done and managed by designer studios or self-help groups owned and managed by women. Similar
products being developed are photo-frames, vases (figure-8), wall-hangings, serving trays etc. In a country like India where empowerment of women is a major necessity, involving them in setting up and running the units are welcome step. Women perform excellently in jobs which require a high level of patience and skill like hand painting, screen printing etc.

3.4 Fitness Aids

19mm thick plywood is laminated to a finger jointed rubber wood section under pressure with clamps to obtain the required profile. Turned finger jointed rubber wood roller lined with re-used rubber tube as a roller. Low technology high skill method gives opportunities for combining a variety of materials. Teenage and young people are the main user group (figure-9) for this product category.

The paper concludes by noting down some points which can play an important role to make re-using and re-purposing packaging timber and plywood in particular and re-using and re-purposing in general as an environmentally sustainable activity

- Packaging designers should have re-usability as one of the main design criterion irrespective of the material used. The re-usability can be in the form of packaging or re-purposing into another product or use
• Better quality of materials to be used for packaging so that they can be put to re-use after serving their original purpose
• Companies have to incorporate usage of re-usable materials and products as part of their corporate social responsibility
• Design led thinking in re-using and re-purposing has to percolate at every level in the chain of procuring, harvesting, manufacturing, distributing, retailing and consumption sectors of our society.

The most important aspect and essence of the paper is to emphasize the re-purposing of high quality Packaging timber and plywood by converting it into value added products. The main highlight of the entire process is that the high quality packaging timber and plywood was meant and has already served the originally intended purpose i.e. PACKAGING.

References

