

Modification of Heat Gun for the purpose of Minimization of air bubbles in wood or laminate

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Abstract— Moisture and water have an effect on the properties of wood during both processing and use. The moisture content affects planing, gluing and surface treatment, for example, along with key properties such as dimensions, strength and resistance to degradation (durability). It is therefore important to know how wood is affected by moisture and how to check its moisture content.

1. INTRODUCTION

The research is on the Minimization of Air bubbles during Furniture manufacturing process. That is the major issue of Manufacturing Industries. The focus of this project is decreasing the air bubbles on manufacturing process. The air bubbles is generated during moisture and moisture is come from whether climate changes. See the project is basically based on industry based project.

The project contains the collection of data from reasearch paper of different authors on the same problem of minimisation of air bubbles during furniture. There are numbers of authors which are focusing on issue and finding solutions of it. So, process is to fix the issue by using such technique.

2 .LITERATURE REVIEW

[1] Pavlo Bekhta, Emilia-Adela Salca he has conducted experimental investigation of Influence of veneer densification on the shear strength and temperature behavior inside the plywood during hot press. To determine the temperature behavior inside the densified veneer plywood was analyze. For that he has performed Veneer densification, Plywood preparation, Core temperature measurement, Shear strength measurement. It was found that the useful for industrial applications to optimize the plywood production. Information on temperature changes

inside veneer package during hot pressing can contribute to the improvement of plywood quality.

[2] Mohammad Farajollah Pour, Hamidreza Edalat, Mohammad Valizadeh Kiamahalleh, Kazem Doost Hoseini he has conducted experimental investigation of Microwave-assisted laminated veneer lumber (LVL): Investigation on the effect of preheating time and moisture content on resin penetration and bonding quality. to determine Investigation on the effect of preheating time and moisture content on resin penetration and bonding quality. For that he has performed Microwave applicator apparatus, LVLs manufacturing, Resin penetration, Evaluation of bonding quality. It was found that the high bonding strength LVL assisted by MW preheating developed in this study is feasible to be used as material in high humid/exterior conditions for general or construction applications.

[3] A.A. Chiniforush, H. Valipour, A. Akbarnezhad he has conducted experimental investigation of Water vapor diffusivity of engineered wood: Effect of temperature and moisture content. To determine diffusion coefficient for different engineered wood products are determined. For that he has performed Cup method, Sorption method, Mass transfer coefficient, Empirical equation for effect of moisture content and temperature. It was found that the consistent with the results of tests conducted on small size clear wood specimens, Surface emissivity for softwood species in longitudinal and transverse direction are in the same range; however, for the hardwood species, the longitudinal surface emissivity are significantly greater than transverse.

[4] He Zhang, Yuchen Chen, Yongkuo Wang he has conducted experimental investigation of the effect of lignin removal on moisture absorption of wood. To determine the effect of lignin emoval on moisture absorption of wood. For that he has performed the

Lignin Removal, Hygroscopicity experiment method. It was found the the average weight loss rate after sodium chlorite treatment is 32%, hygroscopicity test shows that: When the relative humidity is lower than 30%, the hygroscopicity change is not obvious. After lignin removal, the number of hydrophilic groups in the cell wall increases and the moisture absorption capacity of wood increases.

[5] Ismail Aydin, Gursel Colakoglu, Semra Colak, he has conducted experimental investigation of Effects of moisture content on formaldehyde emission and mechanical properties of plywood. To determine effects of moisture content on formaldehyde emission and mechanical properties of plywood. For that he has performed Manufacturing of plywood panels method. It was found that the best bonding results were obtained with veneers having 4–6% moisture content, While the lowest mechanical properties were found for plywood panels manufactured from veneers having 16–18% moisture content.

[6] Suratsavadee K. Korkua, Siraporn Sakphrom he has conducted experimental investigation of Low-cost capacitive sensor for detecting palm-wood moisture content in real-time. To determine the low-cost capacitive sensor for detecting palm-wood moisture content in real-time for that he has performed Methods of measuring MC in wood, Drying-out methods, Electrical moisture-meter method. It was found that The researchers tested the moisture readings of palm-wood with different MCs between 5%–20% to verify the accuracy of the method for measuring the MC by detecting capacitance values.

[7] Kanotha Kamau-Devers, Sabbie A. Miller he has conducted experimental investigation of Using a micromechanical viscoelastic creep model to capture multi-phase deterioration in bio-based wood polymer composites exposed to moisture. To determine Using a micromechanical viscoelastic creep model to capture multi-phase deterioration in bio-based wood polymer composites exposed to moisture. For that he has performed Specimen preparation, Moisture conditioning, Experimental characterization of creep deformation, Experimental characterization of mechanical properties It was found that. Deterioration of the materials sustained from water sorption was captured through changes in mechanical and morphological data, SEM images, and creep deformation.

[8] Burak Ozbeye, Usman Faz, Bernhard Wolf he has conducted experimental investigation of Ultrasensitive moisture content characterization of wood samples by a cylindrical cavity resonator. To determine Ultrasensitive moisture content characterization of wood samples by a cylindrical cavity resonator. For that he has performed. Resonator design, Analysis of sensing process, Simulation. It was found that the investigation of the drying regime of a freshly cut tree branch with a cavity resonator. In view of the climate change with an increasing danger of forest fires.

[9] Ao Zhou, Lik-ho Tam, Zechuan Yu, Denvind Lau he has conducted experimental investigation of Effect of moisture on the mechanical properties of CFRP–wood composite: An experimental and atomistic investigation. To determine Effect of moisture on the mechanical properties of CFRP–wood composite. For that he has performed the method of the CFRP bonded wood samples and conditioning, Test program and instrumentation. It was found that the strength of the FRP–wood interface critically determines the mechanical performance of the entire system. The water molecules absorbed at the interface are crucial to the durability of multi-layer systems and a general mechanism governing the failure modes of such systems is found.

3 .DATA COLLECTION

The company X which is based in X place. The Company is work on the manufacturing of Modular Kitchen and Furnitures. The company visiting and search the problems of this company. There is a Three problems founded on that company. The Problems is 1) During Manufacturing process, Sheet is bend while inserting on panel saw machine. 2) The Groove Holes is filled with solution and nut is tight on a plywood to other plywood but still there is not attached perfectly. And 3) In manufacturing process of furniture there is a air bubbles on plywood is founded.

The First and Second problems are normally generated due to poor precautions of workers. and third problem is major problem of this company. This problem is founded on daily basis and air bubbles is mainly generated due to moisture. Moisture is come from whether climate changes. And sometimes air

bubbles create due to not having proper adhesive layer then it's prevented.

The project is on the minimization of air bubbles during furniture manufacturing process. That is the major issue of Manufacturing company. The focus of this project is decreasing the air bubbles on manufacturing process. The air bubbles is generated during moisture and moisture is come from whether climate changes. See the project is basically based on industry based project. The project contains the collection of data from research paper of different authors on the same problem of minimization of air bubbles during furniture. There are numbers of authors which are focusing on issue and finding solutions of it.

4 .ANALYSIS

The Minimization of Air bubbles during furniture manufacturing process.

There is Two solutions available in market.

1) Hot Press Machine

2) Drying Method by Hot Air Gun, etc

4.1. Hot press machine

The hot-pressing process is a vital step in the manufacture of wood-based composites and directly affects the properties and quality of the final products. During hot pressing, the heat and mass transfer process interact with each other, coupling with the mechanical deformation process of wood-based composites under the high-temperature interaction. In addition, the curing of resin, although governed by the laws of chemical reactions, can result in the release or absorption of heat and water, which may, in turn, affect the heat and mass transfer process. Realizing its complex and coupling nature, many scienHydraulic Plywood Press Machine performs a major role among all the plywood machinery. Hydraulic Plywood press machines are used in plywood manufacturing for making different products like, plywood, ply boards, industrial laminate plywood. Different types of Hydraulic Plywood Press are manufactured in India depending up on the application of hydraulic plywood press machine.tists have conducted long-term, multisided and multilevel studies to better understand hot pressing.



Advantages of Hot press machine:-

- High productivity
- Low maintaince
- Consitent perfoming
- These machines are design to ramp up production without adding to cost of it.

Disadvantages of Hot press machine

- The pressure is set for limit cannot exceed more than that.
- It is highly costly machine.
- It requiered more space.

Hot press machine is available in market but these machine is very very Expensive machine. The costs is Started form above 5 lakhs, The company haven't enough money to purchase a this Machine.

4.2. Drying method by Heat Gun

It is method for removing air bubbles from wood or laminated wood. laminated wood consist of veneer that is glue to a wooden surface, usally plywood or oriented strand board, that gives the wood a finished apperances. Over time to attach the veneer to separate from the underlying wood and create bubbles of air trapped inside. Removing the air bubbles is a relatively simple fix that can leave the veneer looking like new.

Advantages of Heat Gun

- It blows hot air, and it's flameless.
- It has variable temperatures.
- It is a low-cost tool.
- It comes with a variable nozzle which gives more control over the area of heating.
- It is convenient for tiny areas and corners.
- Starting and pausing the tool is very instantaneous.

- It does not emit any poisonous gas and is not messy.
- It is very portable
- It makes low noise like a hairdryer.

Disadvantages of Heat Gun

- It can cause fire to highly flammable materials.
- The hot air can burn your skin.
- The severe temperature can burn the skin on your forehead, chin, neck, and sideburns.
- The severe heat can also cause severe hair fall if not taken care of.
- The harmful heat can nonotrato doon into the hair.

The Drying Method by using hot air gun is available in market to minimize the air bubbles on plywood. The Hot Air Gun price is start from 2000 ₹ at various companies. The Hot Air Gun is known as Drying Method. The Drying Method is usually work on bubbles. The Hot Air Gun is produced the hot air at certain degree of heat. The Gun is above 15 to 20 cm above the bubble at 30 sec to 60 sec of time period. Press by hand with clothed at semicircular angle. Then the bubble is removed or minimize the bubble to accept the company.

So this Project is done by using Drying Method. But these methods have human precautions of body. The hot air gun have heat and handling precautions is needed in that method. The heat is hazards for skin and produce skin burning and skin disease.

For this human body precautions, There is need of Modification on Hot Air Gun. The Modification is backlite material using on nozzle of hot air gun and grabbing handle of hot air gun. These modifications is for body precautions due to heat. Backlite material have very high amount of temperature of melting. So the backlite is best for nozzle to suck the heat and remain the normal room temperature at any amount of heat. This is protected the body for skin burning and skin disease is avoided by these modification. The results of minimize the air bubbles is done by using hot air gun (Drying Method).

4.3. Modification of Heat Gun

A heat gun is similar in appearance to a standard hairdryer, but is operated and used in a vastly different manner. Both are constructed with a motor-driven fan that blows air over an electrically heated

filament. The heating element in a heat gun typically becomes red-hot during use. Heat guns operate at lower air speeds and produce temperature as high as 1200F, hot enough to melt some types of glass. Heat guns are frequently used in research labs to dry glassware, heat the upper parts of a distillation apparatus during distillation of high-boiling point materials, and to develop thin-layer chromatography (TLC) plates.

Application of Heat Guns include

- Remove paints
- Soldering
- Curing epoxy resins
- Heat shrink tubing application
- Removing decals and stickers
- Softening, molding and welding plastic materials
- Accelerate evaporation
- Removing ice accumulation

Safety considerations you should keep in mind when using a heat gun.

- Do not use a heat gun near combustible or flammable materials/atmospheres.
- Keep in mind the presence and direction of the heat produced
- Always switch the tool off before putting it down on any surface.
- Allow the tool to cool before storing it.
- Never touch the hot metal nozzle with clothing or skin.
- Do not look down the nozzle while the gun is turned on.
- Do not insert anything down the nozzle of the gun.
- Never block the inlet grill or obstruct the air flow of the unit while in operation

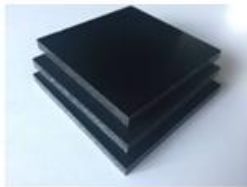
4.4. Accidents involving Heat Guns.

Accidents have occurred at Princeton University due to improper use heat guns. The two most notable accidents involved heat guns used in the presence of flammable solvents resulting in extensive damage and property loss.

- A laboratory worker was using a heat gun to heat approximately 0.5 liters of heptane in a Pyrex beaker by hand over an open bench. A splash of heptane came in contact with the elements of the

heat gun, igniting the heptane and causing him to toss the beaker away from him. The sleeve of the worker's shirt caught fire. The flaming beaker landed on another work surface, spreading the fire to his computer. The worker immediately used a safety shower to put out the fire on his clothing, then used a fire extinguisher to put out the other fire. The worker received burns to his hand. The computer containing his thesis was destroyed.

- A laboratory worker was using a heat gun to accelerate evaporation of flammable solvent and develop thin-layer chromatography slides. Several stacks of paper towels, dispensing bottles of flammable solvent and 100 open vials of flammable solvent were in the fume hood where this process was carried out. The heat from the heat gun ignited the paper and vials of solvent, quickly spreading to the dispensing bottles which added more fuel to the fire. Fortunately, the worker did not sustain any injuries; however, the damage caused to the fumehood and surrounding area was valued at over \$32,000.00. The researcher's reaction product was destroyed as well. The area of the lab involved in the incident was out of commission for several weeks.



4.5. Selection material for Nozzle cover

In general, most pressure cooker handles are made from a type of plastic material that is referred to as Bakelite. Bakelite is a special material that is used for its ability to resist heat. Unlike metal, which is an excellent conductor of heat, Bakelite does not conduct heat well, which makes it the perfect material for creating pressure cooker handle as well as nozzle cover. Bakelite is a hard material that is created when rubber and sulfur are mixed together. Aside from being used for nozzle cover, it is also used commonly for electrical appliances because it is also a great electrical insulator. Although Bakelite material can withstand temperatures of about 150 to 160-degree centigrade, it is not recommended that

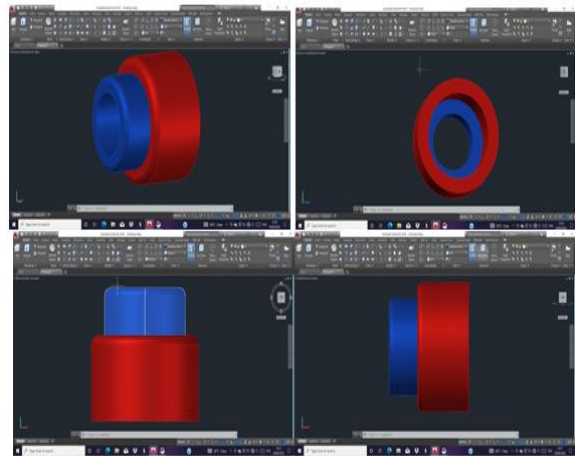
you put them in an oven as exposure to heat long periods of heat can make the handles soft.

Because Bakelite cover are good at resisting heat and are great electric insulators, it allows pressure cooker users to remove the cooker from the heat source without burning themselves. Bakelite, which is a thermosetting plastic, is also very lightweight, which helps to keep the overall weight of the pressure cooker down. Bakelite is generally a cheaper material to use compared to metal. Bakelite material is also used commonly when designing telephone casings, certain kitchenware, toys, knobs, as well as some jewelry.

Properties of Bakelite material

- Good insulator for heat and electricity.
- It can be quickly molded.
- Very smooth molding can be obtained from this polymer.
- Bakelite moldings are heat-resistant and scratch-resistant.
- They are also resistant to several destructive solvents
- Owing to its low electrical conductivity, bakelite is resistant to electric current.

4.6. Design of Nozzle cover



5. RESULT

The company X is work on the manufacture of modular kitchen and furniture. We visited the company and search the major problem of air bubbles in wood or laminate. To solve it, we did a lot of research and read the many research papers. Then we

come to know about the Heat gun. There was some problem in the heat gun. In which heating problem was being created due to the nozzle being hot due to which there was a fear of skin damage to reduce this problem, we have used bakelite material cover on the nozzle. Because it also good insulator of heat and electricity. By changing this we have solve the problem.

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