(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 112 106 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.01.2017 Bulletin 2017/01

(21) Application number: **15174631.0**

(22) Date of filing: **30.06.2015**

(51) Int Cl.:
B27N 1/00 *(2006.01)*
B27N 3/14 *(2006.01)*
B27N 7/00 *(2006.01)*
B27N 3/00 *(2006.01)*
B27N 3/02 *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

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(54) ORIENTED STRAND BOARD PRODUCT

(57) The present invention relates to an oriented strand board, OSB, product such as a panel formed from a plurality of pressed layers. The layers include a top layer, a core layer and a bottom layer, each layer comprising a mixture of wood flakes and wood fines, wherein the volume ratio of wood fines to wood flakes differs between the layers and wherein the air permeability of the product at 50 Pa. is between 0.0005 and 0.0018 $m^3/m^2/h/Pa$.

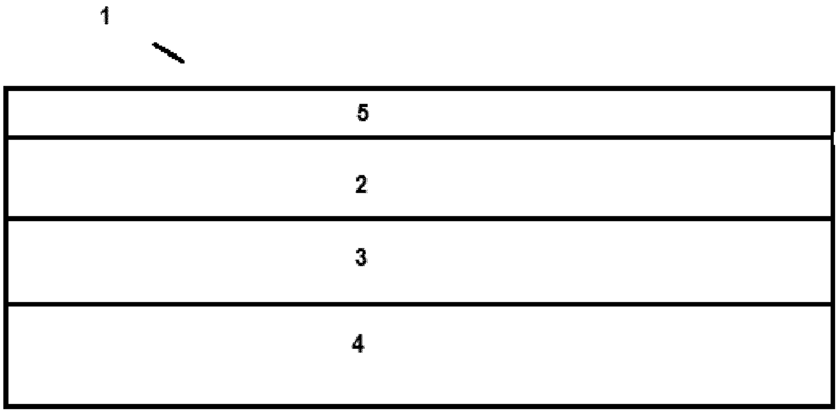

Figure 1

EP 3 112 106 A1

Description

Field of the Invention

[0001] The present invention relates to wood products and in particular to oriented strand board (OSB) having low air permeability, low oxygen gas transmission rate, and high water vapour resistance.

Background to the Invention

[0002] Air leakage through building components is a major issue for energy efficient structure design. The air permeability of a material defines a material propensity to allow air to pass through it. Air permeability is a property of a material regardless of its dimensions. Air permeance of a material refers to the permeability of a material divided by it thickness. Reducing the overall air permeability of a structure i.e. preventing air loss from the inside of a structure to the outside of the structure, can have large benefits in terms of energy costs and overall energy use of the structure. In recent years, oriented strand board (OSB) has had widespread use in the construction industry in both timber frame structures and other building types.

[0003] Studies such as Zeller (Requirements for airtightness of materials, Buildair 2012 Stuttgart), have shown that the air permeability of OSB panels is inconsistent. This scientific study for the Passive House Institute (PHI) 2014 concluded that OSB can be responsible for up to 40% of air leakage and this was considered to be unacceptably high.

[0004] Labelling or certification has been introduced in many countries to certify standardised low energy buildings. Examples include 'Passive House' in Germany and 'Minenergie' in Switzerland, and such standards are becoming increasingly applied in Europe. Both of these labels explicitly require a threshold level of airtightness (0.6 air changes per hour (ACH) at 50 Pa). For timber frame passive houses in Belgium, this requirement is commonly achieved by sealing all the joints in the interior structural sheathing. Although it was generally believed that OSB is sufficiently airtight to act as air barrier, recently the opposite has been shown. A scientific study carried out by Langmans et al (5th Symposium on Build and Ductwork Air tightness - October 2010) compares the air permeability of eight major commercial brands of OSB which cover most of the West European market. The results of this study show a large variation in the air permeance of the different OSB brands tested. The measured data is used to estimate the impact of the air leakage through the air barrier material on the global n50-value of typical passive houses. For most OSB brands tested, the air leakage through the OSB corresponds to significant proportion (up to 80%) of the Passive House limit for airtightness (0.6 ACH). On this basis, the paper concludes that applying OSB as air barrier system in Passive Houses is questionable.

[0005] Water vapour resistance is also a key design criteria for materials used in the building fabric which separates internal from external environments. Studies such as Ojanen and Ahonen (VTT Working Papers 1459 7683) have been carried out on the properties of OSB panels in relation to both water vapour resistance and air tightness. Equivalent air layer thickness (Sd value) was measured for a selection of panels. However, this study concerned OSB panels mainly as wind barriers (exterior sheathing) in Scandinavia, and not as air or vapour barriers for internal use.

[0006] It would therefore be desirable to provide improvements in the vapour resistance and air permeability of OSB and develop solutions to limit water vapour diffusion and air leakage through OSB panels.

Summary of the Invention

[0007] According to an aspect of the present invention, there is provided an oriented strand board, OSB, product, for example a panel, formed from a plurality of layers pressed together to form the product, said plurality of layers comprising a top layer, a core layer and a bottom layer, each layer comprising a mixture of wood flakes and wood fines, wherein the volume ratio of wood fines to wood flakes is from about 3% to about 15% higher in the top layer and the bottom layer compared to the core layer and wherein the air permeability of the formed product at 50 Pa is between about 0.0005 and about 0.0018 $m^3/m^2/h/Pa$. The air permeability of the panel at 50 Pa may be between about 0.0007 and about 0.0015 $m^3/m^2/h/Pa$, for example from between about 0.0009 and about 0.0012 $m^3/m^2/h/Pa$. The OSB product may have an air permeability of about 0.001 $m^3/m^2/h/Pa$.

[0008] This is advantageous as increased volume of fines in a layer increases the density of the layers. This has the effect of the restricting the movement of air through the layer and thus reduces the air permeability rate of the layers. However, too high a proportion of fines in a layer leads to decreased mechanical strength and increased distortion in the panel. Thus, the ratio of fines in each layer must be controlled in order to maintain the structural integrity of the panel. Furthermore, air permeability values in this range display superior properties for a range of construction processes. Additionally, air permeability values in this range are advantageous as they meet the Passive House standard for air permeability of building materials.

[0009] The volume ratio of wood fines to wood flakes may be higher in the top layer and bottom layer compared to the core layer of the OSB product. The volume ratio of wood fines to wood flakes may be from about 3% to about 15%

higher, for example the volume ratio of wood fines to wood flakes may be from about 4% to 12% higher in the top layer and bottom layer compared to the core layer of the OSB product. The volume ratio of wood fines to wood flakes may be from about 5% higher to about 10% higher in the top layer and bottom layer compared to the core layer of the OSB product. In the OSB product, the volume ratio of wood fines to wood flakes may be from about 28% to about 35% in the top layer and bottom layer and wherein the volume ratio of wood fines to wood flakes may be from about 20% to about 25% in the core layer. In the OSB product, the volume ratio of wood fines to wood flakes may be about 30% in the top layer and bottom layer and wherein the volume ratio of wood fines to wood flakes may be about 22% in the core layer.

[0010] As above, too high a proportion of fines in a layer leads to decreased mechanical strength and increased distortion in the panel. Advantageously, a product in which the top and bottom layers have a higher proportion of fines compared to the core layer provides a dual benefit of being mechanically resilient and also displaying reduced air permeability.

[0011] The OSB product may comprise a water vapour resistant coating. This is advantageous as it provides for an OSB product which is water vapour resistant and obviates the need for additional air/vapour control (AVCL) sheets or membranes to be applied to the product to achieve vapour resistance. The vapour resistant coating thus provides an integrated vapour barrier to the product. This further prevents interstitial condensation within a timber frame structure incorporating the OSB product.

[0012] The water vapour resistant coating may comprise one or more cured UV curable layers. This is advantageous as the layers are easy to apply while curing ensures that the surface properties of the product are chemically altered to provide a consistent water vapour resistant surface. This presents an advantage over AVCL sheets which are merely applied to a wood surface and do not change any surface properties, and are easily punctured during construction. The coating is more robust and easier to apply than the application of AVCL membranes. The UV curable coating provides an integrated vapour barrier with consistently high water vapour resistance over the entire surface of the product.

[0013] The dry cup water vapour diffusion factor, μ, of the product may be from about 480 to about 640 for a product of 12.5 mm thickness. The dry cup water vapour diffusion factor of the product may be from about 500 to about 620 for a product of 12.5 mm thickness, for example from between 520 and 600. The dry cup water vapour diffusion factor of the product may be from about 540 to about 580 for a product of 12.5 mm thickness. The dry cup water vapour diffusion factor of the product may be about 560 for a product of 12.5 mm thickness. The wet cup water vapour diffusion factor of the product may be from about 160 to about 240 for a product of 12.5 mm thickness. The wet cup water vapour diffusion factor of the product may be from about 170 to about 230 for a product of 12.5 mm thickness, for example from between 180 and 220. The wet cup water vapour diffusion factor of the product may be from about 190 to about 210 for a product of 12.5 mm thickness. The wet cup water vapour diffusion factor of the product may be about 200 for a product of 12.5 mm thickness.

[0014] The average density of the OSB product may be from about 580 kg/m^3 to about 660 kg/m^3, for example the average density of the OSB product may be from about 600 kg/m^3 to about 640 kg/m^3.The average density of the OSB product may be about 620 kg/m^3. This is advantageous as it provides for a structurally robust product.

[0015] The wood flakes in the core layer of the OSB product may be oriented at 90 degrees relative to the wood flakes in the top and bottom layers. The top layer may have flakes oriented at 0 degrees from the major (x) axis. The core layer may have flakes oriented at 90 degrees to the major (x) axis while the bottom layer may have flakes oriented at 0 degrees from the major (x) axis. The core layer may have a top core and a bottom core. Having different relative orientation for flakes between the layers provide for enhanced structural strength in the OSB product. Providing a top core and a bottom core layer results in enhanced resistance to cupping or deformation of the product.

[0016] The OSB product may be oxygen gas diffusion tight in accordance with ASTM D 3985 and DIN 53 380 Part 3. This is advantageous as typically OSB boards perform as oxygen gas diffusion open which reduces the thermal performance of composite panels (i.e. panels formed from OSB panels facing one insulating layer) by up to 10%. An oxygen gas diffusion tight OSB product provides enhanced thermal performance in composite panels made using the OSB product.

[0017] According to an aspect of the present invention, there is provided a process for forming an oriented strand board, OSB, product comprising a plurality of layers pressed together to form the product, said plurality of layers comprising a top layer, a core layer and a bottom layer, each layer comprising a mixture of wood flakes and wood fines, wherein the volume ratio of wood fines to wood flakes is from about 3% to about 15% higher in the top layer and bottom layer compared to the core layer wherein the air permeability of the product at 50 Pa. is between about 0.0005 and about 0.0018 $m^3/m^2/h/Pa$.

[0018] This is advantageous as such a process provides an OSB product with reduced air permeability compared to a product made via a typical OSB product fabrication process e.g. where the ratio of fines is not altered between layers.

[0019] The process may comprise applying a water vapour resistant coating to the product. The process may comprise applying a water vapour resistant coating to the top or bottom layer. The water vapour resistant coating may be one or more cured UV curable layers. The UV curable coating provides an integrated water vapour barrier with consistently high water vapour resistance over the entire surface of the product.

Description of the Drawings

[0020]

Figure 1 shows a schematic representation of an OSB board, with integrated water vapour barrier
Figure 2 shows a flow diagram for the process of OSB manufacture
Figure 3 shows a flow diagram for control of resin to wood ratio
Figure 4 shows a flow diagram for control of wood moisture content
Figure 5 shows a flow diagram for control of density and density profile of final board
Figure 6 shows a flow diagram of the process of integrating a water vapour resistant barrier application to the OSB.

Detailed Description of the Drawings

[0021] **Figure 1** shows a schematic representation of an embodiment of the present invention. OSB product in the form of the panel 1 comprises three layers, a top layer 2, a core layer 3 and a bottom layer 4. The layers are pressed together to form the OSB panel 1. It should be noted that the relative thickness of the layers in the figure are illustrative only and do not represent the actual relative thickness of the panel layers.

[0022] The structure as described above is typically fabricated via the process flow as shown in **Figure 2.** In order to achieve reduced air permeability of panels which are fabricated via the process, the process is different from a typical OSB manufacturing process as set out below.

OSB Manufacture

[0023] Wood logs suitable for fabrication of OSB are processed 201 to produce wood flakes and wood fines. The flake geometry is monitored and controlled 202 to produce wood flakes and fines of the required dimensions. Each of the layers of the OSB panel comprises a mixture of wood flakes and wood fines. Wood flakes are wood elements with typical dimensions of flake length 100mm +/- 10mm, flake width, 40mm+/- 10mm and flake thickness 0.75mm+/- 0.1mm. Wood fines are smaller wood elements with typical length, width and thickness dimensions of 0.1 mm - 3.3 mm. As will be appreciated in the case of the dimensions given above and more generally it is desirable that the dimensions of the wood fines is less than about 5% of the longest wood flake dimension in the mixture.

[0024] The volume ratio of wood fines to wood flakes in the OSB panel differs between the panel layers. Desirably the volume ratio of wood fines to wood flakes in the OSB panel differs in the top layer and bottom layer compared to the core layer. Suitably the volume ratio of wood fines to wood flakes in the OSB panel is higher in the top layer and bottom layer compared to the core layer. Preferably, the top and bottom layer will have the same volume ratio of wood fines to wood flakes. The core layer will have a different volume ratio of wood fines to wood flakes as compared to the top and bottom layer.

[0025] This ratio of flakes to fines as described can be controlled by addition of additional fines to the flakes/ fines mix of the wood material. The density of the layers can be controlled also in this manner. In an embodiment, for reduced air permeability, a greater ratio of fines is provided in the top and bottom layers when compared to the core layer. Increased fines addition in this manner increases the surface density of the top and bottom layer and reduces the movement of air through these surfaces. Furthermore, maintaining a lower ratio of fines in the core layer provides the strength and structural integrity typically required of an OSB panel.

[0026] The volume ratio of wood fines to wood flakes in the OSB panel is preferably from about 28% to about 35% in the top layer and bottom layer and the volume ratio of wood fines to wood flakes is preferably from about 20% to about 25% in the core layer, for example the volume ratio of wood fines to wood flakes may be about 30% in the top layer and bottom layer and the volume ratio of wood fines to wood flakes may be about 22% in the core layer.

[0027] A number of further process parameters can have a bearing on the properties of the OSB material produced by the process. Control of these parameters can be relevant to the production of quality OSB with reduced air permeability properties. In particular, the following parameters are controlled during the board manufacturing process

- Control of resin to wood ratio
- Control of wood moisture content
- Control of density and density profile of final board

[0028] The resin to wood ratio is controlled in the following manner with reference to Figure 2 and **Figure 3.** The wood product is dried 203 and the wood weight is measured using a calibrated scales conveyor. The actual moisture content is measured using an inline moisture detection unit. This gives a 0% moisture calculation - an O.D (oven dry) weight of wood- which is then used to calculate a required resin content. The rate of resin addition is controlled 204. Required resin content is entered to a user interface or human machine interface (HMI) and this value is fed forward to a Proportional Integral Derivative (PID) control loop. The OD wood weight is also fed forward to the PID control loop. This control instructs pumps to apply a calculated resin amount based on a measured solids content of the particular resin in use. A number of resin types may be used for such a purpose, such as MDI (Methylene Diphenyl Diiocynate) including pMDI (Polymeric Methylene Diphenyl Diiocynate), and MUF (Melamine Urea Formaldehyde) and PF (Phenolic Formaldehyde).

[0029] In a particular embodiment, 40% additional resin is used compared to standard OSB manufacture. Thus, the overall resin content in the formed OSB product fabricated in this manner is 4.0 - 5.5%. This increased resin volume decreases the volume available in the OSB material for gas/air to permeate. This further results in a panel made from the OSB material being more durable than a typical OSB panel in moist conditions. The resin may be further mixed with MPU (Micronized Polyurethane). Use of MPU further results in reduced volume in the surface (top and bottom layers) and core layers for gas/air to permeate. This is as a result of the increased surface area of MPU resin particles, compared to other resin types. A typical MPU to resin mix comprises: Top layer: from about 1% up to about 35% MPU. The top layer may comprise from about 10% up to about 30% MPU, for example the top layer may comprise about 25% MPU.

[0030] Core layer: from about 1% up to about 25% MPU. The core layer may comprise from about 5% up to about 20% MPU, for example the top layer may comprise about 15% MPU.

[0031] Bottom layer: from about 1% up to about 35% MPU. The bottom layer may comprise from about 10% up to about 30% MPU, for example the top layer may comprise about 25% MPU.

[0032] As well as added resin to the OSB material, a moisture resistant release wax is further added at this point in the process.

[0033] The wood moisture content is controlled 205 in the following manner with reference to Figure 2 and **Figure 4:**

OSB material with added resin is stored in "dry" bins. Inline moisture meter determines moisture of the "dry" wood as it leaves the bin. A moisture content of 7% is typical. Wood weight is also measured at this stage. A total moisture target is entered into HMI, e.g. a typical moisture content of 8 to 10% is required for quality OSB. A control loop determines the net percentage of moisture required to be added to the "dry" wood (e.g. 1% to 3% based on the example moisture target above) and calculates the water volume required to be added 206 to achieve this percentage, as a function of the O.D wood flake weight measured. The control instructs the water pumps to apply calculated amount.

[0034] The density profile of the final board is controlled 207 in the following manner with reference to Figure 2 and **Figure 5:**

A density set point for the desired OSB panel is entered into HMI as a weight. This is a predetermined calculation based on thickness and density. This total figure is then split into the Bottom layer (BSL), Core Layer (CR) and Top layers (TSL).The wood weight is measured for each layer and the weights of resin, wax and moisture are subtracted. This gives give the wood weight setpoint to be delivered on the production line. This is replicated at each of 4 forming stations. After the top layer is formed, there is an inline weigh scales. This measures the process value against the setpoint value and modulates the control appropriately.

[0035] The wood flakes are then oriented 208 on a mat before pressing. The top layer will typically have flakes oriented at 0 degrees from the major (x) axis i.e. laid flat and parallel to the mat length. The core layer will typically have flakes oriented at 90 degrees to the major (x) axis, i.e laid flat and perpendicular to the mat length, while the bottom layer will typically have flakes oriented at 0 degrees from the major (x) axis, i.e. laid flat and parallel to the mat length. To resist distortion of the panel, typically cupping along the y axis or bowing along the x axis of the panel, the core layer may be formed from a top core layer and a bottom core layer.

[0036] The layers are then pressed 209 before being sawed 210 into panels. A flatter profile compared to typical OSB may be achieved by faster pressing. This can further increase the density of the core layer. A typical pressing process is as follows: the bottom layer is laid in the major (x) direction first. Prior to pressing this layer is typically about 42.3 mm thick and is pressed to about 4.2 mm. The bottom core layer is laid next in the minor (y) direction. The bottom core is typically about 23 mm thick pre-pressing and about 2.4 mm post-pressing. The top core is laid next in the same direction as the bottom core. The top core layer thickness is typically about 32mm pre-pressing and about 3.2 mm post-pressing. The top layer is laid last in the major (x) direction. The top layer thickness is typically about 42.3 mm pre-pressing and about 4.2 mm post-pressing. As such, based on the above dimensions, the thickness of a typical panel may comprise about 30% top layer thickness, about 23% top core layer thickness, about 17% bottom core layer thickness and about 30% bottom layer thickness.

[0037] The first pressing stage is 'closing'. Closing involves closing the press in a number of controlled compression stages. This stage contributes to the forming of the vertical density profile of the panel. This stage is followed by the 'hold' where the press is held closed for an extended duration. This stage heat cures the resin. Heat is conducted from the press through the wood initially from the surfaces but then the moisture content in the panel is converted to steam which allows more uniform heat transfer through panel. The final stage is the 'open'. Upon the completion of the hold stage there is a large amount of steam pressure in each panel. The open stage is a number of decompression stages which incrementally release internal steam pressure. This is done incrementally to prevent destructive pressure release. Typical panel properties are shown in Table 1 below.

Table 1

Property	Value
Target flake length	100mm± 10mm.
Target flake width	40mm ± 10mm
Target flake thickness	0.75mm± 0.1mm
Fines dimensions	0.1 -3.3mm
Layer - Top	30% orientation 0°
	Flake moisture content = 8-10%
	Fines ratio = >25-35%
Layer - Top Core	23% orientation 90°
	Flake moisture content = 4-6%
	Fines ratio = 20-25%
Layer - Bottom Core	17% orientation 90°
	Flake moisture content = 4-6%
	Fines ratio = 20-25%
Layer - Bottom	30% orientation 0°
	Flake moisture content = 8-10%
	Fines ratio = >25-35%
Target moisture content	8-10%
Overall Density (F/C/F)	630 kg/m^3
Resin	Resin content 4.0 - 5.5%
MPU	Proportion of MPU in resin mix: Top layer: up to 25% Core layer: up to 15% Bottom layer: up to 25%

Vapour Barrier Coating

[0038] Once OSB material is fabricated and is formed into panels 1, the panels 1 have a layer 5 (See Figure 1) comprising a water vapour resistant barrier applied to them in order to enhance the water vapour resistant properties of the panel. **Figure 6** shows a flow diagram of the process of water vapour resistant barrier application to the OSB.

[0039] An uncoated OSB panel 1 is sanded to remove any excess agents that would prevent coating adhesion to wood strands. A base coating is applied to the panel by rollers in two separate layers. A first base coating is applied 601 to the panel and is then cured 602 by UV light. A second coating is applied 603 and is then cured 604 by UV light. After application of the first and second base coating, a third, top coating is applied 605. As with the first and second coating, the top coating may be applied to the panel by any suitable means/ applicator including rollers. The top coat is then cured 606 with UV light. The coatings may be applied to the top or bottom layer of the panel.

[0040] A coating layer of UV curable material was found to be particularly advantageous. The material comprises inorganic pigments and extenders and further comprise

- Photoinitiators; materials that react with the UV light to cause the other materials to polymerise and form the solid coating.
- Oligomers (Resins) these are higher molecular weight (longer chain length) polymers that give the coating its properties.
- Monomers (reactive diluents) these are lower molecular weight (shorter chain length) materials that help reduce the viscosity of the putties and also contribute to the properties of the coating. Unlike solvents these reactive diluents do not evaporate from the coating.

[0041] A smooth finish is applied to the coating. This provides for good adhesion for airtight adhesive tape to seal the expansion gaps between adjacent panels when installed in a structure.

Air Permeability and Vapour Resistance Measurements

[0042] Fabrication of an OSB board as described results in an OSB panel with reduced air permeability and increased water vapour resistance properties.

[0043] Air permeability was tested in accordance with EN 12114:2000 Thermal Performance of Buildings - Air Permeability of Building Components and Building Elements.

[0044] Air permeability values in the range 0.0005 $m^3/m^2/h/Pa$ - 0.0018 $m^3/m^2/h/Pa$ at 50 Pa were achieved. A value of 0.0018 $m^3/m^2/Pa$ is considered particularly advantageous for standardised low energy building construction, for example for Passive House type constructions.

[0045] Water vapour resistance was tested in accordance with EN ISO 12572:2001 Hygrothermal Performance of Building Materials and Products - determination of Water Vapour Transmission Properties. It is necessary to conduct both wet cup and dry cup tests in accordance with EN ISO 12572:2001. The wet cup test measures the resistance of the passage of water vapour from an aqueous solution in a test cup, through an OSB sample (which is sealed to the cup), and into the surrounding atmosphere of the test chamber which is at a lower relative humidity level - vapour pressure is created due to the difference in humidity levels between the cup and the chamber atmosphere, which causes the vapour to pass through the OSB. The test cup assembly with sample is weighed periodically until its weight loss ends when all of the aqueous solution has passed through the OSB. The dry cup test measures water vapour transmission rate in the opposite direction, i.e. water vapour passes from a high humidity environment, through the OSB, and into a desiccant (silica gel). This time the test cup assembly is weighed periodically until its weight gain ends when all of the water vapour in the atmosphere has passed through the OSB and is absorbed by the desiccant.

[0046] Applying a barrier to the panel in the manner described above results in an improvement of the vapour resistance property of the OSB panel. Dry Cup Water Vapour resistance values of 560+/- 80 were achieved for OSB panels with a thickness of 12.5 mm. Wet Cup Water Vapour resistance values of 200 +/- 40 were achieved for OSB panels with a thickness of 12.5 mm.

[0047] Furthermore, the OSB panels as described herein can be classified as oxygen gas diffusion tight. The diffusion tight property of a panel is shown if the oxygen transmission rate is less than 4.5 ml per 24h per m^2 when measured at 23 +/- 3 °C in accordance with ASTM D 3985. It is demonstrated by taking ten facing specimens to be tested with no single result exceeding the limit value of 4.5ml per 24 h per m^2. The specimens are placed in the test apparatus at 23 +/- 3°C and 50 +/- 10% relative humidity with the side on which insulation foam is to be applied to the panel (for example in a wall construction) facing towards a nitrogen chamber and with the edges of the panel unsealed against lateral air infiltration.

[0048] The words "comprises/comprising" and the words "having/including" when used herein with reference to the present invention are used to specify the presence of stated features, integers, steps or components but do not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof. It is appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable sub-combination.

Claims

1. An oriented strand board, OSB, product such as a panel, formed from a plurality of layers pressed together to form the product, said plurality of layers comprising a top layer, a core layer and a bottom layer, each layer comprising a mixture of wood flakes and wood fines, wherein the volume ratio of wood fines to wood flakes is from about 3%

to about 15% higher in the top layer and bottom layer compared to the core layer and wherein the air permeability of the formed product at 50 Pa is between about 0.0005 and about 0.0018 $m^3/m^2/h/Pa$.

2. The OSB product of claim 1 wherein the air permeability of the product is about 0.001 $m^3/m^2/h/Pa$.

3. The OSB product of claim 1 or 2 wherein the volume ratio of wood fines to wood flakes is from about 28% to about 35% in the top layer and bottom layer and wherein the volume ratio of wood fines to wood flakes is from about 20% to about 25% in the core layer.

4. The oriented strand board product of any of claims 1 to 3 wherein the volume ratio of wood fines to wood flakes is about 30% in the top layer and bottom layer and wherein the volume ratio of wood fines to wood flakes is about 22% in the core layer.

5. The OSB product of any of claims 1 to 4 comprising a water vapour resistant coating.

6. The OSB product of claim 5 wherein the water vapour resistant coating comprises one or more cured UV curable layers.

7. The OSB product of claims 5 or 6 wherein the dry cup water vapour diffusion factor of the product is from about 480 to about 640 for a product of 12.5mm thickness.

8. The OSB product of claims 5 or 6 where the wet cup water vapour diffusion factor of the product is from about 160 to about 240 for a product of 12.5mm thickness.

9. The OSB product of any preceding claim wherein the average density of the product is about 620 kg/m^3.

10. The OSB product of any preceding claim wherein the product is oxygen gas diffusion tight in accordance with ASTM D 3985 and DIN 53 380 Part 3.

11. The OSB product of any preceding claim wherein the wood flakes in the core layer are oriented at 90° relative to the wood flakes in the top and bottom layers.

12. A process for forming an oriented strand board, OSB, product comprising
a plurality of layers pressed together to form the product, said plurality of layers comprising a top layer, a core layer and a bottom layer, each layer comprising a mixture of wood flakes and wood fines, wherein the volume ratio of wood fines to wood flakes is from about 3% to about 15% higher in the top layer and bottom layer compared to the core layer and wherein the air permeability of the product at 50 Pa is between about 0.0005 and about 0.0018 $m^3/m^2/h/Pa$.

13. The process of claim 12 comprising applying a water vapour resistant coating to the top or bottom layer.

14. The process of claim 13 wherein the water vapour resistant coating comprises one or more cured UV curable layers.

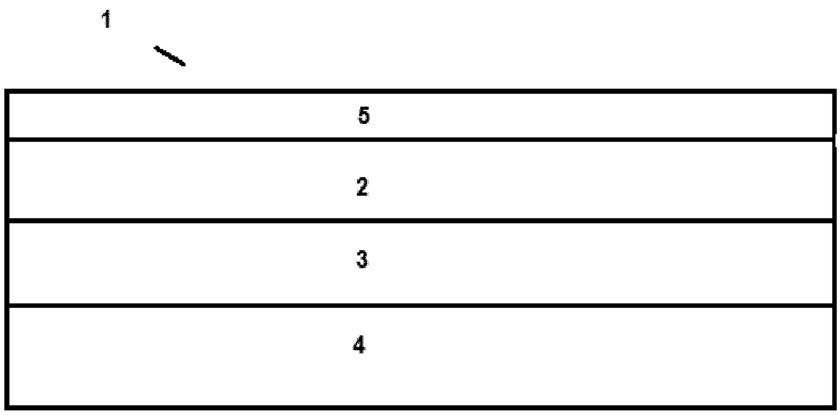

Figure 1

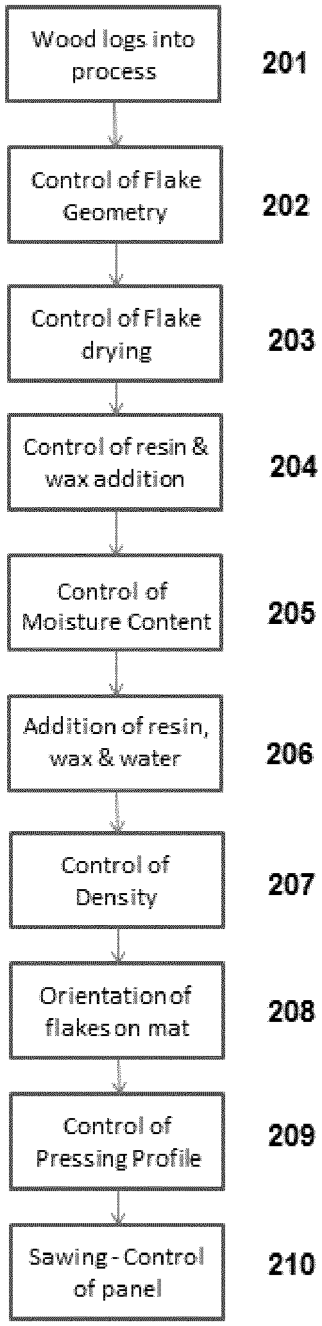
Wood logs into process
201
Control of Flake Geometry
202
Control of Flake drying
203
Control of resin & wax addition
204
Control of Moisture Content
205
Addition of resin, wax & water
206
Control of Density
207
Orientation of flakes on mat
208
Control of Pressing Profile
209
Sawing - Control of panel
210

Figure 2

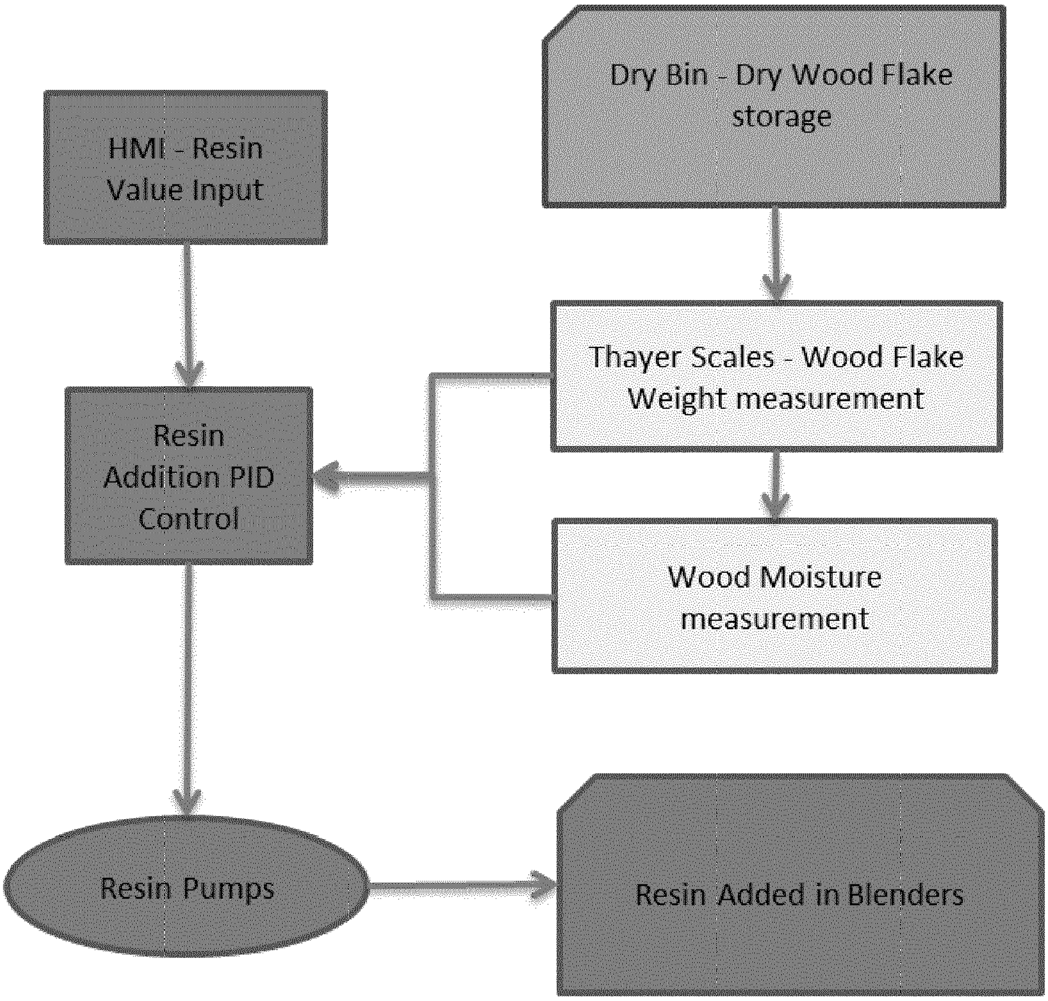
Dry Bin - Dry Wood Flake storage
HMI - Resin Value Input
Thayer Scales - Wood Flake Weight measurement
Resin Addition PID Control
Wood Moisture measurement
Resin Pumps
Resin Added in Blenders

Figure 3

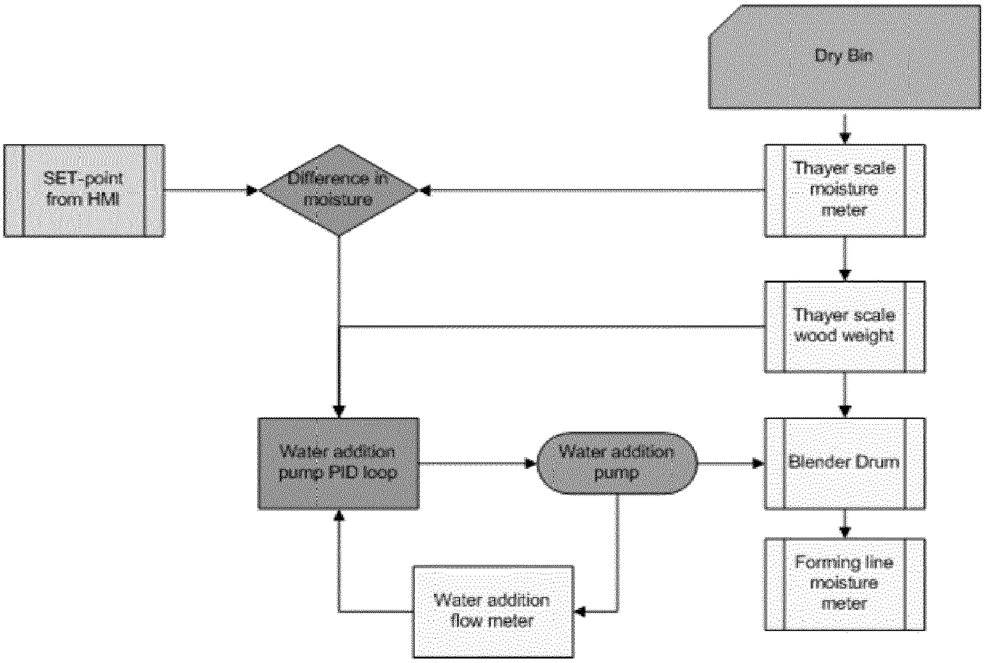
Dry Bin
SET-point from HMI
Difference in moisture
Thayer scale moisture meter
Thayer scale wood weight
Water addition pump PID loop
Water addition pump
Blender Drum
Forming line moisture meter
Water addition flow meter

Figure 4

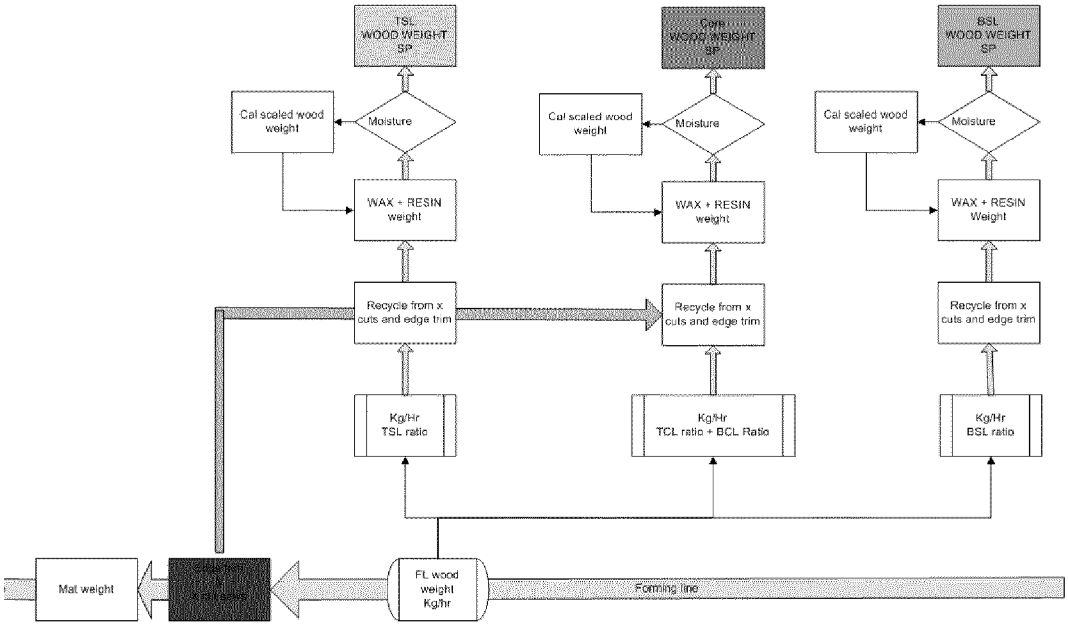
TSL
WOOD WEIGHT
SP
Core
WOOD WEIGHT
SP
BSL
WOOD WEIGHT
SP
Cal scaled wood weight
Moisture
Cal scaled wood weight
Moisture
Cal scaled wood weight
Moisture
WAX + RESIN weight
WAX + RESIN weight
WAX + RESIN Weight
Recycle from x cuts and edge trim
Recycle from x cuts and edge trim
Recycle from x cuts and edge trim
Kg/Hr
TSL ratio
Kg/Hr
TCL ratio + BCL Ratio
Kg/Hr
BSL ratio
Mat weight
FL wood weight Kg/hr
Forming line

Figure 5

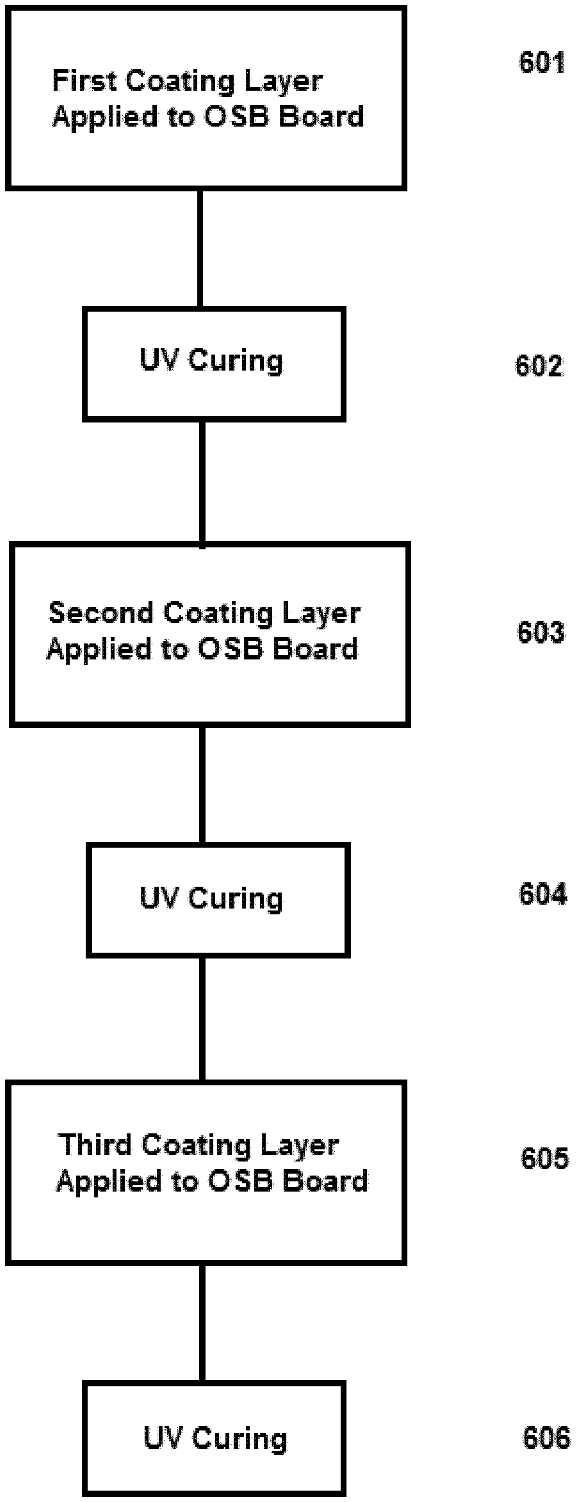
First Coating Layer
Applied to OSB Board
601
UV Curing
602
Second Coating Layer
Applied to OSB Board
603
UV Curing
604
Third Coating Layer
Applied to OSB Board
605
UV Curing
606

Figure 6

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EUROPEAN SEARCH REPORT

Application Number
EP 15 17 4631

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	WO 2005/018890 A1 (BARD MARKUS [CH]) 3 March 2005 (2005-03-03) * claims 1,2,5-7,10,11 * * page 5, line 4 - line 8 * * abstract *	1-5, 10-12 1,5-9, 11-14	INV. B27N1/00 B27N3/14 B27N7/00 ADD. B27N3/00 B27N3/02
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The present search report has been drawn up for all claims

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Place of search	Date of completion of the search	Examiner
The Hague	22 December 2015	Baran, Norbert

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