

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 1 439 359 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

21.07.2004 Bulletin 2004/30(51) Int Cl.7: **F26B 3/02, F26B 21/06**(21) Application number: **03445138.5**(22) Date of filing: **26.11.2003**

(84) Designated Contracting States:

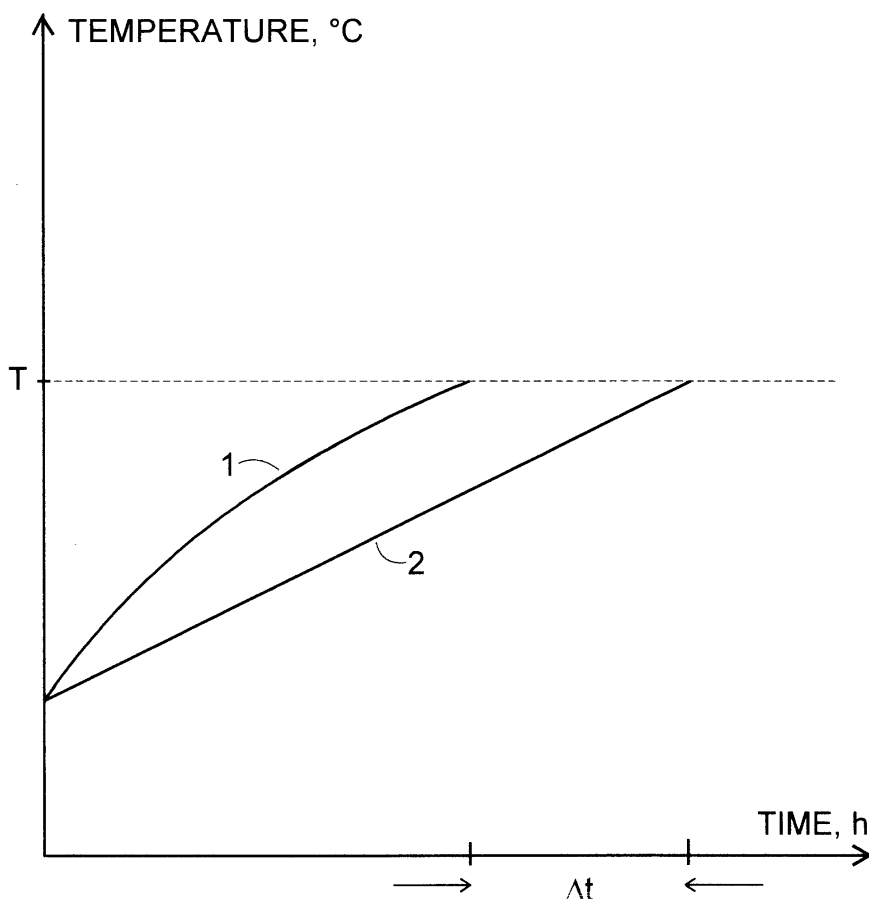
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR**

Designated Extension States:

AL LT LV MK(71) Applicant: **WSAB OY FINLAND****SF-11710 Riihimäki (FI)**(72) Inventor: **Wamming, Thomas****931 38 Skelleftea (SE)**(30) Priority: **20.01.2003 SE 0300140**(74) Representative: **Wiedemann, Bernd****Gislavägen 1****294 93 Sölvesborg (SE)**(54) **A method for heating wood**

(57) The present invention relates to a method of heating timber to a predetermined temperature in a pre-heating phase of a timber drying process. The timber is placed in an at least substantially closed chamber in which there is sustained an atmosphere that contains

aqueous steam and has a wet temperature and a dry temperature. The method includes raising the wet and the dry temperature of the atmosphere. The method is characterised by raising the dry temperature in keeping with a rise in the wet temperature.

**EP 1 439 359 A2**

Description

[0001] The present invention relates to a method of heating timber to a predetermined temperature in a preheating phase of a timber drying process, wherein said predetermined temperature is the starting temperature of a following drying process. The timber is preheated in a substantially closed chamber in which there is sustained a water vapour atmosphere that has a wet temperature and a dry temperature. The method involves increasing the wet and the dry temperature of said atmosphere.

[0002] At present, warm air is used as a heat and moisture transport medium for heating and drying timber in such chambers. The timber is preheated in stacks or batches to the starting temperature of the following timber drying process. It has been found that cracks appear in the outer surface of the timber during the preheating phase.

[0003] It is proposed in W09522035 that the formation of cracks in the outer surface of the timber is prevented by supplying saturated aqueous steam at atmospheric pressure to the warm air circulating around the timber in the chamber used for the preheating process during said preheating phase, so that the steam will condense onto the colder timber surfaces and therewith transfer heat of condensation to the timber.

[0004] Although this process minimises crack formation in a satisfactory manner, the process is not optimal with regard to the length of the preheating phase.

[0005] Accordingly, the object of the present invention is to shorten the time taken by the timber preheating process.

[0006] This object is achieved in accordance with the invention by means of a method of heating timber in a preheating phase of a drying process, comprising the steps of feeding the timber into an at least generally closed chamber, maintaining in said chamber an atmosphere that contains water vapour and that has a wet temperature and a dry temperature, and increasing the wet and the dry temperature of said atmosphere. The process according to the invention is characterised by raising the dry temperature in accordance with the rise in the wet temperature.

[0007] According to one preferred embodiment, the dry temperature is maintained at a level of at most 5 degrees above the wet temperature. For practical reasons, the dry temperature will differ from the wet temperature by at least 0.1 degree. By degrees is meant degrees Celsius.

[0008] According to another preferred embodiment, adaptation of the dry temperature to the wet temperature is caused to continue until the predetermined temperature has been reached.

[0009] According to a further preferred embodiment, adaptation of the dry temperature is carried out intermittently until the predetermined temperature has been reached.

[0010] Moreover, the preferred rise in wet temperature is followed by an equally large rise in the dry temperature. In this regard, the difference between the wet and the dry temperature may swing about a constant value, e.g. 3 degrees.

[0011] According to the embodiment most preferred, the rise in wet temperature is optimised.

[0012] The invention will now be described in more detail with reference to the accompanying drawing, the single figure of which illustrates schematically the rise in temperature in degrees Celsius as a function of time in hours of the chamber atmosphere in accordance with the preheating method used at present and the preheating method according to the invention.

[0013] Timber to be dried is introduced into a drying chamber in stack form and a humid atmosphere (steam-enriched air) is caused to circulate around the stacks of timber, it being ensured that the largest possible surface area of the timber will be in contact with the circulating atmosphere. The process proceeds with a timber-drying phase under changed conditions, upon termination of the preheating process. This switch to the drying phase takes place when the timber has a temperature of, e.g., 58°C or some other chosen temperature. When the preheating process is terminated, it will be seen that the temperature of the timber corresponds to or is roughly equal to the measured wet temperature of said atmosphere.

[0014] The timber placed in the drying chamber has a much lower temperature at the onset of the preheating phase than at the end of said phase, i.e. at the transition from the preheating phase to the drying phase. The timber may often have a temperature beneath 0°C, particularly in the wintertime. This means that the water present in the timber is in the form of ice, which must be melted.

[0015] A conventional method of heating timber from its current temperature in a drying chamber to a predetermined value, for example a temperature of 57°C, corresponding to the wet temperature of the chamber atmosphere at which the transition to the drying phase is intended to take place is to increase the temperature of the timber linearly from the starting value to the end value. The preheating time will depend on the desired increase in temperature per unit of time. Such a preheating phase is illustrated in the figure by the straight line 2. The ordinate axis and the abscissa axis are ungraded and show temperature, °C, and time, h, respectively. A broken line illustrates the ordinate, T, for termination of the preheating phase at which the temperature of the drying phase commences.

[0016] Similar to the known method, aqueous steam is delivered to the chamber atmosphere when preheating timber in accordance with the invention, this steam atmosphere being caused to circulate through and around the stacks of timber in the chamber. The atmosphere is also heated after its passage through the timber stacks and aqueous steam is then added to the heated

atmosphere. Heating of the atmosphere is normally effected by passing the atmosphere through or past electric elements. According to this method, the wet temperature of the atmosphere is measured either intermittently or continuously. The delivery of heat to the atmosphere is adjusted with a starting point from the measured wet temperature of said atmosphere. There is applied a dry temperature control or set-point value that exceeds the true or real value of the wet temperature by a predetermined number of degrees Celsius. The set control value of the dry temperature of the atmosphere will preferably be less than 5°C higher than the wet temperature of the atmosphere. This temperature difference is normally 0.1-5 degrees, preferably 2-3°C.

[0017] The control value of the dry temperature is changed to an extent corresponding to the rise in wet temperature of the atmosphere. This adjustment of the control value of the temperature of the atmosphere shall take place at least generally continuously or intermittently. For example, the control value of the dry temperature of the atmosphere may be changed when the wet temperature of the atmosphere has risen by 0.1 °C or by some other appropriate value, for example by 0.5 or 1 degree. If the wet temperature of the atmosphere has risen by 0.1 of a degree, the control value for the dry temperature will be increased by the same amount.

[0018] According to the invention, the greatest possible steam generating power is used for the timber preheating process, in other words the maximum steam generating capacity of the plant is used to this end.

[0019] The preheating phase may be terminated when the wet temperature of the atmosphere is in the order of 57°C or some other temperature at which it is intended to start the drying process.

[0020] The non-rectilinear graph 1 shown in the figure illustrates the preheating sequence according to the invention. At the commencement of the preheating process the starting temperature of the timber is shown to lie above 0°C, for instance 5°C. It will be seen from the figure that preheating of timber with a starting point from mutually the same starting temperature to mutually the same final temperature is achieved much more quickly by means of the present invention than by means of the known rectilinear preheating process. It has been found that when practising the present invention, the same final timber preheating temperature is achieved much more quickly than was hitherto possible. This time gain is at least 10 percent, and in particularly favourable cases up to 50 percent.

[0021] The curves shown in the graph represent the mean values around which the actual values vary. Such variations may depend on the set parameter values and system inertia.

perature in a preheating phase of a timber drying process, wherein the timber is placed in an at least substantially closed chamber in which there is sustained an atmosphere that contains aqueous steam and that has a wet temperature and a dry temperature, wherein the method comprises the step of increasing the wet and the dry temperature of said atmosphere, **characterised by** increasing the dry temperature in consistency with the rise in the wet temperature.

2. A method according to Claim 1, **characterised by** maintaining the dry temperature in the range of 0.1-5.0 degrees Celsius above the wet temperature.
3. A method according to Claim 1, **characterised by** adapting the dry temperature to the wet temperature continuously until the predetermined temperature has been reached.
4. A method according to Claim 1, **characterised by** adapting the dry temperature to the wet temperature intermittently until the predetermined temperature has been reached.
5. A method according to Claim 1, **characterised by** compensating the increase of the wet temperature with an increase in the dry temperature such as to achieve an at least substantially constant temperature difference.
6. A method according to Claim 5, **characterised in that** said temperature difference is about 3 degrees Celsius.
7. A method according to Claim 1, **characterised by** controlling the temperature increase of said atmosphere in a manner to attain the quickest possible increase of the wet temperature.

Claims

1. A method of heating timber to a predetermined tem-

