

PATENT SPECIFICATION

NO DRAWINGS

Inventor: GEORGE ROBERT SOUTER

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COMPLETE SPECIFICATION

Methods for Drying Timber

We, WESTAIR DYNAMICS LIMITED, of St. Helen's Auckland, Bishop Auckland, Co. Durham, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

THIS INVENTION relates to methods for drying timber and it is an object of the present invention to provide an improved method for this purpose.

The present invention consists in a method of drying timber in which air is passed over and around the timber at a temperature of between 70°F and 130°F to remove moisture from the timber, and is then re-circulated back to the timber at substantially the same temperature after passing through dehumidifying means of the refrigerated type whereat moisture is removed from the air.

In order to carry out the method under optimum conditions, it is desirable to create a set of air conditions surrounding the wood such that at least after an initial period the rate of moisture evaporation from the surface of the wood does not greatly exceed the rate of moisture movement to the surface of the wood. If the rate of moisture evaporation is much greater than this, then the portions of the wood near the surfaces will dry and shrink well in advance of the portions in the centre of the wood, thereby developing internal stresses which may be sufficiently high to split the wood.

The rate at which moisture is removed from the surface of the wood can be controlled by controlling the relative humidity of the air surrounding the wood, and the rate of moisture movement to the surface of the wood can be controlled by controlling the temperature of the air surrounding the wood.

In one form, the method is arranged so that the relative humidity of the air fed to the timber is kept constant, say at a relative humidity of between 65% and 25%, preferably between 50% and 30%, and in another form the relative humidity of this air is allowed to decrease, say from between 65% and 50% at the beginning of the process to between 30% and 25% at the end of the process.

It is preferred that the velocity of the air passing over the surface of the timber should be less than that employed in conventional processes, a velocity of less than about 2 feet per second being thought appropriate.

It is also preferred that the temperature of the air should be between 70°F and 90°F, although higher temperatures up to say 115°F to 130°F may be used depending upon the thickness and nature of the timber. For a hardwood, a temperature of between 70°F and 90°F is to be preferred, whilst for a soft wood a temperature of between 115°F and 130°F may be used, the higher end of the range being used when the wood is very soft or is very wet.

The dehumidifier is of the refrigerated type having a refrigeration circuit comprising a compressor arranged to pump refrigerant around the circuit, a condenser coil, a pressure reducing valve, and an evaporating coil. A fan is arranged to draw air over the evaporator coil and then the condenser coil after which it is expelled from the dehumidifier. As the air passes over the evaporator it is cooled to a temperature below dew point with the consequent deposition of moisture which is collected in a drainage pipe. The air is then reheated by the condenser coil to a temperature slightly above its original entering temperature. The air leaving the dehumidifier is therefore reduced in relative

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midity because of the rise in temperature and reduced in absolute humidity because of the water removed at the evaporator coil. The dehumidifier uses electrical power all of which is utilised to obtain dried air thus providing an extremely efficient method of obtaining dried air for the purpose of timber drying. Small booster fans are conveniently situated in the drying room in order to prevent air stratification in the timber arranged in a stack and promote air velocities commensurate with adequate moisture removal from the timber. The dehumidifier is arranged so as to provide air circulation commensurate with that of the booster fans and arranged generally so that the dried air leaving one end of the dehumidifier will pass into one end of the stack, pass through the stack and then be returned to the inlet of the dehumidifier so that the moisture removed from the wood can be removed from the air by the dehumidifier. At the beginning of the process, the doors of the room are closed and a fan heater or similar device is used to top up heat to the temperature relative to the wood being dried, this temperature being reached within the first few hours of the drying period. It is a principle of the construction of the type of dehumidifier under consideration, that all the latent heat of change of state of the water collected at the evaporator coil is converted into sensible heat to which is added the electrical energy consumed by the machine also converted into sensible heat, all of this being delivered in the air at the delivery end of the dehumidifier and all of which is used for the drying process. It is therefore possible at this stage to remove the fan heater and allow the dehumidifier to control the process which it will do automatically without any attention from an operator. Initially the provision of heat surrounding the wood promotes a rate of moisture removal from the wood which is far greater than the moisture removal capacity of the dehumidifier. This moisture removal rate will depend upon the initial moisture content of the wood which is being dried and illustrates the self compensating value of the process. If the timber is green or of an extremely high moisture content then the moisture removal rate will be high and will produce a high initial relative humidity within the room thereby preventing the case hardening and stressing effects which may otherwise result. Alternatively if the moisture content of the wood is low, say 25% by weight for example, then the moisture removal rate will be also relatively low producing a correspondingly low relative humidity which is still nevertheless sufficient to prevent the case hardening effect which is so undesirable. As the process proceeds the

relative humidity will slowly diminish in proportion to the moisture extraction rate of the dehumidifier and also the rate of moisture removal from the wood. The relative humidity within the drying room will therefore be progressively reduced until the timber is nearly dried. When the timber as a whole is nearly dried a position will almost inevitably arise when some samples indicate that moisture content has been sufficiently reduced whereas others show that further drying is required. However, further adjustments at the end of the drying process are not required, since the dehumidifier is designed so that the air relative humidity can never fall below a fixed level and the drying room operating temperature is such that even if the dehumidification process were allowed to continue indefinitely, stable equilibrium moisture content of the wood would be reached at about 7 to 8% by weight. It is, therefore, not possible to overdry the wood.

WHAT WE CLAIM IS:—

1. A method of drying timber in which air is passed over and around the timber at a temperature of between 70°F and 130°F to remove moisture from the timber, and is then re-circulated back to the timber at substantially the same temperature after passing through dehumidifying means of the refrigerated type as hereinbefore defined whereat moisture is removed from the air.
2. A method as claimed in claim 1, wherein the timber is hard wood and the air temperature is between 70°F and 90°F.
3. A method as claimed in claim 1, wherein the timber is a soft wood and the air temperature is between 115°F and 130°F.
4. A method as claimed in claim 1, 2 or 3, wherein the air passed to the timber is maintained at a constant relative humidity of between 65% and 25%.
5. A method as claimed in claim 4, wherein the relative humidity lies between 50% and 30%.
6. A method as claimed in claim 1, 2 or 3, wherein the relative humidity of the air passed to the timber is arranged to decrease, as the method proceeds, from between 65% and 50% to between 30% and 25%.
7. A method as claimed in any one of claims 1 to 6, wherein the air conditions surrounding the wood are such that at least after an initial period the rate of moisture evaporation from the surface of the wood does not greatly exceed the rate of moisture movement to the surface of the wood.
8. A method as claimed in any one of claims 1 to 7, wherein the velocity of the air over the surface of the wood is less than 2 feet per second.

humidity because of the rise in temperature and reduced in absolute humidity because of the water removed at the evaporator coil. The dehumidifier uses electrical power all of which is utilized to obtain dried air thus providing an extremely efficient method of obtaining dried air for the purpose of timber drying. Small booster fans are conveniently situated in the drying room in order to prevent air stratification in the timber arranged in a stack and promote air velocities commensurate with adequate moisture removal from the timber. The dehumidifier is arranged so as to provide air circulation commensurate with that of the booster fans and arranged generally so that the dried air leaving one end of the dehumidifier will pass into one end of the stack, pass through the stack and then be returned to the inlet of the dehumidifier so that the moisture removed from the wood can be removed from the air by the dehumidifier. At the beginning of the process, the doors of the room are closed and a fan heater or similar device is used to top up heat to the temperature relative to the wood being dried, this temperature being reached within the first few hours of the drying period. It is a principle of the construction of the type of dehumidifier under consideration, that all the latent heat of change of state of the water collected at the evaporator coil is converted into sensible heat to which is added the electrical energy consumed by the machine also converted into sensible heat, all of this being delivered in the air at the delivery end of the dehumidifier and all of which is used for the drying process. It is therefore possible at this stage to remove the fan heater and allow the dehumidifier to control the process which it will do automatically without any attention from an operator. Initially the provision of heat surrounding the wood promotes a rate of moisture removal from the wood which is far greater than the moisture removal capacity of the dehumidifier. This moisture removal rate will depend upon the initial moisture content of the wood which is being dried and illustrates the self compensating value of the process. If the timber is green or of an extremely high moisture content then the moisture removal rate will be high and will produce a high initial relative humidity within the room thereby preventing the case hardening and stressing effects which may otherwise result. Alternatively if the moisture content of the wood is low, say 25% by weight for example, then the moisture removal rate will be also relatively low producing a correspondingly low relative humidity which is still nevertheless sufficient to prevent the case hardening effect which is so undesirable. As the process proceeds the

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2. A method as claimed in claim 1, wherein the timber is hard wood and the air temperature is between 70°F and 90°F.
3. A method as claimed in claim 1, wherein the timber is a soft wood and the air temperature is between 115°F and 130°F.
4. A method as claimed in claim 1, 2 or 3, wherein the air passed to the timber is maintained at a constant relative humidity of between 65% and 25%.
5. A method as claimed in claim 4, wherein the relative humidity lies between 50% and 30%.
6. A method as claimed in claim 1, 2 or 3, wherein the relative humidity of the air passed to the timber is arranged to decrease, as the method proceeds, from between 65% and 50% to between 30% and 25%.
7. A method as claimed in any one of claims 1 to 6, wherein the air conditions surrounding the wood are such that at least after an initial period the rate of moisture evaporation from the surface of the wood does not greatly exceed the rate of moisture movement to the surface of the wood.
8. A method as claimed in any one of claims 1 to 7, wherein the velocity of the air over the surface of the wood is less than 2 feet per second.

9. A method of drying timber substantially as hereinbefore described.

10. Timber when dried by the method as claimed in any one of claims 1 to 9.

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Chartered Patent Agents,
Agents for the Applicant(s).

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