

PRODUCTION OF PLYWOOD FOR FORMWORK

This invention relates to the production of plywood particularly but not exclusively plywood for making formwork or shuttering for use in the casting of concrete and like structure such as floors and decks.

5 More particularly, the invention relates to the production of plywood for such use, the plywood being covered on its surface with films so as to increase its surfacial strength and removability from the cast concrete.

In making formwork special attention must be paid to 10 the fact that it supports heavy slabs of concrete, workers working on the slabs, and the load of mechanical ramming. In addition the formwork is required to be readily removed from the cast concrete as soon as it has set. In order to satisfy these requirements the plywood 15 used for making formwork must be strong and easily removable from the cast concrete.

According to the present invention, we propose a method of producing plywood used for making formwork, the method comprising dispersing a first dose of adhesive 20 polyolefine resin powder on the plywood, preheating the resin powder on the plywood, heat-pressing the preheated resin until it spreads on the surface of the plywood in a molten state and covers the plywood as a first film bonded thereto, dispersing a second dose of 25 nonadhesive polyolefine resin powder on the first film,

the nonadhesive polyolefine resin being chemically compatible with the first resin, preheating the second dose of resin powder on the first film, heat pressing the preheated second resin until a second film is produced on the first film, and cooling the first and second films bonded to each other rapidly with a blast of cooling medium until the surfacial temperature drops below 80°C.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawing which is a diagrammatic view showing the sequence of process according to the invention.

A sheet of plywood 1 is conveyed by a conveyor 12, in the course of which an adhesive polyolefine resin powder 2 is dispersed on the surface of the passing plywood 1 through a disperser 3. The amount of the dispersing powder is in the range of 10 to 20 g/m². A commercial adhesive polyolefine resin can be used. The grain sizes of the powder are preferably in the range of 70 to 200 meshes. A disperser utilizing electrostatic force can be used for the disperser 3.

The plywood 1 advances and passes under a heater 4, for example an infrared ray heater, whereby the plywood is preheated. The plywood 1 is then passed between heated rollers 5, and is compressed at high temperature provided by the rollers 5. As a result, the resin powder 2 dispersed on the plywood 1 melts and spreads over the surface thereof in a molten state. By virtue of the pressure provided by the rollers 5 the fluid resin is

is evenly distributed over the surface of the plywood. The linear pressure is preferably at least 20 kg/cm. At this stage the film is still porous, and allows the passage of air.

5 The plywood 1 further advances and passes under a second disperser 7 through which a nonadhesive polyolefine resin powder 6 is dispersed on the first laid film, thereby producing a dual layer coating on the surface of the plywood 1. The amount of the 10 dispersing nonadhesive polyolefine resin powder 6 depends on a desired product strength, but is normally in the range of 50 to 150 g/m². The adhesive and nonadhesive polyolefine resin are chemically compatible with each other. The grain sizes of the second resin are in the range 15 of 50 to 200 meshes, and it is preferred that their molecular weights are as large as possible.

 The plywood 1 is passed under a second heater 8, whereby the second resin powder is heated and melted. The molten resin is pressed by second heated rollers 9, 20 whereby the fluid resin is flattened into thin films spread over the first laid films. The second film is 50 to 150 microns thick. In order to heat the second resin powder, more than 2 pairs of heated rollers can be employed. Alternatively, it is possible to step up the 25 heat provided by the heaters 8, without increasing the number of the heated rollers 9. A single heated roller may be enough.

Finally the plywood 1 reaches a cooling section where cooling rollers 20 and a cold air duct 13 are provided to cool the heated films as rapidly as possible. The temperatures on the cooling rollers are preferably in the range of 10 to 25°C. The cold air ducts 23 are intended to keep the surface temperatures of the rollers 9 in this range, and it is required to keep the air at a much lower temperature. During passage of the plywood 1, through the cooling section, a desired fine crystallisation occurs to produce a flat, smooth film, in which molecular linkage is desirably obtained.

When the plywood 1 is subject to elevated temperature, a deal of vapour is generated, but because of the porous quality of the first laid film it escapes through the pores. At this stage the nonadhesive resin remains in a powdery form, thereby allowing the vapour to pass therethrough. The internal vapour pressure is prevented from building up inside the plywood. During passage of the plywood 1 under the second heaters 8, the second resin gradually transforms into an airtight film whereby the internal vapour pressure begins to build up beneath the outermost films tending to produce unwanted froth. To avoid this it is required to cool the plywood as quickly as possible. Normally froth starts to occur 1.5 to 5 seconds after the plywood 1 has passed through the second heaters 8, and the frothing will continue for 10 to 40 seconds thereafter,

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depending on the melting point of the resin. It is required to reduce the temperature of the plywood 1 to below 80°C. For example, when high density polyethylene is used for the second resin, the temperature of the plywood as a whole must be reduced below 80°C because it deforms at temperatures in the range 80 to 93°C. Then there is no worry about a possible occurrence of froth.

To cool the plywood rapidly, the cooling rollers 20 are located adjacent to the heated rollers 9. A cooling medium is circulated in the cooling rollers 20. In addition to the cold air duct 23, or without it a cold water spray nozzle 11 is provided.

For a better understanding examples will be described:

EXAMPLE 1

15 The rollers 5 and 9 were heated to 200°C, and cold water at 15°C was circulated in the cooling rollers 20. Infrared ray heaters each having a length of 4m were employed for the dispersers 3 and 7. Cold air was blown through the cold air duct 23. The conveyors 12 were 20 roller conveyors, and driven at a speed of 10m/min. (RTM)
The first resin powder 2 was "Admer/NS-100" produced by Mitsui Oil Chemistry Co. Ltd. in the form of powder of 50 to 150 meshes. The second resin powder was "Hizex- (RTM) 8200CP" produced by the same manufacturer, the grain size 25 of which was 50 to 200 meshes. The plywood was 12 mm thick with five 5 plies in commerce.

The first adhesive resin powder was evenly dispersed

on the plywood at the rate of 20g/m^2 . The second resin powder was dispersed on the first laid film at the rate of 120g/m^2 . The cold air had a temperature of 5°C at the outlet of the duct 23. The cold water spray nozzle 21 was not operated. The distance between the heated rollers 9 and the first situated cooling rollers 20 was 400mm, over which the plywood was conveyed in 2.4 seconds. The durability and removability from concrete were improved.

EXAMPLE 2

The conditions for this experiment were the same as those for the first example, from the disperser 3 to the second heated rollers 9, the only difference being that the cold water spray nozzle 21 was operated instead of the cold air duct 23. The water drops remaining on the surface of the film vapourised in the course of the plywood passing through the cooling rollers 20. The surface temperature of the plywood at the last situated cooling rollers was about 7°C lower than that achieved in the Example (1). The crystals of the resin were found to be very fine. The durability and removability from concrete were satisfactory.

EXAMPLE 3

The conditions for this experiment were the same as those for the Examples (1) and (2), the only difference being that both the cold air duct 23 and the cold water spray nozzle 21 were operated. The water drops on the surface of the film vaporised in the course of the plywood

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passing through the cooling rollers 20. The surface temperature of the plywood at the last cooling rollers was about 3°C lower than that achieved in the Example (2). The crystals of the resin were found to be
5 finer than those obtained in the Examples (1) and (2).

CLAIMS:

1. A method of producing plywood used for making formwork, the method comprising dispersing a first dose of adhesive polyolefine resin powder on the plywood, preheating the resin powder on the plywood,
5 heat-pressing the preheated resin until it spreads on the surface of the plywood in a molten state and covers the plywood as a first film bonded thereto, dispersing a second dose of nonadhesive polyolefine resin powder on the first film, the nonadhesive polyolefine resin being
10 chemically compatible with the first resin, preheating the second dose of resin powder on the first film, heat-pressing the preheated second resin until a second film is produced on the first film, and cooling the first and second films bonded to each other rapidly with a blast of
15 cooling medium until the surfacial temperature drops below 80°C.
2. A method according to claim 1, wherein the blast of cooling medium is a cold water.
3. A method according to claim 1, wherein the blast
20 of cooling medium is cold air.
4. A method according to any one of claims 1 to 3 wherein each heat-pressing stop is effected using a heat pressing roller.

