Timber Seasoning Methods in Australia

By DOMINGO LANTICAN
College of Forestry

(*Continued from last issue*)

D. THE PREDRYER

1. *Description.* The predryer is a huge unit used to dry timber to an air dry state at an accelerated rate.

It is similar to a kiln in operation but the main difference lies in that the predryer has much bigger capacity say, 160,000 bd. ft. at one loading, and so designed as to dry the timber to an air dry state with moisture content of about 25%. For this reason, predryers have lower steam consumption per thousand board feet capacity than those of kilns.

The pre-dryer has no dividing walls in between stacks as in a kiln. It has an air circulation unit and a main heating and a humidifying unit, but in addition it has a reheat or booster coil in between stacks.

2. *Essential parts.* a. Heating units.—The primary heating units are steam coils located above the timber pile at the entering air side of the stack and is of the return-bend-header type.
The reheat coils are of the same type but are so distributed that each bank of reheat coils are located in between the stack.

b. Circulation system.—Circulation is furnished by flat blade propeller fans which may either be longitudinal or cross shaft. The number and size of the fans vary with the size of the pre-dryer. For a five-line predryer, fourteen 48" diameter fans are used.

c. Humidifier Unit.—The humidifier unit consists of a bank of perforated steam pipes, located above the timber pile. Vents are also used to control the humidity.

V. SEASONING METHODS

A. AIR DRYING

Air drying which under certain conditions is the simplest and cheapest of the seasoning methods is practised in Australia. Such method is used for two purposes, namely: (a) as a means of seasoning entirely from the green to the dry state; and (b) as a means of preliminary drying for stacks to be dried in the kilns or to be reconditioned.

1. *Preparing the timber charge.* — The usual size of stack used in Australia is 6 ft. high, 6 ft. wide and 20 ft. long especially those that are to be finally dried in the kiln.

For average size stacks, the boards are spaced by means of strips 3/4" x 1-1/2" which are placed about 24" between centers. In air drying stacks, the boards are arranged in such a way that vertical flues of about 1 or 2 inches are provided between boards. Care is practised to have the spacing between boards straight from the bottom up. The use of the spacing strips and the flue is to provide a good air circulation.

The timber are stacked on supports which are 12-18 inches from the ground to provide necessary air circulation.

For stacks 20' x 5' x 6', a space of 48" to 24" spacing is commonly used and for larger stacks of the same width and height, 36". For stacks which are higher and longer, 4-6' spacing is provided. Two or three feet spacing are provided between ends of the stacks.

Space for handling and for access varies with the transportation method used. In

yards using Christensen lift truck, the space is usually 30 feet.

For uniform length, piling is not much of a problem because the length of the stack is governed by the length of the boards.

For mixed stacks, the longest boards are placed at the bottom and the shortest on top. Such method avoids overhanging ends of boards.

For stocks to be finally kiln dried, the usual practice is to box stack, that is, the ends of the pile are flushed. This is achieved by placing short boards end to end to make up for length. Some gaps although present in the center of the pile has been found better than having stacks with few long boards at the bottom and short boards toward the top because of the difficulty of baffling the ends of the stack during the kiln run.

2. *The drying procedure*: a. Control of the drying condition.—In air drying, air circulation is the only factor that could be controlled. This is done by providing vertical flues of about 1 to 2 inches between boards to provide a continuous flow of air from top to bottom.

Putting of strips is another means of controlling air circulation rates. Generally, the thinner the stock, the thicker is the strips and vice versa. The reason for this is that thicker material requires slower drying.

Where very refractory materials are being dried, sometimes canvas covers are fitted along the sides of the stacks during the early stage of drying.

b. Measures to minimize degrade.—Control of air circulation is in itself a means of controlling degrade as a result of the control of the drying. However, certain measures are necessary to control degrades which could not be attained by controlling the air circulation alone.

In air drying, the ends of the boards at the outer end would always dry faster than towards the inside. To prevent this, end coatings of special paints are applied. Application is done either hot or cold.

To prevent warping and checking, the stacks are covered with canvas or boards to protect them from exposure to sun and rain.

B. KILN DRYING

In Australia, kilns are used for the following purposes: (a) drying lumber from the green, (b) drying partially air dried lumber, (c) drying collapse-susceptible species for both preliminary and final drying.

1. *Control of conidtions in the kiln*:

a. Temperature.—Most Australian kilns do not use automatic control instruments because drying from the green is not usually practised. Manual control is more common.

At the start of drying, all the coils are put into action until the desired temperature is reached. The number of coils in operation are then reduced and the minimum number of coils sufficient to maintain the required conditions are left in operation.

The initial conditions are usually lower than those toward the end of the drying although the highest temperature which the species could stand is initially used. The reason for this is that an excessively high initial temperature could result in degrades of the materials being dried. As the drying goes on, higher temperature could almost without danger be used especially so when the moisture content of the lumber is below fiber saturation point.

The increase of temperature as the dryng goes on varies with the species. That is why a drying schedule for each species is necessary to obtain good results.

b. Air circulation.—Air circulation in the kiln is maintained at about 500 to 600 feet per minute to provide an adequate air flow. However, even at that speed, there is no doubt that drying at the entering air side of the stack will be very much faster than that at the leaving air side. To offset this, the circulation is reversed at intervals depending on the moisture content and the thickness of the materials. Materials with higher moisture content require frequent reversal of circulation as the air easily gets

saturated. Similarly, thinner stacks need frequent reversal of circulation due to the fast drying at the entering air side.

|1.. Internal circulation.—It is the movement of air within the kiln and on it depends the evenness of drying within the timber charge. Since the circulation system is so designed to provide a constant air speed and to deliver an optimum volume of air within a given time, what is controlled in internal circulation is the evenness of air flow through the stack. Baffling of the fans to insure positive air flow and baffling of all openings around the stack to minimize short circuiting of the air is resorted to.

(2) External circulation.—External circulation refers to the inflow of dry air from the outside and the expulsion of saturated air from the kiln. This is one of the very important factors governing the rate of drying as humidity largely depends on the amount of saturated air expelled and fresh air taken in. Control of external circulation is done by regulating the opening of the vents.

c. Humidity.—The easiest means of controlling the humidity is by means of the steam spray, which could be done automatically although manual control is more favored in Australia because of the expense involved in installing automatic control instruments. The only disadvantage that arises in using the steam spray is that at very low temperature run, it could raise the dry bulb as well. Besides, it increases the need for steam.

Vent control could be used at times although it requires more attention particularly so when automatic vent control is not used.

In most firms, however, the combination steam spray and damper control is commonly used depending on which is more convenient to use for any particularly stage of drying. There are cases when humidity continues to rise even when the steam spray is closed. In such instances, the dampers are used to lower the humidity by increasing the vent openings.

2. *Determination of the progress of drying*:

a. Rate of drying.—The rate of drying of the timber pile is determined by the use of sample boards which are inspected daily. The moisture content is determined by weighing the samples from time to time and comparing its current weights with that of the calculated oven dry weight of the board. In Australia this method is used commercially if kiln drying commences from the green. For partially dried materials, most operators find the use of resistance type electrical moisture meters more convenient.

b. Determination of stresses.—Determination of stress present in the wood is determined by the use of prongs cut from the sample boards. This is done from time to time during the drying.

Experienced operators, however, rely on daily inspection of the boards inside the kilns to determine the stress through the early signs of degrades as checking and splitting. Although, of course, these are just for precautionary measures because kiln operators follow standard drying schedules prepared by the C. S. I. R. O. Division of Forest Products.

3. *Drying non-collapse susceptible species*: —In drying non-collapse susceptible species, drying may be done from the green. Some softwoods dry in a few days, say 4 or 5 days while hardwoods may take a week or two or even longer.

The most important consideration in drying from the green is the tendency of some species to check at high temperature during the early stages of drying. Initially, therefore, mild drying schedule is used and as drying goes on, more severe drying conditions are applied particularly so when the moisture content has gone below fiber saturation point. The success of drying lies in the use of suitable drying schedule for a given species.

For partially air dried stacks, shorter kiln

runs are used because the wood at that stage is almost if not entirely below fiber saturation point and would stand severe drying conditions.

The final moisture content to which timber in Australia is dried is dependent upon the locality where the wood is to be used. In Victoria, the final moisture content is about 12 to 16% ad as much as 17% in some places in Queensland. Generally, it is lower in the interior and higher toward the coast. As a guide to operators, the C.S. I. R. O. has published wood moisture content chart for wood for different parts of Australia based on certain species.

4. *Kiln drying collapse susceptible species*:

a. Preliminary drying.—Preliminary drying is the drying of timber either from the green or from the air dry state with the purpose of bringing the wood to a moisture content most suitable for reconditioning, i.e., a moisture content of about 15 to 17%.

In such preliminary run, the temperature and humidity is the most important factor that is considered due to the danger of using too high temperature which could cause permanent collapse or checking and warping of the material.

Such runs may take about 4 or 5 days depending upon the initial moisture content of the wood, very much longer if dried from the green. Drying refractory species from the green is not usually done in Australia.

The usual practice is to kiln dry partially air dried materials only due to the fact that collapse takes place at the stage of drying when wood is still above fiber saturation point.

5. Reconditioning.—Reconditioning as applied to seasoning of timber is the process of steaming collapsed material in a closed chamber for a certain length of time at a temperature of from 180° to 212° F with the object of restoring the collapsed cells to their normal shape.

(1) The treatment.—The stack to be reconditioned is placed in the reconditioning chamber and the doors tightly closed. Saturated steam is introduced into the chamber for a period of four to eight hours depending upon the species, severity of collapse, the thickness of the stack and the density of the timber.

Such treatment causes the cells to recover their normal shape so that the material assumes a size which it would have really attained during the drying had collapse not set in.

Care is practised to steam the stack just to the point of maximum recovery because of the possibility of the stack to assume a green state with the danger of recollapsing during the redrying process.

Inasmuch as reconditioning treatment is most effective when the moisture content is beween 15 to 17%, drying is not carried to lower moisture content than what is required during the preliminary kiln run.

c. Other effects of reconditioning of timber.—Reconditioning sometimes causes checking in some species in which case a lower temperature is used, say 180°F, and allowing the charge to cool off before removal from the chamber. In some cases, checks which have opened and subsequently closed during the preliminary drying reopens during the reconditioning process.

Internal checks, on the other hand, close during the treatment but aside from improving the appearance, no advantage with regard to strength properties is gained.

d. Final drying.—Aside from an increase in moisture content in the outer shell of the wood, the steaming treatment causes reverse stresses to develop which makes final drying necessary to dry them to an even moisture content as well as to relieve any stress that may have occured.

Final drying is the same as the preliminary run with respect to the drying schedule used.

c. Use of the kiln as a means of relieving stresses.—Stresses in timber may be removed by subjecting it to a steaming treatment or high humidity treatment.

For stacks in which the core has a mois-

ture content of 18% or higher and the core above fiber saturation point, steaming treatmen is used. Otherwise, a high humidity treatment is applied. The reason for this is that steaming very dry timber might result in reverse case hardening which could not be ordinarily removed.

C. PRE-DRYING

Pre-drying is not yet commonly practised in Australia and is done only in Tasmania and in some places in Victoria. Such practice is essential in places where dry periods during the year is too short.

Green or partially green timber are dried in pre-dryers to a moisture content of about 25%. Whereas it would take about three or four months to dry a charge of timber, it takes only about three or four weeks to dry them in a pre-dryer.

The procedure used in the operation of pre-dryers is very much similar to kilns and standard schedules prescribed by the C.S.I.R.O. Division of Forest Products are used.

VI. POSSIBLE APPLICATION OF THE METHODS TO PHILIPPINE TIMBER SPECIES

Philippine timber species are hardwoods some of which are very refractory. Ordinarily, the practice is to air dry to 39 or 40% moisture content which takes about 30 to 90 days (and a year or more before it dries to 18 or 17%). At such moisture content, no real advantage is gained as far as stability is concerned because it is only the free moisture that would have been removed. At this stage, the material is still at its maximum size and would shrink as the moisture content goes down and develops stresses as well.

It must be remembered that wood begins to shrink only when it begins to dry below the fiber saturation point (25 to 30% M.C.).

Opening of joints in wood walls and floors and furniture; splitting and cupping of table tops; twisting of doors; loosening of windows; and other similar defects are in general due to assembling undried if not altogether green material. Even twisting and cuppling and warping of coreboards and plywood may be attributed to this factor. Such defects do not only cause wooden structures and furniture to become unsightly but also to weaken the structure resulting in expensive repairs and reassembling.

Aside from such defects in finished articles, great amount of waste is incurred after milling due to checking and splitting and warping which are due to unregulated drying condition.

Other effects other than those caused by stresses in the wood during drying are fungus and insect attacks. Staining of lumber would occur only when the lumber is wet or when there is sufficient moisture in the material to support fungal growth. Some borers attack timber when it is wet and do not reinfest it once it has dried.

All these defects could be avoided and minimized if not altogether removed if seasoning is practised.

Air seasoning if done properly would suffice to minimize the causes of most if not all defects. The only disadvantage of air seasoning is that drying is rather slow and in places where cost of land is high it may become very expensive aside from tying up of capital in the drying yard. Besides, the high temperature used in the kiln which above certain limits sterilizes the wood could not be taken advantage of.

Kiln seasoning could be done and has been done for years in small scale by firms in the Philippines. Although it entails capital to install a kiln, it sometimes becomes less expensive in the long run due to the shorter time required to dry the material.

Combined air and kiln seasoning as is commonly done in Australia could very well be done in the Philippines. Although the handling method is such that the pile of timber is built on the truck itself before going into the kiln and then breaking it again before the truck could be used for the next

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13. *Los Baños* (Faculty & Employees)

Prof. Calixto Mabesa	5.00
Prof. Gregorio Zamuco	5.00
Dr. Artemio Manza	5.00
Prof. Jose B. Blando	5.00
Prof. Froilan Rosqueta	5.00
Prof. Teodoro Delizo	5.00
Forester Valentin Sajor	5.00
Forester Francisco Tamolang	5.00
Forester Faustino Francia	5.00
Forester Caesar Recto	5.00
Forester Domingo Lantican	5.00
Forester Domingo Jacalne	4.00
Prof. Emiliano Roldan	3.00
Forester Matrin Lagrimas	3.00
Forester Rosario Cortes	3.00
Mr. Napoleon Vergara	3.00
Forester Osiris Valderrama	3.00
Miss Herminia Jundos	3.00
Mr. Felipe Lopez	2.00
Forester Mario Eusebio	2.00
For. Guard Lucio Quimbo	2.00
* * *	
Forester Isabelo Achacoso	5.00
Forester Agapito L. Cenabre	5.00
Forester Martin Reyes	1.00

COLLEGE BUILDING INAUGURATION

The Forestry Student Body Organization has unanimously approved at its recent meeting to hold the inauguration and Moving-up Day jointly on March 20, 1955.

Any College alumnus who wishes to attend the affair is requested to communicate with either the Forester-in Charge, Prof. C. Mabesa, or the President of the FSBO, Mr. Eduardo Llapitan not later than February 15, 1955. *The cost of per cover is* ₱2.00 (Two pesos) *for reservations.*

A NOTE OF THANKS

The FORESTRY LEAVES wishes to express its thanks to its advertisers and the District Foresters, who in one way or another helped solicit ads for us, and to its subscribers for their continued support and patronage.

The ads that arrived on or before the deadline are included in this issue. Those that came later will appear in the Inauguration Issue on March 20, 1955.

The Management.

TIMBER . . .

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charge, still we have that advantage in that our species do not require reconditioning due to the comparative freedom from collapse. Handling therefore is not much of a problem.

The use of Christensen lift truck which is a very flexible means of moving a pile of timber in a seasoning plant or manufacturing mill which has been adopted in Australia as a standard equipment could easily be adopted here due to the simplicity of design and does not require special machinery to construct.

In places where there are extensive local species which are presently not used due to its tendency to collapse, reconditioning unit could be installed which will enable the commercial use of such trees instead of throwing them away or leaving them untouched.

Timber seasoning would not only favor the timber users but would favor the producers as well. The users would be able to use the lumber satisfactorily and the producers would benefit by avoiding waste and unnecessary tying up of their capital in the drying yard as well as promote the use of lumber which will in effect be beneficial to the lumber industry.

B. F. NOTES . .

(*Continued from page* 62)

A. Saura, chief, Sr. Rangers, V. Ergino, P. Aganad and B. Lansigan, members; T.I. Party No. 3—For. G. P. Juan, chief, Sr. Rangers, B. Agaloos and E. Cabote, members; T.I. Party No. 4—For. M. Maun, chief, Sr. Rangers, C. Cortes and J. Lomeda, members; T.I. Party No. 5—For. J. Miranda, chief, Sr. Rangers R. Bobon and M. Abuan, members. The Regional Inspector of the Timber Inventory parties is Forester Roman R. Aquino.

FORESTRY IN THE . . .

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5) As soon as a forest officer has determined that there are no more matured trees which may be cut in the licensed area, the corresponding timber licenses shall be cancelled.

***Daily Mirror, Dec.* 23, 1954**