WOOD PROCESSING TECHNIQUES IN THE UNITED STATES AND ITS POSSIBLE APPLICATION FOR PAKISTAN

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1. Introduction :- This report is the result of a study tour of a fair cross section of wood processing Industries of the Midwestern and Southern United States. The States visited are, West Virginia, Kentuckly, Indiana, Illinois, Missouri, Tennessee, Arkansas and Wisconsin, which fall mostly within the hard wood region of the country. However, several soft wood processing plants were visited also. The range of industries visited covers from small single operations upto large integrated operations. Degree of mechanization and automation also, varies considerably. Some of the industries specialize in one single product, where as, some others are extremely diversified operations. In general, the report covers a wide variety of wood processing industries, particularly, hard wood processing industries of the U.S.A. Besides, several wood products research units, falling within the same general area, were visited also.

II. Types of wood processing industries and research units visited:- The Following is a classification of the wood-processing industries and research units visited. (A detail list of industries and research units visited is given in the appendix.)

A. Single operations:-

1. Saw mill
2. Dimension mill
3. Laminated timber mill
4. Flooring plant
5. Sliced veneer plant
6. Box and crates making plants
7. Chipping mill
8. Charcoal plant

B. Integrated operations:-

1. Saw mill (fliching mill) and sliced veneer plant
2. Dimension mill and Flooring plant
3. Saw mill and Dimension plant
4. Saw mill, Prefinishing mill and Dimension mill
5. Saw mill, Dimension mill and Flooring plant
6. Saw mill, Veneer mill and Box and crates making plant
7. Lumber concentration yard, Truss and Wall panel making plant and Millwork

C. Research laboratories and experiment stations:-

1. Fundamental and applied research on wood and wood products. Forest products research lab. Madison, Wisconsin.
2. Forest products marketting research. Forest products marketting research lab. Princeton, W.Va.

3. Applied research on local problems. Central States Forest Experiment stations Berea, Kentucky and Carbondale, Illinois.

III. General description of industries visited:-

1. Saw mill:- Both Circular and Band saw mills of various size and with various degrees of mechanization and automation were visited. Circular saw mills are usually small to medium in size and used mostly for sawing soft wood structural lumber, where accuracy is not so important. A small portable circular mill which can still be found in or near the woods, may have a manually operated carriage and a few dead rolls only. On the other hand, a medium or large size circular saw mill may be equipped with a debarker, automatic carriage with loader, kicker and turner, an elaborate fully or semi automatic conveyor system, a resaw and an edger and a trim saw. It may also be equipped with a chipper to utilize the slabs and the edgings.

Band saw mills also vary tremendously in size and degree of mechanization and automation. Usually, they are larger than circular mills. The simplest one will have a band head saw with an automatic carriage, with loader, kicker and turner and an edger and a trimmer. A larger set up may have two band head saws, two resaws, two edgers and a multiple-saw trimmer. There may or may not be a debarker.

Particularly, hard wood band saw mills on the Mississippi, where logs are rafted down the rtver, and the bark is worn out no debarking is necessary. Almost all modern mill will have a chipper. Capacity may vary from 20,000 bd. ft. per 8-hour day upto 200,000 bd. ft. per 16-hour day.

Most soft wood mills will have dry kilns where as hard wood mills will usually have large air drying yards and sometimes, forced air drying facilities.

2. Dimension mill:- They are usually large operations, sometimes integrated with saw mills and/or flooring plants. They vary widely in products. Some of them specialize in producing parts for one or two suits of furniture, where as some others will produce very diversified products such as all kinds of furniture and cabinet parts and sport goods. Gonbols bros. inc. Luiville, Kentucky is an example of extreme diversification. They produce wide varieties furniture and cabinet parts as well as parts for musical instruments sport items, and ladders.

They are mostly highly mechanized and conveyorized process, often partly automated. Besides, cut off saws, jointers planers, rip saws, moulders, routers, shapers, tennoner and mortizer, they are often equipped with edge gluing press, clamp type and/or high frequency type, for making core stock for certain parts. They feed the furniture, cabinet, musical instrument and sport good manufacturing industries.

They usually do not do any finishing work except some specialized items. This industry is the largest consumer of higher grade hard wood.

3. Laminated timber mill:- These are plants which mostly use prefinished, stress graded soft wood lumber. The lumber is then further planed fresh and then edge and side glued with caesin or phenol-resorcinol glue and cured in clamps at temperature above 70°F. Very large laminated beams and arches are made in this way. This composite structure randomizes the defects and makes possible very large dimensions.

The operation is fairly mechanized. Gluing is done by mechanical spreaders with conveyors and the cured structures are moved by over head cranes. Clamping is done partly manually. Their business is mostly of custom-order type.

4. Flooring plant:- These are usually pretty large operations, producing mostly hard wood strip and parquette floorings. They are highly mechanized and partly automated, operations. Often, they are integrated with dimension mill. The species used is mostly oak. Some maple and other hard wood species are also used. The kiln dried lumber is cut off into sizes removing the defects. They are then, planed, shaped, sanded and put on a prefinish of wax coat. The product is the prefinished flooring material.

This industry is a large consumer of lower grade -

hard woods, mostly oak. For sometimes, this industry was in hard competetion with other flooring materials. But the recent trend is in favour of wood flooring materials.

5. Sliced veneer plant:- These are the plants which slice hard wood veneer logs into sliced veneer, which exposes the beauty of the different grain patterns. These veneers are free of lathe checks and give beautiful grain patterns. They are in demand for facing for wall panelling, and furniture and cabinet. The main species used are Wallnut, Butter nut, Cherry etc., but many imported species like, Mahogony, Teak, Rosewood, Satin wood etc. are also used.

Slicing mills are always provided with a band saw mill, called the flicking mill, which break down veneer logs into flitches. The flitches are then steamed, sliced into veneers, clopped, dried in a continuous drier, packed and then stored or shipped. These are fairly large specialized operations.

6. Box and crates making plant:- These are small to large operations, fairly mechanized. Often, they are integrated with saw mill and veneer plant. They use all kind of low grade hard wood lumber.

The lumber is planed, cut off into pieces, and then nailed into boxes or crates. The products are used for packing all kind of shipments, particularly fruits and vegetables.

7. Chipping mill:- These are small operations, usually near the forest. Small hard wood logs from the forest and farms, and sometimes, small saw mill slabs and edgings, are fed through a chipper and the chips are blown directly into railway cars and shipped to paper mills. They usually operate as contract supplier of chips to the paper mills.

8. Charcoal plant:- The recent trend in this industry is the decline of the retort system and come back to simple charcoak kilns, as the recovery of wood chemicals is no longer economical, because of competetion from synthetic chemicals. Missouri type kilns are quite common. The charcoal from the kiln are then passed through a briquette making plant where the charcoal powder is mixed with starch solution and pressmoulded into oval briquettes, which are packed and shipped. The demand for charcoal briquettes, in this country is mostly for outdoor cooking.

1. Possible application of wood processing technique of the U.S.A., in Pakistan.

A. General back ground of forest industries in Pakistan :- Pakistan is a developing country with its economy still based mostly on agriculture. Agriculture accounts for about 50% of the national income. Geographically, it has two units, East and West Pakistan, seperated by a thousand miles of Indian territory. East Pakistan is a part of the Gangetic plain and is very densely populated.

(About a 1,000 people/sq. mile.) Alarge portion of West Pakistan is rugged mounteneous and the population density is not so high. (About 150/sq. mile)

Pakistan is terribly short of forest, the area under forest being only 3.7%. The situation is a little bit better in East Pakistan, with 15.5% area under forest than West Pakistan with 1.6% area under forest. Though, the forest area is small, a considerable part of forest in East Pakistan is still unexploited and some more part not intensively exploited. Thus, there is a potentialfor increased exploitation of timber and growth and expansion of forest industries,; in East Pakistan, particularly.

A study conducted by FAO shows that the demand of forest products in the area is increasing very rapidly. Moreover, Pakistan is making great strides towards industrialization, but, is very much short of raw materials for industry. To a limitted extent, forest resources can provide raw materials for a wide range of industries. So, forest industry is destined to play an important role in the economic development of the country. However, the development of forest industries will ultimately be limitted by the limitted forest resources, but, as of now, the rapid growth and expansion of forest industries will continue for quite some time.

In this era of rapid growth and expansion of forest

industries, the techniques used by the wood processing industries of the U.S.A. would be of tremendous help in setting up of new industries, as well as modernizing the old ones.

B. Application:- The present set up of wood processing industries in Pakistan can be improved tremendously, through judicious application of the wood processing techniques used in the U.S.A. The following is a deliberation of the possible applications of these techniques, in different types of forest industries:-

1. Saw mill:- The present s aw mills in Pakistan are mostly circular saw mills with manually operated carriage. They are not provided with debarkers or chipping facilities. Slabs and edgings are usually burned out or seldom sold as firewood. The following are the improvements, which can be brought about in the light of the techniques, used in the U.S.A/ :-

Swtching to band saw mills:- As, East Pakistan, which is the important timber growing part of Pakistan, has only hard woods, band saw mills will be more suitable. More uniform lumber can be obtained and wastage in the form of saw dust can be reduced by the use of band saw mills. This improvement of quality and reduction of wastage will definitely improve the lumber industry as a whole. But this will necessiate larger capital investment, which will be more than justified, in the long run.

Addition of debarkers:- Rossing head type debarkers will definitely increase the production and decrease the maintanance cost of the saws. But, debarkers will be of limitted use only, as most logs are transported by water in raftsin which process, the barks are peeled off automatically.

Addition of chippers:- Addition of chippers has a good prospect, as the pulp and paper industry based on hard wood is in the process of expansion. The saw mill chips will be a big source of raw material for expanding pulp and paper industry.

Introduction of automatic carriage:- This is not anticipated at the moment, as the labour supply is plentiful and inexpensive and the creation of jobs is a basic objective of the industrialization of the country. So, at the moment, efforts will be limitted to mechanization, rather than automation.

2. Dimension mill:- At the moment, the furniture and cabinet industry in Pakistan is very poorly mechanized. Lot of work is done manually and the productions are very small. The following are the things which can definitely be improved in the light of the dimesion milling practices in the U.S.A. :-

Mechanization:- There is a tremendous scope of

improving the production of furniture and cabinet parts through mechanization. Hand tools can be replaced by manually operated machines, which will increase the production without much elimination of man power. The stage is not yet set for automatic machines. But, manually operated machines will improve the efficiency of the operation tremendously, without unnecessary elimination of man power.

Adoption of modern finishing techniques:- Adoption of modern finishing techniques as practised in the U.S.A. can improve the quality of the products considerably, and increase the efficiency of the operation.

3. Laminated timber industry:- This industry has not developed in Pakistan, yet. At present steel beams are used where laminated timber beams could be more suitable. But as the lumber available is mostly hard wood sufficient experimentation is necessary to ascertain whether local hard woods can be used successfully in lamination. However, in West Pakistan, where some soft wood is available, this industry has a good chance to grow.

4. Flooring plant:- Because of shortage of wood aswell as subtropical moist climate, wood flooring has never been used in considerable quantity. Because of the conventional constructional practices, wooden flooring has very little chance to be used considerably. So, in the near future,

the technique of making hard wood flooring will be of very little use to Pakistan.

5. Sliced veneer plant:- At present, furniture are mostly made up of solid wood. Sliced veneer plants can boost the making of veneer faced furniture which will improve the utilization of expensive wood, like teak, and will reduce the cost of furniture which, in turn, will help in the expansion of sales of furniture. So the slicing technique can be very fruitfully utilized in developing veneer, plywood and furniture industries of the country. However, the use of sliced veneer will be limitted to furniture and cabinets only, as wall panelling is rare in the present constructional practices.

6. Box and crates making plant:- The technique of making boxes and crates can be used very profitably, in Pakistan. In tropical forests of East Pakistan, there are many inferior hard wood species which are not at all used, at present. Some of these can provide a very inexpensive raw material for boxes and crates making. However, difficulty of transportation may be a limitting factor, in some areas. However, considerable demand for packing boxes exist in the country and the prospect of applying boxes and crates making techniques used in the U.S.A. in Pakistan, is very bright. Wire bound boxes will be the most suitable one, to start with.

7. Chipping mill:- Chipping mill near the forest has a good prospect in Pakistan, as many hard wood species are not

even harvested, as they have no use at present. Chipping this inexpensive raw material in the forest will provide a very effective use of these useless species and also solve the problem of transportation, partly. However, the use of this technique depends on the development of the pulping industry and particle board industry, adapted to use hard wood chips. As the above industries are in the growing stage, chipping technique will definitely find application in Pakistan in recent future.

8. Charcoal plant:- Simple kiln technique of making charcoal from low grade hard wood, will be of definite use in Pakistan. Wood is widely used as fuel, even today and the country suffers from shortage of fuel wood. The hard wood species which are not used at all, at present can be made into charcoal, near or within the forest, which will reduce the bulk and make the transportation economic. So, charcoal making technique will find ready application in the country, provided, the hard wood species are found suitable for charcoal making.

Conclusion:- Though, the general economic and technological level in Pakistan will not allow immediate application of all the highly mechanized and automated techniques of wood processing in the U.S.A. many of them can, very profitably be applied in modernization and expansion of wood processing industry in Pakistan.

In short, the wood processing industry of Pakistan can be benefited highly from the knowledge of the wood processing techniques in the U.S.A. gathered during the trip.

APPENDIX.

LIST OF INDUSTRIES AND RESEARCH CENTERS VISITED.

1. Anderson-tully Co. Memphis, Tennessee.
2. Berea research unit, Central states forest experiment station, Berea, Kentucky.
3. Carbondale research unit, Central states forest experiment station, Carbondale, 111.
4. Charcoal corp. Burnside, Ky.
5. Chester B. Stem Inc. New Albany, Ind.
6. Dierks forests Inc. Dierks, Ark.
7. Edward Hines Lumber co. Chicago, 111.
8. E.L.Bruce Co. Inc. Memphis, Tennessee.
9. Forest Products Lab. Madison, Wisconsin.
10. Forest Products Marketting Lab. Princetion, W. Va.
11. Gamble Bros. Inc. Luisville, Ky.
12. Memphis Hardwood Flooring Co. Memphis, Tennessee.
13. Potlach Forests Inc. Warren, Ark.
14. Maipe-Bros. Inc. Kornak.111.
15. Ralph-Anderson Lumber Co. New Madrid, Missouri.
16. Shawnee Chipping Co. Tamms, 111.