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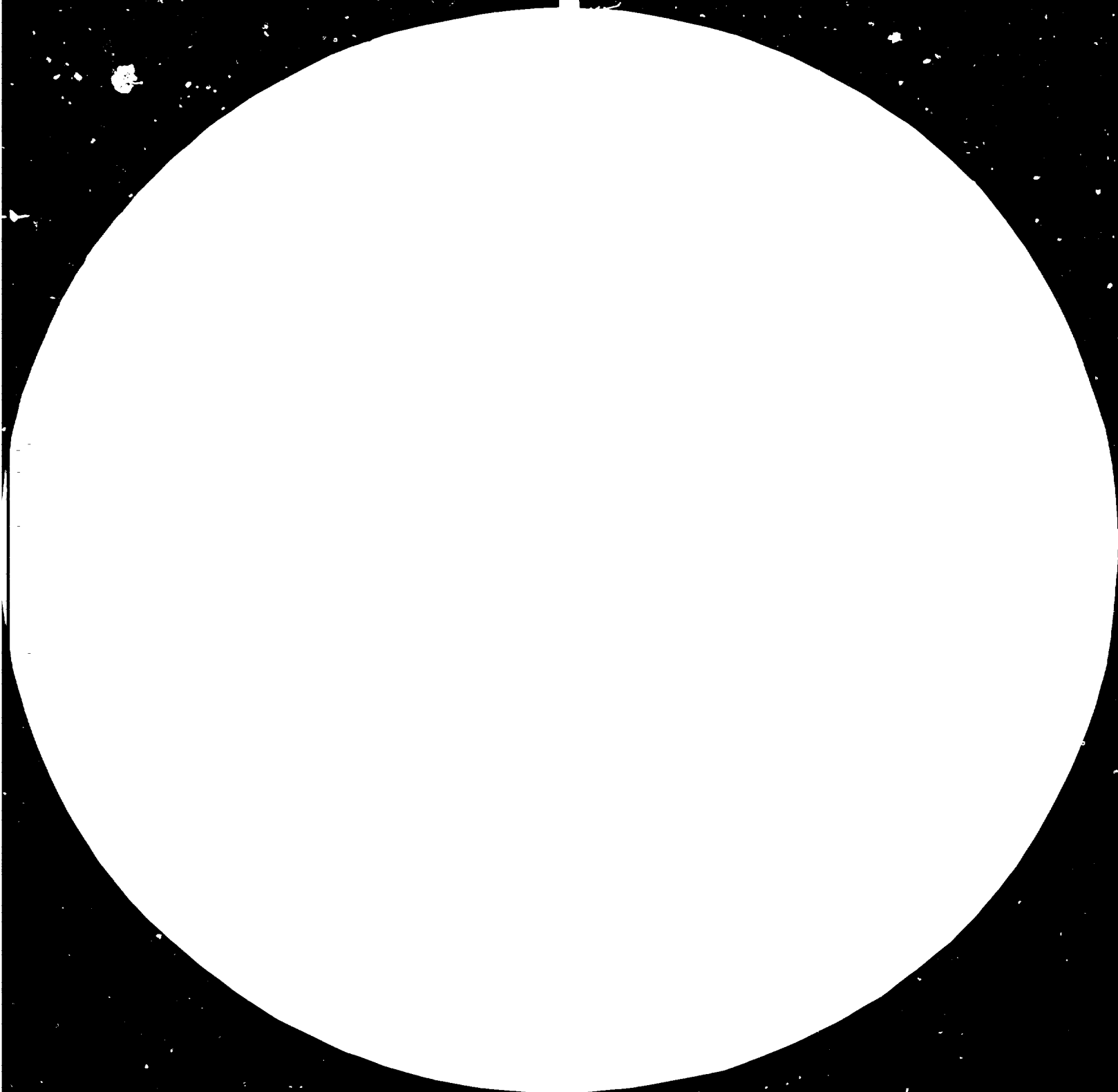

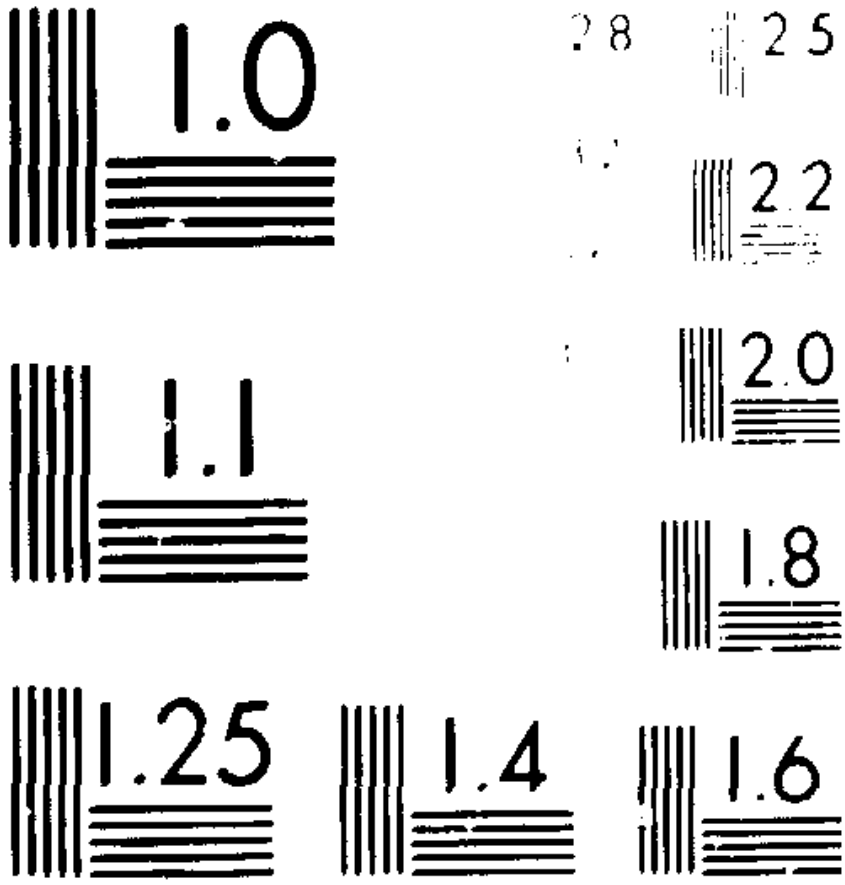
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DEVELOPMENT OF PRIMARY PROCESSING IN THE WOOD AND WOOD PRODUCTS INDUSTRY OF DEVELOPING COUNTRIES *

Discussion Paper

by

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CONTENTS

1. Introduction

The following discussion paper on the primary wood processing industry in developing countries has been prepared for the Global Meeting in preparation of the First Consultation on the Wood and Wood Products Industry, to be held in Vienna from 24 to 26 January 1983. It is supposed

- to summarize the findings of the country and regional papers prepared for the regional preparatory meetings which have been held in Africa, Asia and Latin America in 1982;
- to be a basis for a discussion over the constraints such developments face in developing countries;
- and to determine possible areas for international co-operation to overcome those constraints.

2. Present situation in the primary wood processing industry in developing countries

2.1. Sawmilling

Sawmilling in practically all developing countries is suffering from:

- low recovery being in the range between 25 and 40 per cent of the log input only and
- too simple equipment, which does almost allow for immediate quality cutting but requires re-sorting, re-grading and re-cutting.

2.1.1. Existing equipment and means to improve

In the natural sequence of the development but also as the first and main product being needed in every local market, sawmilling was started in all countries very early as the first step in the development of the wood industry.

As a result sawmilling is mostly considered as simple, thus not requiring technology, good (and often expensive) machinery, nor skill and maintenance.

Consequently in most developing countries sawmilling capacities are not considered an "output" but an "input". Leaving it to the luck, the mood of the operator and to the quality of the logs what will be the output. Many sawmillers have no control over the real recovery rate of their sawmills. This is a relic

from the "good old times" when logs were available in any quantity and had to be harvested.

It will be important in all countries to change the sawmiller's mind from "harvesting" to "best utilization" of the valuable raw material. Machines and equipment are available for this purpose and technologies can be implemented. Besides, in many sawmills not even new equipment and machines are needed but only the acceptance of a different better technology which is new for them but old for others.

The fact that European sawmills despite their extreme small log diameters are operating with "true volume recoveries" of 60 to 70 per cent in comparison to the average of 30 to 35 per cent in developing countries with their much larger diameters, should be borne in mind.

The key to higher recoveries is:

- careful log grading at the log pond or log yard,
- implementation of cutting according to saw patterns which have to be developed in the office. Such saw patterns will maximize the utilization of the timber and will produce that kind of sawn lumber which is needed for the orders.

The main achievement of such a system is that the decision of how the timber is to be cut will be taken away from the saw operator and will be transferred to the management level.

2.1.2. Manpower

Manpower in most sawmills in developing countries is considered to be a real problem. But if saw patterns would be included into the standard operation then the importance of the manpower will be reduced immediately.

Manpower for certain sectors of a sawmill will always remain very important such as maintenance and saw-doctoring.

The change in the cutting method as described in 2.1.1. will improve the utilization of the logs and thus improve the economy of the operation.

A good maintenance crew will keep the machines running and producing and will improve the utilization of the machinery and thus again improve the economy.

The saw-doctor is directly involved in the quality of the products and he can ruin a company but he can also get it into the range of real quality suppliers.

The general problem with manpower in developing countries is the training. This can be done by sending staff abroad or training them on the job. Both methods require additional classroom training. But both methods suffer from the same problem to keep the trained staff working with the company for a long time instead of them running away to the next mill for a few cents more. Here the achievement of real loyalty would provide for the greatest success.

2.1.3. Technology

The most important technology - to adapt the cutting of the logs according to saw patterns being prepared in the office by the management - was mentioned already.

This dominates not only all other technology considerations such as mechanization and/or automation and/or even computerization in developing countries but it mostly replaces them, too.

While mechanization in a sawmill with a large capacity is sometimes unavoidable, any further developments into automation and/or computerization will have to be decided only and in direct connection with the manpower available or needed. Automation and computerization require not only the best skill of the maintenance crew (often highly educated expatriates are unavoidable) but also a perfect communication and infrastructure-system because the higher the degree of automation/computerization, the lesser any chance for "repair" and the higher the need for essential replacements of parts.

To find and locate the origin of a breakdown the expert is needed and to replace the faulty part, the spare part stock is required or at least the good communication and infrastructure to receive the missing part without delay.

The summary of this paragraph leads to the finding that for the success of a sawmill in a developing country good management for the choice and implementation of the best applicable technology is more important than the best and most expensive machines or even automation or computerization.

And in this field the developed countries could assist the developing countries successfully by teaching them their methods for the achievement of good qualities by means of management rather than selling them sophisticated machines.

2.1.4. Other problems

Although most of the problems for a sawmiller in a developing country have been mentioned (in very general terms) one problem is still left: quality control.

From the old days of harvesting the lack of care is not only related to quantity (recovery and output) but also to quality.

An additional business line has developed for the sorting, kiln drying, grading and export packing of the sawn lumber because the average sawmiller does not like to be involved in such problems. He only wants to cut the log and to sell the outcome - if possible complete and without any further action.

Quality control in connection with the introduction of cutting along saw patterns could give the sawmiller the possibility to achieve the same products and to add the value to his own profit.

To summarize this paragraph it can be said that:

- recovery is more important than input,
- management (internal or external) is more important than automation,
- and a good saw-doctor has often more value than a new machine.

2.2. Rotary cut veneer and plywood

While in the sawmilling industry the best improvement can be achieved through management measures, in the veneer and plywood industry the quality of the machines and the skill of the operators and maintenance crew are likely to be of dominating importance.

2.2.1. Existing equipment and means to improve it

At this stage the very different conditions in different developing areas must be taken into consideration.

South East Asia is surely the best place for the production of rotary cut veneer or plywood. Logs are of large diameters. The number of species is extremely low, thus the number of logs per hectare (of the commercial species) is very high, and the quality of the logs is mostly very good with the only exception of those logs from swampy areas which may have defects from borers and/or rotten hearts.

East, South and West Asia are suffering from shortage of forest in general and therefore veneer and plywood industries are either based on log imports or rare in general.

East Africa has some indigenous forest but mainly plantations. Log diameters which are a criteria for the technology to be used are reasonable in the indigenous forest but small in plantation forests.

West Africa is the home of a still acceptable number of tropical timber species. Many of those species are very useful for peeling operations and plywood production. The problem in West Africa is that it was a log supplier to the European plywood industry over two decades. Thus, most of the commercial species in reach by any means of transportation and in a reasonable distance from the sea ports are all gone to Europe, and the remaining "virgin" areas are inaccessible due to the missing infrastructure.

In the tropical range of Latin America the forest is still very rich and dense. But the number of species is indescribably high, the distances to the sea ports for export of products or to populated zones are extremely far, many timber species are too hard for peeling, and many of the areas are either inaccessible or at least not very homely for settlers.

The subtropical range of Latin America is suffering from rare forest in general and where forest is available the number of species is also very large and the densities are high. Altogether, these are not very attractive conditions for a peeling industry.

The moderate and cold part of Latin America has softwoods with small diameters and very restricted markets for softwood veneer and/or plywood.

The machinery and technology is very different for logs from

- tropical hardwood forest,
- moderate climate hardwood forest or
- softwood forest.

Peeling of tropical hardwood logs requires very heavy duty machines which allow peeling of large diameters. The best technology is the one which provides for the best and highest utilization of the machinery for which a perfect balancing of the unit capacities is also essential.

Modern machinery usually provides for the linkage of several machines to systems such as for peeling with reeling, drying, clipping and stacking, or for glue spreading with stacking, prepressing, hot pressing, sorting, repair, sizing and sanding.

The technology has not changed or improved since the development of the continuous veneer drying system. Therefore, improvements cannot be recommended except in connection with the development of new machines, systems or technologies in general.

Peeling of hardwoods from moderate zones is seldom very attractive because it requires heavy and expensive machines which cannot be highly utilized because of the uneveness of the logs and their defects and knots.

Special machines have been developed in Finland for Finnish birch, in Italy for Italian poplar and in Germany for beech. Those machines cannot generally be transferred to other areas but most of them need modifications.

Even more specialized are the machines for the production of softwood plywood and/or veneer. Small diameters of logs require very fast operations and the handling of large numbers of logs per minute to achieve high capacities.

This operation needs automation and computerization and understanding of the buyers that softwood is rarely available without knots and defects.

In general it must be said that the means for improvement in the peeling and plywood manufacturing industry are mainly restricted to the best possible utilization of the machinery.

2.2.2. Manpower

The skill of the manpower in the plywood and peeling industry is very important because with exception of the softwood plywood industry all machines are operated by men.

Training of the manpower is therefore of great importance, with the consequences mentioned before regarding loyalty. The skill of labour is not only connected with the quality but mainly with quantity. Thus, to achieve the intended high utilization of the machinery the operator crew must be skilled and the maintenance men must not only have skill but experience.

Means for improvement are training on the job, but maybe even more classroom training. During such a training in the classroom it is possible to train manpower not only technically but also to improve loyalty by means of involvement and

information on company matters.

Manpower in a plywood mill needs much more care than in many other industries.

2.2.3. Technology

Besides, the items mentioned already in connection with the machinery, technology itself is important.

While hardwoods from moderate zones and most softwoods need steaming before the peeling process (to soften the fiber) tropical timber is mostly peeled fresh from the forest or log pond - or even log yard.

Reeling is common for tropical veneer while softwoods and small diameter hardwoods from moderate zones have such small diameters that the veneer is usually sent to tray systems for fast removal from the peeling lathe.

Generally it can be stated that capacities are highest in South East Asia for tropical timber and North America for softwood plywood.

Means for improvement in the plywood and peeling industry are leading again to the highest possible utilization of the machines while possibilities to reduce manpower or to improve the recovery are very limited.

2.2.4. Other problems

Management activities are often a serious problem. Logging is relatively easy to be controlled and directed. When it comes to sawmilling this requires already production facilities. But when it comes to peeling or plywood it needs management concentration on logistics, manpower handling and training, maintenance, production planning, quality control and many items more.

And management is often a real problem in developing countries because of the lack of management skill. The normal case is that an entrepreneur starts with something small or with logging. Then he expands into sawmilling on a small scale. But when he then expands to plywood and maybe even integrated industries, it would be most essential and advisable that the owner either employs a trained and skilled manager or he himself takes several management courses. Management can be trained and learnt and it must be learnt because the "born" manager is extremely rare.

And here is a real possibility to improve the operation by means of training not only for the machine operators on the job and in the classroom but also for the manager and owner.

2.3. Decorative veneer

The market and the manufacturing of decorative sliced veneer is in the hand of large companies and organizations whereby the end-use of the final product (the furniture, or wall-partitioning, etc.) dictates the market and therefore, the production. Those manufacturing companies are in most of the cases foreign owned.

While South East Asia does not provide for more than just a few species which can be marketed as decorative sliced veneer such species can be found in the rest of Asia and mainly in the tropical forest of Africa and the Amazonas region.

2.3.1. Existing equipment and means to improve

It is surely known that five different systems are existing for the slicing of veneer:

- the horizontal slicing method with the knife carrier moving over the flitch - machines from Europe;
- the horizontal slicing method with the flitch moving over the knife carrier - machines from Japan;
- the slanting slicing method with also the knife carrier moving over the flitch but at a slanting angle - machines from Italy;
- the vertical slicing method - machines from the USA or Europe;
- the rotary slicing method - with either using a special rotary slicing machine from Italy or a rotary lathe with special devices;

None of these systems is new and they are used in many countries. But since the slicing operation is a production which has been mainly localized in developed countries rather than in developing countries most improvements have been done to save labour.

Those improvements have linked the slicing machine together with the dryer in such a way that no handling is needed in between. Unfortunately this system

is not applicable for every veneer specie since some of them require that the veneer becomes stacked and stored for several hours before being dried.

And even those slicing operations which have been shifted from developed to developing countries are joint-ventures and are operated and controlled by the same companies which are still working in the developed countries.

Means for improvement can hardly be given because the market is also really very sensitive. The oak trend in Europe e.g. has, last but not least, concentrated on American red oak and oak from a small and special area in Germany, leaving aside all the other oak species being available in so many countries in the world.

Therefore, if any company in a developing country intends to go into slicing of veneer it will be very advisable to co-operate in some way with a company being in this field of operation for long already.

2.3.2. Manpower

Most of the personnel in a veneer slicing operation must be highly trained with some of them also very experienced. For example, the operator of the band mill who decides the flitch cutting, needs not only skill but mainly experience because he must look into the log to imagine where the grain can be cut which the customers are looking and paying the highest price for.

Skill and care are needed throughout the production flow because the value of the material is very high. Therefore, the personnel must be trained not only on the machines but also in the direction of responsibility.

To summarize this paragraph it can be said that any company considering the setting up of a sliced veneer production in a developing country should do this only if timber species which are marketable in the "delicate" veneer market are available. "New timber species" must be introduced into the market which may not only take many years but may also fail. And even if "known timber species" are existing the market must be carefully tested before the investment is implemented.

Only if such a test has proven successful the manpower problem begins with finding an experienced flitch cutter. The rest of the training is then no extraordinary problem.

2.3.3. Technology

The technology is not uniform and every expert is of the opinion that the one he uses is the best for his operation.

It starts with the softening of the fiber structure where some timber species are better cooked while others are better steamed. But already the question whether the whole log or the flitch must be steamed is answered differently by different experts. The same is the case with the length of the steaming process, where almost every company has its own secrets.

Generally it can be said that cooking keeps the moisture in the wood besides the softening effect from the heat influence. But many species do not react well to cooking, which causes colour alterations, etc. through chemical reactions.

Steaming is done in pits (underground and overground) and in steaming chambers. Contrary to the general understanding steaming does not moisten the timber but dries it considerably because the steam pits or chambers are not tight enough to allow for steam pressure to be built inside the pit or chamber. And without pressure the maximum moisture equilibrium which can be achieved is only 28 per cent which means that any timber will release moisture into the surrounding steam and air mixture.

And exactly this must be considered when deciding if flitches or logs or log cuts should be steamed. A general rule does not exist and cannot be given. But at this stage the future band mill operator who will decide about the cutting of the logs into flitches must be consulted.

The further technology is then quite even and mainly depending on the kind of machine being chosen for the slicing operation. In very general terms it can be said that vertical machines are much faster than horizontal ones and that slanting machines operate in between as far as the number of cuts per minute is concerned.

Vertical machines are considered to be not that extremely precise in the veener thickness while the slow moving horizontal machine still stands for the lowest tolerance in veneer thickness.

Japanese machines are working mostly for the production of extremely thin veneer.

Rotary slicing with logs being clamped "excentrically" was used to get a very high recovery out of the log but it stands for mass production rather than for high quality.

Drying in the sliced veneer production does not require very special technology except that certain species have a content of acids which cause decolorization during the drying process or at least marking of the dryer mesh belts on the veneer surface.

Special care is needed for the storage of the veneer which must not only be temperature and climate controlled but must also be large enough to show the buyer all the various species and grades being there for sale. Decorative sliced veneer is never bought in quantities but is chosen according to taste. And the prices are accordingly.

2.4. Other primary products

The list of other primary products will have to be filled during the discussion of the meeting but two shall be mentioned here already for demonstration.

2.4.1. Wood chips

With the setting up of pulp and paper mills in countries and areas with insufficient raw material supply it became necessary for those mills to import the raw material. In the beginning this was done in the form of logs. But with the increasing intention of the developing countries to have the processing industry within the country rather than supplying logs to such industries in other countries ships mills were developed.

In such mills large quantities of logs will be cleaned, debarked and chipped. The chips must be stored in the open until the next vessel arrives for loading. This loading has then to happen very fast because loading times for ships are very costly; thus, ships owners try to reduce them to the very minimum.

In the last years, an industry has developed in some developing countries which now export chips, instead of logs as before.

2.4.2. Woodwool

While the chips industry as one of the primary industries has been developed only recently, the production of woodwool is known since long but has reduced considerably because woodwool has widely been used as packing material and has been replaced by all kinds of foamed plastics.

For the production of woodwool only such kinds of wood can be used which allow for a cutting of the wood in fibre direction without causing problems of splitting, etc.

The process is simple if the right timber specie is available because pieces of small diameter logs or squares are cut to the operating length of the woodwool machine. A forward and backward moving knife carrier with horizontal and vertical knives cuts then the woodwool directly out of those flitches. Drying is usually not required. Thus, the woodwool is ready after the machine and is sold in pressed form.

3. Prospects

Under this paragraph several delicate issues are to be discussed such as the pros and cons of the transfer of production capacities from developed countries to developing countries with a large raw material base.

Since the timber processing industry in the world lives from the logs being brought out of the forest it is and it will be much more important in the future to make the best possible and the highest added-value use of those precious logs. Utilization and recycling of forest and production residues is one of the real prospects.

But unfortunately not all wood residues can be recycled to produce a value-added new product. Many of them must be used in a different way. And one of these ways is and will be the turning of wood residues into heat or electric energy.

3.1. Transfer of production lines to the source of the raw material

Several decades ago it was most natural that the countries in Africa produced logs which were sent to Europe for producing sawn lumber, plywood and veneer there. The shifting of those production lines from Europe to Africa was not so much originated by the African states but by the European owner who wanted to save on the freight costs. This process has widely been finished but there are still logs coming from Africa to be used in primary production lines in Europe.

In Asia the development was different. The market was originally mainly in North America, where sawn timber was needed as well as hardwood plywood for the interior decoration of the houses.

Already in the early stages the production of primary products such as sawn lumber, rotary cut veneer and plywood was established in Japan and the Philippines, while almost always products rather than logs were exported to North America.

However, in Asia another shifting process has happened in the past decade. Production capacities which had been built in countries without forest such as

Japan, Korea, Taiwan and Singapore had to be transferred from there to countries with forest resources such as Malaysia and Indonesia. The most typical example is the complete transfer of one of the largest plywood factories from Pusan, Korea to Seram island in Indonesia.

Numerous other examples could be given. But all this transfer of production lines and capacities must be seen under two different views.

While it was likely a very short-sighted decision to instal such big production capacities for the use of tropical hardwood in countries without timber resources, it was natural that one day this production would be transferred to the source of the raw material - only from the point of cheaper production. This is a very understandable reason.

Much more of a problem is the transfer of such capacities and factories from *developed countries to developing countries*.

Developing countries with the source of raw material are claiming that the production should be done where the raw material is. But developed countries are claiming that not only production capacities are transferred but that jobs in the developed country are getting lost.

It will be hard to find a solution for this problem because both sides are claiming their right. But there might be a solution if both sides try to understand the other side's position.

Developed countries may have invested much to create the technology and this should not be dishonoured. But developing countries really need jobs for their population.

If both would accept the other's need in such a way that developing countries would be satisfied with turning logs into primary products only and to export those to the developed countries then it would likely be easier for the developed countries to keep their industries going - not exactly on the basis of logs as raw material but at least turning primary products into secondary or final products.

With such mutual understanding both sides could achieve satisfaction. Probably this could be one of the possible solutions for the North South Dialogue.

3.2. Use and recycling of residues

Residues are existing from the forest as well as from any production. Production residues are available in either solid or chipped form.

The aim of every timber processing plant should be to recycle the solid residues into the production flow and to make a value-added product out of it.

Good and known examples are here the production of blockboard from veneer and from the peeler cores from a plywood factory. But what can be done with other residues?

Since standard production lines are not in the market for such a recycling of the solid residues it remains to the decision of each individual plywood factory to find markets and methods. One sawmill once mentioned that they found a toy manufacturer in Japan looking for millions of wooden pieces of 10 x 10 x 100 mm size. This company had found a solution to the problem.

Many plywood factories are cutting their peeler cores for packing lumber - which is also a possibility even if not a very profitable one.

Other plywood factories are recutting their trim waste to a certain width and are using it (after cutting some slots) in crosswise composition as core for a flushdoor production.

Others are composing re-cut fishtail veneer waste together to core veneer and are reducing the amount of residues and are at the same time increasing their recovery.

A Japanese company has developed a machine which cuts something like large finger joints into log ends. If two or more of those log ends are glued together they can be used for peeling of core veneer.

All these are means for recycling of production residues. Certainly also chipboard, fibreboard and MDF can be made out of production re provided a local market is available or can be created.

Last but not least many more products can be made from residues, not only for local markets but also for exports in the whole range between coat hangers and tooth-picks.

Very similar are the conditions for the logging waste. But the criteria there are mostly the transportation costs from the forest to the production site. In many cases these are high. But often it is simply easier to leave the residues behind rather than to bring them to the production site.

But the main problem is likely to be found in the lack of management responsibilities. These managements prefer to make the easy Dollars by chopping

the trees and exporting them as logs - and in all countries it needed strong government pressure to force those managements into production of sawn-lumber and plywood and to export those products.

It will probably need the same government pressure to force them into a better utilization of the precious raw material.

3.3. Power plants

At almost every time production residues in developed countries have been sold to chipboard and pulp and paper mills. There it was most common to use public electricity supply and oil or gas for the required heat.

But what are factories in developing countries doing if neither a chipboard nor a pulp or paper mill is nearby and willing to take their production residues?

Therefore, in those countries it is quite common to use at least part of the residues for burning in a boiler to produce the needed steam for dry kilns, veneer dryers and presses. But with the increased oil costs not only factories in developed countries are turning back to make their own steam and even electric power from their own residues. This is even more the case in developing countries where it is most often much cheaper to use logging residues rather than transporting expensive oil to the factory site.

Today systems are available where steam can be produced in compact boilers and electricity can be made with the use of rather simple and uncomplicated turbines. Here much can be achieved. And here the timber processing industry must likely learn from other industries such as sugar or rice mills which since long use the burning of their residues to produce steam and generate electricity from turbine operations.

4. Constraints

This paragraph will serve as a summary of the paper. Surely the points are understood and known, but the implementation is the problem.

To solve a problem it is always needed to identify it first. This paper should have done some identification of the problems. Logs must be better used in sawmills by implementing better management and residues should be recycled for further products by finding markets, the technique being available. And finally such residues which cannot be recycled should be used for heat and electric power plants.

But all this needs in the first instant much goodwill.

And where this goodwill cannot be found from the management level probably governments must step in with force.

Establishment of a well operating and profit making primary industry in developing countries should allow developed countries to keep their production of secondary and final products going without excessive loss of jobs.

Thus, with some goodwill, but with much of mutual understanding, it should be possible to improve our common source for living, income and work - the timber processing industry - to better and world-wide operation and co-operation.