

ally, it may be mentioned, that for the color reversion reactions too free radicals may play a role, and that in the course of color reversion both graft copolymerization and depositing polymerization may occur (7). Here too model experiments with suitable monomers may prove informative.

In sulfate pulping, alkali is consumed for the neutralization of low molecular weight acids formed. One might try to perform this neutralization by cationic polymers, this would save alkali and enhance the yield.

To increase the yield in pulping, one has three possibilities:

1. Avoid carbohydrate losses
2. Make lignin useful
3. Add cheap and suitable monomers

While point 1. and 2. are familiar and currently used, point 3. is new, and next to nothing has been done in this regard. Here we have a completely new field for experimentation, although it might depart somewhat from orthodox papermaking. During pulping, both cellulose fibers and hemicellulose may be partners of

1. Readsorption of hemi (e.g. on pH decrease in sulfate pulping)
2. Repolymerization (condensation) of carbohydrates and lignin

- 2.1 Depositing polymerization (lead to inclusion)

2.2 Graft copolymerization (leads to chemical bonds)

Both secondary polymerization processes may increase the yield. As a possible, though at present somewhat utopistic goal it may even be feasible to arrive at a yield of more than 100% by addition of suitable monomers. Although at present we are far away from such results, it still is time to explore the potentialities of secondary polymerization processes initiated by the addition of monomers. Of course it has to be tried out, at what stage these monomers should be added, and what monomers are most promising. The field is completely new, and there is next to nothing available in literature. It will be hard to tell how such a "marriage" between cellulose and synthetic polymers will influence the paper properties, apart from the fact that certain special features (water repellency, inflammability) could be added. But this is trivial, more interesting are the changes which could be expected in the mechanical properties. Here we may imagine that coiled, elastic linear chain molecules with a type of lateral bonding similar to that found in cellulose, could take up stress peaks which would otherwise destroy the paper. Durability too, e.g. in flexing, could be improved. In general, we should not stick to the question: how can we improve paper, but should rather ask: how can we produce

a material which is superior to paper. It is our strong opinion, that the possibilities of synthetic polymers should be tested on a broad scale.

The ideas layed out in the foregoing call for a good understanding of both pulping chemistry and polymer chemistry. Only if these conditions are met, we may try to follow this new approach, including the potential possibilities of polymers. Its eventual aim will be the integration of cellulose and wood chemistry into the broad science of macromolecules.

LITERATURE

- 1) **H. Cronert and H. Knauth**
Deutsche Papierwirtsch. 1969 (12), p. 13
- 2) **cf. F. Kann and R. Fuchsel**
Das Papier 21, 174 (1967)
- 3) **H. Haas**
Das Papier 23, 653 (1969)
- 4) **G. Fiehn**
Zellstoff und Papier 17, 67 (1968)
- 5) **H. Schroter**
Wochenblatt f. Papierfabr. 96, 725 (1968)
- 6) **Th. N. Kleinert**
Das Papier 21, 653 (1967)
- 7) **J. Schurz, D. Kaempgen, M. Schlor and K. Windisch**
Das Papier 17, 556 (1963)

Presented by Josef Schurz at the International Seminar of IPPTA, held at New Delhi, December 3—5, 1969.

B. D. SOMANI

In the modern Industrial Era, a large number of industries depend on forest products as their raw materials. There are three major categories of Industries

B. D. Somani, Director, West Coast Paper Mills Ltd., and Andhra Pradesh Paper Mills, Ltd., Bombay.

which are utilising various forest produce. They are:

1. Pulp and Paper Industry,
2. Plywood, Hardboards, Insulating Boards Industry, and
3. Match Box Industry.

Over and above this, the use of Timber is also valuable for do-

mestic and packing purposes. The demand from the industries is increasing sharply and the Pulp and Paper Industry alone has already made rapid progress and is expanding very fast in an astounding manner by the proposed planned production programme of increasing four-fold from the present rate of production, that

Need for a Viable Forest Policy

is from 6 lakh tonnes to 20 lakh tonnes per annum in a span of only ten years i.e. from 1970 to 1980. This is certainly going to create a real gigantic problem of getting adequate supply of raw material especially if we can visualise that already the industry is facing shortage of suitable species of long fibre raw material.

The Planning Commission has recommended certain measures for raising industrial plantations of cellulosic raw materials during the fourth and fifth five year Plan periods. In order to achieve the targets of 4th and 5th five year plans, highly concentrated efforts are required with the re-orientation of our National Forest Policy and the State Governments have to play a crucial role in the matter since the Forest today is exclusively a State subject.

The Forest Policy in India still continues to dominate in the same manner although the country's industrialisation programme has moved very fast. The guiding principles of our National Forest Policy must be based on the primary consideration of achieving the highest sustained yield through technical and economical management of the forests. As a matter of fact, our National Forest Policy must be chalked out on a long-term basis which undoubtedly often clashes with the consideration of getting maximum revenue from the standing forest as is frequently seen from the annual auctions of the standing forest by our State Governments, completely disregarding the regeneration.

LOW YIELD

The basic reason why our Forest yield is very low is that there is no private ownership of the forest and as such no scope open to other private parties to develop the forest on modern methods in a competitive spirit so that there may be a healthy rivalry of constantly increasing the sus-

tained annual yield. It has been assessed that only about 9 per cent of total wood produced is available in India, for the industries. Taking into consideration the annual forest yield, according to the statistics available, we stand very low with 0.53 m³/ha. against the world average of 2.1 m³/ha. It is, therefore, not only important that we should bring in more land under forest but also see how best we can increase the forest yield by undertaking intensive forest plantation.

In this aspect, it is quite obvious that the persons, who are directly interested on a commercial basis in getting high sustained yield, would certainly put in more personal efforts than the present system of leaving the entire development of forest under one Government Department, tied up with usual red tape. We have, therefore, to evolve some definite plans and frame our National Forest Policy to see how best the existing forests could be improved to give much higher yield per acre which may be favourably compared with progressive countries.

Whilst it would be necessary in the interest of the Nation in general to earmark a sizeable area of our forests to serve as a 'Reservoir of Forests', on the climatic and physical grounds, it would also be equally important and necessary to allocate forests tracts in all the States for the purpose of the wood-based industries. Re-conversion of such forest tracts which are, at present, giving poor yield and poor return, should be earmarked for what may be called "Industrial Forests". Apart from reconversion of part of such forests into industrial forests, it is worthwhile considering afforestation of what are called potentially productive barren lands. India has 60 million ha., i.e. about 18 per cent of the total area in this category of land. Certainly 10 per cent of this productive land could be brought imme-

diately under forests by raising plantation useful for the wood based industries.

LOP SIDED

It has to be admitted that in India, the large rural and even partly urban population depends upon the Government forest lands for grazing their cattle and also for domestic fuel requirements. The present unsatisfactory situation in this regard has remained unsolved. That is because our approach to this important problem and the co-operation of the people to solve this problem have all along been treated on lop-sided view.

With the fast increasing human and cattle population in this country this problem would go beyond the scope of human control, if it is not handled properly. It is needless to say that the grazing has had a deterrent effect on our once beautiful forests. The natural regeneration of the trees is adversely affected by such excessive and unauthorised grazing.

In several States the present system of annual auction of the standing crops of forest or babboos to the highest bidder or contractors, whose sole interest is to extract maximum possible quantities, regardless of future growth, is certainly detrimental to the re-growth of the forest and must be discouraged. Then, of course, the annual forest fires, mostly set by the villagers, to promote early growth of grass, has an adverse effect both on the natural regeneration as well as on the soil, by the destruction of the litter or 'humus' as it is called in forestry terms.

The National Forest Policy, in consideration of all these setbacks does need a drastic revision. First of all the approach to this problem must be based on this assumption that the development of our forest is national problem and must be tackled as such. It looks as if these valuable national assets are the concern of

the State Forest Departments only and have been like everybody's and nobody's property. There is also an impression gathered that the forest in many states are "Politicians Platforms" where the goodwill of the rural population is won over by extending all sorts of concessions to the "interested parties" which are no doubt against the ethics of forest policy and detrimental to the development and preservation of forests.

Added to the above, it has been noticed that some of the State Governments have started converting lakhs of acres of the forest areas for agricultural cultivation of rubber or tea plantation which would only result in reducing the forest areas further which is already short for generating adequately supply of raw materials. Thus we may have to face a situation whereby production will be hampered for lack of adequate supply of raw materials needed for increasing the production target. This action of the State Governments has been brought to the notice of the Planning Commission as well as the Ministry of Food & Agriculture and it is hoped necessary directives will be issued to the State Governments concerned to desist from converting the forests areas for agricultural cultivation or other plantations but to preserve them for the forest based industries.

Firstly, it is essential to have a reclassification of the forests in view of the changed conditions. After carrying out a proper survey of our forest areas we should classify our forests under the following categories.

1. Forest Reservoirs (a new phraseology I would like to suggest)
2. Timber Forests
3. Commercial Forests
4. Fuel Forests, and
5. Grazing reserves (pastures)

All these categories should be clearly demarcated in all States. The so-called wastelands or productive barren lands should be earmarked for commercial forests, fuel forests and grazing reserves (pastures); Secondly, the cattle for which India is so notoriously known, may be controlled by levying grazing fees and limiting it to the essential line. All such grazing levy should be utilised for improvement of the pastures, by modern technique like introduction to varieties of fodder grass, fertilisation etc. Grazing by stray cattle, particularly in demarcated and deserved forest lands must be stopped at once. If this grazing problem is solved satisfactorily then the other problems like fires and damage to natural regeneration would probably be automatically solved.

Our next main object should be of attaining self-sufficiency in our requirements of wood for wood-based industries. The problem is a gigantic and a colossal one but certainly not beyond the scope of solving it. A pre-requisite for this would be a proper survey of the existing forests and to find out what is exactly required by various wood-based industries. How much is available and what is the deficit to be made up? It would then be necessary to re-allocate certain compact blocks of forest areas for the purpose of growing concentrated plantations of industrial woods, as far as possible, in the near vicinity of such industries to cut down unnecessary cost of long haulage and transport and thus help in reducing the ultimate production cost. Also, areas available from the vacant lands should be earmarked for industrial forests.

Concerted efforts to replant the areas with useful species by raising large scale industry-oriented plantations would obviously be necessary. Now comes the question whether with the existing capacity of State Forest Department alone this work can be done

or all others should join in this national enterprise. The primary question is how such a colossal problem of raising large scale plantation can be tackled by one agency only. The Development Council for Paper, Pulp and Allied Industries has strongly recommended that industries interested in raising self-plantation should be granted long-term leases of forest areas at reasonable rate and that plantations of fast growing species should be simultaneously taken up by the States as well as by the Industries. In this context, Planning Commission had also recommended, for the 4th and 5th five year plan periods, regular programme of annual plantation of 87,500 ha. of Eucalyptus, 5,000 ha. of Conifers and 37,500 ha. of Bamboo at an estimated cost of about Rs. 44 crores per year. In this gigantic task of rapid regeneration of cellulosic raw material, the industries, if given an opportunity, can also contribute considerably.

There should be no vexed feelings of dismay or fear in the minds of the forest controlling authorities that the industries, if allowed to share their burden by supplementing their efforts, would upset the administrative policy of the Forest Department. Under properly drawn out programme along with the guidance and supervision of the Forest Department, there should be no room for entertaining any doubts about the bonafide intentions of the industries. The Committee set up under the aegis of the Planning Commission and Government of India has, after mature consideration, recommended such a step—a step in right direction would go a long way in solving our problem. It is strange to note that, in spite of this policy being recommended from the highest quarters, still the State Governments and the Forest Departments are having a luke-warm attitude towards this.

Formations of what may be termed as Industrial Forest Plantation Corporations or Co-operative Societies should be given the task of undertaking the development of private forest areas on long-term leases on agreed terms and under the supervision of the Forest Department and start such plantations which are useful for industries. When Forestry by in-

dividual farmers and the companies are doing very well in other countries, particularly in US, Sweden, and Canada, there is no reason why we cannot adopt those methods to achieve our progress rapidly.

We have already lost valuable time of the first 15 years of the three consecutive Five Year Plan periods during which period no-

thing much has been achieved to improve the forest conditions. The tempo of development for the next two Five Year Plan periods must be based on realistic consideration and on sound footings, inviting the co-operation of all private agencies and corporations thereby mobilising the maximum resources both human and physical.

The W. R. Grace pulp and paper research group reaffirmed the need for a more homogeneous cook of their bagasse pulp, since bagasse fiber is a natural fiber blend material, with low lignin and high hemicellulose content and certainly opposite to the mechanical composition of softwood fiber.

The question of how much delignification should be conducted

Dr. E. J. Villavicencio, Vice-President and Director, Research and Development, PEADCO, Paramonga—Peru.

out the reasons for the heterogeneity of the pulp. Shives were strong and resistant to any mechanical defibrating device.

BAGASSE DELIGNIFICATION REACTIONS

Generally speaking, the bagasse pulps were well-delignified, and the lignin removal was shown to be preferentially from the cell-wall up to the point of 50% total lignin removed. The lignin in the middle lamella was less attacked. Under stronger delignification conditions, the same reaction was shown followed by a rapid rate of removal of lignin from the middle lamella.

into the fiber during the natural flash-off of steam. Air is pulled into the fiber pores by the vacuum produced when the setam pressure is reduced to zero. As a result of this, the lignin becomes hard and brittle. Defibration of such fiber and fiber bundles becomes inefficient.

Experimental work has shown that when bagasse fiber bundles are defibered at the blow-line (before the blow-tank) at temperatures above 290° F and at a consistency over 20%, air introduction is prevented and the lignin does not harden. Fiber pores are filled by the water condensed during the defibration stage