

HARDWOOD UTILIZATION IN NEW YORK AND NEW ENGLAND PULP AND PAPER MILLS

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HARDWOOD UTILIZATION IN NEW YORK AND NEW ENGLAND

PULP AND PAPER MILLS¹

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Summary

Hardwoods, including aspen, comprised 22 percent of the pulpwood received in the New York and New England States pulp mills in 1944 when war-time conditions favored the use of all available wood. The denser hardwoods alone, however, amounted to only 9 percent of all the pulpwood, and this value is reduced to 7 percent when imports are subtracted.

Possibilities for increasing hardwood utilization lie in using domestic instead of imported hardwoods, using a minimum of 10 percent hardwood fiber in present paper grades, constructing new sulfate and semichemical mills for producing strong hardwood pulp for definite uses, and changing certain paper grades to accommodate more hardwood fiber. If all these possibilities were realized, it is estimated that the consumption of domestic short-fibered wood could be increased from 14 to 33 percent on the basis of 1944 data.

Although the technology of the use of hardwoods is sufficiently advanced to permit major increases in their utilization, research is urgently needed to show how a much better ground-wood pulp can be made, to determine the variables of chemical pulping, and to improve fiber-processing and paper-making procedures.

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Introduction

The most important current problem in forest utilization in the Northeast, as in other regions, is probably how to use low-grade wood and little-used species in association with the favored species. Such a use is imperative for realizing badly needed improvement in silviculture in the forests and for supplementing rapidly dwindling supplies of woods of grades and species heretofore considered necessary to the industry's products. It is of particular importance to the pulp-and-paper industry in the Northeast that the seriously diminished supplies of spruce and fir in the area be supplemented therefrom if this region is to continue to provide the industry with woods for its present grades of paper independently of outside sources. This supplementary supply will probably have to come mainly from the deciduous trees, birch, maple, beech, and oak, which have been considered undesirable in the past or have been used only to a limited extent for special purposes.

The purposes of the present report are (a) to analyze the present situation regarding hardwood utilization for pulp and paper in New York State and New England, (b) to suggest possibilities for increasing the utilization of northeastern hardwoods for pulp and paper, and (c) to indicate hardwood pulp-and-paper research needed. Much of the material on which this report is based was obtained from visits³ to the major pulp and paper mills in New York and New England during February and March, 1946. Information on hardwood pulping practice, pulp properties, and pulping problems obtained during these visits has been included in recent reports on these subjects (2), (3). The subject of available wood supplies in the Northeast has been covered recently (1) and so will not be discussed in this report.

Although aspen has certain properties in common with the denser hardwoods, including its short fiber, the problems of its use are less difficult, and, further, it is a relatively unimportant species in the Northeast. Therefore, it will be considered in this report apart, in certain respects, from the other hardwoods.

Present Situation Regarding Hardwood Utilization

A small amount of denser hardwoods and an appreciable amount of aspen have been used for many years in manufacturing pulp in New York and the New England states. During the recent war hardwood utilization reached a peak when practically any wood was accepted at the pulp mills. In 1944 in New York dense hardwoods comprised in round numbers 3 percent of the total pulpwood mill receipts of 800,000 cords, compared to 17 percent for aspen and 80 percent for softwoods. In the same year in New England these figures were 12, 11, and 77 percent, respectively, of the total pulpwood receipts of 2,000,000 cords. The total short-fibered wood consumed in the New York - New England region was, thus, 22 percent of all the pulpwood, although the value drops to 9 percent if aspen is not considered. The

³In cooperation with Northeastern Forest Experiment Station, U. S. Forest Service, Philadelphia, Pennsylvania.

softwoods used in this region included spruce, fir, hemlock, and northern pine. The denser hardwoods included paper and yellow birch, hard and soft maple, and small amounts of beech and oak.

Whereas 39 percent of the softwoods and 69 percent of the aspen received at the New York mills came from Canada, only 24 percent of the denser hardwoods were thus imported. Imports accounted for 43 percent of the total pulpwood received in New York. In New England 28 percent of all the wood received was imported. The importations of softwoods and of aspen and other hardwoods were 27, 39, and 21 percent, respectively. Thus, domestic short-fibered wood comprised only 14 percent of the total pulpwood received at the New York - New England mills, and the hardwoods, exclusive of aspen, comprised only 7 percent.

Approximately 85 percent of the aspen and 50 percent of the other hardwoods received in New York and New England mills in 1944, or about 70 percent of the short-fibered wood pulped in these states, were utilized by soda or modified soda-pulp mills. Further, approximately 40 percent of the dense hardwoods, or nearly 20 percent of the short-fibered wood, was consumed by one large sulfite mill. The small remainder of dense hardwoods was used more or less unwillingly in a number of ground-wood and sulfite mills in small percentages, usually 5 percent or less of a mill's consumption. Several sulfite mills also used aspen in amounts near 10 percent of their pulpwood consumption, apparently to replace soda pulp not available on the market. A few sulfite and ground-wood mills apparently used no short-fibered woods whatever.

All but a few of the pulp mills in New York State and New England are integrated with paper mills. In addition to the integrated paper mills, there are also a large number of paper mills in this region operating on purchased pulp. The few mills manufacturing sulfite pulp for sale have not had any calls for hardwood sulfite pulp for paper-making purposes, although one integrated pulp mill does produce for sale a small amount of purified hardwood sulfite pulp for the chemical conversion field. The integrated mills convert their pulp chiefly into the following major grades of paper: (1) newsprint, (2) ground-wood printing and specialty, (3) book, (4) fine papers and sulfite specialties, (5) tissue, absorbent and sanitary, and (6) board. The hardwood soda pulps, which, as previously said, account for 70 percent of the short-fiber pulp, found, for the most part, their major outlet in book paper. A small portion was also used in fine papers. The aspen sulfite pulp was used generally in fine papers and sulfite specialties. A small amount of denser hardwood sulfite pulp was used in absorbent paper. The list of hardwood-pulp outlets is virtually completed by including the very small amounts used in ground-wood printing and specialty papers and in roofing felt.

The condition of the wood received at the mill with respect to the presence or absence of bark and the ability of the mill to remove bark if present, also have an important bearing on the present situation regarding hardwood utilization. These factors are important because of the relatively short peeling season in the woods for hardwoods in comparison to softwoods and of the more difficult removal of hardwood bark at the mill in comparison to softwood bark. Until the war period the soda mills for the most part received their wood in the peeled condition and, therefore, had little or no bark removal facilities. Fortunately, when peeled wood was not always available because of man-power shortages, the soda-pulp mills were often able to cook the wood without removing

the bark. This was, of course, done at some expense of pulp quality. The grades of paper made require ground-wood and sulfite mills, on the other hand, to utilize only wood with the bark removed. Further, many of these mills had little or no barking equipment at the start of the war, or else had equipment not suited for hardwood barking. Several mills were able to supplement their barking equipment with a newly developed type of hydraulic barker, but few mills are in a good position with respect to equipment for removing bark from any large quantity of hardwoods.

Another factor affecting the present situation regarding hardwood utilization is the ability or inability of the sulfite and ground-wood mills to handle hardwoods separately, straight through from the woodyard to the paper mill. Separate processing is desirable if the best pulp quality is to be obtained from the hardwoods, and if the proportion of hardwood pulp entering the final product is to be under strict control in order to assure use of the maximum practical amount of such pulp. Very few mills are set up to deal with hardwoods and softwoods separately or in such controlled proportions.

Possibilities of Increasing Hardwood Utilization

It is possible that hardwood utilization in the pulp mills in New York and New England can be increased. Rough estimates of the amount of the possible increases can be readily made upon the basis of certain assumptions--namely, that (a) the hardwoods will be available in economic competition with softwoods and in a form suitable for use, (b) the necessary technology for pulping the hardwoods and converting them into paper is known, and (c) the markets for hardwood papers are developed. Upon these assumptions it is possible to estimate possible increases in hardwood utilization for pulp and paper on the basis of the following conditions: (1) Using present pulping facilities and making the present grades of paper, (2) constructing new facilities for producing the strongest and most useful hardwood pulps, and (3) making grades of pulp and paper capable of utilizing more hardwood fiber.

Using Present Facilities

It was stated above that a considerable amount of aspen and a small amount of other hardwoods were imported. It was also pointed out that 70 percent of the hardwoods were pulped by the soda or modified soda processes. It has been found that the denser hardwoods can replace aspen for certain purposes without important changes in operation. If an amount of hardwoods equivalent to that imported were obtained in the New York and New England regions, where hardwoods of dense varieties predominate, an increased utilization of, roughly, 225,000 cords of domestic hardwoods, on the basis of 1944 statistics, could be expected by the soda-pulp mills.

It was also stated that 10 percent or less aspen and hardwoods were used in a number of the sulfite and ground-wood mills (excluding one large sulfite mill that consumes a high proportion of hardwoods), and that a few mills used no hardwoods whatever. If these small or nonconsumers of hardwoods would substitute up to 10 percent of the wood they consume with hardwoods for a filler pulp, it is estimated that something over 100,000 cords of hardwoods could be consumed in the present ground-wood and sulfite mills.

If the two possibilities of substituting domestic for imported hardwoods and of using a fixed minimum of hardwood fiber in present grades of paper were realized, the overall consumption of domestic hardwoods would be increased from 14 to 25 percent.

Constructing New Pulp Mills

It was stated earlier that the pulp produced in New York and New England did not fulfill the requirements of all the paper mills in the region. That is, a number of converting mills import pulp from out of the region. It has been demonstrated quite conclusively that bleached hardwood sulfate pulps are equivalent in most respects to many bleached softwood sulfite pulps and can be used satisfactorily for a wide range of fine papers. Unbleached hardwood sulfate pulps also have considerable usefulness. If mill sites with suitable wood supply, water, power, and transportation were available, it is possible that the region could support several hardwood sulfate mills. One such mill, of 200 tons daily capacity, is under construction at the present time. Two mills of this capacity would consume approximately 225,000 cords of hardwoods annually.

The production of corrugating and liner board from semichemical pulp has been recently expanding in the Southern and Lake States, and demand for these products is increasing. It seems possible that the New York State and New England regions could support two semichemical mills, each of 100 tons daily capacity, for the production of corrugating board from hardwoods. Two such mills would consume approximately 80,000 cords of hardwoods annually. If present experimental results prove technologically correct and economically sound, it is also possible that the New York-New England region could support one mill with a daily capacity of 100 tons of bleached semichemical pulp produced from hardwoods. This hardwood pulp would supplement bleached softwood sulfite pulp in many products. A 100-ton bleached semichemical pulp mill would consume, roughly, 55,000 cords of hardwoods annually.

Although several mills in the New York-New England region are using part-wood pulp to produce saturating felt, increasing demands for this product warrant consideration of an increase in present manufacturing capacity. The pulp could be made according to present practice involving a softening treatment with steam or chemicals followed by fiberizing in an attrition mill. One such felt mill would consume 25,000 cords of hardwoods annually.

If the new sulfate, semichemical, and saturating-felt mills suggested above were built, hardwood utilization would be increased by 385,000 cords. This increase would raise the hardwood consumption to 31 percent of the total pulp-wood used in the region.

Making of Papers Capable of Accommodating More Hardwood Fiber

Several mills in this region, manufacturing grades of paper of the highest quality, are finding increasingly stronger competition from mills more favorably situated elsewhere. Hardwood pulps cannot ordinarily qualify for these grades because of their strength and cleanliness requirements. If

Northeastern mills now finding it difficult to process the necessary softwood pulpwood were to concentrate on lower grades in the fine-paper field instead of on the top grades, they might be able to utilize 10 to 20 percent of hardwood fiber in their products; and, although the selling price of their products would be lowered, they would probably find themselves in a better competitive position.

On the other hand, a number of mills manufacture grades of paper containing high percentages of ground-wood pulp. Competition from newer, better-situated, lower-cost mills (e.g., Canadian newsprint mills) has made the grades of high ground-wood pulp content less attractive to manufacturers. If these mills were to produce papers with higher percentages of chemical pulp, it is possible that at least a part of this increase in chemical pulp could be made up of hardwood sulfite or sulfate pulp. Two mills are known to be converting from newsprint grades of high ground-wood pulp content to book and specialty grades of lower ground-wood pulp content. It is possible that hardwood sulfite or sulfate pulps could find some use in these new grades.

Hardwood sulfite pulps have a small market for chemical conversion at present. It is possible that this market could be enlarged along with the generally increasing demand for wood pulps of this type. There is available in New England some capacity for chemical-pulp manufacture, now using softwoods, that possibly could be changed over to hardwoods.

If all the changes were made in pulp and paper grades as suggested above, it is estimated that 50,000 cords of hardwoods could be consumed annually for the purposes named.

Total Possible Increase in Hardwood Utilization

If the amounts of hardwoods that could possibly be used for these purposes with present facilities, with new construction, and with changed grades, are added, the result is a total of more than 1,000,000 cords annually. This is 33 percent of the total annual pulpwood consumption estimated under the conditions described.

Research Needed on Hardwood Pulping and Paper Making

The technology of hardwood pulping and paper making is sufficiently advanced for realization of the possibilities of increased hardwood utilization suggested in the previous paragraphs upon the basis of present information. However, these possibilities would more likely become realities if additional information were available, much of which is urgently needed. Some of the research required to obtain this information is outlined below.

Barking of wood.---Pulpwood barking machines have undergone a rather remarkable development during the last few years. A survey of the available machines should be made and trials arranged for determining the

suitability of the various types of machines for hardwoods. Any further developments found necessary in the trials should then be initiated.

Groundwood pulping.--Half of the total pulp-producing capacity in New York State and New England is in ground-wood pulping. In spite of present-day pulp shortages, this capacity is not fully used. Most hardwood ground-wood pulps made according to best-known practice are of low quality and have only limited uses. Aspen ground-wood pulps are an exception, because they can be produced with qualities approaching those of the softwood pulps. If, with reasonable changes, some way of employing present grinding equipment could be developed that would enable the production of more useful hardwood ground-wood pulp, a considerably larger amount of hardwoods could be used. Treatment of hardwoods with steam or chemicals improves the strength of the ground-wood pulp obtained therefrom, and researches along these lines being conducted in several places may lead to increased hardwood utilization in grinding. Information is needed on the optimum grinding conditions for producing the best possible pulps from specific hardwoods. Development of a stone surface particularly suited to hardwoods is also needed.

Chemical pulping.--Information on the pulping of specific northeastern hardwoods by different processes is sketchy and incomplete. More complete knowledge on the effect of the major variables in the pulping of all the hardwoods is highly desirable. Information on the pulping of the hardwoods in mixture with themselves and with softwoods is also needed.

Hardwoods for board.--Building, insulating, and hard boards are in great demand. There will be a large consumption of them during the next few years. Apparently, new methods of producing these boards are needed if they are to be made generally and profitably from woods or mill waste. The possibility of using hardwood wastes for this purpose is of high importance.

Pulping dead and decayed wood.--The ravages of the bronzed birch borer and other infestations have created a serious salvage problem among northeastern hardwoods. Information is needed on the pulping and use of dead (and possibly decayed) birch and beech.

Processing and papermaking.--Hardwood fibers have different processing characteristics than softwood fiber, and there is relatively little knowledge on ways of developing their best qualities. Improvement in paper-making procedures is also highly desirable in order to overcome certain inherent handicaps of the hardwood pulps such as their low wet-web strength.

Bonding agents.--A promising field of research in which considerable work has been and is being done, is the developing of bonding agents for improving the strength of certain papers. The application of these bonding agents to hardwood pulp furnishes should do a great deal in aiding the development of hardwood utilization.

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