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ABSORBENT PAPER

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It is an object of this invention to provide an improved absorbent paper suitable for toweling, facial tissue, toilet paper and similar uses.

It is a further object of this invention to provide a method of producing paper as aforesaid.

In the past, hardwoods have been utilized in the manufacture of paper intended for toweling, facial tissue, toilet paper, and the like, but oak pulp, when so used, has generally been in admixture with other hardwood pulps. The peculiar character and virtue of oak pulp and the concomitant requirement for a variation from the standard methods of making such papers has not heretofore been fully recognized. Accordingly, the full possibilities of softness and absorbency of such papers containing oak pulps were not achieved.

In many latitudes there are large quantities of oak juxtaposed or, for all practical purposes, intermingled with the coniferous woods normally employed for the manufacture of pulp so that economically there is great incentive to find a means whereby a pulp mill can obtain full utility when the oak and similar hardwoods are in its timber holdings.

It has now been determined that if oak or similar hardwood is subjected to the usual chipping operation and the chips given a kraft cook of drasticity normal for the production of a chemical pulp from such a wood and then without, or with very little, mechanical refinement the resultant pulp be mixed with from 30 to 75 percent of coniferous pulp which has been given a normal kraft cook for paper making purposes and given a greater than normal amount of mechanical refinement for such purposes, the resultant mixture constitutes a furnish from which exceptionally soft absorbent paper may be formed.

The details of the kraft pulping process are well known and need not be described here. It will be understood that the ranges and limitations hereinafter discussed are not necessarily critical. The variations of a normal wood supply are such that, were all the other factors involved in the cooking held constant, at times the product would be unusable. Accordingly the processing details must be adjusted to the character of the raw material being processed at any given time. It is also a fact that various factors of the cooking process operate in the same direction, hence they may not be varied simultaneously in the same direction but must be varied in opposite directions to avoid excessive effect one way or the other.

Kraft or sulphate oak pulps prepared according to commercially acceptable cooking procedures are satisfactory provided the degree of drasticity of the cook falls within certain limits. The drasticity of cooking is usually measured and expressed directly or indirectly in terms relating to the amount of non-carbohydrate matter remaining in the pulp. The most common test is the so-called permanganate number. Unfortunately the numerical value of the result may vary considerably depending on the exact experimental conditions. The standard most generally applied is a technique established by the Technical Association of the Pulp and Paper Industry entitled "Standard Method T 214 m-42." Using the method above described it is recommended that the oak be cooked to a permanganate number between 6 and 14 although it cannot be said that pulps having permanganate numbers outside these limits will not work. Cooking to a lower permanganate number seriously degrades the carbohydrate matter and results in low yields of pulp from the wood. Cooking to a higher permanga-

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nate number results in a pulp with an excessive content of fiber bundles or shives.

Subject to the comments above mentioned the pine for use in this invention should be cooked to a permanganate number between 14 and 30.

The oak pulp should be refined almost not at all. If given any substantial degree of mechanical refinement, oak pulp cooked as above described has a tendency to make the final sheet of paper hard, harsh, less absorbent, and with considerable rattle, all qualities which are undesirable for the purposes here contemplated. This oak pulp rather easily takes on superficial hydration and it will be found that the pumping and handling incidental to washing out the cooking liquor and other inevitable operations will usually produce adequate hydration of the oak pulp for the purpose.

The oak pulp is very short-fibered and the pine pulp operates as a binder much in the manner in which sulphite pulp is used in newsprint. Accordingly the refinement of the pine pulp should be carried out with a minimum of shortening of fiber, that is, if beaters are used, beater rolls should be eased over the bed plate and if jordans are used the filler and filler setting should be to produce a brushing rather than a cutting effect. As a specific example, when using a furnish containing 50 percent each of pine and oak pulp and refining with a one and one-half pound Valley Laboratory Beater, refinement of the pine pulp to a Canadian Standard freeness of 500 ml. (Technical Association of the Pulp and Paper Industry Standard Method T 227 m-49) has been found satisfactory in bringing out the desired compromise between tensile strength, tearing strength, softness and absorbency.

For facial and toilet tissue use a fifty-fifty oak and pine combination is recommended but, depending on the precise end purposes, from 25 to 70 percent of oak pulp may be used with the remainder made up of properly refined pine pulp. At the 70 percent end of the range would be the most absorbent facial tissue and at the 25 percent end would be the more rugged towel stock.

It is to be understood that the oak pulp contributes very little to the strength of the sheet which must be built up by proper refining of the remainder of the furnish. This refinement in all cases will greatly exceed that which would be given to an all coniferous chemical pulp sheet of similar character.

This invention has been described primarily with reference to a mixture of oak and pine pulps, pine being an example of a suitable coniferous pulp. Most or all commercial coniferous pulps are satisfactory for the purpose. The oak pulp, however, as an ingredient of a furnish will confer softness and absorbency on the ultimate sheet. It will, for example, increase the softness and absorbency of any towel stock, even one containing ground wood, so that the invention is not to be considered limited to a simple mixture of oak and pine pulps.

Whatever the furnish, the oak pulp is necessarily added after refining the strength-giving fiber component or components and may be done in any convenient manner as, for example, by addition of lap pulp to the beater with the roll raised or by simple fluid mixing in slush pulp systems.

Any of the ordinary commercial bleaching methods either reductive or oxidative may be used when desired. In the case of towels, when necessary, any of the normal wet strength agents for regular paper towels are satisfactory, including melamine and plain or modified urea-formaldehyde resins.

The addition of a wetting agent may be indicated, especially when using some of the wet strength resins which exert a slight sizing action. For example, the alkyl aryl polyether alcohol type of wetting agent marketed by the Rohm and Haas Company, Washington Square, Philadelphia, Pennsylvania, under the trade name of Triton X-100, added to the stock in the amount of 0.05 per cent of the weight of the fiber has been found quite satisfactory for this purpose.

While various specific ranges and proportions have been discussed herein, it is not intended that this invention be limited to the precise details disclosed but only

as set forth in the subjoined claims which are to be broadly construed.

I claim:

1. A soft, absorbent paper suitable for use as toweling and facial tissue and the like; comprising a mixture of oak pulp cooked by the kraft process to a permanganate number, unbleached, between approximately 6 and approximately 14 and pulp formed of coniferous wood cooked by the kraft process to a permanganate number, unbleached, between approximately 14 and approximately 30, the oak pulp being substantially mechanically unrefined and the coniferous pulp being long-fibred and mechanically highly refined, the oak pulp being present in from 25 to 70 percent of the total furnish.

2. Paper according to claim 1 in which the oak pulp is approximately 50 percent of the total furnish.

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