This invention relates to the pulping of wet-strength paper broke. Broke is a waste product of the paper industry which, if not repulped and utilized, represents a substantial loss. It is customary, therefore, to repulp the broke and reuse it in the process. This has worked out quite well in the case of broke containing such materials as resin size, starch, clay and the like since this type of broke can be handled in the usual equipment. In the case of wet-strength broke, however, the resin-fiber bonds are very difficult to break and have generally required the use of high temperatures and low pHs. This necessitates special equipment, thus increasing costs and, in addition, may result in damage to the fibers. It has now been found that the pulping of wet-strength broke is greatly facilitated by the action of aqueous solutions of various oxidizing salts. Exemplary of the oxidizing salts which have been found effective for the purpose are sodium hypochlorite, calcium hypochlorite, sodium chlorite, chlorine dioxide, sodium peroxyde, sodium hydrosulfite, sodium chlorate, potassium chlorate, ammonium persulfate and similar water-soluble alkali metal and alkali earth metal salts. In fact, it appears that the particular cation associated with the oxidizing anion has no pronounced effect and that any water-soluble oxidizing salt may be employed. The water-soluble metal hypochlorites are preferred.

In carrying out the process of the invention, the wet-strength broke is treated with a dilute aqueous solution of the oxidizing salt. This may be accomplished advantageously by introducing the broke into a dilute aqueous solution of the salt and permitting it to soak until the desired loosening of the fiber-resin-fiber bonds is obtained, i.e., until the fiber-resin-fiber bonds are loosened to the point where the broke can be pulped in conventional pulping equipment. The treated broke may then be subjected to mechanical pulping in the usual manner. Stirring is not necessary during treatment of the broke but may be used if desired.

The time required to obtain the desired loosening of the fiber-resin-fiber bonds will vary depending upon a number of factors such as the type and concentration of salt, temperature of treatment, type of wet-strength resin, extent of defibering desired and so on. In general, times from about 15 minutes to about 90 minutes have been found satisfactory although more or less time may be used, if desired. From about 30 minutes to about 60 minutes is preferred.

The concentration of the oxidizing salt, based on dry pulp, may be varied from about 0.05% to about 10% but will usually be from about 0.1% to about 10%. The defibering proceeds somewhat more rapidly if an excess of the oxidizing salt is present at the outset of the treatment, and hence, this is the preferred procedure. Satisfactory loosening of the fibers with a minimum of damage thereto takes place at pH's from about 4 to about 10. Since the pH during treatment will normally fall within this range, adjustment of pH is generally not necessary.

The treatment herein described is most advantageously carried out with a hot oxidizing salt solution at temperatures from about 30°C. to about 90°C. Preferred temperatures are from about 40°C to about 75°C. The process of the invention is useful in connection with the repulping of broke containing any adsorbed wet-strength resin. Typical of these are cationic amine-modified urea-formaldehyde resins, melamine-formaldehyde resins, cationic resins prepared by reacting epichlorohydrin with a polyamide of a saturated dicarboxylic acid and a polyalkylene polyamine, cationic resins prepared by reacting epichlorohydrin with a polyalkylene polyamine, and so on.

The following examples will illustrate the invention. The wet-strength broke utilized in the examples was prepared by adding to an aqueous suspension of paper pulp (70% groundwood, 20% unbleached sulfite and 10% semibleached kraft) about 1.0% by weight, based on the weight of pulp, of a cationic amine modified urea-formaldehyde wet-strength resin and then sheeting and drying the pulp in conventional manner. The cationic urea-formaldehyde resin was formed by reacting urea, aqueous formaldehyde and triethyleneetramine (technical grade) together first for a short time under alkaline conditions and then under acid conditions until the viscosity of the solution rose to about 60% V-V Gardner-Holdt. The reagents were utilized in a ratio of about 21.32 parts of urea, 63.26 parts of 37% formaldehyde, 82.84 parts of triethyleneetramine.

Example 1

Twenty grams of the wet-strength broke described above was immersed in a solution containing 100 ml of Dazzle bleach (5.25% NaOCl), 1 g of sodium hydroxide (98% NaOH) and 300 ml of water. The mixture was heated to 110°F. and maintained at this temperature during the treatment. Five minutes after charging, the stock was light cream in color and sufficiently tender to be dispensed in water after rolling a piece between the thumb and the forefinger. The condition of the stock 15 minutes after charging was about the same as at 5 minutes. Thirty minutes after charging the stock was white in color and easily dispersed in water. The fiber length was good.

Example 2

Twenty grams of the same wet-strength broke treated in Example 1 was immersed in a solution containing 100 ml of Dazzle bleach (5.25% NaOCl), 0.5 g of sodium hydroxide (98% NaOH) and 350 ml of water. The mixture was warmed to 120°F. and placed on a hot water bath. Five minutes after charging the stock was pale yellow in color and was partially defibered when rolled between the thumb and forefinger. Ten minutes after charging the stock was almost all defibered when pieces were rolled between the thumb and forefinger.

Thirty minutes after charging the stock was white and sufficiently softened to be completely defibered when rolled between the thumb and forefinger. Final temperature was 130°F. The liquor was only very slightly slippery but alkaline to phenol phthalein. The pH at 30°C. was 8.9. It required 1 cc. of 3% alum per 50 cc. of liquor to adjust the pH to 7.0.

Two hours after charging the fiber was tender and readily defibered by rolling between the thumb and forefinger. The liquor pH at 30°C. was 8.9.

It is readily apparent that the process of the invention is highly effective in facilitating the defibering of wet-
strength broke. While preferred embodiments of the invention have been disclosed, it is not intended that the invention be limited to the specific details illustrated and described except as they may be included in the following claims.

What I claim and desire to protect by Letters Patent is:

1. A process for the pulping of paper broke composed of cellulose fibers bonded together by an adsorbed content of at least one wet-strength resin which comprises: slurring said broke with a dilute aqueous solution of an inorganic oxidizing salt thereby loosening the fiber-resin-fiber bonds in said broke, and then subjecting the broke to mechanical pulping.

2. A process according to claim 1 wherein the oxidizing salt is a water-soluble colorless metal hypochlorite.

3. A process according to claim 1 wherein the oxidizing salt solution is hot.

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S. LEON BASHORE, Primary Examiner.

U.S. Cl. X.R.
Dedication


Hereby dedicates to the Public the entire term of said patent.

[Official Gazette July 8, 1969.]