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METHOD OF MAKING ASBESTOS BOARD

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This invention relates to a method of sizing asbestos in a beater engine and the improved product resulting from same.

Asbestos has long been considered in the paper making art a fiber which is difficult and unsatisfactory to run into structures having the smooth, strong, uniform structure such as is obtained with cellulosic fibers. The reason for this difference is the normal sliminess of asbestos when wet and its low degree of freeness (a measure of the tendency of water to leave the fibers in paper making operations such as felting on the cylinder mold and pressing between rolls). The results of this are weakness of the wet web and relative ease of crushing under pressure when wet. None of the sizing materials heretofore used in making asbestos board have any considerable tendency to improve the quality of the web. As a matter of fact, most of the asbestos board now made is produced with merely a starch binder obtained by the addition of boiled starch in the beater engine. The purpose of the starch as heretofore used is essentially to stiffen the soft asbestos board.

Furthermore, due to the slowness or lack of freeness in the stock, it has been the practice to use considerable proportions of paper fibers such as sulfite and wood pulp to improve the qualities, and this has of course resulted in a deterioration of the ultimate characteristics desired in asbestos board, which are resistance to heat and flame.

The improvements herein described rest on two main characteristics of asbestos which have not been heretofore recognized and employed to advantage. First, is the marked tendency of asbestos to adsorb certain sizing materials and thereby to become flocculated in a beater engine, and second, the marked superiority of running such a beater mix in a decidedly alkaline condition, as against precipitation of the size by alum or other acidic reagent, which method is directly the opposite of the methods of handling sizing materials in paper practice.

Among the sizing materials which possess the characteristic of being adsorbed by asbestos and which run most satisfactorily in an alkaline condition are rosin size, causticized starch, glue-formaldehyde solutions and casein in partial solution. On adding these sizing materials to asbestos in a beater engine, a flocculating effect on the asbestos is obtained either immediately or after a short beating period apparently due to the adsorption of the sizing material in a relatively insoluble form on the surface of the asbestos. That this effect is an adsorption and not mere adhesion seems to be proven by the fact that only a limited quantity of sizing material may be added in this way, the maximum proportion varying for the different sizing materials but limited by the point at which the water in the beater becomes cloudy and remains so. Thus, for causticized starch the upper limit seems to be about 1½% by weight of the dry asbestos; for casein, the upper limit seems to be about 5%, for rosin size, the upper limit seems to be about 2 to 5% depending upon the amount of alkali in the size, and for glue-formaldehyde solutions, the upper limit seems to be about 5%.

After the self-flocculation due to the adsorption of the size it is generally necessary to continue the beating action until the stock is smoothed out, otherwise long strips of fiber produced by the adherence of short fibers through the action of the size will be found in the wet web when the stock is run on a paper machine and the running qualities are short of the optimum. The stock when prepared in this way has much greater freeness than it would have if alum or an equivalent were added to coagulate the size in the manner normal to the handling of cellulosic fibers. By virtue of its greater freeness thicker webs may be run than previously. The webs have greater adhesion for one another as well as considerable wet web strength. This allows easy handling in paper machines and also the possibility of building up considerable thicknesses on the makeup roll of wet machines.

In one embodiment of this invention the following materials are added to the beater engine:

	Pounds
XX Asbestos fiber	2500
C Asbestos fiber	500

These materials are allowed to mix in the beater engine until smooth. Causticized starch size is prepared as follows: Suspend approximately 25 pounds of starch in 500 pounds of water. Stir well and add about 21 pounds of a 14° Baumé solution of caustic soda in water (five pounds caustic soda and sixteen pounds water), and continue stirring until the mass becomes gelatinous and transparent. Dilute with an equal volume of water. This size may be heated if desired, in which case a slightly greater sizing effect is obtained in the finished product. The size is added slowly to the stock in the beater engine and the flocculation of the stock is immediately observed, usually stopping circulation in the beater. More water is added if necessary and the large flocculates are beaten out until the stock is smooth enough to run

evenly and freely. On running this beater mix over a wet machine it is immediately observed that the formation on the cylinder mold is free and when carried over to the makeup or press rolls on which the stock builds up the water leaves the compressed, convoluted plies readily without any substantial tendency to crush and wrinkle.

In commercial use it has been found necessary to shut off a Millspaugh suction roll which had previously been used at full vacuum on an asbestos-boiled starch composition, because when running this improved stock with the Millspaugh suction roll, the web came to the makeup roll so dry that adherence of the plies was greatly diminished. This is another evidence of the marked freeness that the improved sizing method conferred on the stock.

Again, due to the excellent adhesion of the plies on normal running and resistance to crushing under the roll pressure, it was found possible to build up sheets as thick as 1⅝" on a 14" diameter roll without crushing or wrinkling, whereas with the old type of asbestos mix it was very difficult to run ⅜" thickness board at all, and the product obtained thereby was seriously crushed, broken and wrinkled.

Due to the adhesion of the plies, board made by the above method is admirably suitable as a base for friction elements in that there is almost no tendency towards splitting in the finished product. The product is also adaptable for any of the purposes to which asbestos millboard is now put and materially widens the possibility of asbestos board as insulation in that comparatively great thickneses may be built up under pressure with correspondingly greater insulating properties. Further, it is quite unnecessary if desired to use any wood pulp or wood fiber thereby further increasing the heat-resisting qualities of the product. A small proportion of wood flour may be incorporated merely for the purpose of obtaining greater production.

It will be observed that the above beater mix was decidedly alkaline. As a matter of fact the pH was approximately 10. It was found that if the pH was reduced to 6 by making the beater mix slightly acid the running qualities of the stock on the wet machine were decidedly inferior in respect to freeness and the stock could not be built up to the thicknesses above stated nor did the plies adhere so firmly. In a recirculating water system a composition similar to the above has already been run several months in commercial production with the water at a pH of between 9.5 and 10 with excellent results.

The other sizing materials may be added in similar fashion with excellent results. For example, the fact that glue solutions may be adsorbed on asbestos fibers offers the possibility of producing hardened, strong asbestos sheets of a nature that have not heretofore been available in the industry. Casein is also a powerful sizing material in this case, whereas, as is well known, it is relatively poor in cellulosic fiber. In using casein a satisfactory method is to allow the powdered casein to dissolve in the beater containing asbestos to which a small amount of alkali has been added until the flocculating effect appears, after which the stock is again smoothed out. Heating the beater to 160–200° F. makes the addition of alkali unnecessary.

The following differentiates and characterizes the product of the present invention from previous products containing starch or similar sizing materials:

(1) The sizing material is adsorbed on the surface of the fibers and is insoluble in water of pH 8–10. Unadsorbed sizes do not flocculate the pulp and may be largely washed out in water of pH 8–10.

The pH of normal asbestos in water is about 8, whereas as has been stated I prefer to run at a more alkaline hydrogen ion concentration in most cases.

(2) Another difference between the products of this process is that they are generally more alkaline than has been previously the case, inasmuch as it has not been a practice to prefer the alkaline condition of running over any other condition.

(3) The causticized starch product contains alkali and a sizing material and when wet is alkaline to litmus.

I claim as my invention:

1. A felted asbestos sheet having paper-machine characteristics containing a sizing material adsorbed on the fibers and substantially insoluble in water of pH 8–10.

2. A felted asbestos sheet having paper-machine characteristics containing a sizing material adsorbed on the fibers and substantially insoluble in water of pH 8–10 and containing free soluble alkali.

3. In a process of sizing asbestos fibers adapted to be sheeted, the improvement which comprises adding to asbestos fibers in aqueous suspension in a beater engine a sizing material possessing the characteristic of being adsorbed by the asbestos, beating such mixture until the stock is smooth enough to run evenly and freely and sheeting said sized stock.

4. In a process of sizing asbestos wherein asbestos fibers in aqueous suspension are beaten in a beater engine in the presence of the sizing material and sheeted, the improvement which comprises incorporating with the aqueous suspension of asbestos fibers a sizing material having the properties of flocculating the stock and of being adsorbed by the asbestos and sheeting said sized stock.

5. In a process of sizing asbestos wherein asbestos fibers in aqueous suspension are beaten in a beater engine in the presence of the sizing material and sheeted, the improvement which comprises incorporating with the aqueous suspension of asbestos fibers a sizing material having the properties of flocculating the stock and of being adsorbed by the asbestos, limiting the amount of such sizing material to that which can be adsorbed by the asbestos and sheeting said sized stock.

6. In a process of sizing asbestos wherein asbestos fibers in aqueous suspension are beaten in a beater engine in the presence of the sizing material and sheeted, the improvement which comprises incorporating with the aqueous suspension of asbestos fibers a sizing material having the properties of flocculating the stock in such limited amount as to be adsorbed by the asbestos and sheeting said sized stock.

7. In a process of sizing asbestos, wherein asbestos fibers in aqueous suspension are beaten in a beater engine in the presence of the sizing material and thereafter sheeted, the improvement which comprises incorporating with the aqueous suspension of asbestos fiber being beaten less than 2%, by weight of dry asbestos, of causticized starch and sheeting said sized stock.

8. In a process of sizing asbestos wherein asbestos fibers in aqueous suspension are beaten in

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a beater engine in the presence of the sizing material and sheeted, the improvement which comprises incorporating with the aqueous suspension of asbestos fibers a sizing material having the properties of flocculating the stock and of being adsorbed by the asbestos, maintaining said beaten mix in an alkaline condition and sheeting said sized stock.

9. In a process of sizing asbestos wherein asbestos fibers in aqueous suspension are beaten in a beater engine in the presence of the sizing material and sheeted, the improvement which comprises incorporating with the aqueous suspension of asbestos fibers a sizing material having the properties of flocculating the stock and of being adsorbed by the asbestos, maintaining the water in the beater at a pH value of between 8 and 10 and sheeting said sized stock.

10. In a process of sizing asbestos wherein asbestos fibers in aqueous suspension are beaten in a beater engine in the presence of the sizing material and sheeted, the improvement which comprises incorporating with the aqueous suspension of asbestos fibers a sizing material having the properties of flocculating the stock and of being adsorbed by the asbestos, maintaining the water in the beater at a pH value of between 9 and 10 and sheeting said sized stock.

11. In a process of sizing asbestos wherein asbestos fibers in aqueous suspension are beater in a beater engine in the presence of the sizing material and sheeted, the improvement which comprises incorporating with the aqueous suspension of asbestos fibers a sizing material having the properties of flocculating the stock and of being adsorbed by the asbestos, maintaining the water in the beater at a pH value in excess of the pH of asbestos in water, and sheeting said sized stock.

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