CHEMISTRY

# Paper Finds New Uses

**Can be treated by various methods to give it high wet-strength in order that it can be used to make such things as parachutes and mouth masks.**

By MARTHA G. MORROW

➤ PAPER has at last been developed that doesn't have to be brought in out of the rain. It can even be washed and used again. Now that a simple treatment keeps it from losing its strength and disintegrating when wet, paper is performing innumerable tasks undreamed of before the war.

Tents and even clothing may some day be made of paper. Crepe paper parachutes will deliver supplies to our soldiers. Even now it is successfully replacing cloth and burlap for bags and is giving the contents greater protection against the elements. Paper bags are actually pinch-hitting for steel drums.

Cartons that can withstand all kinds of weather are made of paper. Vegetables are wrapped in paper bags that stay strong even when dampened by the natural moisture of the vegetables. Flour and sugar, packed in bags of treated paper, remain unharmed when stored in damp places or when water seeps into the warehouse.

Most significant just now, when blueprints and maps by the thousands of tons are required in the war effort, is the longer life of treated paper when blueprints and maps are handled during manufacture or in actual use.

The wet-strength which can now be given paper is independent of any coating or sizing on the paper itself. It is an integral part of the paper. Some types of high wet-strength paper soak up water, others shed it. This depends entirely on the nature of the paper and on other treatments it may receive.

### Looks the Same

Paper which has been treated for wet-strength looks exactly like untreated paper of the same kind. Only by wetting them with water can anyone but an expert tell them apart. The absorbency of the paper is not materially affected by this treatment, while the strength of the wet paper is greatly raised. Tests show that wet paper can retain as much as 40% of its original dry strength.

Paper that would retain its strength when wet was brought into the market some years ago, but had several disadvantages. The early processes required so much treating material that the paper became brittle and non-absorbent. Today over a score of mills are producing high wet-strength paper, and several quite different processes are employed.

A new method of giving paper a high wet-strength consists of adding a small amount of a synthetic resin, melamine-formaldehyde, to the paper pulp in the beater just before the sheet is formed. The resin added to the paper pulp is absorbed by the paper fibers.

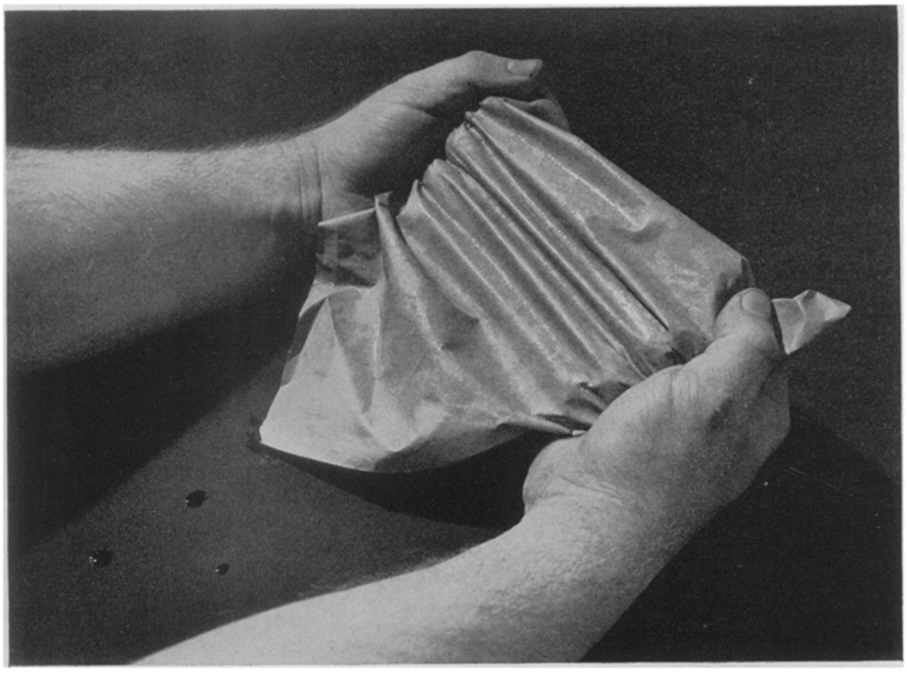
No change in usual machinery or operation is required to give wet-strength with the resin. The resin is merely added to the suspended pulp and the paper fibers are subsequently carried through a regular paper-making machine to convert them into a sheet.

When a small amount of the resin is added to paper pulp, in the course of its preparation in the regular paper mill, the resin particles cling tenaciously to the fibers. When the fibers are felted together into a sheet and passed through the heated drying rolls of the paper-making machine, the resin is cured and produces a strong water-proof bond to hold the fibers together.

The individual cellulose fibers in paper are interlocked and fastened by another method based on the use of urea-formaldehyde resin. This also gives an inherent wet-strength through the sheet. An earlier method of producing wet-strength paper was to use a viscose preparation. The cost, however, is much higher than that of other processes widely used today.

One wet-strength paper has been developed specifically for the armed services to replace lens tissue, which in the past has been made from raw material no longer available. The paper is soft and absorbent, and in many respects similar to our familiar handkerchief tissues. Yet instead of falling into a thousand pieces when saturated with water, it sticks together and can be hung up to dry just like a handkerchief and used again.

***DRENCHED—To test the ability of paper bags to withstand rough treatment, paper shipping sacks developed by Bemis Bro. Bag Co. and the American Cyanamid and Chemical Corp. were sprayed with water for 24 hours.***



***STRONG—Paper treated for wet-strength does not tear easily when soaked with water even if you pull on it very hard.***

Parachutes of paper have been developed so that supplies can be dropped to our fighting men whose lines of communication have been cut by enemy action. Replacing nylon, these chutes of creped kraft paper can carry as much as 100 pounds of food or equipment when dropped from an airplane flying as fast as 180 miles per hour. Rain will not damage them, and they can be used several times.

Mouth masks for use in a sickroom can now be made of paper. Cotton masks, which were heavy, hot affairs, are being replaced by light paper masks. The material used has a good wet-strength so that when the wearer moistens his lips he won't break it. When soiled, it can be boiled for sterilization and re-used.

### Protects Against Dust

Masks of this type are used in industrial plants where powdery substances are produced or handled, to protect workers against inhaling toxic dust.

Soap tissues of wet-strength paper can be used once and thrown away. These individual wash cloths are saturated with soap, and the paper base gives the hands something to work on.

Paper bags can even be made to hold water. The old type of brown bag, even if it didn't leak the minute water was put into it, could never be used to carry the liquid any distance. Now its wet-strength twin can serve just such a purpose.

### Uniform Markings

In order that wet-strength paper may be easily distinguished from untreated paper, the government is specifying that uniform markings be used. All wet-strength paper used in the manufacture of single wall, duplex and multi-wall paper shipping sacks should be distinctly colored, stained, printed or marked with longitudinal stripes spaced not less than two inches or more than ten inches across the width of the paper. The stripes are required to be not less than one-eighth inch in width. No other grade of paper used in the manufacture of such shipping sacks may be so marked.

Paper containers offer interesting possibilities for transportation and open storage of chemicals. Where warehouse space is limited, for export shipments, and as containers for fine chemicals, paper sacks may solve difficult problems at an extremely low cost compared with rigid containers such as barrels and drums.

Various tests have been conducted to prove the ability of wet-strength paper to pinch-hit for other materials in bags. One such test was designed to simulate the worst abuses that might be encountered in shipping supplies overseas.

Bags of different materials were each filled with 50 pounds of crystalline trisodium phosphate. This is soluble in water and cakes readily when moist. A total of 836 bags of eight different types were tested.

These bags were handled more roughly and transported by trucks more often than would occur during regular factory operations. Sacks of each type were dropped several times from a height of six feet before they were submerged and sprayed with water. After the wetting, half of the bags were dropped from an elevater conveyor a number of times.

The bags were loaded into a freight car, shipped several hundred miles and dropped six or seven feet onto a square-edged timber which would have caused any ordinary bag to split wide open. Reloaded and shipped again, the filled bags were once more dropped onto a square-edged timber.

At the end of the test the bags were opened and the amount of lumped or spoiled material estimated. Bags of high wet-strength paper passed this difficult test with flying colors.

*You can obtain samples of these new kinds of paper, including the specially treated wet-strength paper and other sheets that look like it but are not treated, by sending 50 cents and asking for the THINGS OF SCIENCE unit on "Unusual Paper and Sheeting." The unit also gives you a mouth mask and soap tissue sheets, and tells you how to perform experiments with the paper for yourself. Address: THINGS, care of SCIENCE NEWS LETTER, 1719 N Street, N. W., Washington 6, D. C.*

*Science News Letter, January 8, 1944*

***LOADED — Parachutes of wet-strength paper to deliver food and supplies to our armed forces were developed by the U. S. Navy Department with the cooperation of Dennison Mfg. Co.***