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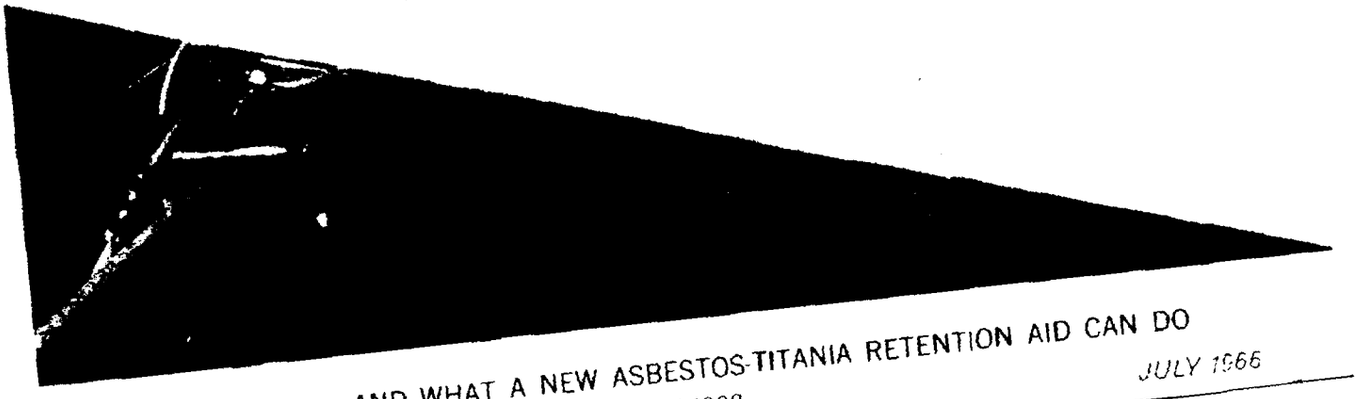
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# Chemical 26

*The Business Magazine of the Pulp and Paper Industry*



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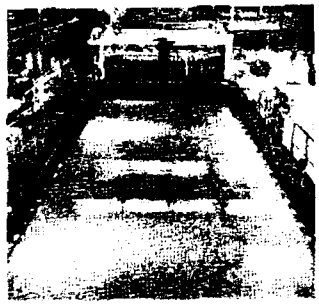
CHECKING OPACITY — AND WHAT A NEW ASBESTOS-TITANIA RETENTION AID CAN DO



JULY 1966

This paper contains asbestos "T"...

Note the high opacity and brightness of the paper on which this reprint was made. It is a 70-lb. offset grade produced by P. H. Glatfelter Co., Spring Grove, Pa. The rigid opacity and brightness specifications for this high-quality paper were maintained when asbestos "T" was substituted for part of the $TiO_2$ in the furnish.



# a high-purity pairing: asbestos-titania

There are all the appearances of a solid future for asbestos in papermaking.

So Union Carbide Corp's Mining and Metals Div. (New York) thinks. For proof, the division points to over 200 mills that have used the fiber for retention, pitch control, saveall recoveries and softness. Now the company, confident about its markets, has brought out a modification of the original high-purity asbestos — what it calls asbestos "T", with the fiber intimately bonded to titanium dioxide. This bonding, says Carbide, means that $TiO_2$ retention is at the same level as that of asbestos, said to be the highest of all furnish fillers.

There are two other features also important to asbestos "T." The titania in the new product is dispersed uniformly throughout the fiber and does not agglomerate in use, yielding maximum optical efficiency. And at the same time, asbestos "T" improves the retention of separately added $TiO_2$, clay, cellulose fines and dyestuffs in the furnish.

## OPPOSITES ATTRACT

The reason asbestos acts this way lies with its electrostatic charge. At most pH's, the positively charged asbestos has a strong attraction for negatively charged $TiO_2$. This pull is great enough to hold the titania contained in the product and still attract particles of separately added $TiO_2$ that come in contact with the asbestos in the furnish — and the bond holds up under severe agitation.

This effect is also responsible for the ability of asbestos to optimize the optical efficiency of $TiO_2$. Without asbestos in the system, the $TiO_2$ particles tend to agglomerate, reducing their optical efficiency. But the strong opposite charge between asbestos and $TiO_2$ helps keep titania scattered uniformly throughout the sheet, and this uniform distribution retains the optimum surface area and size for optical efficiency. Result: mills have found less $TiO_2$ is needed in the sheet to obtain a given opacity.

Mill experience has shown that asbestos "T" improves the retention and optical properties of $TiO_2$

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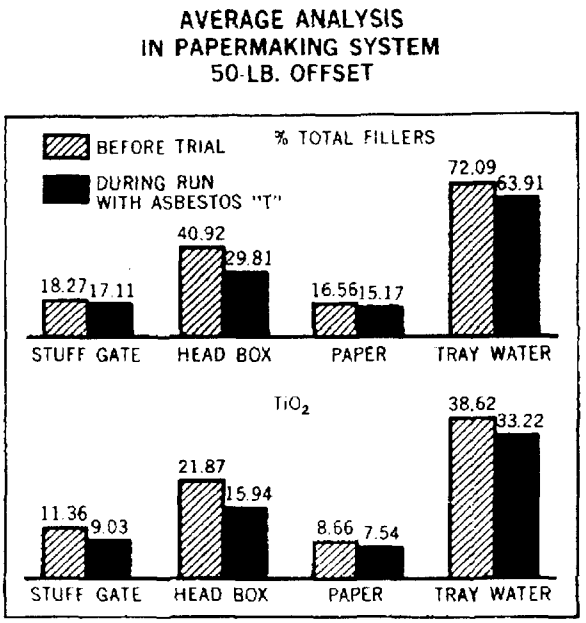
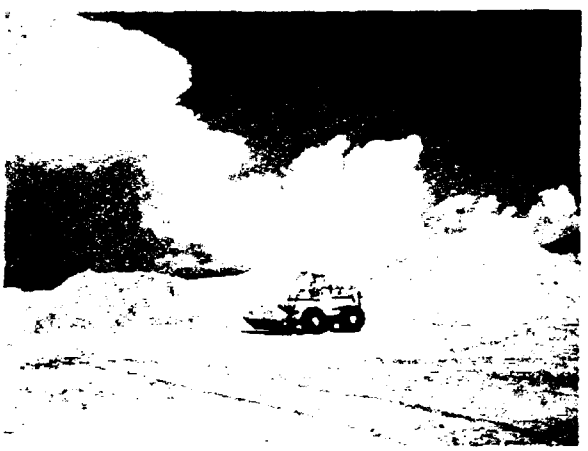



**Figure 1. During this production trial, 50 lbs. of Union Carbide's asbestos "T" (4.3%) replaced the equivalent amount of titanium dioxide in preparation of the furnish.**



**Carbide's California mine supplies high-purity asbestos.**

to such an extent that in many furnishes, 1 lb. of asbestos "T" can replace 1 lb. of $TiO_2$ without sacrificing opacity or brightness. Carbide now figures that since asbestos "T" costs about two-thirds as much as $TiO_2$, the substitution can yield significant savings. By making a complete or partial replacement, says Carbide, mills have cut papermaking costs by $3-8/ton. And they can achieve these savings by using the compound in much the same manner as the company's high-purity asbestos. How the product's handled: the "T" pellets (used for compactness in shipping) are added to the pulper or beater, where they open up into short fibers that mix with the furnish components. (Carbide recommends that asbestos "T" at first replace up to 50% of $TiO_2$ content, but not exceed a 5% addition, based on cellulose content. With experience mills can replace more than 50% of $TiO_2$.)

Once in the system, asbestos "T" provides improved retention by reducing solids losses to the tray water and the subsequent buildup of solids in the head box — and it improves solids recoveries in the save-all, thereby reducing their loss in the mill effluent. The end-product, says Carbide, could be a paper with such pluses as better sheet formation, smoothness and printability. Such benefits from asbestos "T" have often resulted from mills which first started with the high-purity grade and then graduated to the new formulation. What follows, then, are detailed results from several mills with experience in both these retention aids.

## ON TO OFFSET

One of the first production runs using asbestos "T" was at an operation making 50-lb. offset paper. Mill goal: to replace part of the $TiO_2$ in the furnish with asbestos "T" on a pound-for-pound basis. Thus, during this production run, 50 lbs. of asbestos "T" (4.3%) replaced 50 lbs. of $TiO_2$ added to the beater, and specifications for the paper were maintained. Trial run results showed the presence of asbestos "T" improved the retention of separately added $TiO_2$ by 18% while retention of all fillers improved by 16%. And the single-pass retention of asbestos "T" (including both the asbestos and $TiO_2$ in the product) was 57.1% — higher than the other components. *(Figure 1 shows the total filler and $TiO_2$ percentages at various points in the papermaking system before and during asbestos usage; single-pass retention figures determined from these numbers are indicated in figure 2.)*

For the overall system, asbestos "T" improved the retention of separately added $TiO_2$ by 9.6% — from 76.2% to 83.5% — with asbestos "T" retention (both components) at 79%. Mill analysis shows that 75 min. after additions of the retention aid were stopped, the head box contained 4.5% asbestos "T" and the sheet, 2.6%. On the basis of this information, Carbide says, the asbestos remaining in the recycle system continued to work effectively long after it was removed as an additive.

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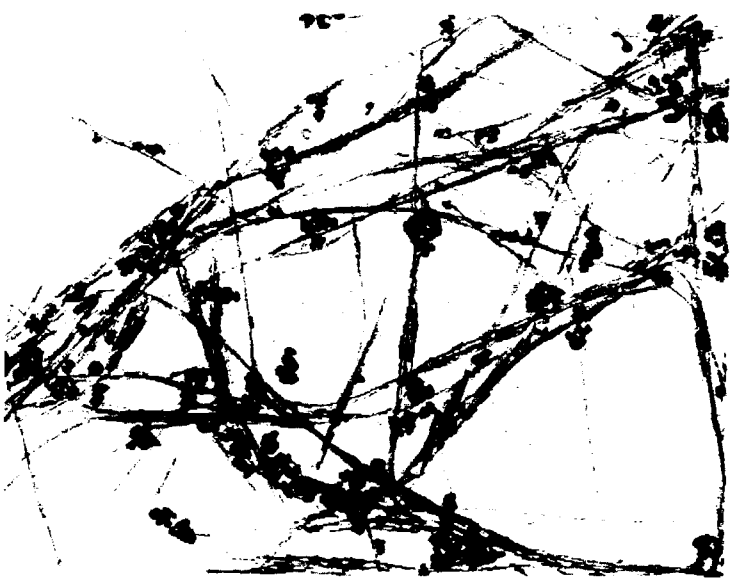
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The improved retention provided by the asbestos reduced the loading of inorganic solids in the head box and buildup in the tray water. At the same time, the presence of asbestos "T" in the saveall improved recovery there. At the head box, the total filler content was reduced from 41% to 30%. As for the solids content in the tray water and saveall:

Total solids, lbs./1000 gallons

| | No asbestos | With asbestos |
|---|---|---|
| Tray water | 26.54 | 17.14 |
| Saveall influent | 18.08 | 13.60 |
| Saveall effluent | 0.34 | 0.11 |

Thus the solids in the tray water were reduced by 34%, while the saveall influent and effluent were reduced by 25% and 68%, respectively. Overall recoveries in this flotation saveall increased from 98.1% to 99.2% in the presence of asbestos.

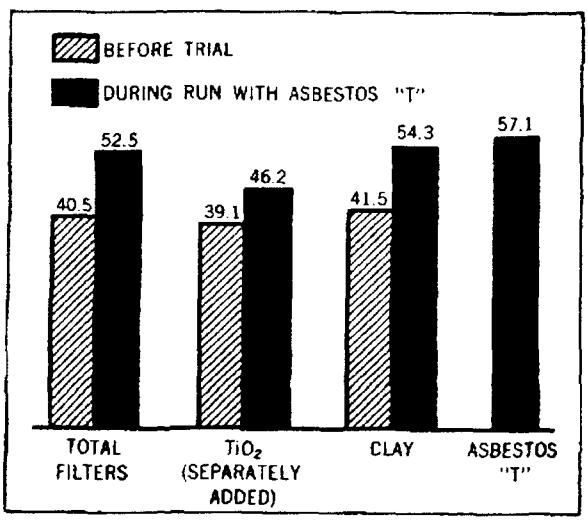


This mill, says Carbide, was most concerned with the maintenance of its opacity and brightness specifications. However, all quality specifications were met — opacity was kept at 91.0% vs. a prior 90.7% and brightness averaged 85.3% compared to 85.5% before. Moreover, claims Carbide, high values were maintained despite a drop in the $TiO_2$ content of the sheet from 8.66% to 7.34 % when asbestos "T" was substituted for part of the titanium dioxide in the furnish. Supplier and customer conclusion: data confirm the ability of asbestos "T" to optimize the light-scattering efficiency of $TiO_2$, yielding improved opacity and brightness at lower filler levels.

## IT'S A GIFT

Asbestos "T" has yielded similar results in other production runs. For example, a mill producing 25-lb. white gift wrap used 30 lbs. of asbestos "T" to replace the same amount (or 50%) of the $TiO_2$ going into the furnish. According to mill information *(see figure 3)*, the new asbestos formulation improved across-the-wire retention of ash by 28% and separately-added $TiO_2$ by 6%. Retention improvements for the entire system were 50% and 15%, respectively. Retention of the asbestos "T" (both the asbestos and the $TiO_2$ in the product) was much higher than the other components — 41% across the wire and 76% overall, mill personnel reported.

**SINGLE-PASS RETENTION, PER CENT**
**50-LB. OFFSET**




**Electron micrograph (left) shows the dispersed particles of titanium dioxide clinging to the asbestos fibers. Asbestos "T" itself (figure 2, above) improved the single-pass retention of fillers and titanium dioxide.**

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These results reduced solids in the tray water from 7.8 lbs./1000 gallons to 6.4 lbs./1000 gallons and saveall effluent content from 0.79 lbs./1,000 gallons to 0.53 lbs./1.000 gallons. The brightness of the paper increased 3.5% with the addition of asbestos "T" — rising from 79.3% to 82.8%, making it possible for the mill to replace even more $TiO_2$ while maintaining the original 79% level. Opacity with asbestos, however, was down slightly. This was due in part to a 2-lb. higher basis weight when no retention aid was present in the system.

## GOVERNMENT ISSUE

Meanwhile, Union Carbide's regular high-purity asbestos has been proving itself as another means for reducing clay and $TiO_2$ input. Some mills, says the company, take advantage of the improved retention to obtain quality improvements without adding additional fillers — and Carbide claims either objective can be accomplished with considerable savings in furnish costs by the use of asbestos.

One mill which obtained such improvements used asbestos in the production of 40-lb. government offset. An average of 2.20% asbestos was fed into the machine, replacing an equivalent amount of clay, and $TiO_2$ additions came to 3%. Results: asbestos improved ash retention from 23.4% to 25.6% across the wire and from 40% to 51.5% overall. *(The total ash content at various points in the papermaking system over a three-day period is shown in figure 4.)*

Because of this improved retention, the $TiO_2$ content of the reel was increased from 1.16% to 1.40%. This meant an increase in opacity from 89.3% to 91.2%, while brightness remained the same and all other sheet specifications were met.

This mill also obtained a substantial reduction in traywater and saveall losses:

Total solids, lbs./1000 gallons

| | No asbestos | With asbestos |
|---|---|---|
| Tray water | 149.9 | 113.7 |
| Cloudy effluent | 28.0 | 13.0 |
| Clear effluent | 17.7 | 6.2 |

The addition of asbestos led to a 20% reduction of tray-water solids ($TiO_2$, clay, cellulose fines). And at the same time, the solids in the cloudy and clear saveall effluents were cut back by 55% and 65%, respectively.

## TAKING OUT TITANIA

Another mill producing 40-lb. white opaque paper used the improved retention obtained from asbestos to reduce $TiO_2$ addition. Initially, 3% high-purity as-

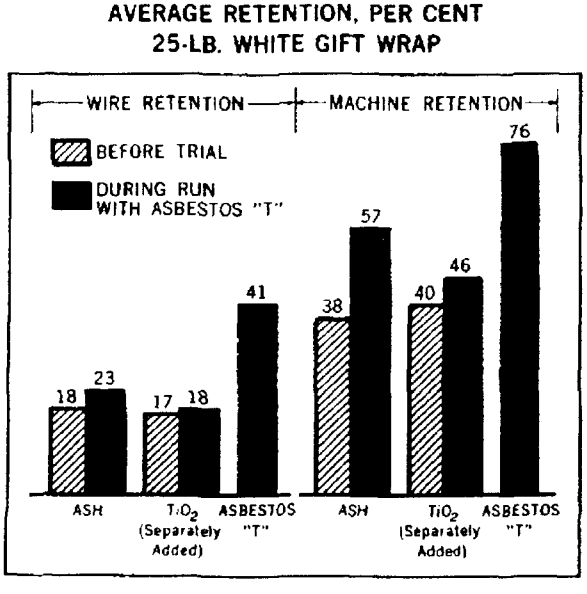



**Figure 3. Asbestos "T" (which comes in the rod-shaped pellets shown on the right) at this mill boosted the retention of ash and titanium dioxide across the wire.**



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bestos was used to replace a similar amount of clay. Then the $TiO_2$ additions were reduced from 8% to 6.8%. This resulted in an ash retention increase during the production run from 38.4% to 40.6% across the wire and from 68.1% to 71.8% overall. *(Data on this analysis throughout an 11-hour period are shown in figure 5.)*

But despite the reduction in $TiO_2$, the ash and titania contents of the paper at the couch remained about the same as before the trial. The $TiO_2$ content averaged 6.26% with asbestos compared to 6.12% before, and opacity and brightness were therefore kept at 92% and 81.5%, respectively.

As at the other mills, tray-water and saveall effluent solids were markedly reduced:

Total solids, lbs./1000 gallons

| | No asbestos | With asbestos |
|---|---|---|
| Tray-water | 30.3 | 25.5 |
| Saveall influent | 22.0 | 19.2 |
| Saveall effluent | 11.7 | 8.9 |

From the figures, the mill estimates that tray-water solids were reduced by over 15% while losses from the saveall were slashed by 24%. Saveall recoveries improved from 47.0% to 53.7% with asbestos in the system.

Asbestos' contributions apparently have not been limited to paper. Board producers also report significant improvements in retention by using the high-purity variety. One mill producing 28-35 pt. white vat-lined chipboard increased the retention of pigments in both the topliner and underliner, as measured by the decrease in solids in the white water.

In the topliner system, 1.9% asbestos was added to the furnish without any other change in the furnish components. White-water solids were sharply reduced from 20.5 lbs./1000 gallons to 3.8 lbs./1000 gallons. As for the underliner, a 1.4% asbestos addition meant a reduction in white-water solids from 17.7 lbs./1000 gallons to 4.9 lbs./1000 gallons. Clay addition was then cut from 3.8% to 2.5%, further reducing white-water solids to 4.1 lbs./1000 gallons. Besides obtaining an improvement in pigment retention, mill personnel reported better smoothness with asbestos present in the liner — an improvement that could lead to better printability.

What all this data point up, Carbide hopes, is something the company has claimed over the past few years — that asbestos isn't as foreign an aid to papermaking as its industrial history would seem to imply. ●

AVERAGE ASH ANALYSIS
IN PAPERMAKING SYSTEM, PER CENT
40-LB. GOVERNMENT OFFSET

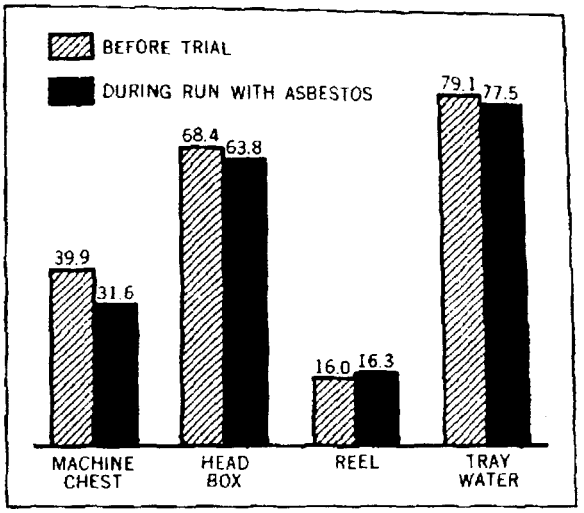



**Figure 4. Carbide's high-purity asbestos does well also. This furnish held 2.2% of the fiber, enough to raise ash retention by 10% across the wire and 30% overall.**

AVERAGE ASH ANALYSIS
IN PAPERMAKING SYSTEM, PER CENT
40-LB. WHITE OPAQUE

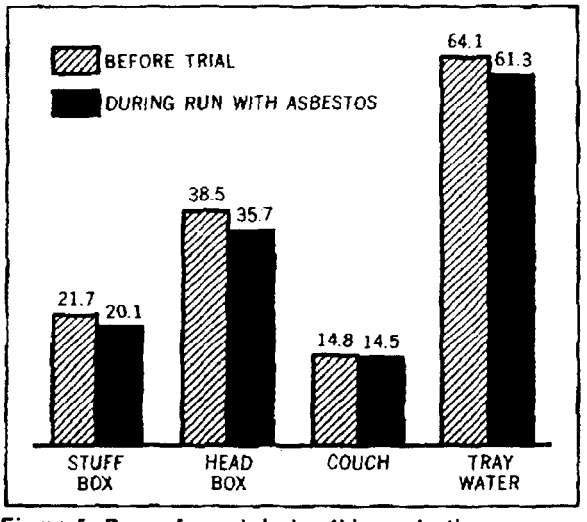
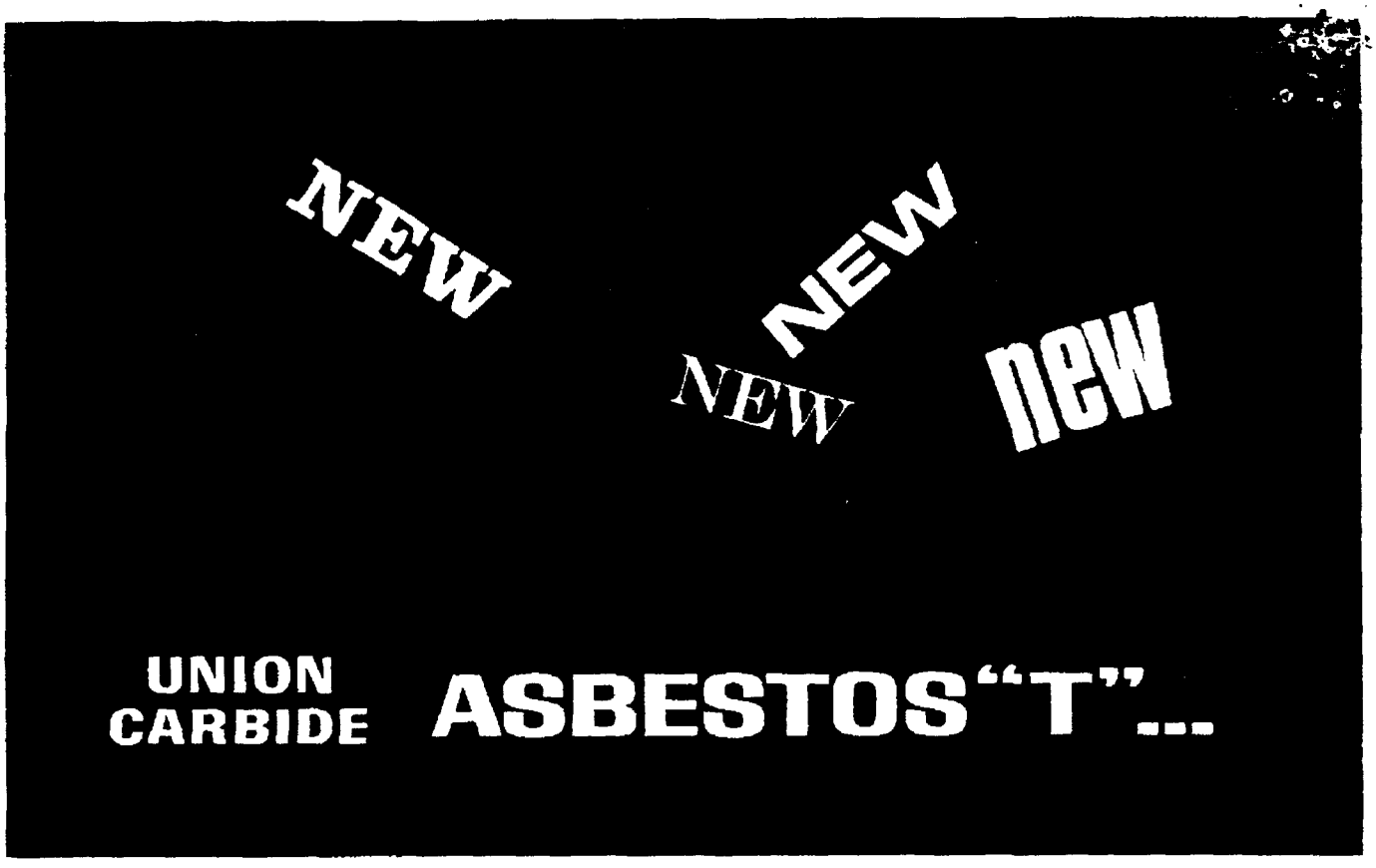
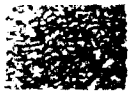



**Figure 5. Paper formed during this production run contained 3% high-purity asbestos and maintained its ash content despite a reduction in $TiO_2$ and clay additions.**

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# reduces furnish costs



**LOW-COST WET-END ADDITIVE**

Asbestos "T" is a special combination of asbestos and $TiO_2$. The product gives unusually high retention—not only of its own components but also of separately added $TiO_2$ and fillers. Thus, 1 lb. of asbestos "T" can often replace 1 lb. of $TiO_2$ without sacrificing opacity or brightness. Since asbestos "T" costs about 60 per cent as much as $TiO_2$, substantial savings can be made.



**IMPROVED RETENTION OF FURNISH**

Positively charged asbestos "T" strongly attracts negatively charged pigments and fillers. A typical mill improved overall retention of separately added $TiO_2$ from 76 to 84%. Retention of asbestos "T" was highest of all fillers.



**EFFECTIVE $TiO_2$ EXTENDER**

Asbestos "T" improves opacity by optimizing the light-scattering efficiency of $TiO_2$. Thus, higher opacity can be obtained at lower $TiO_2$ levels, reducing $TiO_2$ costs. A typical mill reduced the $TiO_2$ content of its sheet from 8.7 to 7.3% without any loss of opacity.




**BETTER SAVEALL EFFICIENCY** A07649

With asbestos "T" in the papermaking system, mills have improved their recoveries of $TiO_2$ and other solids in the saveall. Improvements have been made in flotation, filtration, and sedimentation savealls. One mill reduced losses of solids in the saveall effluent by 68%. By discharging a clearer effluent, it also reduced river pollution.

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