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Johns-Manville

To W. C. Streib, R&D Center

Date November 15, 1973

From R. S. Lamar, R&D Center

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Subject SOME COMMENTS ON THE USE OF TALC IN PAPER WITH A SUMMARY OF MIGRATION STUDIES OF TALC-FILLED PAPER FOR FOOD PACKAGING

I. Uses for Talc in the Paper Industry

These uses can be divided into several catagories:

A. Pitch and tramp organic control in pulp mills.
B. Pitch and tramp organic control in fine paper and board mills.
C. High brightness filler and white pigment in fine paper.
D. Titanium dioxide extender in fine paper.

In each of these uses talc provides a valuable function. For example:

A. For pitch and tramp organic control in pulp mills no other material functions as well as talc. The talc selectively adsorbs pitch and other oleoresinous substances as they are released from the wood during pulping and digestion. The talc with its adsorbed pitch remains in the sheet of paper. The talc holds the pitch in a finely dispersed, innocuous state. When first released these organic substances are colloidal in size. If not properly controlled, they form agglomerates that deposit out on the machinery and necessitate frequent shut-downs for cleaning.

Prior methods of control have involved the use of surface active agents or wetting agents to form an emulsion with the pitch that is then washed out of the pulp and into the river or stream. Recent studies in British Columbia (where they have a strong fishing and tourist industry as well as many large new pulp mills) have shown that these surface active agents and emulsified pitch effluents are highly toxic to fish. These mills are being required to close up their systems, to stop the discharge of pitch and toxic emulsions. This greatly aggravates the problem within the mill--unless talc is used for control.

When using talc for pitch control in the pulp mill no surface active agents are needed. The talc is added at several points during processing to adsorb the pitch as it is released from the pulp. The fine particles of talc with adsorbed pitch remain in the pulp. Mills can then be closed up to reduce or eliminate the discharge of toxic substances into streams and rivers. No other white adsorbent is known to possess these unusual surface characteristics of talc. Normal rates of talc addition in a pulp mill will vary with the severity of the problem. These rates range from as little as 0.05 percent to 1.5 percent based on the weight of dry pulp.

B. For pitch and tramp organic control in fine paper and board mills additional talc is required even though talc-control might have been exercized in the pulping operation. As the pulp is beat and further refined in the paper mill, additional pitch is released and additional talc is needed for control. Also in the manufacture of fine paper alum-rosin sizing in many cases accentuates the pitch problem. Rosin size made from pitch, is added back to the paper. Under certain conditions (improper pH control, hard water, etc.) this rosin size will precipitate, recombine with natural pitch, and magnify the problem.

In the paper mill the pitch is generally in a more agglomerated form than in the pulp mill. The talc is not as effective in adsorbing and controlling these larger agglomerates. Therefore, heavier dosages are needed. Paper mill talc additions for pitch control generally range from 0.25 percent to 2.5 percent again depending on the severity of the problem.

Talc retention in paper will vary with a number of factors including the freeness or degree of beating of the pulp, the type of pulp (sulfite or kraft), basis weight, etc. In most cases talc retention is higher than with other pigments such as clay, TiO_2, etc. Talc with its adsorbed pitch is mostly retained in the sheet. White water problems are reduced through the use of talc in the paper mill. Effluents to streams and rivers are similarly reduced.

C. High brightness filler and white pigment uses for talc in the manufacture of fine paper are growing. In this

use rather substantial additions (up to 20 percent by weight) of talc are added to paper to improve brightness, opacity, smoothness, and receptivity to high fidelity color printing. With the growing shortage of titanium dioxide this use for talc in this industry is becoming increasingly important. Certain commercial grades of talc having very high brightness, whiteness, and the proper particle size for optimum light scattering efficiency probably perform these combined functions better than any other white pigment.

D. Another rapidly growing use for talc in the paper industry involves its use as an extenter pigment for titanium dioxide. TiO_2 tends to form tight agglomerates which act as larger particles thus reducing opacifying efficiency (which is a function of both particle size and index of refraction). Talc of the proper particle size helps disperse the TiO_2 and hold it in the properly dispersed state. The talc particles act as "spacers" between the TiO_2 particles.

From the above you can see that the use of talc in paper is not only important to J-M but is also important to the paper industry. Talc serves a number of valuable, important functions. Its restricted use would be detrimental to the paper industry and would create additional environmental control problems.

II. The Proposed FDA Test Method and Specification for Talc in Food and Food Packaging Materials

This would severely restrict and limit the use of talc containing minor amounts of asbestos minerals in food packaging uses (paper, plastics, etc.).

It is of the greatest importance here that a distinction be made between the use of talc as a direct food additive and its use in food packaging materials. Direct food additive uses for talc are of minor, even insignificant, commercial importance. These include the coating and polishing of rice, dusting of chewing gum to prevent sticking in the wrapper, and the preparation of tablets for pharmaceutical use. In these applications where talc is directly ingested, perhaps some kind of control might be justified if indeed it is shown that the ingestion of asbestos-containing talc is medically harmful. The question here is without any doubt primarily medical.

In these direct food additive uses talc serves no real purpose that might not be served by the use of some other agent or by a change in processing methods. In this respect it is quite different from the valuable uses for talc in food packaging and most specifically paper.

In food packaging applications for talc the really important question has been: "Does the talc stay in the paper under normal use conditions or does it somehow leave the paper and contaminate the food?" If no migration or contamination occurs then it is our opinion that in this use talc in food packaging should not be classified as a food additive and no restrictions should be necessary. We have, for this reason, devoted a great deal of time to migration studies. This work has been confined to talc-filled paper.

In talc-filled plastics used for food packaging the talc would be even more tightly "locked-in" and if no migration occurs in paper, it would be logical to assume that migration from plastics would also not occur.

III. A Summary of Migration Studies of Talc-Filled Paper for Food Packaging

Recognizing the great importance and significance the FDA attaches to these studies, J-M and particularly the Celite Research and Basic Research groups have devoted a great deal of time and expense to this subject. It is fair to state that it has received our finest effort. We have been completely objective and scientifically honest in all of these evaluations performed at the J-M Research Center. All of those working on the project understood that complete objectivity and scientific honesty were of paramount importance regardless of the outcome, regardless of the findings.

These migration studies have taken several different forms:

A. The preparation of talc-filled paper on the pilot machine at Western Michigan University.

B. An evaluation of these papers at Western Michigan University by means of a wet-pick test.

C. An evaluation of these same papers by Walter C. McCrone and Associates using a meating wrapping test and freezing procedure to simulate actual use conditions.

D. The development of a dry salt-scuffing test to study the breakdown of talc-filled paper.

E. An extension of this salt-scuffing test into more practical and real use conditions.

F. An examinati of various dry packaged foods to determine the actual presence of talc in the paper food container or paper and to resolve the question: "Does talc in fact migrate from the paper container under actual use conditions and thereby contaminate food?"

Sections A-C

A summary of points A-C is given by R. P. Carter in his letter of April 20, 1973, to Allen T. Spiher, Jr., Food and Drug Administration. These will not be repeated in detail here, but several comments should be restated from page 8 of Carter's letter:

1. As Mr. Stewart states in Exhibit E, referring to the test in which the meat was sandwiched between the papers: "Even though in some instances the paper had been completely saturated by the natural juices from the meat, there was no quantifiable transfer of tremolite from the paper to the meat." In other words, McCrone was unable to find any tremolite fibers in the meat following these test procedures, therefore, concluding that absolutely no migration had taken place.

2. Even more significant was the finding resulting from the meat wrapping-freezing tests which found no tremolite migration whatsoever. This was a test involving the normal and regular use of food packaging paper by the consuming public. As Mr. Stewart has stated in Exhibit E: "The object of these wrapping tests was to subject the paper to folding and handling stresses similar to those which it would undergo in normal use and which might result in greater degradation of the paper, and hense greater migration of the tremolite than would the sandwich tests described above." The test evidenced the total absence of any tremolite migration from the paper to the food.

3. Second, commercial food packaging paper always contains a coating of wax or polymers, which our test papers did

not have and which would further retard any possible migration.

Section D, The Dry Salt-scuffing Test

This test was de sed after talking with some of the people at FDA. We all agreed that dry salt (granular NaCl) would be a good abrasive material for this kind of evaluation. A test method was developed and a number of commercial grades of talc-filled paper evaluated. (See J-M Research and Engineering Center Report No. 414-2, September 28, 1973). The test can be varied in degree of severity simply by varying the shaking time. In fact, the amount of paper scuffed or abraded away was found to be a linear function of time. Salt was found to be extremely abrasive under these test conditions and even attacked and frosted the necks of the glass jars used in the test.

The results of these simulated use tests showed that talc and/or associated tremolite used to fill paper does not selectively migrate from the paper. Any migration that does occur is the result of a complete breakdown of the structure of the paper itself. Unless the paper fiber structure is destroyed by some scuffing or abrasive action the talc does not otherwise leave this structure.

Section E, An Extension of the Salt-scuffing Test into more Practical and Real use Conditions

These results have been described in detail in J-M Research and Engineering Center Report No. 414-6, November 15, 1973. Here paper-lined glass jars identical to those used in the simulated salt-scuffing test were shipped by truck from Denver, Colorado to Manville, New Jersey and back. This was meant to simulate actual use and transportation conditions. After being received back in Denver the salt was examined petrographically and by means of the transmission electron microscope for paper fiber, talc, tremolite, and chrysotile contamination. These results show that under these actual use conditions the paper structure is not destroyed and no contamination with talc, tremolite, or chrysotile occurs. These results also show that the simulated salt-scuffing test is far too severe and does not simulate use conditions. The

simulated test has performed one valuable function. It proves that talc and/or asbestos minerals "migrate" only when the paper structure itself is destroyed. These later tests prove that this does not normally occur during prolonged transportation.

Section E, An Examination of Various dry Packaged Foods

This work is also described in Report No. 414-6. Various dry packaged foods were purchased at a local supermarket. These paper food containers were tested petrographically and by X-ray diffraction to confirm the presence of talc in the paper. The various foods packaged in each paper were also examined by the same procedures to determine if any detectable amounts of talc, tremolite, or chrysotile were present due to contamination. In these studies the most careful and detailed examinations were made using the electron microscope. These tests also show that even though talc is present in most of the paper containers, no talc or asbestos minerals were present in the packaged foods. We must, therefore, conclude that migration does not occur under actual conditions with a variety of dry packaged foods.

Since migration does not occur, talc should not be considered a food additive when used in paper.

IV. Conclusions

Both meat wrapping and dry salt-scuffing tests, devised to simulate as closely as possible actual use conditions, have shown that talc and/or asbestos mineral contained in paper does not migrate or contaminate food. Migration only occurs when conditions are severe enough to destroy the paper structure itself--a condition which we have no reason to believe occurs in actual use situations. An examination of a number of dry packaged foods has shown that these packages remain intact and in use and no contamination results.

If medical evidence indicates that the ingestion of talc and/or associated asbestos minerals is harmful, then FDA restrictions need be applied only to direct food or drug additive uses, not to food and drug packaging materials.

R. S. Lamar

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