

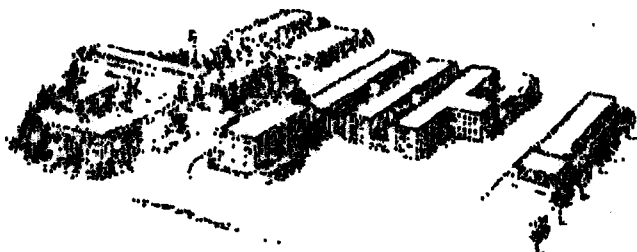
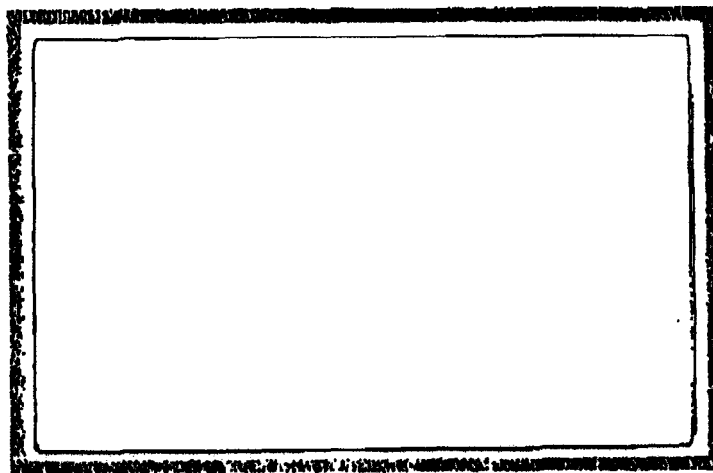
FILE NAME: Johnson & Johnson (JAJ)

DATE: 1959 Aug 31

DOC#: JAJ032

DOCUMENT DESCRIPTION: Report - Ultrasonic Comminution of
Talc Presented to J & J Research

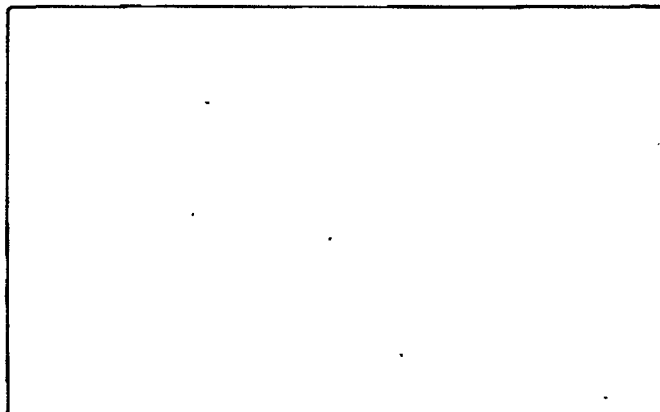
SUMMARY REPORT



BATTELLE MEMORIAL INSTITUTE

EXHIBIT

24



BATTELLE FIELDS OF RESEARCH

AERONAUTICAL ENGINEERING	INSTRUMENTATION
AGRICULTURAL SCIENCES	LIGHT ALLOYS AND RARE METALS
AIR AND STREAM POLLUTION CONTROL	MECHANICAL ENGINEERING
ANALYTICAL CHEMISTRY	METALLURGY
BIOCHEMISTRY	MINERALS PROCESSING
BIOPHYSICS	NONDESTRUCTIVE INSPECTION
CERAMICS	NUCLEONICS
CHEMICAL ENGINEERING	OPERATIONS RESEARCH
CORROSION TECHNOLOGY	ORGANIC CHEMISTRY
ECONOMICS	ORGANIC COATINGS
ELECTRICAL ENGINEERING	PETROLEUM ENGINEERING
ELECTROCHEMICAL ENGINEERING	PHYSICAL CHEMISTRY
ELECTROCHEMISTRY	PROCESS METALLURGY
ELECTRONICS	PRODUCTION ENGINEERING
EXTRACTIVE METALLURGY	PULP AND PAPER
FOOD AND FOOD PROCESSING	RADIOISOTOPES AND RADIATION
FOURTH PRODUCTS	REACTOR TECHNOLOGY
FOUNDRY PRACTICE	RUBBER AND PLASTICS
FUELS AND COMBUSTION	SOLID STATE DEVICES
GRAPHIC ARTS TECHNOLOGY	SYSTEMS ENGINEERING
HIGH-TEMPERATURE METALLURGY	TEXTILES AND FIBERS
INDUSTRIAL PHYSICS	THEORETICAL AND APPLIED MECHANICS
INFORMATION PROCESSING	THERMODYNAMICS
INORGANIC CHEMISTRY	WELDING TECHNOLOGY

BUSINESS CONFIDENTIAL

SUMMARY REPORT

on

ULTRASONIC COMMINUTION OF TALC

to

JOHNSON AND JOHNSON RESEARCH

August 31, 1959

by

J. N. Antonevich, W. E. Chase, and L. E. Walkup

**BATTELLE MEMORIAL INSTITUTE
505 King Avenue
Columbus 1, Ohio**

Battelle is not engaged in research for advertising, sales promotion, or publicity purposes, and this report may not be reproduced in full or in part for such purposes.

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

Battelle Memorial Institute

505 KING AVENUE COLUMBUS 1, OHIO

October 8, 1959

Mr. W. H. Ashton
Research Department
Johnson and Johnson
New Brunswick, New Jersey

Dear Mr. Ashton:

Work on the project "Ultrasonic Comminution of Talc" has been terminated, as requested during your July 27, 1959, phone conversation with Mr. Macdonald of our Minerals Beneficiation Division.

We are submitting a report on the work done. On the basis of incomplete data, it appears that the ultrasonic comminution of talc can be developed into a useful process for producing high-quality powder. The data are not sufficient as yet, however, to define all the parameters that influence the ultrasonic grinding process. We would be glad to undertake this further work if Johnson and Johnson should decide on the basis of this report to reopen the study. The adaptability of various transducers to determine minimum equipment and operating costs for processing talc with vibratory energy also should be included in any further work.

We enjoyed working on this project. If there are any questions concerning the report, we would be glad to answer them.

Very truly yours,

Lewis E. Walkup

Lewis E. Walkup, Chief
Applied Physics Division

LEW:mar
Enc. (6)

cc: Dr. W. H. Lycan
Mr. C. V. Swank

DEDICATED TO THE ADVANCEMENT OF SCIENCE
BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

TABLE OF CONTENTS

	<u>Page</u>
SUMMARY	1
INTRODUCTION	1
EXPERIMENTAL PROCEDURE	2
EXPERIMENTAL RESULTS	4
DISCUSSION	11
CONCLUSIONS AND RECOMMENDATIONS	12

LIST OF FIGURES

Figure 1. Assembly for Comminuting Talc With 20-Kc Vibrations	3
Figure 2. Relationship Between Amount of Minus 10-Mesh Talc Comminuted to Minus 200 Mesh, and Treatment Time at Various Ultrasonic Power Levels	5
Figure 3. Relationship Between Comminution Rate and Solids Content of a Minus 10-Mesh Talc Slurry Exposed to 20-Kc Vibrations	5
Figure 4. Relationship Between Comminution Rate and Ultrasonic Power for Batch Grinding of 10-Mesh Talc to Minus 200-Mesh Talc	6
Figure 5. Relationship Between Comminution Rate and Ultrasonic Power for Grinding a Simulated Recirculating Load of 10-Mesh Talc to Minus 200-Mesh Talc	6
Figure 6. Relationship Between Exposure Time to Reach Equilibrium and Ultrasonic Power When Grinding a Simulated Recirculating Load of 10-Mesh Talc to 200-Mesh Talc	6
Figure 7. Photomicrograph of Minus 200-Mesh Plus 10-Micron Fraction of Ultrasonically Ground Talc	10

LIST OF TABLES

Table 1. Size Distribution of Comminuted Talc When Treated With 1.28 Kw per 50-Gram Load	7
Table 2. Distribution of Particle Sizes in Flotation Feed Obtained From Comminuted Talc When Treated With 1.28 Kw per 50-Gram Load	7
Table 3. Flotation Results Obtained From Ultrasonically Comminuted Talc	8
Table 4. Particle-Size Distribution of Series I and Series II Samples	9
Table 5. Mineral Character of Series I and Series II Samples	9

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

ULTRASONIC COMMINATION OF TALC

by

J. N. Antonevich, W. E. Chase, and L. E. Walkup

SUMMARY

A study was made of the process parameters affecting ultrasonic comminution of plus 200 minus 10-mesh talc to plus 10-micron minus 200-mesh talc. It was found that the rate of comminution in a batch process and a process in which the oversize fraction was recirculated increases linearly with ultrasonic power. At a given power level, the process using a recirculating load was three times more efficient than the batch process. A talc slurry having approximately 40 per cent solids appeared to give optimum comminution rates.

On the basis of line power consumed by the magnetostrictive transducer assembly used in this study, having an over-all efficiency of approximately 15 per cent, the total energy required to grind 1 pound of minus 10-mesh talc to minus 200-mesh talc ranged from 3 to 4 kwhr. The use of fluid dynamic transducers can possibly reduce total energy requirements by a factor of 10.

Ultrasonic grinding appears to be selective in producing platy talc preferentially; the ground plates appear to be thinner than those produced by conventional grinding methods, and about 80 per cent of the individual plates have rounded corners.

There is an indication that some of the impurities in platy talc, although not the carbonate, are finely ground during ultrasonic grinding and can be rejected by simple classification. In one instance a product prepared in this way contained 98 per cent platy talc.

The application of ultrasonic or sonic energy to grinding talc into a high-quality powder appears to be technically feasible. Additional studies will be needed to define the practical limitations of the process.

INTRODUCTION

Prior to this project, exploratory experiments had been conducted using ultrasonic techniques to comminute talc. They indicated that plus 200 minus 10-mesh talc can be comminuted to minus 200 mesh at a power rate of 1800 kwhr/ton. Microscopical examinations of the ultrasonically ground talc showed a high-quality talc, in that individual talc platelets were intact having rounded corners and appearing to be in the thinnest possible platelet form. There appeared to be some degree of selective comminution, i. e., only talc appeared to be comminuted - other minerals in the raw ore were not appreciably broken down.

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

2

The apparent high quality of the ultrasonically comminuted talc and the reasonable power cost estimate of 1 cent per pound (on the basis of 1 cent per kw-hr for power) warranted further investigation. On April 1, 1959, an investigation was undertaken on the effects of frequency, power level, and initial particle size on the comminution rate and final particle size of talc exposed to vibratory energy.

This report describes the work done toward establishing the important process parameters affecting the comminution of plus 200 minus 10-mesh talc to plus 10-micron minus 200-mesh high-quality talc.

EXPERIMENTAL PROCEDURE

Investigations were made into the process parameters affecting ultrasonic comminution of plus 200 minus 10-mesh talc to plus 10-micron minus 200-mesh high-quality talc. These process parameters include the solids content of the talc slurry, and the ultrasonic power level as they influence the ultrasonic comminution of talc in a batch process and in a process in which the oversize fraction is recirculated.

A Sheffield-Cavitron Model 1000 A power oscillator and 20-kc transducer (Sheffield Corp., Dayton, Ohio) were used to generate ultrasonic power. Figure 1 shows the experimental arrangement used for most of the experiments. It consists of a stainless steel chamber 4 inches deep, having an inside diameter of 1-3/4 inches. This chamber was inserted within a coil of 1/4-inch copper tubing, and was restrained and gasketed within a steel enclosure constructed about the coil. The temperature of the talc slurry was maintained constant by running tap water through the copper tubing. This eliminated the possibility of temperature influencing the comminution rate. The chamber assembly was fitted over a standard double-cylinder mechanical transformer or horn (Sheffield No. 35-258) having a 1-1/2-inch-diameter radiating face. An O-ring was used as a seal between the cylindrical chamber and the horn.

Relative power supplied to the transducer was monitored by an ammeter in the plate circuit of the power oscillator driving the transducer. It was assumed that the power output of the oscillator was directly proportional to the plate current, and that the oscillator was 50 per cent efficient. With these assumptions, maximum power delivered to the transducer would be 1 kw, the rating of the transducer-oscillator combination. The total maximum power consumed from the line would be 2 kw.

Slurries of desired solids content, composed of plus 200 minus 10-mesh talc and deionized water, were placed in the chamber to form a column 3 inches deep. This depth was chosen as it appeared to produce a resonant column with 20-kc vibrations at any concentration of talc investigated. A resonant column is desired for maximum energy transfer from the transducer to the slurry.

The natural agitation accompanying the ultrasonic treatment of low talc concentration was sufficient to obtain reproducible comminution results. At high solids content, results were not consistent. To obtain consistent results, a stirring motor had to be used to keep talc from settling on the vibrating face of the double-cylinder mechanical transformer.

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

3

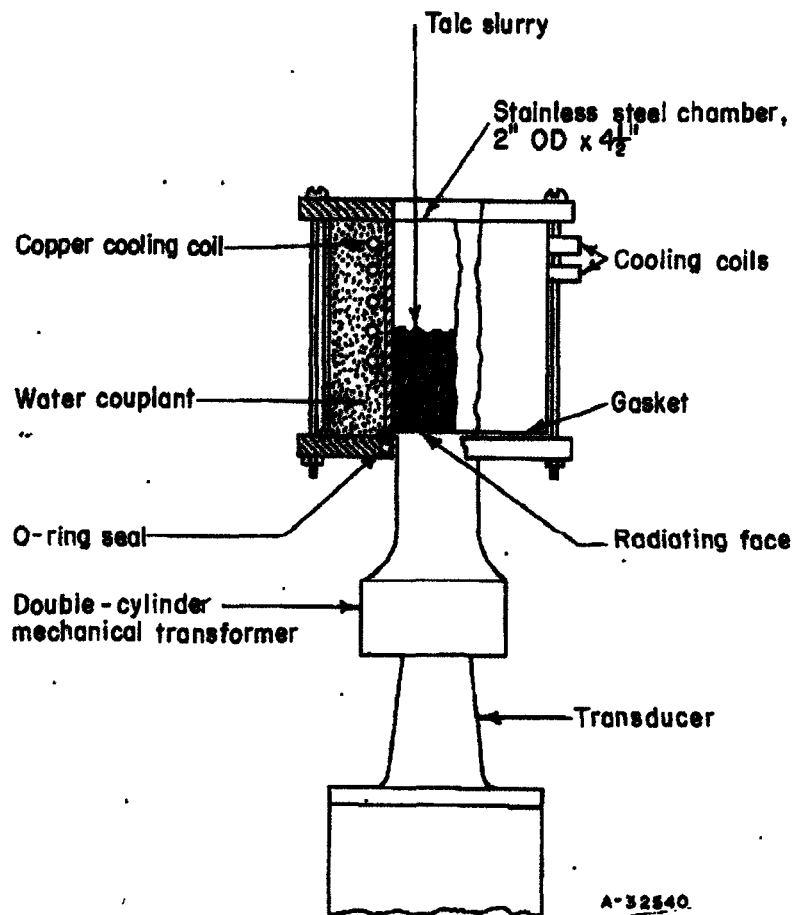


FIGURE 1. ASSEMBLY FOR COMMINUTING TALC WITH 20-KC VIBRATIONS

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

4

The criterion used for comminution was the weight of talc ground sufficiently to pass through a 200-mesh sieve. In the case of batch treatments, the talc was exposed to 20-kc vibrations for 5, 15, and 35 minutes. At the end of each exposure, the talc was sieved, dried, and weighed to determine the amount of talc reduced to minus 200 mesh. In the case of recirculating-load treatments, a given concentration of plus 200 minus 10-mesh talc was given a series of 5-minute treatments. At the end of each 5-minute period, the fines passing through a 200-mesh screen were collected, dried, and weighed. An amount equal to the fines removed was added to the remaining talc to maintain a constant concentration of talc for each time period of treatments.

EXPERIMENTAL RESULTS

A series of experiments was made to determine the comminution characteristics of talc treated in batches. Figure 2 shows the relationship between the amount of a 25-gram talc load comminuted to minus 200 mesh and the time of treatment at various power levels.

A series of experiments also was made to determine the influence of solids content on the ultrasonic comminution of talc. Figure 3 shows the relationship between comminution rate and the solids content for a fixed time of exposure and power level. For the experimental arrangement used, a talc slurry having a 40 per cent solids content appeared to be best. At other power levels and stirring conditions, it is possible that other concentrations would be found better. An ideal arrangement would be one in which the energy density and particle distribution throughout the slurry is uniform. Under such conditions, the rate of comminution might be directly proportional to the solids content as indicated by work reported on the ultrasonic dispersion of Progesterone*.

Figure 4 shows the relationship between maximum batch-comminution rate and electrical power used in processing the talc. The relationships shown are linear for talc loads having 20 and 35 per cent solids content.

A series of experiments also was made to establish the comminution characteristics of talc when a recirculating load was exposed to ultrasonic vibrations. Conditions of a recirculating load were approximated by treating the load for 5-minute periods, removing fines and adding an equal amount of coarse talc at the end of each time period, until the amount of fines removed was constant.

Figure 5 shows the relationship obtained between comminution rate and electrical power for a simulated recirculating load. Figure 6 shows the approximate time required to reach equilibrium in the simulated circulating load at various power levels.

Twelve pounds of minus 10-mesh talc was batch treated using an equivalent of 1.28 kw per 50-gram load in the experimental arrangement. Each batch, or charge,

*Misek, B., and Skaven, D. M., "A Study of Dispersion with Ultrasound", J. Am. Pharm. Assoc. Scientific Edition, XLVII, (1) (Jan. 1958), reprinted in Ultrasonic News, 2 (7), 18-16 (1958).

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

5

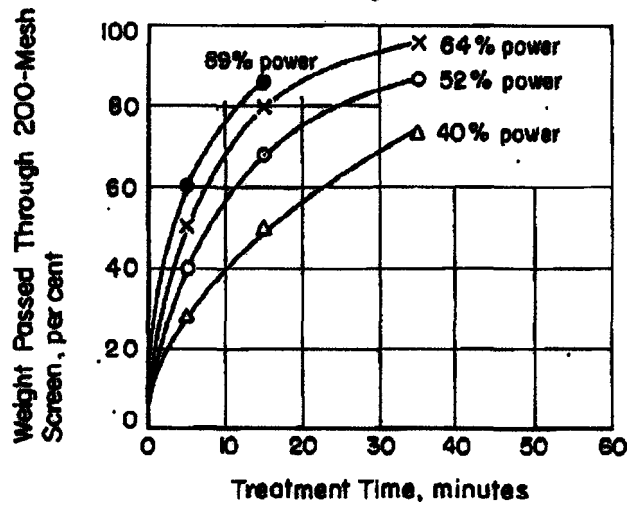


FIGURE 2. RELATIONSHIP BETWEEN AMOUNT OF MINUS 10-MESH TALC COMMUNUTED TO MINUS 200 MESH, AND TREATMENT TIME AT VARIOUS ULTRASONIC POWER LEVELS

Frequency of vibration, 20 kc; weight of talc, 25 grams; solids content of slurry, 19 per cent; transducer rating, 1 kw

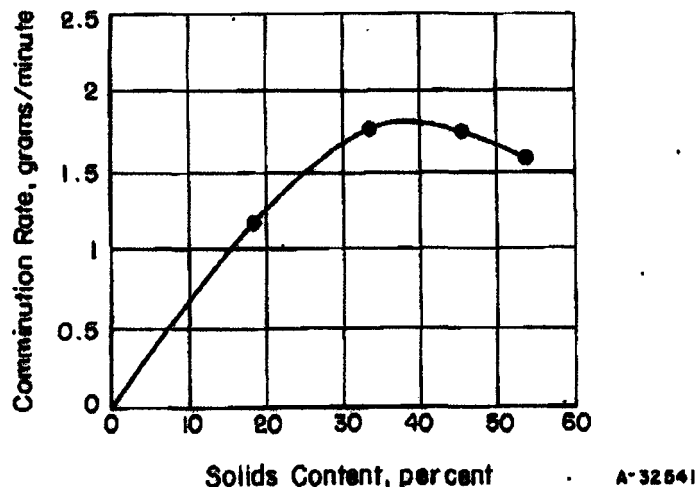


FIGURE 3. RELATIONSHIP BETWEEN COMMUNUTION RATE AND SOLIDS CONTENT OF A MINUS 10-MESH TALC SLURRY EXPOSED TO 20 KC VIBRATIONS

Exposure time, 15 minutes; transducer driven at 50 per cent rated power; volume of slurry, 118 cm³; talc ground to minus 200 mesh

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

6

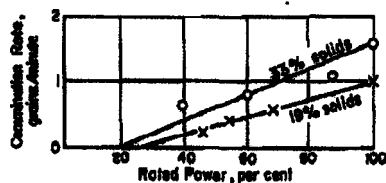


FIGURE 4. RELATIONSHIP BETWEEN COMMUNITION RATE AND ULTRASONIC POWER FOR BATCH GRINDING OF 10-MESH TALC TO MINUS 200-MESH TALC

Transducer rating is 1 kw.

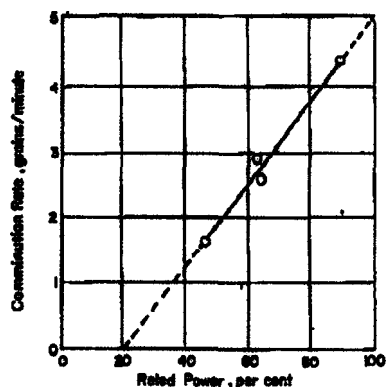


FIGURE 5. RELATIONSHIP BETWEEN COMMUNITION RATE AND ULTRASONIC POWER FOR GRINDING A SIMULATED RECIRCULATING LOAD OF 10-MESH TALC TO MINUS 200-MESH TALC

Transducer rating is 1 kw. The solids content of the talc slurry is 33 per cent. Exposure of load was made in 5-minute increments.

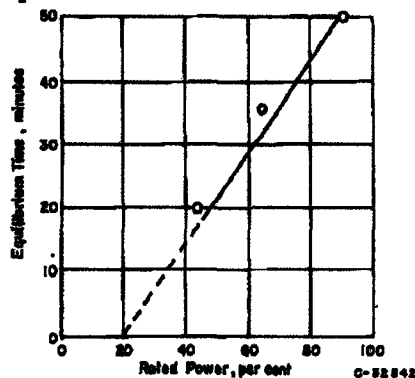


FIGURE 6. RELATIONSHIP BETWEEN EXPOSURE TIME TO REACH EQUILIBRIUM AND ULTRASONIC POWER WHEN GRINDING A SIMULATED RECIRCULATING LOAD OF 10-MESH TALC TO MINUS 200-MESH TALC

Transducer rating is 1 kw and the solids content of the circulating slurry is 33 per cent

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

7

was treated for 5 minutes to obtain an ultrasonically processed talc that could be used for preliminary beneficiation experiments.

A screen and sedimentation analysis of the 12 pounds of ultrasonically ground talc was made. Results were obtained as shown in Table 1.

TABLE 1. SIZE DISTRIBUTION OF COMMINUTED TALC WHEN TREATED WITH 1.28 KW PER 50-GRAM LOAD

Size Fractions	Weight Per Cent
Plus 200 mesh	42.8
Minus 200 mesh plus 10 micron	45.8
Minus 10 micron	<u>11.4</u> 100.0

Table 1 shows that by the particular experimental arrangement used on the 12 pounds of talc, about 46 per cent of the talc was produced in the desired size range of minus 200 mesh plus 10 microns. The plus 200-mesh fraction accounts for over 42 per cent of the feed. This portion should be removed by screening to be returned and blended with new feed. By this procedure a closed grinding circuit can be simulated.

Information on how the ultrasonically ground talc responds to flotation was obtained from a few preliminary flotation experiments on the 12-pound batch. The ultrasonically ground product was wet screened to remove the 200-mesh oversize. Based on the figures obtained on the screen and sedimentation work, the size distribution of the flotation feed was calculated after the plus 200-mesh fraction was removed.

Table 2 shows the calculated values.

TABLE 2. DISTRIBUTION OF PARTICLE SIZES IN FLOTATION FEED OBTAINED FROM COMMINUTED TALC WHEN TREATED WITH 1.28 KW PER 50-GRAM LOAD

Size Fraction	Weight Per Cent
Minus 200 mesh plus 10 micron	80.1
Minus 10 micron	19.9

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

8

The minus 200-mesh fraction was then cycloned and the resulting minus 200-mesh plus 10-micron fraction was floated. Five flotation experiments were made. The first flotation experiments showed that acicular particles of talc floated with the platelets. Therefore, modifications in the beneficiation procedure were made in an attempt to eliminate these acicular particles. These modifications consisted of using greater dilution during cycloning and in using smaller quantities of reagents during flotation.

Table 3 shows the best flotation separation obtained with talc ground ultrasonically.

TABLE 3. FLOTATION RESULTS OBTAINED FROM ULTRASONICALLY COMMINUTED TALC

Product	Weight Per Cent	Microscopic Count, per cent	
		Platy	Nonplaty (Mostly Acicular)
Cyclone overflow	33.0	(a)	(a)
Float 1	39.2	97-98	2-3
Float 2	11.6	96	4
Flotation underflow	16.2	(a)	(a)
Total	100.0		

It is emphasized that neither the grind nor the flotation conditions were considered as being optimum in these five exploratory experiments.

Two other ultrasonically ground samples were submitted to Battelle's Minerals Beneficiation Division for flotation experiments.

These two samples, Series I and II, were made in a simulated recirculating ultrasonic grinding circuit using 90 and 46 per cent of the rated power of the ultrasonic transducer, respectively.

A representative fraction of each of the two samples was treated by sedimentation to determine the amount of minus 10-micron material present. Table 4 shows the distribution of sizes in these fractions.

Table 4 shows that the Series II samples contained 32.4 per cent of the material finer than 10 microns, compared with 43.9 per cent finer than 10 microns in the Series I samples. The lower energy level produced fewer minus 10-micron particles.

The sedimentation products were examined under the petrographic microscope to determine the mineral character. Table 5 summarizes these observations.

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

9

TABLE 4. PARTICLE-SIZE DISTRIBUTION OF SERIES I
AND SERIES II SAMPLES

Product	Weight Per Cent
Series I; minus 200 mesh plus 10 micron	56.1
Series I; minus 10 micron	43.9
Total	100.0
Series II; minus 200 mesh plus 10 micron	67.6
Series II; minus 10 micron	32.4
Total	100.0

TABLE 5. MINERAL CHARACTER OF SERIES I
AND SERIES II SAMPLES

Product	Sedimentation Products, per cent			
	Platy Talc	Nonplaty Talc	Carbonate	Tremolite
Series I; minus 200 mesh plus 10 micron	98	±1	+1	Trace
Series II; minus 200 mesh plus 10 micron	98	<1	+1	Trace
Series I; minus 10 micron	None	72 fines and shards	<1	±4
Series II; minus 10 micron	None	70 fines and shards 25 nonplaty	<1	±5

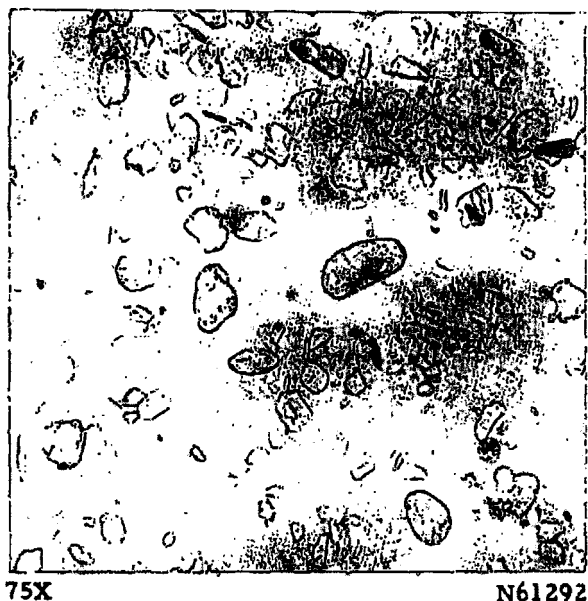
BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

10

Microscopic examination showed that both minus 200-mesh plus 10-micron samples (Series I and II) were excellent products. Each contained a large proportion of well-developed platelets, i. e., thin, flat, circular, or rounded. Figure 7 shows a photomicrograph of Series I sedimentation products.



Plane-Polarized Light.

FIGURE 7. PHOTOMICROGRAPH OF MINUS 200-MESH PLUS 10-MICRON FRACTION OF ULTRASONICALLY GROUND TALC

Recirculating load exposed to 46 per cent of rated power of ultrasonic transducer.

Attention is directed to the data of Table 5, which show that talc of very high platy content was obtained simply by sedimentation of the ultrasonically ground talc. The carbonate content of these products, however, is still greater than 1 per cent. A flotation step would be required to eliminate it. These limited experiments should not be taken as conclusive, but there is an indication that at this power level the nonplaty talc is broken down to the minus 10-micron range preferentially by ultrasonic grinding. If further experimental work verifies this trend, it might be possible to produce a high-grade finished talc product from a low-carbonate feed simply by grinding and classification for removal of fines, without the necessity of introducing a beneficiation step such as froth flotation. This same trend has been shown in ball-mill grinding, but to a lesser extent. For instance, the classification for removal of fines from the Italian No. 2 talc, which has been carried out in the talc pilot plant, has increased the platy content from 90 to 95 per cent. This is the same talc on which the ultrasonic grinding

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

11

was done. There is no instance however, where talc of 98 per cent platy quality has been produced without the use of flotation, other than the data of Table 5.

No cyclone or flotation experiments were made on the Series I or II samples, because the development work was curtailed as requested by the Sponsor.

DISCUSSION

Assuming that the conditions used to obtain the above data on the ultrasonic comminution of a circulating load of talc are optimum and that electrical power costs are 1 cent per kwhr, the cost of comminuting 1 pound of 10-mesh talc to minus 200-mesh talc would be from 3 to 4 cents. Therefore, the power cost to process a pound of talc would be almost constant if an electrical generator, such as a rotary generator having low standby losses, could be used. It is estimated that the over-all efficiency of power transformation from electrical to 20-kc vibratory power of the experimental assembly was 15 per cent. In general, the efficiency of electrical power oscillators of the type used is about 50 per cent, and for the type of ultrasonic transducer used 30 per cent. It is conceivable that systems for comminuting talc can be designed with higher over-all efficiencies. This would reduce processing costs. For example, if sonic frequencies are used, in particular 15 kc, then an over-all efficiency in the neighborhood of 30 per cent might be obtained, halving processing costs. A more promising approach would be to use fluid dynamic transducers, which in general have reduced the cost of ultrasonic processes, when applicable, by a factor of 10. A simple experiment had been performed using a blender (230-watt Osterizer, John Oster Mfg. Co., Milwaukee, Wis.) to determine this possibility. Rough estimates indicated that a batch of 10-mesh talc could be ground to 200-mesh talc by this method at a power expenditure of 1 kwhr per pound. It can be assumed that for a circulating load the power expended per pound of processed talc would be much less.

The quality of ultrasonically processed talc appears to be a function of the vibratory energy level to which it is exposed. Observations made of talc-water suspensions after various ultrasonic comminution conditions indicated that batch samples exposed to power levels above 440 watts for any time period produced a colloidal suspension of some of the particles. In general, as the time of exposure or power level increased, the amount of particles colloiddally suspended increased. It was also observed that particles other than talc found in the suspension were not notably fractured at any of the energy levels used. Although work was interrupted before a relationship between initial talc particle size and its ultrasonic comminution rate could be determined, the literature indicates that the smaller the initial particle size the smaller will be the size of the suspended particles after ultrasonic treatment for a given time period. The literature appears to substantiate the possibility of controlled comminution by the ultrasonic process. In the ultrasonic dispersion of Progesterone it was found that the extent of dispersion was directly related to the ultrasonic intensity applied, and that the extent of dispersion was a function of time of application and initial particle size. In a closed-flow circuit ultrasonic comminution process the minimum particle size can be controlled through the rate of flow of talc slurry and the rate of comminution by the ultrasonic intensity or power.

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

BUSINESS CONFIDENTIAL

12

CONCLUSIONS AND RECOMMENDATIONS

Ultrasonic comminution appears to be a promising method of producing talc powder of a high and controllable quality. The power required to comminute 1 pound of plus 200-mesh talc minus 10-mesh talc to minus 200-mesh talc is estimated at 3.5 kw. using magnetostrictive transducers. The applicability of fluid dynamic transducers would be expected to reduce processing costs by a factor of 10 or more.

The minus 200-mesh plus 10-micron talc produced by an ultrasonic comminution is unique in that almost 80 per cent of the platelets are rounded. Other grinding procedures such as roller or pebble milling yield only a few per cent rounded platelets.

Ultrasonic comminution, at the energy levels and the laboratory techniques tried, produced a minimum of 33 per cent of the weight finer than 10 microns when comminution was carried to the point where all the material passed a 200-mesh sieve. Part of the objective of obtaining a small amount of minus 10-micron particles was not obtained. It is believed that standard grinding methods can be controlled to produce less than 20 per cent of the weight finer than 10 microns, but the particles larger than 10 microns do not contain more than a few per cent of rounded platelets.

A 98 per cent platy talc representing 67 per cent of the original weight was obtained by ultrasonic comminution followed by sedimentation for removal of minus 10-micron particles. This product contained 0.69 per cent CO_2 (1.44 per cent dolomite) as the principal contaminant. If elimination of dolomite is important, acid leaching or flotation would be effective.

It is recommended that Johnson and Johnson consider continuing this work to complete studies on the effect of initial particle size of talc and frequency of vibration on the comminution rate of talc. These studies would establish the upper practical limit of particle sizes that can be ground ultrasonically and indicate the practicability of using high-efficiency lower frequency transducers in producing high-quality talc. Work also should be continued to complete the analysis of talc ground under various grinding conditions to definitely establish its quality as compared with talc powder produced by conventional grinding processes.

JNA:WEC:LEW/mar

BATTELLE MEMORIAL INSTITUTE

BUSINESS CONFIDENTIAL

2018
07/18/2018