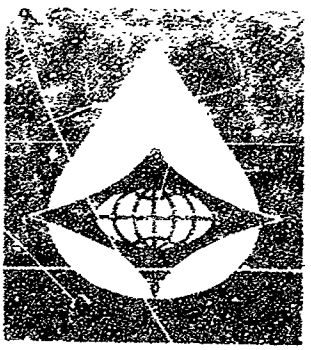

IONAC CHEMICAL COMPANY
a division of PFAUDLER PERMUTIT INC.
Birmingham, New Jersey

First Progress Report for Phase II of NASA Desalting Kit Development

November 12, 1964

Contract #NAS-9-2560

IONAC CHEMICAL COMPANY

NASA Desalting Kit - Contract NAS-9-2560

First Progress Report for Phase II of NASA Desalting Kit Development

November 12, 1964

IONAC CHEMICAL COMPANY

C. Calmon, Reporting

Contributors: W. Grundner, G.P. Simon, and E.A. Zink

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NASA Desalting Kit - Contract NAS-9-2580

First Progress Report for Phase II
of NASA Desalting Kit Development
November 12, 1964

IONAC CHEMICAL COMPANY
C. Calmon, Reporting

Contributors: W. Grundner, G.P. Simon, and E.A. Zink

INTRODUCTION

This is the first progress report for work carried out since verbal (September 9, 1964) approval was received for Phase II of this contract. The body of the report is divided into sections which cover the following information:

A. Progress

B. Current Problems

C. Additional Work Planned

SUMMARY

The following statements summarize briefly the work carried out to date on the items shown. A more detailed review of each subject is covered in the section under progress.

(a) Container

A new container design has been completed as shown in Figure 1. This design now incorporates those changes suggested by NASA personnel (4). Six test cans are now on order. Silk screens have also been ordered for the printed matter which appears on the can.

(b) Bag

The processing bag design has been fixed, however, there are two possible closures which are applicable. Silk screens for the instructions which appear on the bag are being prepared and the calibration of the bag as suggested by NASA

personnel (4) is completed.

(c) Briquet

Tests have been carried out in cooperation with F. J. Stokes Manufacturing Company for briquetting the blended desalting chemicals. As a result a design for the briquetting die has been settled on, and manufacture of this tool is proceeding. Studies of the following nature have been carried out on the desalting chemical blend:

1. Various lubricants were studied to improve die release.
2. Various binders were studied to improve briquet structural strength.
3. Effect of briquetting pressures up to 50 tons/in^2 were evaluated for briquet capacity and disruption.

The briquet wrapper remains the same as previously reported, 2 mil Mylar film, heat sealed. As suggested by NASA personnel (4), each briquet will now be individually wrapped and appropriately marked. The stamp for it is ordered.

PROGRESS

A) Container

The overall dimensions of the container and the general geometric shape remains the same as previously described (3), however, as shown in Figure 1, all the major improvements suggested by NASA personnel (4) have been made. At the present time, several cans of the type shown in Figure 1 are being fabricated for test purposes.

After the completion of these tests, one or two kits will be packed, using wooden model briquets, and shipped to the National Aeronautics and Space Administration for comments and suggested changes during the week of November 23, 1964.

All the test data available on the test cans will also be forwarded with these initial models.

As suggested (4) by NASA personnel, the final aluminum container will have an embossed mark indicating the 1/2 pint level for processing seawater in the container.

B) The Text on the Container

The text on the container incorporates all the current changes (4) and will read as follows:

Front Panel

NASA Part No. CSD-20540 Serial No. xxx Manufacturing Date: _____
Ionac Chemical Company
Birmingham, New Jersey

This kit contains 16 chemical briquets which convert seawater into potable water. This is done by filling the plastic bag with seawater to the desired level. The desired number of envelopes are unwrapped and the contents dropped into the water. The bag is then closed and the contents kneaded for 30 minutes. Drink the water directly from the open filter outlet, or discharge it into the empty container by squeezing the plastic bag.

Rear Panel

CAUTIONS & SUGGESTIONS

1. Do not drink seawater.
2. Be sure to tie kit to raft or suspend it around neck.
3. On opening kit save tape for repair of plastic bag if torn.
4. Each envelope containing 1 briquet yields about 1/2 pint of potable water.
5. A small amount of salt is deliberately left in the treated water.
6. If bag becomes unusable, the reaction can be carried out in the container and then filtered through a cloth or sipped when settled clear.

In processing water in the container, use the content of one envelope and fill container with seawater to the 1/2 pint level only.

7. Allow 30 minutes for the reaction in the container and agitate using the finger if necessary.

As indicated on the front panel, the serial number will start at 100 and the date of manufacture has also been included.

The wording given above will be printed in blue using Bl #8104 a product of Interchemical Company. The clear baked enamel protective coating is still undecided, since samples of at least two enamels sent to NASA some time ago remain untested.

The prototype kits therefore will be coated with a modified epoxy finish V-683 manufactured by the Midland Industrial Finishings Company. A final choice on the enamel to be used for the production kit will be made at a later date.

C) Processing Bag

The processing bag is essentially the same as indicated earlier (3) with the changes in wording and marking as suggested by NASA personnel (4). The calibration of the bag has been carried out and the measurements to the various fill levels is shown in Figure 2.

In addition, a new and rather novel closure has been developed for the processing bag. A plain processing bag with this new closure is prepared and will be sent with the packed kits for your inspection and comments.

Tests of this new closure have shown that it will perform its function with the same or better reliability than the snap fastener.

D) Processing Bag Marking

The processing bag will be printed with the same ink as the container Bl #8104

and the calibration will be as indicated in Figure 2. The wording on the bag will be as follows:

Contract No. NAS-9-2580
Ionac Chemical Company

INSTRUCTIONS

1. Make sure valve on bottom is closed.
2. Fill bag to desired level with seawater and close to prevent water loss.
3. Remove the desired number of envelopes (each envelope yields 1/2 pint of potable water) and reclose the container.
4. Remove the wrapper, open the bag and place the chemical briquet in plastic bag containing the seawater.
5. Roll top of bag down and close securely to make it watertight.
6. After the briquet is disrupted, knead gently until all of it is broken into fine particles.
7. Agitate gently for 30 minutes.
8. To drink water, open valve at bottom, place it in mouth and suck with gentle squeezing of the bag. The first few drops may be salty so spit these out.
9. When finished drinking, close valve. Any remaining water can be left in the bag until needed.
10. When all the water is drawn from the bag, be sure to rinse all the chemical out with seawater before reusing.
11. In case bag develops a puncture or tear, carefully dry the affected area and apply a patch of mending tape.

The silk screens for the above marking are now being prepared by the bag manufacturer, and proofs will be prepared for approval and editing before any bags are silk screened.

E) Briquet Wrapper

As suggested by NASA personnel (4), each briquet will be marked as follows:

The contents of this envelope will yield about 1/2 pint of potable water date_____.

F) Desalting Briquet

Since the final report for Phase I of this contract (3), some additional qualification work has been carried out to determine the briquet ability of the final blended chemicals (5), (6), (7), (8), (9). The data from each of these reports are presented below with a brief discussion of the observations made.

Reference (5)

This study was carried out in an attempt to improve the structural strength of the briquets by blending silver impregnated amorphous alumino silicate exchangers with the high capacity materials already in use. A total of 5 blends were prepared and briquetted at 15,000 lbs. per sq. inch. The density, Cl^- ion capacity, cation capacity, and briquet strength were determined for each blend with the following results.

Effect of Admixed Alumino Silicates

Blend No.	Weight Percent Alumino Silicates	Ag_2O	Density gm. $cm.^3$	Capacity meq/gm. for Cl^-	Cations	Briquet Strength gms. (a)
0	100	0	1.61	3.88	3.90	300 to 900
5	95	5	1.63	3.78	3.78	600 to 1100
10	90	10	1.60	3.66	3.68	700 to 1150
20	80	20	1.59	3.72	3.67	1300 to 1500
30	70	30	1.55	3.58	3.54	600 to 950
50	50	50	1.52	3.41	3.29	1500 to 1700

(a) Determined on pairs of briquets.

While it is apparent that an increase in structural strength is achieved, it is at the cost of capacity, since the amorphous alumino silicates have a lower capacity than the 4A sieves used. Additional work was carried out to produce a better briquet by blending in small amounts of stearyl alcohol, and briquetting hot. The results of this study are given in the following Table.

Effect of Stearyl Alcohol

Percent Stearyl Alcohol Added	Density gms/cm.3	Capacity for Cl^- meq/gm.
0.00	1.61	3.88
0.167	1.74	3.73
0.333	1.72	3.64
0.667	1.75	3.50
1.20	1.85	0.63

The addition of small amounts of stearyl alcohol has a very marked effect on the briquet capacity without materially improving the briquet strength or the surface dusting properties of the finished briquet.

Reference (6)

An attempt was made in this study to find a substitute disruptor which would work more efficiently than the material now being used (-200 mesh Ionac C-240 in the silver form). The vermiculite, however, failed to produce a disruption of the briquetted blend.

Reference (7) & (8)

In view of the apparent briquet weakness and dusting observed in previous studies (5), attempts were made to evaluate several binders for the desalting briquet. Eleven different plant base binders were evaluated and no improvement of the physical properties of the briquets was observed.

Concurrently with the above studies, the F. J. Stokes Company was carrying out studies of the briquetting properties as a function of pressure (8). This work was carried out by this company in preparation for final die design. The sample briquets received from F. J. Stokes Company were evaluated for density and capacity with the following results.

Pressure tons/in.^{2}	Density gr/ml.	Capacity, meq/gm. for Chloride Ion (a)	Total Cations (a)
10	1.73	3.99	4.23
20	1.90	3.84	4.17
30	2.13	3.48	3.49
40	2.27	3.16	3.28
50	2.41	2.85	3.44 (?)

(a) Capacities at 32°F. and with 30 min. contact time.

These studies lead to the following conclusions:

a) Briquets made at pressures of 10 tons/in.^{2} or more are physically strong, with only a small dusting problem.

b) The inclusion of various binders does not improve the structural strength of the final briquet.

c) Briquetting pressures above 10 tons/in.^{2} should be avoided, since the finished briquet capacity drops off rapidly past this point.

Reference (9)

Is a routine evaluation of the several products of the alumino silicates available from Linde. It is interesting to note that slightly higher capacities can be obtained if the products are purchased without the final calcining step normally included in their manufacture.

References 10 and 11

These studies were carried out on the experimental briquets prepared by F. J. Stokes Company at high pressures (7, 8). The contact time during the reaction was increased substantially to determine the effect of this factor on the capacities of these briquets. The data observed is given in the following Table.

Pressure tons/in.^{2}	Density gms/cm.^{3}	Capacity at 320°F. for Contact Times of 30 Min.	60 Min.	4 Hr.	% Improvement at 60 Min.	at 4 Hr.
30	2.13	3.48	3.71	----	6.6	----
	2.27	3.16	3.46	3.67	9.5	16.1
	2.4	2.85	3.13	3.42	9.8	23.5

A substantial improvement of briquet capacity is observed when the contact time is extended from 30 minutes to 4 hours. This effect is much more pronounced for materials briquetted at pressures in excess of 30 tons/in.^{2}

G) Work Now Underway

1. Briquet Chemicals

Orders have been placed for the ingredients necessary to produce the final blend for the NASA test kits. The die has been designed and machining is underway.

2. Briquet Wrapper

No change, each individual briquet will be wrapped and sealed in Mylar film of 2 mil thickness.

3. Processing Bag

The order for these bags has been let and silk screens are being prepared for the text and calibration shown in this report.

4. Container

Six test cans complete with all the changes suggested by NASA personnel are on order. Two of these will be sent to NASA-CSD section for comments. Silk screens for the container text are also in preparation.

5. Assembled Kit

Sufficient lanyards, rivets, tie tape and mending tape are available for completion of the test kit requirements outlined in Phase II of this contract.

REFERENCES

(1) NASA Desalting Kit Progress Report No. 1
April 20 to May 15, 1964

(2) NASA Desalting Kit Progress Report No. 2
May 15 to June 19, 1964

(3) NASA Desalting Kit Final Report Phase I
June 24, 1964

(4) Minutes of CSD/Ionac Chemical Company Meeting
Desalter Kit Development - August 20, 1964

(5) Use of Vermiculite as a Disruptor
From W.T. Grundner to Dr. C. Calmon - 10-28-64

(6) Inorganic Ion Exchangers for Desalting
From W.T. Grundner to Dr. C. Calmon - 10-8-64

(7) Desalting Briquets for NASA Kits
From W.T. Grundner to Dr. C. Calmon - 10-26-64

(8) Communication to G. P. Simon from F. J. Stokes Company
Dated 10-30-64

(9) Desalting Capacity of Silver Impregnated 4A Molecular Sieves
From W.T. Grundner to Dr. C. Calmon - 11-2-64

(10) Desalting Briquets for NASA Kits
From W.T. Grundner to Dr. C. Calmon - 11-4-64

(11) Desalting Briquets for NASA Kits
From W.T. Grundner to Dr. C. Calmon - 11-6-64

Mr. Simon

(6)

Dr. C. Calmon | 5004

W. T. Grundner | Birmingham

Use of Vermiculite as A Disruptor | Oct. 28, 1964

A sample of "rolled and brushed vermiculite LE4FGBS-20" was received from J. K, Chapin, Jr., Zonolite Division, W. R. Grace & Co. This was a -20 mesh material.

Several briquets were made containing 1% of this material and placed in seawater. The materials used were as follows:

-100 mesh as received
-100 mesh oven dried overnight at 120°C
as received (size-wise) oven dried overnight at 120°C.

None of the materials appeared to be suited for use as a disruptor although a partial disruption occurred with the third-listed material. This was by no means comparable to that obtained with the same amount of Ag form Ionac C-240.

W. T. Grundner

WTG:mbm

cc: Mr. G. Simon
Mr. E. Zink
Dict. file
File

M. G. Simon

(5)

Dr. C. Calt — 5004

T. Grundner — Birmingham

Inorganic Ion Exchangers for Desalting — Oct. 8, 1964
NASA 9-2580

1. Relationship Between Cation Capacity of Impregnated 4A Sieves and pH of Treated Sea-water.

An examination of the data reported 6-11-64 concerning the capacities of Linde 4A molecular sieves indicates that there is a relationship between the cation capacity of the material and the pH of seawater treated with the impregnated sieves during the determination of their capacity. This relationship is shown on the attached graph.

2. Substitution of Amorphous Gel for 4A Sieves and Its Effect on Briquet Strength and Capacity.

It was suggested that the strength of the briquets prepared from a blend described previously (WTG to CC 7-14-64 page 8) might be increased by substituting a small amount of an amorphous gel for the crystalline 4A sieves from Linde.

In order to do this, a quantity of the standard silver Decalso from the plant was ground in a ball mill and screened to separate out the -100 mesh particles which were used in the work described below.

Several blends were prepared as follows:

Blend #0 contained,
- 58 gm 4A - Ag Sieves
- 1.2 gm C-240 Ag (-200 mesh)
- 0.4 gm activated carbon
- 0.3 gm graphite
- 0.03 gm alum (finely ground)
- 0.001 gm Separan

Blend #5 was as blend 0 with 5% of the 4A-Ag Sieves removed and replaced with -100 mesh Ag Decalso.

Blend #10 as #5 but with 10% Substitution.
Blend #20 " #5 " " 20% "
Blend #30 " #5 " " 30% "
Blend #50 " #5 " " 50% "

After thorough mixing of the blends they were pressed into briquets of approximately 15 gm. at a pressure of 15,000 #/in.

The capacities and densities of these materials were determined and these values are recorded in the following table:

Blend	Density (gm/ml)	(Capacity meq/gm.) Cl	Cations
0	1.610	3.88	3.90
5	1.630	3.78	3.78
10	1.597	3.66	3.68
20	1.587	3.72	3.67
30	1.549	3.58	3.54
50	1.519	3.41	3.29

The relative strength of these briquets was determined by use of the rather crude device described in the attached diagram. Each briquet being tested was supported between two wooden blocks so that 3/16 inch on either side of the briquet was supported and the center thereof was suspended above a free space. Pressure was applied to the center of the briquet over an area 1/16 inch in diameter and this pressure was increased by pouring a steady slow stream of lead shot into the container suspended from the end of the lever arrangement. When the briquet broke the relative pressure exerted thereon was determined by weighing the container and its contents. The pressure was applied to the briquet (through a lever arrangement as shown in the diagram) by means of a wood screw the point of which had been filed to produce a flat surface 1/16 inch in diameter.

Two briquets from each blend were subjected to this test; and, in the case of each blend, it was noted that there was not good agreement between the two trials. The data was plotted as on the attached graph, however, and this indicated that there is a trend toward greater briquet strength as a greater amount of amorphous silver zeolite is included in the blend.

It was also noted that this substitution did not reduce the dusting from the surface of the briquet that has been noted in the past.

The conclusion reached on the basis of the above was as follows:

(1) substitution of increasing amounts of amorphous gel into the blend results in increasing briquet strength.

(2) the greater this substitution the lower the desalting capacity.

(3) such substitution would not be desirable due to the drop in capacity noted.

3. Expansion of Briquets When Removed from Die

In order to determine the degree of expansion of the briquets on release from the mold in which they were formed three of the briquets pressed above were measured. The results were as follows:

Inside diameter of Die = 1.1315 in.

Blend	Briquet diameter (inches)	Expansion (inches)	drain only	Volumetric %
0	1.143	0.0115	1.01%	1.75%
5	1.140	0.0085	0.74%	
10	1.140	0.0085	0.74%	

4. Prevention of Dusting from Finished Briquets

Briquets prepared from what has become more or less the standard blend of Ag-4A Sieves exhibit undesirable dusting properties in that a film of fine powder is removed from the briquet surface on handling. The standard briquets from the desalting kits presently being manufactured have a glazed surface and do not exhibit this action.

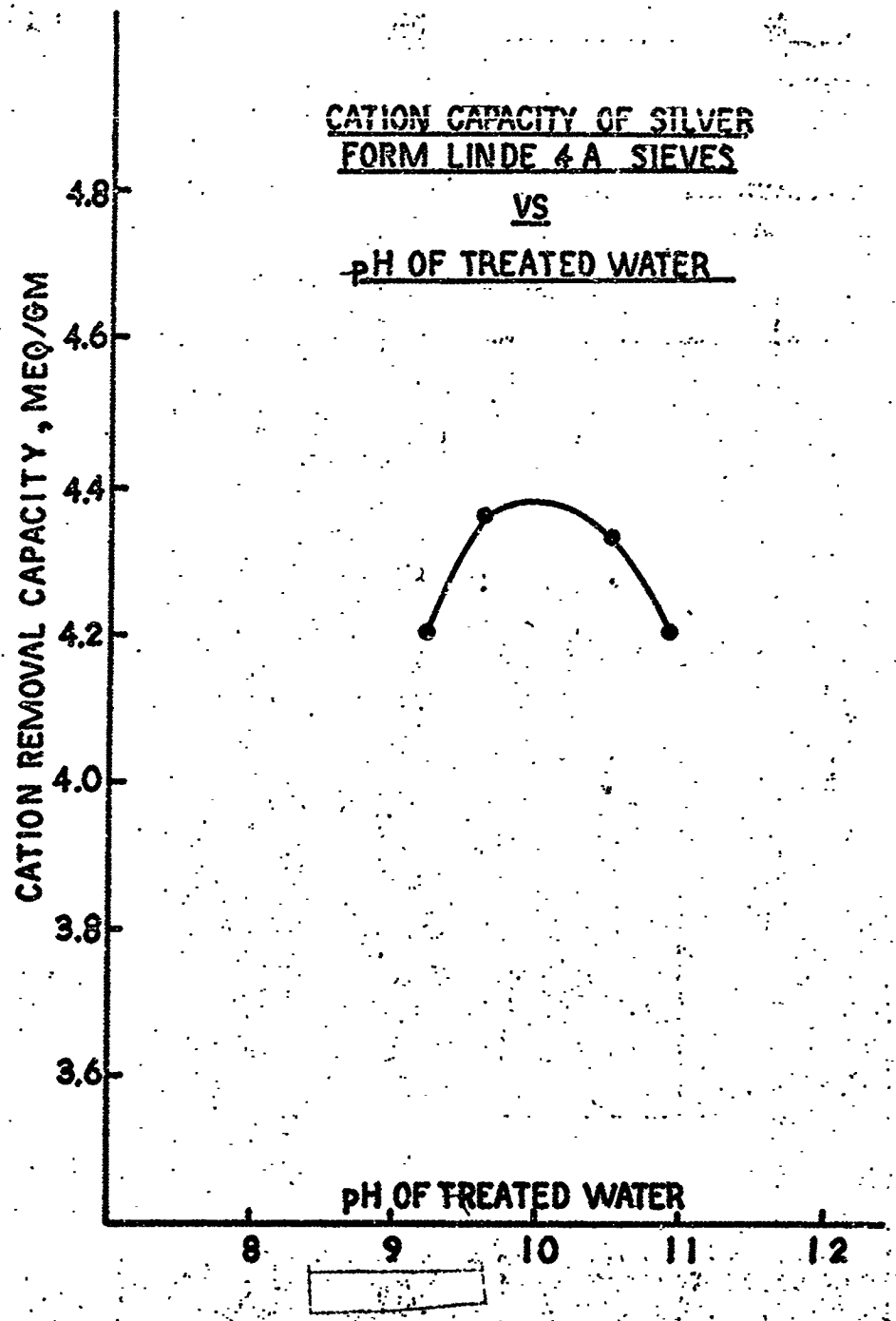
This glaze was assumed to be due at least in part to the presence of stearic acid in these briquets. Since the stearic acid present apparently contributes considerable taste to the water it was suggested that stearyl alcohol might be used instead. Several briquets were prepared with various amounts of Lorol 28 (du Pont's brand of stearyl alcohol) in the regular briquetting mixture. (Blend heated to 105°C for about 2 1/2 hours to blend stearyl alcohol into other ingredients).

Blend	% Stearyl Alcohol	Density (gm/ml)	Capacity for Cl meq/gm.
(a)	0.167	1.735	3.73
(b)	0.333	1.717	3.64
(c)	0.667	1.750	3.50
(d)	1.2	1.856	0.63

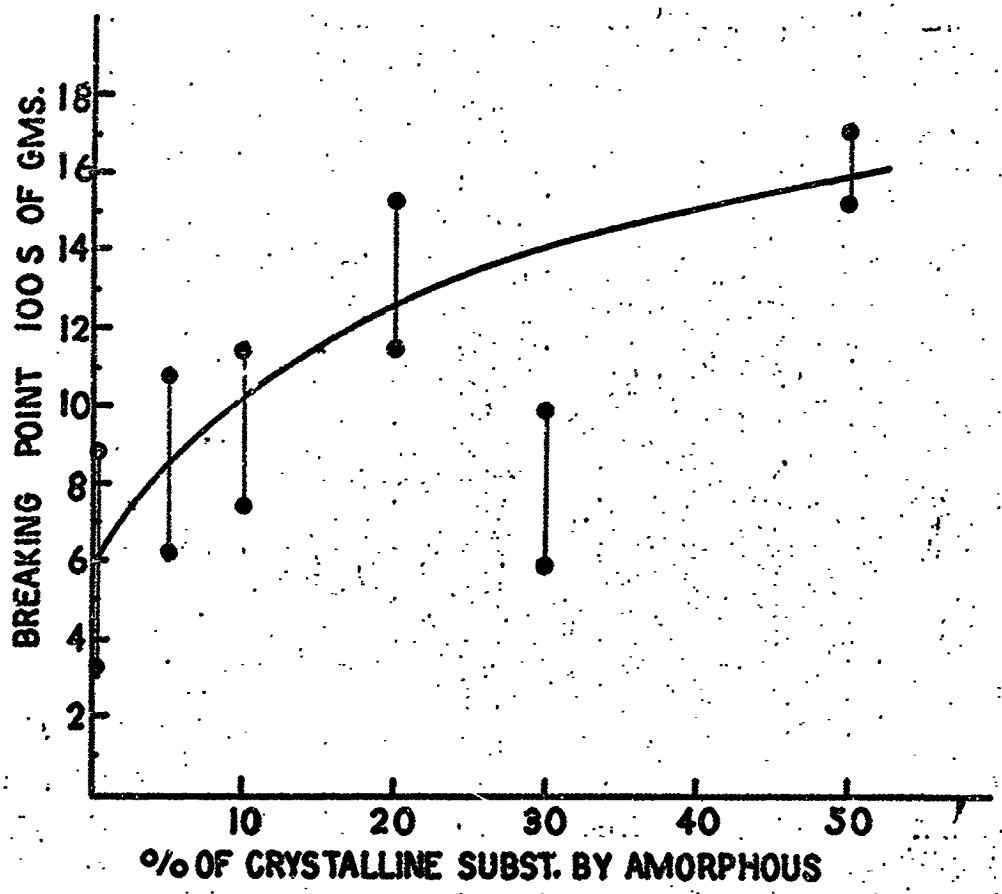
The data shown above indicates a drop in capacity with increase in the alcohol content of the briquets. No improvement in the dusting properties of these briquets was noted and the briquets themselves were physically weaker than those prepared without the addition of stearyl alcohol.

W. T. Grundner

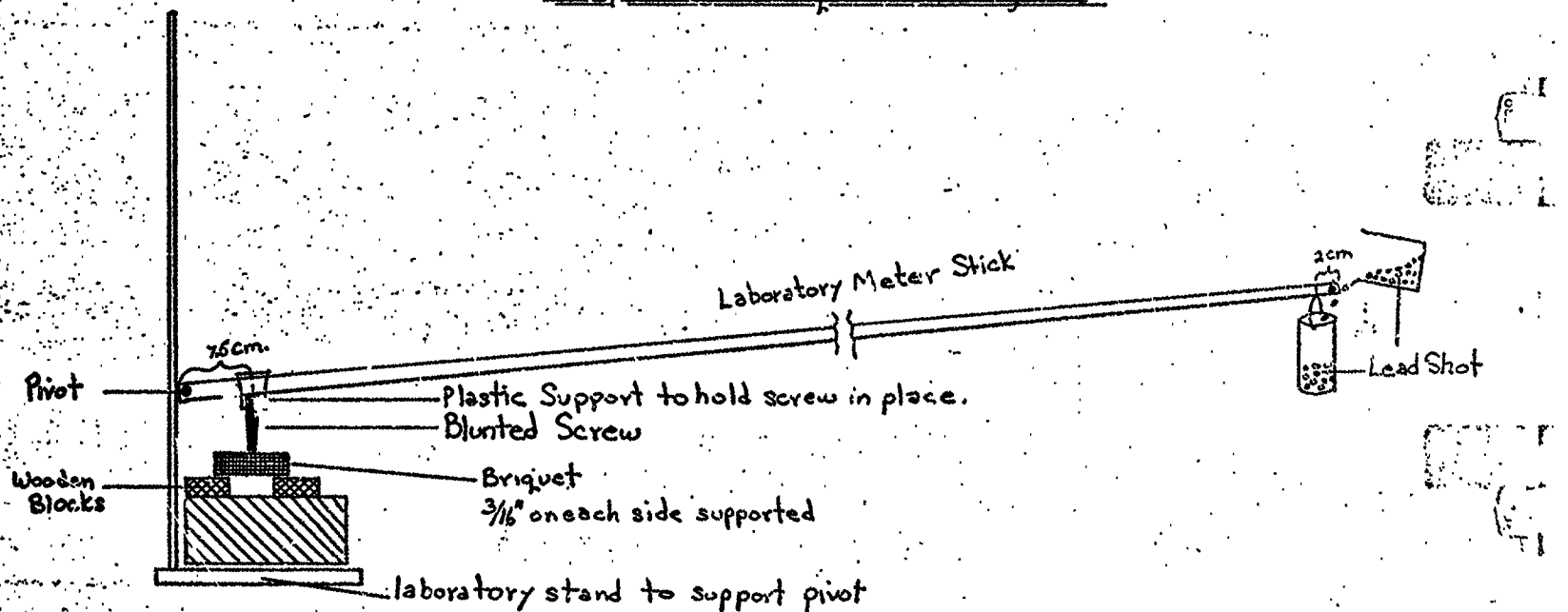
WTG:MBM
cc: Mr. G. Simon
Mr. W. Wood
Mr. E. Zink

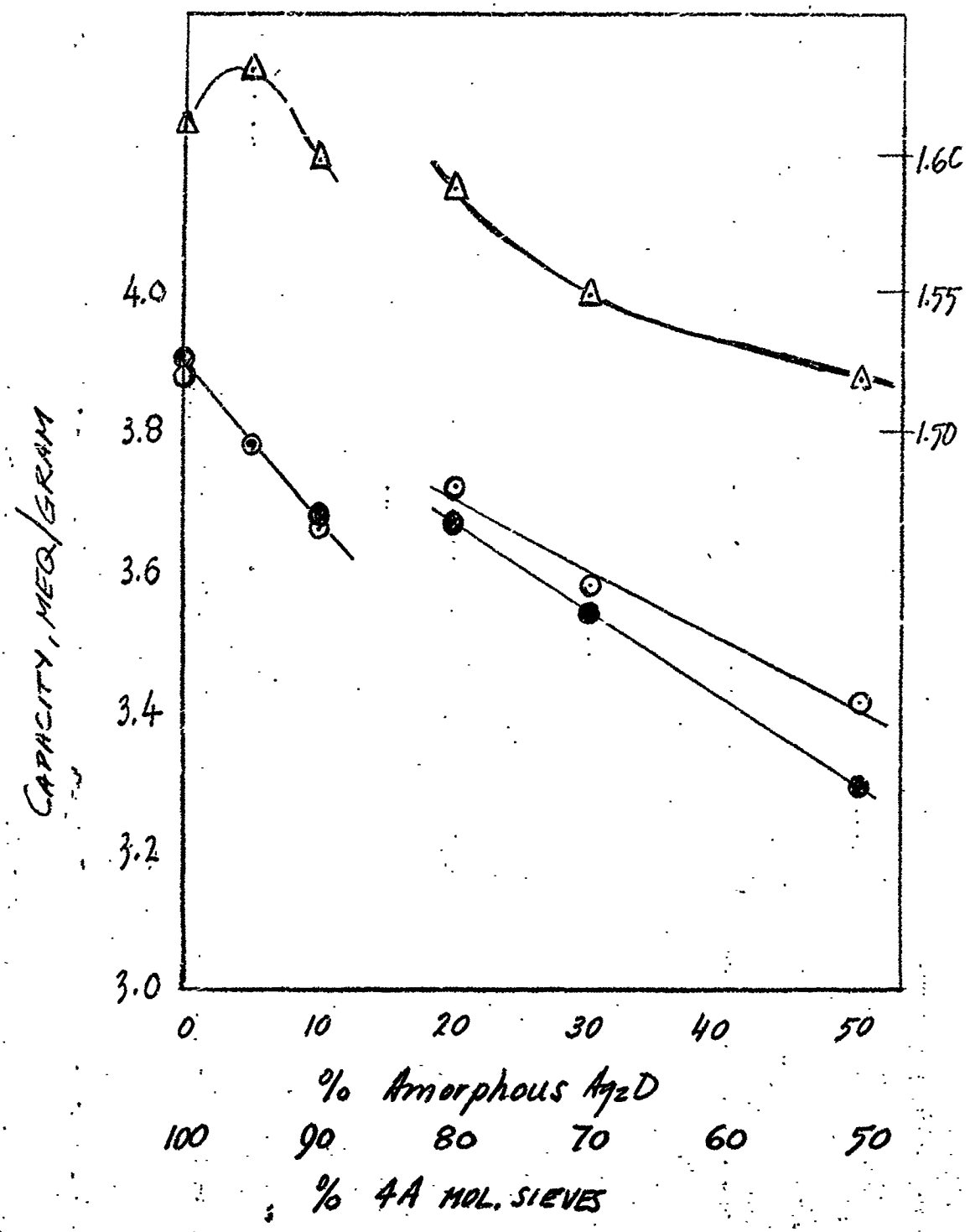

CATION CAPACITY OF SILVER
FORM LINDE 4 A SIEVES
VS
pH OF TREATED WATER
CATION REMOVAL CAPACITY, MEQ/GM
4.8
4.6
4.4
4.2
4.0
3.8
3.6
pH OF TREATED WATER
8
9
10
11
12

EFFECT OF SUBSTITUTING AMORPHOUS FOR CRYSTALLINE EXCHANGER ON STRENGTH OF BRIQUET.



Apparatus Used to Measure Comparative Briquet Strengths




CAPACITY, MEQ/GRAM
4.0
3.8
3.6
3.4
3.2
3.0
1.60
1.55
1.50
0
10
20
30
40
50
% Amorphous Ag2O
100
90
80
70
60
50
% 4A MOL. SIEVES

M. Simon

(B)

Dr. C. Calmon | 5004

W. T. Grundner | Birmingham

Desalting Briquets for NASA Kit | Oct. 26, 1964

A. Incorporation of Various Binders into Briquetting Mixture

The materials listed below were incorporated into the standard NASA briquetting mixture to the extent indicated in an effort to form a stronger briquet with reduced dusting propensities. In no case did the briquet produced appear to be superior to those produced without addition of a binder.

After thorough blending of the binder into the other ingredients the mixture was placed in an oven at 120°C for at least one hour. The material was then briquetted at 15,000 #/in.^{2} in a hot die. The binders employed were as follows:

Binder	% of Briquet
Gluten	0.25
Dialdehyde gluten	0.25
Stearic acid	0.5, 1.0
Mogul cereal binder	0.5
Kel Colloid KV	0.5
Dextrose	0.5
Corn Starch	0.5
Zein	0.5
Carbopol 941	0.5
Dialdehyde gluten - gelatin	0.5
Silver Stearate	0.5, 1.0, 2.5

The capacity at 32°F (with 30 minutes of contact) for the removal of chloride and cations from seawater was determined for several of these

Binder	% Binder	Density (gm/ml.)	Cl Cap. (meq/gm)	Cation Cap. meq/gm)
Dextrose	0.5	1.614	3.62	3.92
Starch (corn)	0.25	1.609	3.97	4.10
Starch (corn)	0.5	1.644	3.97	4.13

This indicates no drop in capacity due to inclusion of starch as a binder. This addition, however, as well as the others, resulted in no improvement in the physical qualities of the briquets.

B. Briquets Pressed by F. J. Stokes Company

Several briquets were returned from the F. J. Stokes Company where they had been formed at various pressures using our standard NASA desalting

-ixture. These were examined and found to be quite satisfactory except for those prepared at higher pressures where some laminating had occurred. The average briquet was approximately 1.6 cm. in diameter and weighed approximately 1.76 gms. The thickness of each varied with the pressure used in pressing the briquets.

The densities and capacities determined are recorded in the following table and their relationships one to another are shown on the attached graph.

Pressure (Tons/in.^{2})	Density (gm/ml)	Capacity* (meq./gm.) Cl	Cations
10	1.73	3.99	4.23
20	1.90	3.84	4.17
30	2.13	3.48	3.49
40	2.27	3.16	3.28
50	2.41	2.85	3.44 (??)

*Capacities at 32°F and with 30 minutes contact time.

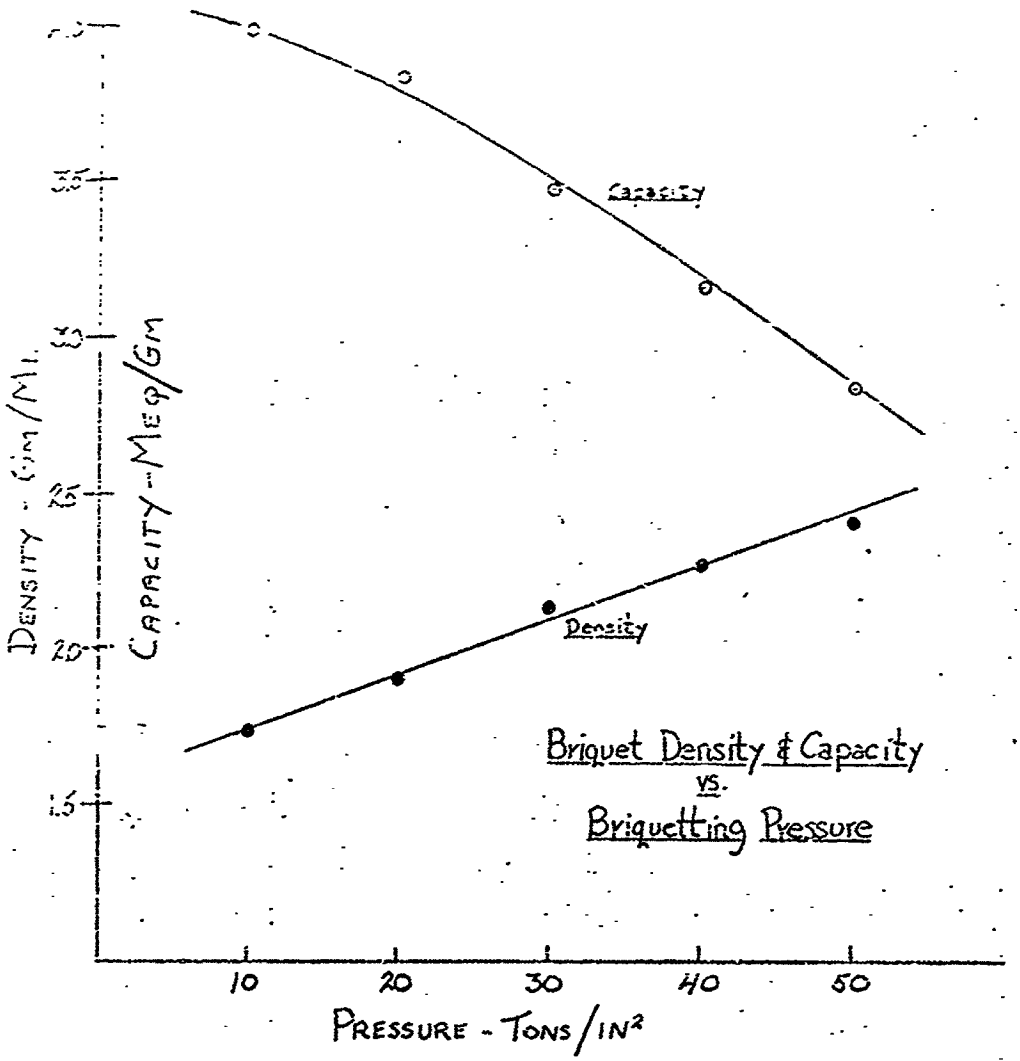
Briquets pressed in the laboratory at 20,000 #/in.^{2} (10 tons/in.^{2}) using the 1.1315 in. diameter die and varying amounts of blend (i.e., 5, 10, 15 gm.) produced briquets with sharp edges on the upper side but with chipped edges on the underneath side. It was theorized that this may have been due to excessive wear at the loweredge of the die.

Conclusions: There does not appear to be any improvement in the physical strength of briquets produced with the inclusion of various binders over those produced without such additions. Briquets pressed at 10 tons/in.^{2} (20,000 #/in.^{2}) appear to be reasonably sturdy with some dusting from the surface which does not appear to be avoidable. It does not appear desirable to increase the pressure employed in briquetting above 10 tons/in.^{2} since capacities drop off above this level. This is shown in the attached graph which confirms data previously reported 7/24/64.

W. T. Grundner

WTG:mbm

cc: Mr. G. P. Simon
Mr. E. Zink
Dist. file
File



Briquet Density & Capacity
vs.
Briquetting Pressure

Briquets Prepared From Standard NASA Blend
By F. J. Stokes Company

STOKES

F. J. STOKES COMPANY

A DIVISION OF PENNSALT CHEMICALS CORPORATION

5500 TABOR ROAD, PHILADELPHIA, PENNSYLVANIA 19120

October 30, 1964

Jonas Chemical Company
Birmingham, New Jersey

Attention: Mr. G. P. Simon

RE: Your P. O. #BI-10466
Our Order #T-41767

Dear Mr. Simon:

The attached laboratory report and pressure density curve were developed as a result of the laboratory investigation of your desalting material. This represents approximately 5 hours lab time which will be reflected in our billing.

The information concerning tooling has been turned over to our Punch and Die Division. I am now in a better position to answer the question you asked during our telephone conversation. It appears that the expansion noted on the small diameter pieces can be expected to follow in direct proportion to the larger rectangular shape. The taper in the die will therefore have to be made accordingly.

The specifications referred to our Punch and Die Division assume that a 1/8" underfill will be used. This means that after the die has been charged the lower punch is dropped 1/8" prior to entrance of the upper punch. If you will recall the purpose of underfill was to prevent puff-out. The purpose of the taper was to improve the tendency to ship the bottom side of the compact at ejection.

chip

F. J. STOKES COMPANY

October 30, 1964

We believe that the information contained herein is reasonably clear. There is however one point we would like to call to your attention. The flow characteristics of the material is generally poor and special consideration will have to be given to the feed problem. If there is any question about the contents of the report or if we can offer our assistance in any way please feel free to call on us.

Very truly yours,

F. J. STOKES COMPANY

D. B. Daubert
Industrial Compacting Press Dept.

DBD/csb
cc: 546

October 21, 1964

IONAC CHEMICAL CO.
Birmingham, New Jersey

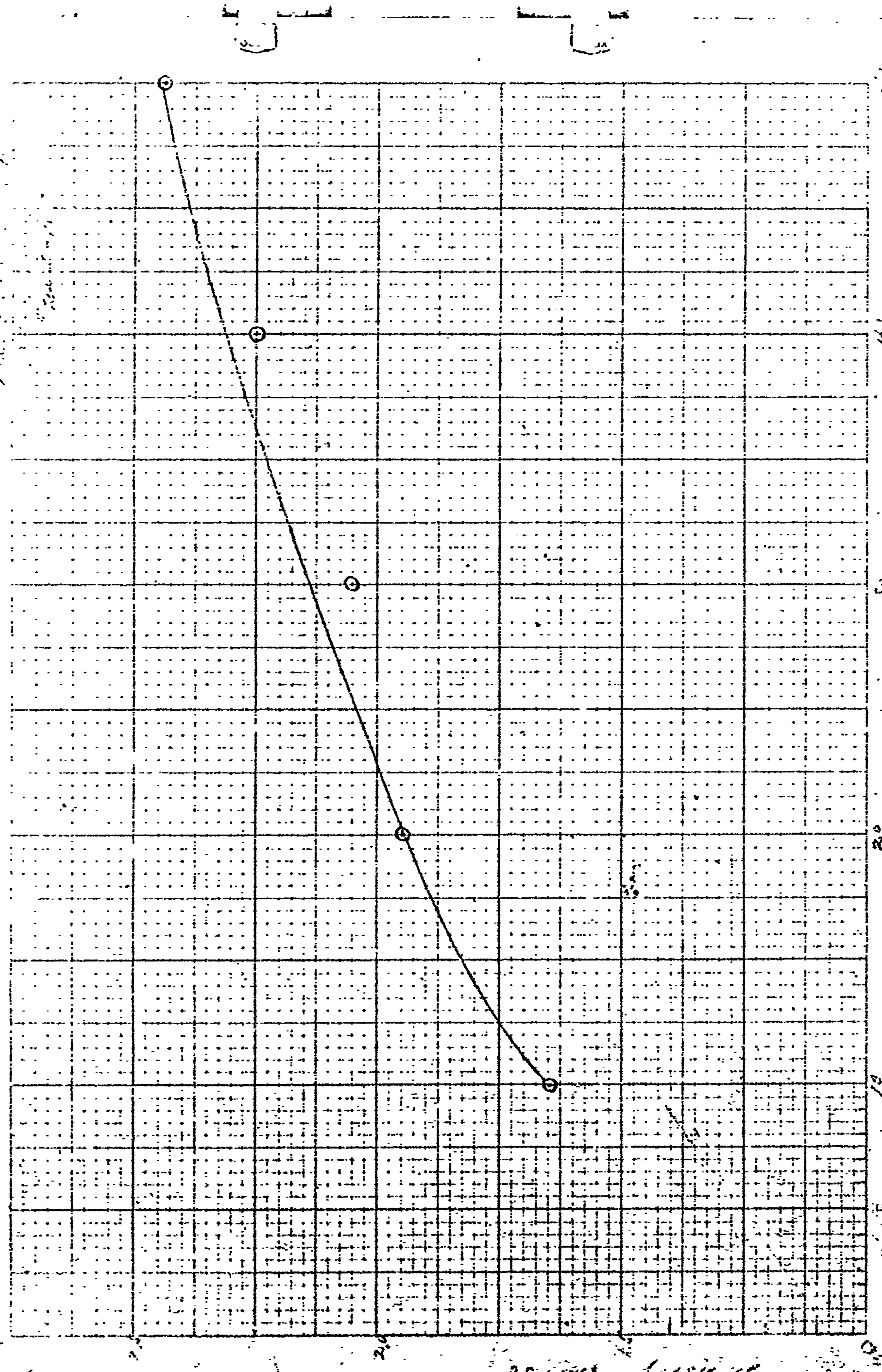
MATERIAL: Desalting mix

PURPOSE: To prepare pressure density curve also observe flow and tabletting properties of material.

MACHINE: R4- 5/8" diameter, flat face punch and die - carbide die - straight 0.626" diameter.
Received a bottle of grey color fine powder and soft agglomerates.

TEST NO.	FILL	THICKNESS	WT./GMS.	PRESSURE TONS TOTAL	T.S.I.	SPEED TPM	TABLET DIA.	DENSITY GMS/C.C
1-A	35/64"	.195"	1.75	3	10,	15	.633"	1.64
B	"	.174"	1.74	6	20	15	.633"	1.94
C	"	.166"	1.75	9	30	15	.633"	2.05
D	"	.151"	1.75	12	40	15	.633"	2.25
E	"	.139"	1.75	15	50	15	.633"	2.44

Material was hand fed to make the above tests. Material flows very sluggish and erratic. Weight will not hold reasonably constant even with hand feeding. Material also tends to puff badly out of die cavity. This would be still worse with a tapered die unless underfill is used. Bottom edge of tablets tend to flake and crack off due to the high expansion factor. Tablets are all good. Strong but those made at 40 TSI and upwards are extremely hot and hard as ejected. They all tend to soften if exposed to atmosphere moisture for any extended period of time. The above samples were immediately sealed in brown bottles for customers evaluation. Tablet density (3.42) calculated from customers data appears to be in error. See attached pressure density chart.



Mr. Simon

(3)

Dr. C. Calmon

W. T. Grundner — Birmingham

Desalting Capacity of Silver Impregnated 4A Molecular Sieves — Nov. 2, 1964

Two samples of Linde 4A Molecular Sieves were received in the laboratory. They were identified as follows:

Sample	Type	Size	Wt.	Lot No.
(1)	4A	Powder	-	45242
(2)	4A	Cake	2 lbs.	440594

The second sample was wet i.e., moist enough to feel damp.

The samples were impregnated with silver after first being treated with 5% NaOH. The capacities of the materials were found to be as follows:

Sample	pH of Soln.	Final soln. after treat. Cl conc. (ppm as $CaCO_3$)	Na conc. (ppm as $CaCO_3$)	TH conc. (ppm as $CaCO_3$)	Capacity (meq/gm) Cl	Cations
(1)	10.0	3074	4400	1280	4.31	4.30
(2)	9.8	4032	4000	2160	4.14	4.05

W. T. Grundner

WTG:mhm

cc: Mr. E. Zink
Mr. G. P. Simon
Dict. file
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Mr. Simon

(10)

Dr. C. Calvon — 5004

W. T. Grundner — Birmingham

Desalting Briquets for NASA Kits — Nov. 4, 1964

The capacity for chloride of several of the briquets prepared by the F. J. Stokes Company (WTG to CC 10-26-64) was determined at 32°F with a 60 minute contact period. It was found that there was an increase in capacity of those briquets formed at higher pressure of 6.6-9.8% when this longer contact time was employed.

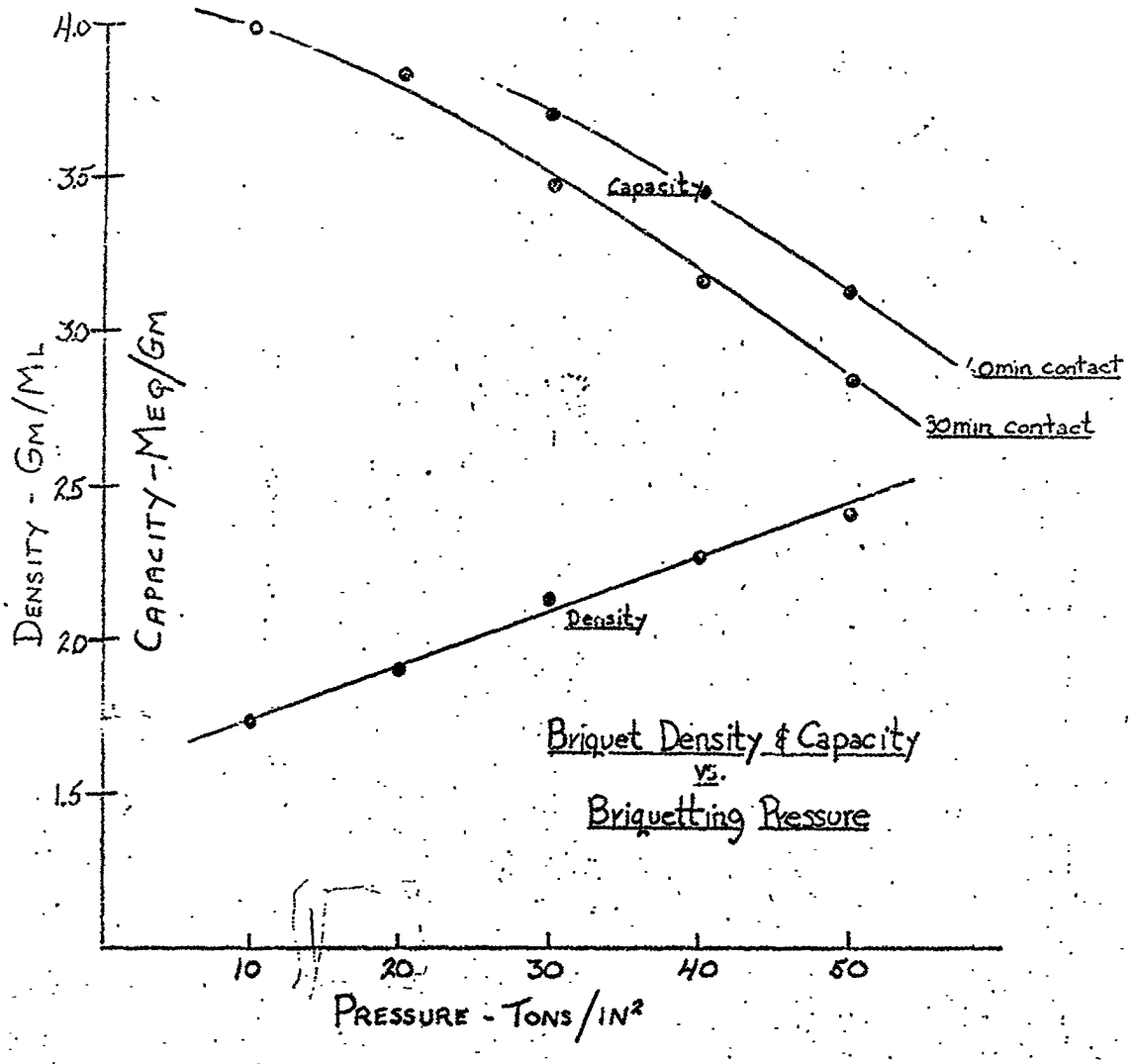
Briquetting Pressure	Capacity at 32°F (meq./gm.) (a) 30 min. contact	(b) 60 min. contact	% Improvement $\frac{(b)-(a)}{(a)} \times 100$
TSI			
30	3.48	3.71	6.6
40	3.16	3.46	9.5
50	2.85	3.13	9.8

W. T. Grundner

W. T. Grundner

WTG:mbm

cc: Mr. C. Simon
Mr. E. Zink
Dist. file



Briquet Density & Capacity
vs.
Briquetting Pressure

Briquets Prepared From Standard NASA Blend
By F.J. Stokes Company

Mr. Simon

(18)

Dr. C. Calmon | 5004

W. T. Grundner | Birmingham

Desalting Briquets for NASA Kits | Nov. 6, 1964 .

The capacity for chloride of several of the briquets prepared by the F. J. Stokes Company (WTG to CC 10-26-64) was determined at 32°F with 4 hour contact time. It was found that there was some increase in capacity but at a diminishing rate as compared with that obtained on increasing from 1/2 to 1 hour.

Briquetting Pressure TSI	Capacity at 32°F (meq/gm) (a) 30 min contact	(b) 60 min contact	(c) 4 hr. cont.	% Improvement 60 min. $\frac{(b-a)}{a} \times 100$	4 hr. $\frac{(c-a)}{a} \times 100$
30	3.48	3.71	—	6.6	—
40	3.16	3.46	3.67	9.5	16.1
50	2.85	3.13	3.42	9.8	23.5

The accompanying graphs show these relationships.

W. T. Grundner

WTG:hm

cc: Mr. C. Simon
Mr. E. Zink
Dict. file
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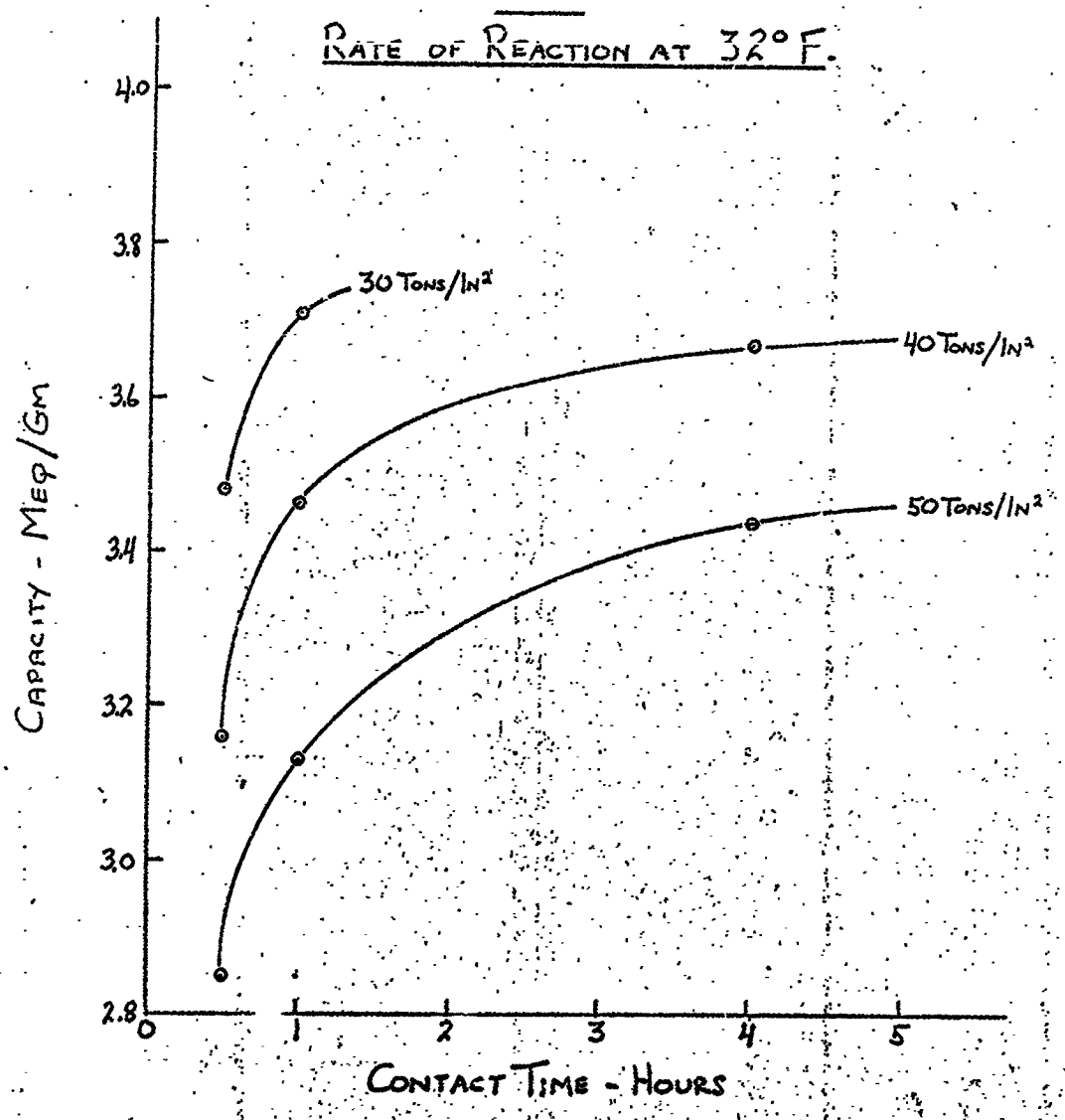
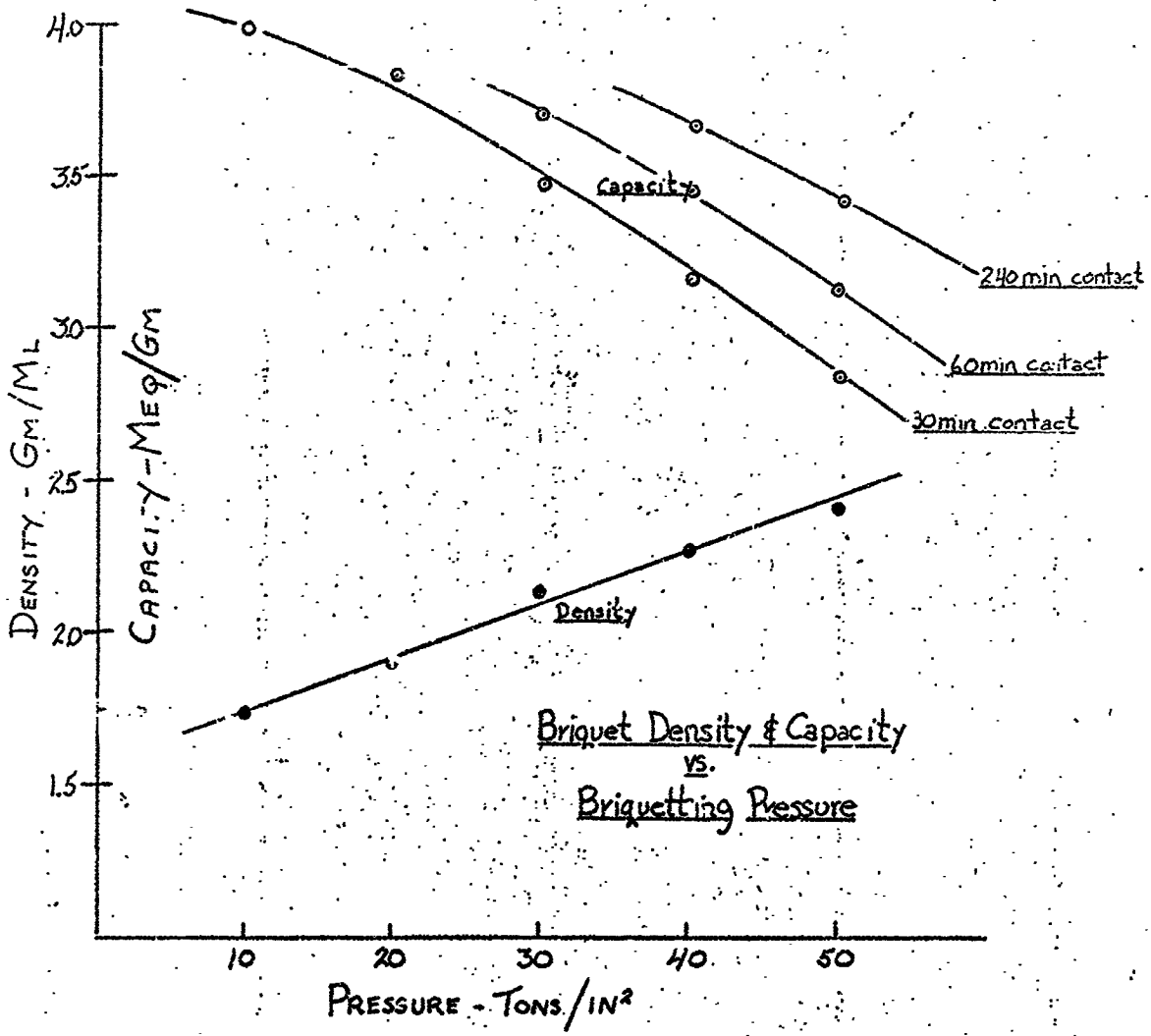
BRIQUETS PREPARED FROM STANDARD NASA BLEND
BY F. J. STOKES COMPANY

RATE OF REACTION AT 32° F.





Briquet Density & Capacity
vs.
Briquetting Pressure

Briquets Prepared From Standard NASA Blend
By F. J. Stokes Company

FIGURE 1

U.S. JOINT MILITARY SPECIFICATION MIL-C-

DETAIL OF ... SECTION

... SEAL CAN

OPEN TO USE AS HANDLE

LANYARD RIVET

DETAIL OF LANYARD ATTACHMENT

HINGE

HOLD - PIN

SPOT WELD

LANYARD RIVET

3 3/16"

2 1/16"

4 15/16"

5 1/4"

IONAC CHEMICAL CO.
BIRMINGHAM, NEW JERSEY

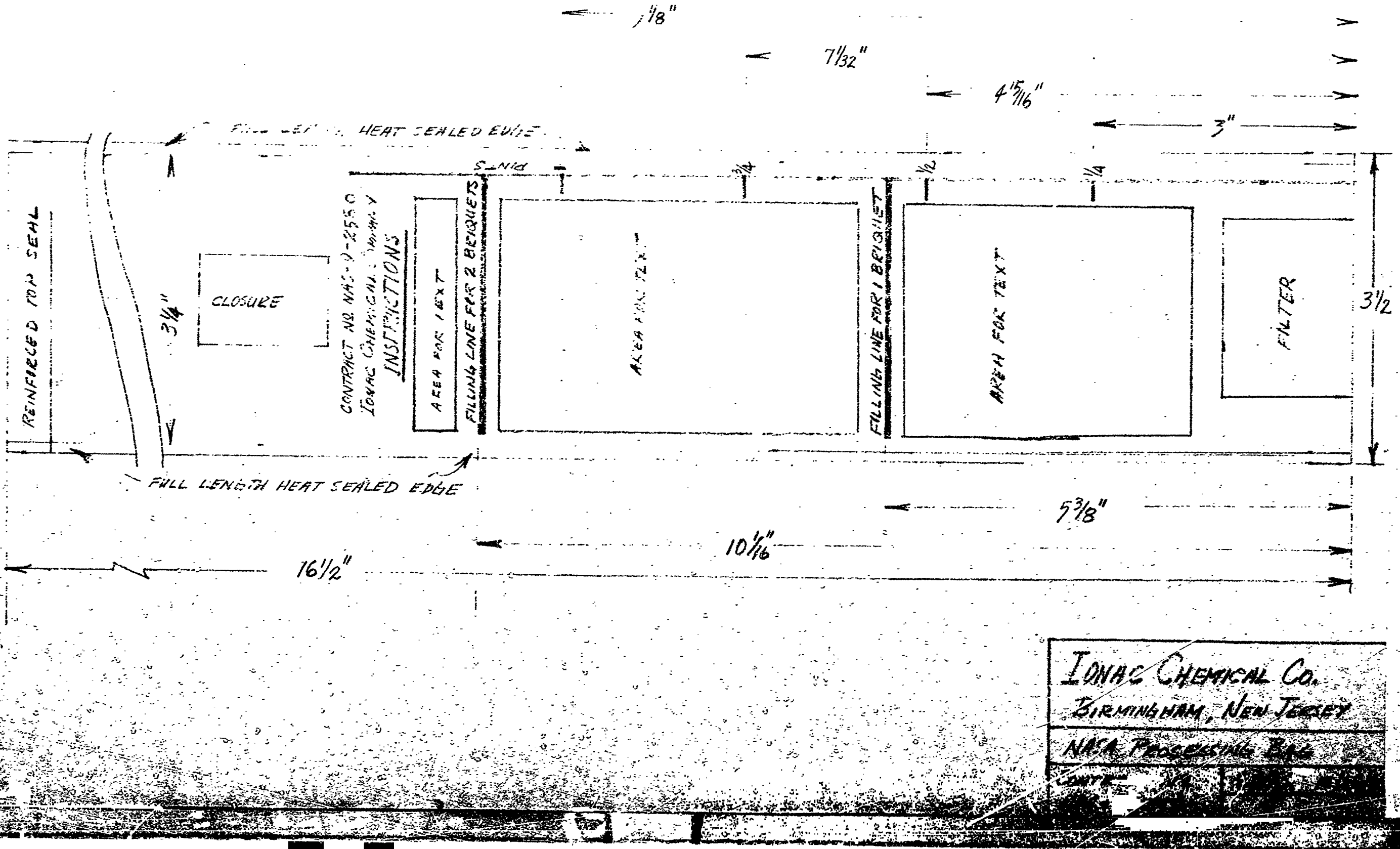
NASA CONTAINER

CONTRACT NO. NAS 7-[illegible]

421

FIGURE 2

CALIBRATION CURVE-SHOWING EFFECT OF HEAT SEALED EDGE



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BIRMINGHAM, NEW JERSEY
NASA PROCESSING BAG
DATE
NO.