BOWEN ENGINEERING, Inc.

SPECIALISTS IN DRYING EQUIPMENT SINCE 1926

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E. I. duPont de Nemours & Company, Inc.
Newport Pigments Plant
Newport, Delaware

Attention: Mr. Earl Jex
Mr. D. H. Eastham

Gentlemen:

This is to report spray drying test LB-66-2724 conducted on the Bowen Conical Bottom Laboratory Spray Dryer located at North Branch Station, New Jersey. Mr. Earl Jex represented your firm when your CPC pigment in kerosene was processed.

During the spray drying trials we used indirect gas heat and low dryer feed rates so as to stay below the lower explosive limit of the kerosene material. The objective of the spray drying test was to drive off the kerosene water and water in the slurry to prepare a solvent-free dry powder. We also were to determine the optimum drying temperature conditions to prepare material containing less than 1/2% by weight of residual kerosene. In general we found that the pigment dried very readily but that in order to eliminate the kerosene down to the low level desired we had to maintain dryer outlet temperatures in excess of 400°F. The maximum inlet temperature available, using our indirect gas heater assembly, was 550°F. We found that by recirculating the spray dried powder through the equipment we could hold sufficiently high temperatures to remove practically all of the kerosene.

The test results indicate that in order to remove the kerosene in the material down to less than 1/2 of 1% it will be necessary to hold dryer exit gas temperatures in the neighborhood of 450°F. If a two-stage operation is considered it will be possible to hold high dryer inlet temperatures as dictated by the materials of construction of the indirect air heater and relatively low exit temperatures in the neighborhood of 250°F. This powder, then containing 4 or 5% volatile, could be processed through a small secondary drying system to remove the volatile down to the desired level.

We simulated this during Runs 4 and 8 where we took powder that had been processed through the spray dryer in Run 4 and which contained 4% volatile, and then repassed this through the drying chamber as a dry powder using high exit temperatures. This secondary treatment brought the final volatile content well within specification. Another method of handling this job would be to

handle the original feed material as a filter cake at approximately 40 to 50% solids in a dispersion dryer. This material would then have to be taken out as a relatively dry powder at perhaps 90% solids and passed through a second dispersion dryer where a rotating wheel could break the material up. This secondary treatment would remove the last traces of volatile. This operation was simulated during Runs 6 and 7.

TEST DISCUSSION

(A) Feed Handling

As noted on the data sheet during the first four spray drying runs we processed a diluted filter cake which was diluted from approximately 42% solids to 28% by adding kerosene. We dried this slurry under a range of drying gas temperatures and established that in order to dry the material to the level desired by the customer, the exit gas temperature would have to be above 425°F. The maximum exit temperature we could achieve using our indirect air heater was approximately 425°F.

In Run 4 we demonstrated that the material could be dried at dryer exit temperatures as low as 235°F with good equipment conditions existing. The first four runs indicated to us that a single stage spray drying operation would necessitate holding excessively high exit gas temperatures in order to remove the kerosene to the level desired by the customer. They also indicated that the material dried very well in the system and that low exit gas temperatures could be used if capacity was desired from a spray drying system. We wanted to produce material at a low exit temperature in order to have material to study for a two-stage drying step and this was also an objective during Run 4.

In Run 5 we took some of the powder produced during Run 4 and recirculated it as a powder through the drying chamber. This second treatment of the material brought the product volatile down close to product specifications.

In Run 6 we took some of the original filter cake and fed it through a funnel and into the drying chamber to observe what might be produced in a dispersion type dryer. The product from Run 6 contained approximately 39% volatile and this material was relatively free-flowing.

In Run 7 we took Run 6 powder and repassed it through the drying chamber at high temperatures. During Run 8 we took Run 4 cyclone powder and repassed it through the drying chamber again at high temperatures. We were able to use high temperatures during Runs 7 and 8 due to the use of the direct gas heater. We used direct gas during Runs 7 and 8 since we had eliminated most of the kerosene from the powder and the hazard would be substantially less. Runs 7 and 8 were both successful in that they both produced a powder relatively free of solvent.

The samples of dried material were returned with your company representative at the conclusion of the testing. When you have completed your evaluation of the samples, we would appreciate your completing and returning to us the enclosed questionnaire, keeping one copy for your files. This questionnaire will aid us in future test work or equipment design for your materials.

Enclosed with this report is a summary of data obtained during these runs.

We wish to thank you for the opportunity of rendering you this test service. Should you desire further information concerning the application of spray drying to your products, please contact our Mr. Ronald W. Bayliss or our representative in your area: T. E. Grimme Company, P. O. Box 7, Cherry Hill, New Jersey 08034. Telephone: 609 - No 3-4900. Our representative will contact you within a short time to arrange a meeting to review the test results and discuss future steps that you may wish to take.

Very truly yours,

BOWEN ENGINEERING, INC.

Richard S. DeHoff, Manager
Test & Development Department

RSD/mp

Enclosures: Questionnaires
Test Data Sheet

E. I. duPONT de NEMOURS & COMPANY, INC.

CPC PIGMENT IN KEROSENE

TEST NO. LB-66-2724

TEST DATA SHEET

RUN NO.	1	2	3	4	5	6	7	8
FEED CONDITIONS:								
Identification	CPC pigment in kerosene →							
Feed Make-Up	Diluted filter Cake →				Run 4 Cyclone Powder	As Received Cake	Run 6 Cyclone Powder →	Run 4 Cyclone
Type	Slurry →							
Wt. % Solids	28.0 →				96.0	42.0	61.0	96.0
Spec. Gravity	0.963 →				-	-	-	-
Temperature °F	Room →							
Pressure (psig)	No Record →							
Feed Rate cm/min	100	100	50	150	50 gms/min	240	245	100
Product Volatile Wt. %	1.0	0.6	0.6	4.0	0.3	33.0	0.0	0.0
OPERATING CONDITIONS:								
Inlet Temp. °F	393	545	550	300	520	570	700	550
Outlet Temp. °F	305	410	425	235	415	450	525	445
Type Heat	Indirect Gas →						Direct Gas →	
Atomizer Type	Cocurrent 2 Fluid Nozzle →					None →		
Atomizer Description	SS#5M →				None →			
Atomizing Force, Air Press. psig	100 →							
Cold Air Utilization	None →							
Chamber Conditions	Light, Loose Accum →			Clean →				
MATERIAL BALANCE:								
Cyclone Collector, gms	140	95	65	470	55	515	240	70
Chamber Wall, gms	5	5	1	-	-	-	-	-
Total Collected, gms	145	100	66	470	55	515	240	70
Total Feed, cc	640	900	380	2000	100	720	370	100