BUSINESS CONFIDENTIAL R&D File MONTHLY REPORT

MEMORANDUM

RECEIVED
SEP 9 1968
R. N. Wheeler

TO: Dr. C. K. Fink

FROM: L. G. Krauskopf

DATE: August 28, 1968

SUBJECT: Vinyl Resins and Plasticizer Summary - Tarrytown Technical Center
August, 1968

CALENDERING, FLOORING AND RECORDS

VINYL SUSPENSION RESINS FOR CALENDERING (333 S 90)

1. VINYL CHLORIDE - ETHYLENE COPOLYMERS

The vinyl chloride-ethylene copolymers are being evaluated for heat and light stability as a function of molecular weight and ethylene content. Stability studies are complete, except for the long term light stability program. Initial light stability data will not be available until November.

The static oven test was employed to determine the stabilizer effect on ethylene copolymers with respect to heat degradation. Barium/cadmium and barium/cadmium/zinc stabilizer systems showed a definite loss of heat stability as a function of ethylene copolymer level in the medium molecular weight resins (I.V. = 0.95 - 1.00). This was further established when the formulations were compared in the high speed mill test. Both lead and tin stabilized compositions showed that high level (1.5%) of ethylene copolymer had no effect on initial color and only a slightly detrimental effect on ultimate heat stability.

(J. A. Young)

2. HAARTZ AUTO FABRICS, ACTON, MASSACHUSETTS

This customer has reported difficulty with respect to die-lip hang-up, in the extrusion of vinyl sheeting from a dryblend based on QSAP-7. The problem had generally been considered a "necessary evil" by Haartz until it was found that Geon 102 EP F5 was significantly less troublesome than QSAP-7. The Texas City Resins Laboratory is investigating various modifications of UCC resins with respect to the problem. It is expected that if no obvious cause and effect is established, the solution of the problem could entail a lengthy application Research and Development study. Meanwhile, at the customer's request, we are shipping a five pound sample of BAKELITE® resin QYSL-7.

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FLOORING PLASTICIZERS (333 R 50)

1. EFFICIENCY RATING - FLEXOL 128 VS. BBP IN VINYL ASBESTOS TILE

Evaluation of PM 4959 (63% DIDP, 32% FLEXOL 128, 5% EPO) at GAF's Houston plant resulted in the claim that it was approximately 10% less efficient than its BBP counterpart. As a result an efficiency comparison of the pure esters (FLEXOL 128 and BBP) were redetermined in vinyl asbestos tile. Results of this work are documented in the writer's August 15, 1968 memorandum to W. H. Bauer. Based upon this study employing plasticizer and binder at various levels, it was concluded that BBP is between 1.4% and 3.5% more efficient than FLEXOL 128. This is considered almost negligible and confirms the original evaluation made by L. G. Krauskopf.

(R. P. Braddicks)

2. EFFICIENCY AND COSTING OF PM 4959

As an assist to sales promotion, formulation costs of PM 4959 vs. GAF's standard blend were computed assuming a 7.5% loss of efficiency for FLEXOL 128 substitution. (Ruberoid's original claim calculates as 7.5% loss of efficiency.) These calculations have been collated and reported in R. Braddick's memorandum to W. H. Bauer dated August 12, 1968. Analysis of these costs shows that efficiency of plasticizer affects ultimate tile costs in a very minor manner. The fact that the customer spends more for plasticizer but less for resin results in a stand-off of pound volume cost for the finished product. Essentially this means that with FLEXOL 128 proposed pricing, GAF's claim of 7.5% efficiency loss does not warrant its rejection on a cost basis.

(R. P. Braddicks)

3. UCANE® ALKYLATES AS VINYL ASBESTOS TILE PLASTICIZER EXTENDERS

Two selected fractions of UCANE Alkylate LR have been evaluated as plasticizer extenders for Vinyl Asbestos Tile. The results of this study have been reported in a Project Report dated August 8, 1968, File No. 68-256. These findings suggest that the combination of these two fractions would serve as a practical and economical extender matching the performance of the competitive product XF-125. Critical analysis of the data indicates water sensitivity of Canadian Asbestos containing tile is increased with the use of these products. Caldria asbestos made tile did not exhibit this defect. Additional work is scheduled comparing water sensitivity of tile made with FLEXOL 128, extended FLEXOL 128, BBP and extended BBP. The study will also compare these plasticizer systems with Canadian as well as Caldria asbestos containing tile.

(R. P. Braddicks)

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4. VINYL PLASTICS INC. TANK LINING COMPOUND

Vinyl Plastics, Inc. has requested an analysis of a tank lining compound, a sample of which was submitted via G. L. Casiello. Plasticizer type and amount as well as type of stabilizer system are to be provided. Work to date indicates the plasticizer is NHDP and is employed at a level of approximately 33% of the compound. Based on Specific Gravity and percent plasticizer, it is reasoned that the stabilizer system is probably lead based. The Analytical Department has been requested to check for lead. The customer believes this information will assist in formulating a lower cost compound.

(R. P. Braddicks)

5. FLEXOL 128 - WATER SENSITIVITY

Stocks used to rate the efficiency of FLEXOL 128 vs. BBP in vinyl asbestos tile were used to determine the water absorption properties of these two esters. Results derived indicate FLEXOL 128 is definitely poorer in water resistance than is BBP in tile compositions. Because of the extreme importance of this performance property in flooring compositions, this study will be expanded.

(R. P. Braddicks)

WIRE AND CABLE

PLASTICIZERS FOR WIRE AND CABLE (223 T 50)

1. ROME CABLE CORPORATION, ROME, NEW YORK

Mr. Stewart Barrett of Rome requested the writer to assist him in determining the reason for poor insulation resistance in wire made using certain lots of di(tridecyl) phthlate. Mr. Barrett has narrowed the cause of the problem to the plasticizer and sent samples of two bad lots and one good lot for our inspection.

(E. B. Harris)

2. OMNI CHEMICAL, UNION CITY, NEW JERSEY

Plans are underway to introduce FLEXOL 63 (DOP/Cereclor 42) to this customer in place of FLEXOL 62 (FLEXOL 10-10/Sohio CD-101) in order to reduce our product line without impairing UCC's position as a supplier. It has been determined that FLEXOL 63 is about ten percent more efficient than FLEXOL 62 in electrical insulation type formulations.

(L. G. Krauskopf)

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MOLDING AND EXTRUSION

VINYL SUSPENSION RESINS FOR MOLDING AND EXTRUSION (211 V 90)

1. SALEM PLASTICS COMPANY, SALEM, MASSACHUSETTS

Analytical tests have been concluded on samples of extruded strips from Salem Plastics. The results indicate that the inferior color of BAKELITE® Resin QSAN-7 - Blend 346 as compared to Diamond PVC 450 is a result of the lack of violet toner in the QSAN-7 sample. No heat stability problem was found with the QSAN-7 strip; in fact, it was found superior to the Diamond 450 strip on a gradient temperature hot bar. A Project Report is being prepared.

(T. A. Grillo)

PLASTICIZERS FOR MOLDING AND EXTRUSION (211 V 50)

1. GEAUGA PLASTICS, CRESTLINE, OHIO

A Project Report was prepared reporting the results of the polystyrene marring tests conducted at Geauga Plastics.

(T. A. Grillo)

SPECIAL PROJECTS

DRYBLEND EXTRUSION RESIN (347 B 20)

1. Performance evaluation of QSAN-7, Blend 1750 (I.V. = 1.02, 0.68% C_2H_4) is still in progress but at this point Blend 1750 appears to be a good competitor to Diamond 450 and preparations are underway to introduce Blend 1750 to Hatfield Wire and Cable for a plant trial in their dryblending operation. Laboratory work is in progress to resolve the question of heat stability of ethylene modified QSAN-7 type resins in vinyl granular compounds for the wire and cable market.

(L. G. Krauskopf)

2. Work continues with the thermally programmed No. 6 roller head (Brabender Plasti-Corder) to characterize both UCC and competitive wire and cable resins as a function of plasticizer interchange. Dry blend grade resins, based on 30 PHR plasticizer as the only formulating variable, show significant differences with respect to processing characteristics as defined by a plot of torque vs. temperature. Compound temperature is ploted from 60°C until fusion. The most dramatic polymer to date is the Geon 102-EP-F1 based on 30 PHR 13-13 which holds the lead as a good dry blend polymer while ultimately showing a marked improvement in the fusion characteristics of the polymer.

(A. W. Conkling)

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3. Efforts to develop a dryblend grade resin that is equivalent or superior to the Geon resins have directed our attention toward understanding the "F" designation employed by Goodrich. One field report indicates that the "F" identifies the suspension formula or process; another report implies no pattern exists - yet field experience indicates that molding and extrusion customers observe differences in processability as a function of the "F" designation, although no obvious differences are apparent in the character of the resin particles. We have collected a series of Geon resins representing six different "F" designations. Samples are being forwarded to South Charleston Research and Development for analysis of extractables.

(L. G. Krauskopf)

HENSCHEL SCALE-UP RUN

A dryblend trial on a 400 lb. Henschel mixer at Prodex Corporation in Fords, New Jersey has been scheduled for August 29th. The run is designed to accumulate data on large scale equipment for correlation with smaller equipment. Also coming out of the run will be information on the dryblending characteristics of BAKELITE Resins QSAN-7 Blend 1750 and Blend 111 as compared to Diamond PVC-450 and Dow QX-3596. (T. A. Grillo)

PLASTICIZERS DERIVED FROM CAPROLACTONE (451 N 11)

1. Blends of polycaprolactone and PVC with and without a norbornene crosslinking agent have been calendered at Tarrytown and irradiated with an electron accelerator at Sterling Forest. These systems are now undergoing a time study on physical properties using DOP and polymeric plasticizer based formulations for comparison.

(E. B. Harris)

2. Analytical work aimed at defining what product resulted from the milling of epsilon-caprolactone monomer with PVC has not been completed. Cursory attempts to produce the same product in glassware were unsuccessful. It was determined that the reaction of caprolactone with HCl is very dependent upon the concentration of water present when the water is present in small amounts. No appreciable reaction occurred in an anhydrous system at 160°C.

(E. B. Harris)

PLASTICIZER SYNTHESIS (ALLOCATED)

1. NORBORNANE TRIESTERS

In order to determine the effect of the stereochemistry of the anhydride group in 5-norbornene-2, 3-dicarboxylic acid anhydride, on the ease of addition to the double bond, the endo compound was rearranged to the exo by heating at 190°C. Further reaction with 2-ethylhexanol led to the diester. Because of an improved vacuum distillation apparatus, it was possible to distill this diester. Previously this had not been possible. The addition of acetic acid to this compound has been carried out and is now in the process of work-up.

(S. Solomon)

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2. ALDEHYDE-EPOXIDE REACTION

The reaction of an aldehyde with an epoxide under free-radical conditions could theoretically lead to the formation of an ester. A preliminary search of the literature revealed that such a reaction has not previously been attempted. The availability of olefins such as styrene, cyclohexene, stilbene and those used in the Oxo reaction, along with the oxidizing capabilities of the Taft plant could make epoxides useful intermediates in ester syntheses should the above reaction prove successful.

In this connection, n-heptaldehyde was reacted with stilbene oxide at 150° C in the presence of a catalytic amount of di-t-butyl peroxide. Examination of the infra-red spectrum of the product indicates the presence of a heptanoic acid ester, however, the alkyl portion of the ester has not been determined as yet.

(S. Solomon)

3. BUTYL BENZYL PHTHALATE DIMER

If two moles of the monobutyl ester of phthalic acid are treated with one mole of stilbene oxide, it could theoretically lead to di-n-butyl, 1,2-diphenyl ethylene glycol bis-phthalate. This compound is essentially a dimer of butyl benzyl phthalate. It should have all of the chemical properties of the monomer, however, with its increased molecular weight should show a markedly decreased volatility. The monoester acid has now been prepared and the reaction with stilbene oxide will soon be carried out.

(S. Solomon)

L. G. Krauskopf:bm

L. G. Krauskopf /bm

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