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R. N. Wheeler

TECHNOLOGY MANAGER'S REPORT

TO: Mr. C. R. Field

BUSINESS DEPARTMENT 22
BUSINESS AREA 223

FROM: F. A. DeMelio

DATE: November 1, 1967

OCTOBER 1967

WIRE AND CABLE MATERIALS

HIGHLIGHTS

HFDA-5608 Rome Cable (5000 lbs.) and Phelps Dodge (3000 lbs.) are the first to order sales quantities of our new natural copolymer vulcanizable power cable insulation, HFDA-5608 Natural. A 30,000 pound production run is scheduled for early November, and a New Product Data Bulletin is in press. (A. A. D'Onofrio)

Ocean Cable Insulation Tests for contamination and electricals on the first two hopper cars loaded at Perth Amboy showed excellent quality, easily meeting Western Electric specifications. The first shipment will be about November 1. (R. J. Turbett/T. Hazen)

Polysulfone Film for EHV Cable Insulation General Cable's laboratory has confirmed our results which showed the most recent production of polysulfone film to have excellent electrical properties. Based on these results, General Cable has requested and received 80 pounds of 5 mil PSF film for further evaluation as a power cable wrap. (J. J. Helbling)

MIL-C-3702 Wire Insulation As reported last month, Y-3755 has passed Eltra Corporation's testing against MIL-C-3702. The second step toward approval at Eltra is a successful 100,000 ft. run of wire. This is planned for sometime in November after the necessary 2,500 pounds of base has been prepared and tested at Sistersville. (D. B. Braun/W. W. Foster)

Research and Development Department
Chemicals and Plastics
Union Carbide C rporation
Bound Brook, New Jersey

Polyethylene for Power Cable
Bound Brook (F. A. DeMelio, A. A. D'Onofrio)
October 1967

HIGH VOLTAGE INSULATIONS

1. HFDA-4208 Natural

Laboratory experiments confirmed Kaiser's findings that the September shipments of HFDA-4208 Natural were somewhat more sticky (power whitlockability) than the initial material approved by Kaiser. As a result, Production has reverted back to the 80°C peroxide blending temperature. While some stickiness still exists, we believe the present level can be tolerated. Hopefully, further improvement will be realized when this product is produced in the Bay 7N equipment using a larger pellet configuration.

Two recent blends of HFDA-4208 Natural, produced with DiCup "R" and a high melting version of Agerite Resin D polyethylene were a further improvement with respect to the stickiness problem. These materials were sampled to Reynolds in an attempt to solve their screw plate-out and "halo-void" problems. Unfortunately, Reynolds' initial run was of too short a duration to establish whether the plate-out problem was resolved. The answer must await a longer insulation run at Reynolds and further investigation on our part of the cable samples.

J. F. Groel, E. L. Schmidt,
BB Manufacturing Personnel

2. Bound Brook Power Cable Failure

Inspection of the 5KV power cable which failed at the Bound Brook phenol plant did not indicate that the cable failed due to defective raw materials or workmanship, but that the failure was most likely due to a direct lightning strike. Simplex, who produced this cable, used a clay filled vulcanizable as the insulation and although the cable undoubtedly met the Bound Brook purchasing specification, we informed General Engineering that better insulating compounds formulated without clay are available. We agreed to assist Engineering in rewriting their cable specifications if they so desire.

E. L. Schmidt

3. HFDA-5608 Natural (ne HXFD-2604)

Rome Cable (5000 lbs) and Phelps Dodge (3000 lbs.) are the first to order sales quantities of our new natural copolymer vulcanizable power cable insulation, HFDA-5608 Natural. A 30,000 pound production run is scheduled for early November, and a New Product Data Bulletin is in press.

A. A. D'Onofrio

4. Crosslinked Polyethylene Stabilization

Work has been initiated on a program to develop a new antioxidant system for crosslinked low density polyethylene resins.

In view of patent considerations, the goal of this program is to develop an antioxidant with equivalent or better economics than polymerized trimethyl dehydroquinoline (Flectol H) while possessing at least equivalent aging characteristics at 150°C in the pertinent formulations.

W. N. DeMasi

5. DYNH/Allyl Ester of Polymer H Mixtures

Curing rates of mixtures of DYNH and the allyl ester of DXM-234 were determined. Unsaturation supplied by the allyl ester in these mixtures improved the rate of cure over straight DYNH. This was so even at concentrations as low as 25% of the allyl ester.

E. J. Fisher

6. Vinyl Acetate Copolymer (HXFD-2604) Curing Curve

The cure curve of an HXFD-2604 was determined. Deformations of 30% were obtained at 7-1/2 minutes, 175°C cure conditions. This compares to a deformation of 40% with DYNH. It is interesting to note that several of the experimental copolymers screened in our fast curing investigation exhibited faster cure than this known faster curing compound.

E. J. Fisher

7. Fast Curing Resin Report

A report was written which summarizes the results of our fast curing resin screening program. As a result of this investigation it was recommended that more detailed work be done of ethylene/ethylidene BCH and ethylene norbornadiene copolymers.

E. J. Fisher

8. Monsanto Rheometer

Approval for the purchase of a Monsanto Rheometer has been obtained. This instrument should be installed during the last week of November. The utilization of this instrument in crosslinking resin studies is anxiously awaited.

E. J. Fisher

MEDIUM AND LOW VOLTAGE CABLE

1. Underwriters' Submittal of Copolymer Vulcanizables

Evaluation and wire sample production of our second generation black filled vulcanizables continues. Flame tests conducted at Hatfield Wire and Cable confirm our findings that the 40 part black equivalent, HFDA-5625, will need to be coated with flame retardant paint only on the 14 gauge wire samples. Alcan Cable, on the other hand, reports that the 25 part equivalent (only 12% carbon black) HFDA-5612 will have to be painted for all the wire sizes (14-6) being submitted to Underwriters. An 8500 pound production run (Bldg. 14) of HFDA-5612 was completed during this period using dry carbon black directly in the banbury. Preliminary testing is quite encouraging. Part of this production will be used to fill a 1000 pound order for Rome Cable.

E. L. Schmidt, V. Villani

2. Utopia Compound

A small production lot of HFDA-4504 Blk. 9845, the copolymer analog of HFDA-4204 Blk. 9845, was prepared in Bldg. 14. The material will be used to fill a longstanding request of Alcan Cable for a tougher insulation for 5KV unshielded cable. The quality control test results are quite encouraging.

E. L. Schmidt, V. Villani

SEMI-CONDUCTIVE POLYETHYLENE

DHD-7240 Blk. 55 Semi-Conductive - Moisture Pickup

Tests run at room temperature and 100% relative humidity indicate that DHD-3240 Blk. 55 picks up approximately 40% more moisture than DHD-7702 Blk. 55. While field trials have demonstrated that DHD-3240 can be extruded without voids, there is no question that customers with borderline drying facilities will have more problems with this new product than with DHD-7702 Blk. 9845.

J. F. Groel

Technical Service - Hatfield Wire and Cable

As a courtesy to Hatfield Wire and Cable, mechanical and electrical properties were obtained on samples of both semi-conductive and non-conductive rubber type.

J. F. Groel

TRACK RESISTANT INSULATIONS

Alcan extruded a cable from HXFD-3509, our new crosslinked track resistant EVA copolymer compound. Their reports on extrusion performance and preliminary electrical tests have been very good. Russ Havourd of N. J. Public Service has received the cable and started characterization tests. In an initial test at Westinghouse for impulse strength, the -3509 cable was compared to comparable constructions made with:

1. Butyl-neoprene.
2. Conventional filled vulcanizables.
3. Blue-grey VPE (HFDA-4215).
4. A high/low density polyethylene composite with a semi-conductive strand shielding.

All the constructions failed at approximately the same voltage stress except item four which was significantly higher. We question the validity of the test since the materials differ greatly in basic electrical properties and degree of filler loading.

Hatfield Wire and Cable has also received -3509 and will produce a cable (#2 AWG with 10/64" wall) for dynamic testing by Baltimore Gas and Electric in an actual spacer cable installation.

In addition to the aforementioned, Olin Conductors will be sampled with HXFD-3509 in the near future.

E. L. Schmidt

AUTOMOTIVE INSULATIONS

1. Battery Cable Insulation

All of the needed raw materials to make an experimental battery cable insulation for Packard Electric have been received. Pilot plant production of this compound will be delayed for at least four weeks, due to heavy scheduling and an extended vinyl run.

E. L. Schmidt

2. HFDA-4730 Natural

A small experimental run in the Bay 17 #4 FCM demonstrated that an excellently dispersed intermediate product (HFNA-4930 Natural) could be prepared in a continuous mixer. This bodes well for the ultimate transfer of this product out of Bay 3 and into the more productive Bay 6.

V. Villani, M. E. Fishtein,
A. A. D'Onofrio

Trips

10/5	E. L. Schmidt A. A. D'Onofrio	General Cable, Bayonne	Cooperative R&D Programs
10/16	E. L. Schmidt	Triangle Cable, New Brunswick	HFDA-4340 Technical Service
10/17	E. L. Schmidt A. A. D'Onofrio	Phelps Dodge, Yonkers	New Power Cable Products
10/27	A. A. D'Onofrio	Essex W&C, Marion, Indiana	Power Cable Seminar

Visitors

		Hosts	
10/25	Dr. Itoh Nippon UNICAR	J. F. Groel A. A. D'Onofrio J. J. Helbling	Power Cable, Communications Cable

TELEPHONE CABLE

High Density Polyethylene Jackets

1. Ocean Cable Jacket

Shrinkage tests run on DGDJ-3469 extruded as pipe and as a heavy wire coating have confirmed the high shrinkage levels (~ 70%) obtained by Cables de Lyon.

Extrusion as pipe does not appear to be a satisfactory method for comparing resins for shrinkage because of the cold water quench, but wire coating with gradient cooling should be useful:

	% Shrinkage*	
	As Pipe	As Wire Coating
DGDJ-3469	73	68
Phillips TR-201	66	-
8484-109-1	68	57

* 1.5" specimens cut from extruded samples (machine direction) and heated 1 hour at 145°C.

TR-201 is the compound in competition with our DGDA-3110 at CdL and WE. Shrinkage with TR-201 is normally around 50% on ocean cable.

Compound 8484-109 was made from a double-compounded S copolymer. The effect of shearing the high molecular weight tail is apparent from the reduced shrinkage as wire coating.

If S-9 copolymers (to be evaluated soon) do not offer reduced shrinkage, the double compounding route will be considered for improving J-3469.

R. J. Turbett

2. DGDJ-3466 Blk. 9845 - Whitney Blake

A visit was made to Whitney Blake to assist them in eliminating blows or skips in the jacket when extruding DGDJ-3466 Blk. 9845. We believed the blows were caused by inadequate drying. The problem appeared resolved when the air temperature of the hopper drier was varied to 225°F and the stock temperature of the exudate was reduced to 440°F. However, the customer has just reported further problems with blows in the jackets, indicating that moisture may not be the only culprit. Competitive products reportedly, do not give this problem.

J. F. Groel

Low Density Polyethylene Jackets

1. Improved DFDC-0506

One-fifth to 1/3 of the DXH-28 in DFDC-0506 has been replaced with DFDA-0363, a 1 melt index stirred reactor resin. The DFDA-0363 reduced the brittle failure level at -76°C from 20% to approximately 10%. It raised the melt index from 0.25 to 0.35. Stress crack resistance was borderline due to failures with slow cooled samples in Hostapal. The DFDA-0363 will be evaluated to raise the melt index of the low melt index direct antioxidant injection DXH-28. Outstanding brittle temperature and environmental stress crack resistance properties are predicted for this mixture along with good extrudability.

N. M. Burns

2. Competitive Evaluation

The properties of the Dow jacketing resin 862 have been screened. Dow 862 has a vinyl acetate copolymer odor and the glossy appearance common when a wax is present. Melt index was 0.16. Brittle temperature and carbon black dispersion were borderline.

The IR of fractions of Monsanto MPE-19 and Alathon 1250 have been examined to estimate their composition. MPE-19 is rather similar to DFDC-0506. There is some evidence that the ethylene-vinyl acetate wax is more soluble, suggesting either a higher VA content or lower molecular weight. Alathon 1250 is a vinyl acetate copolymer; both high and low molecular weight fractions contained the same level of vinyl acetate. There is 5% of a very soluble material. It has hydroxyl and ester functionality. We will try to characterize it.

H. M. Quackenbos, N. M. Burns

3. DFDC-0506 Blk. 9845 - Bound Brook

Due to a shortage of resin, several hopper cars of DFDC-0506 Blk. 9845 were produced with rejected DFD-0173 Natural ocean cable compound. While the end product passed the REA-PE-200 specifications, failures were encountered in the Western Electric Brabender Processing Degradation tests. Work is still in progress to determine the cause of these unexpected failures.

J. F. Groel, Manufacturing

4. DFDC-0506 Blk. 9845 - Torrance

The 10 pound sample of Torrance produced DFDC-0506 Blk. 9845 for submittal to Western Electric, Kearny, has been delayed. The sample under test at Bound Brook was found to be borderline in carbon black dispersion. Additional samples have been requested from Torrance.

J. F. Groel, Manufacturing

5. Western Electric Specification 59071
Issue 2 (DFDC-0506 Blk. 9845)

Data were presented Western Electric, Kearny, indicating that the new molding procedure specified in Issue 2 of 59071 does not give more reproducible results than the older methods. The information served no useful purpose as Western is insistent that the new molding procedure be employed. Our main objection was economics; the old method is capable of press automation, the new method is not.

J. F. Groel, Manufacturing

6. Technical Service - International

A crack in a cable from Germany has been evaluated. It is definitely not a slit. It may be either a stress crack or brittle failure. Samples of the cable were cracked by both methods for comparison. The failures all look the same. The material has a 0.5 melt index and poor brittle and stress crack properties.

N. M. Burns

7. Ethylene-Ethyl Acrylate Waxes

Two ethylene-ethyl acrylate waxes have been evaluated in the DFDC-0506 formulation to see how they compare to the ethylene-vinyl acetate wax DXM-197. At best they gave equivalent brittle temperature results to those experienced with DXM-197.

N. M. Burns

8. Stress Crack Resistance - Basic Studies

A study of crystalline structure and molecular weight distribution and how these factors influence stress crack resistance is in progress with J. H. Ross and E. Walter at South Charleston. A recent aim has been to obtain stress cracked samples of DEX-1202, a very narrow molecular weight

distribution resin. Stress cracking this resin is very difficult. Some surface cracks were obtained on samples strained 25% at 104°C and aged @70°C for 18 hours. The usual failure through the whole sample has not been obtained.

N. M. Burns

Low Density Polyethylene Insulation

1. Ocean Cable Trial

An extrusion trial of DFDA-0160 was conducted on October 24 on the ocean cable line at Western Electric, Baltimore. For this purpose, 3000 pounds from current production had been shipped directly from Seadrift.

Although trial conditions were not ideal (wire rope was used to simulate inner conductor), it appeared as if there will be no problems with -0160 in actual production which is scheduled to start December 1.

J. F. Groel, R. J. Turbett

2. Ocean Cable Testing

We visited the Seadrift, Texas plant in connection with electrical testing of DFDA-0160, polyethylene for ocean cable insulation. Molded test specimens of DFDA-0160 were submitted to Bell Telephone Labs on October 7 and have been found to be within Western Electric Company's specifications for dielectric constant and dissipation factor.

Tests for contamination and electricals on the first two hopper cars loaded at Perth Amboy showed excellent quality, easily meeting Western Electric specs. The first shipment will be about November 1.

R. J. Turbett, T. Hazen

3. Ocean Cable - Conductance Standard

We arranged for the fabrication of a calibration standard for very low loss electrical measurements of polyethylene. Bell Labs' design was used. If satisfactory, a second standard will be recommended for the Seadrift plant in the event additional low-loss insulation business is obtained.

R. J. Turbett, T. Hazen

4. Electrical Testing of Low-Loss Polyethylene

Our WC-64-J, Issue 3, for determination of dielectric constant and dissipation factor of polyethylene by the liquid-displacement method, is being revised to conform with Western Electric Company's requirements for tests of low-loss ocean cable compound, DFDA-0160.

T. Hazen

5. Ocean Cable - Antioxidant

We have requested a short plant run to be made at Seadrift to produce DFDA-0160 type ocean cable resin using Irganox 1010 instead of Ionox 330. Ionox will not be available after the first quarter of 1968. Manufacture may be picked up by another company, but this is not certain. Irganox 1010 is, in the opinion of Bell Labs, the only possible substitute. The run is necessary to establish the dissipation factor versus frequency curve, which cannot be properly measured on laboratory-prepared samples. If satisfactory, material will be sent to Western Electric, Baltimore, for a trial length of ocean cable.

R. J. Turbett

6. Ocean Cable, Cables de Lyon

Cables de Lyon, France has encountered serious contamination in ocean cable extruded from DFD-0173 Natural. Samples of the contamination found in the screen pack of their extruder and on unloading the Sealdbin have been analyzed at Bound Brook. Both infrared and mass spectrograph tests confirm that the contamination is GRS type rubber corresponding to that used on the interior of our Sealdbins.

All DFD-0173 is now being supplied in reconditioned Sealdbins and Cables de Lyon has also set up to visually inspect all material prior to entering the extruder.

J. F. Groel

7. Western Electric Insulation

DXFD-3699, a low density insulation compound, designed to replace DFD-2005, has been formulated and submitted to Western Electric. The requirements of this compound are (a) smooth extrusion at a low temperature and (b) compliance with Western Electric spec. 58411, Type 4. If this compound is approved it could represent 300M pounds of incremental business.

In the course of evaluating 2.0 melt index materials for this application, an attempt was made to gain smoothness via addition of "S" high density polyethylene. Rathern than promote smoothness, the "S" additive was found to cause increased roughness when used in low molecular weight polyethylene (melt index = 2.0). The reasons for this reversal will be investigated when time permits.

J. J. Helbling

8. General Cable - DFDA-0197

Aging studies on molded samples of our standard low density insulating compounds show that DFDA-0197 (.1 melt index) retains almost 100% of its unaged tensile, elongation, and brittleness properties after six months at 100°C. This is in contrast to a 50% decline in the properties of DFDA-6030 (.25 melt index) aged under the same condition. These tests are progressing at lower temperatures (60°C and 80°C) but have terminated at 100°C due to a catastrophic oven failure in the testing service laboratory.

J. J. Helbling

9. BTL Samples

Samples of DFD-6505 and DFD-0173 were provided to John Howard of Bell Labs for part of his research program on the stress crack resistance of insulation products.

N. M. Burns

Adhesives

1. Western Electric Adhesive Test

A Western Electric adhesive testing procedure was evaluated. This procedure which simulates the low pressure bonding affected in low pressure cable jacketing operation did indeed show that our electrocoated samples do not bond as well as competitive Zetabon materials.

E. J. Fisher

2. Electrodeposition

In view of recent failures of our electrocoated aluminum samples to provide adequate adhesion at Western Electric, a program has been established to see if the level of adhesion can be improved. Included in this program are:

(a) The electrocoating of low per cent neutralized emulsion of DXM-237.

(b) Electrocating of high neutralization DXM-238 emulsion.

(c) Electrocoating of EVA, EEA, and asphalt emulsions of various Polymer H resins.

(d) Electrocoating an emulsion of a high melt index (over 1000) and 15% AA resin.

E. J. Fisher,
W. L. Wheelwright

3. Silane Coupling Agents in Vinyl Drop Wire Formulations

A program has been initiated to determine if silane coupling agents improve the adhesion of PVC drop wire formulations to copperweld wire. At the present time, sample compounds have been preparedbut no wire extrusions have been run.

E. J. Fisher, H. J. Pazinski,
L. P. Ziemianski

4. DQWB-0301

A complaint from Superior Wire and Cable was received this month indicating that they were unable to get the desired level of adhesion with DQWB-0301 QC 69878 in figure 8 telephone cable constructions. Upon investigation it was established that much of the DQWC-0355 (the same material as -0301) made in the last several months was under reacted. It did not contain enough of the diethyl phosphite adduct in the wax. This could possibly be the reason for the low level of adhesion obtained at Superior.

To help Superior out we immediately supplied them with material which was properly reacted and which also had the proper viscosity. In the future, all blends of DQWB-0301 will be checked to see if they are properly reacted and also if they have a viscosity of at least 1000 cp.

E. J. Fisher,
A. Berkhart

5. Co-mer - EVA Flooding Compound

A hot melt adhesive compound based on EVA-501 has been formulated. This system is a potential replacement for a competitive system now in use by Western Electric Company as a floding compound for telephone cable sheath. Melt viscosity data of the EVA-501 based adhesive system compares favorably with the system now in use - 2,820 cps at 300°F at 100 sec.$^{-1}$ (Newtonian) versus 2,410 cps at 300°F at 67 sec.$^{-1}$ (non-Newtonian).

E.J. Fisher, J.D. Domine

CELLULAR

1. DFDB-6660 Natural - Die Plate-Out Problem

In our program to eliminate or minimize die plate-out we tried a number of additives recommended by the Polymers Department to determine if they would react with the blowing agent residues. We also tried modifying the die surface (chrome plating) to determine if this would reduce the deposits. The results show:

Plate-out of DFDB-6660 was found to occur on a chrome plated wire insulation die as well as the standard hard steel die.

The use of 5% of calcium carbonate physically blended with DFD-6660 showed no die plate-out.

The use of 2-1/2% of Cab-O-Sil physically blended with DFD-6660 showed no die plate-out. A similar blend with .25% Cab-O-Sil showed die plate-out. A sample of DFD-6660 in which 2.5% of Cab-O-Sil was added by hot compounding showed only very slight plate-out. However, the expansion properties were poor and the temperature range to effect expansion was significantly increased.

H. J. Pazinski

2. DFD-4960 - Program to Improve Dissipation Factor

We have initiated a study to improve the dissipation factor of our DFD-4960 at least up to the level of the competitive MPE-27 (Monsanto). The effect of the Santonox antioxidant concentration on dissipation factor at the higher frequencies and the use of different antioxidants are under way. Recent data indicates a serious increase in dissipation factor of the base resin, DXM-254, over recent months. Manufacturing is correcting the problem.

H. J. Pazinski

3. DFD-4960 - Technical Service - General Cable

At the request of General Cable, Bayonne, we have written up an extrusion test as a method for determining the amount of blow in our DFD-4960. Data was also supplied showing the effect of conductor preheat on density and dielectric strength versus density.

H. J. Pazinski

4. DFD-4960 - Technical Service - Saxton Products

Density determinations have been made on a cellular twin lead antenna lead-in wire for Saxton Products. The construction is a green cellular oval shaped primary approximately .120" x .330" which is covered with a yellow cellular jacket to an O.D. of approximately .240" x .450". This is then covered with an aluminum tape shield and a black polyethylene jacket. Densities of .64 on the green and .75 on the yellow were obtained.

H. J. Pazinski

5. DFD-4960 - Technical Service - Belden

At Sales request, we visited Belden Mfg. Co. in Richmond, Indiana, to discuss CATV cable problems they recently encountered. The problems were attributed to processing variables rather than compound problems. We reviewed the necessary precautions that must be taken to ensure good quality cable. This included the effect of equipment variables and extrusion variables which could cause irregularities in the insulation and resulting in suck-outs. We recommended the use of a transducer to pinpoint temperature and pressure variations in the extruder. Since they do not dry the core, we recommended they do so and showed data on the effect of moisture on dissipation factor.

H. J. Pazinski

Trips

10/3 to 10/6	T. Hazen	Seadrift	Electrical testing
10/4	H. J. Pazinski	Belden	Cellular extrusion problems
10/11	R. J. Turbett W. H. Joyce	Western Electric, Baltimore	Discuss extrusion
10/16	R. J. Turbett	Seadrift	Ocean cable

10/17	R. J. Turbett	Houston Eng. Center	H. D. Finishing Team Meeting
10/17	J. F. Groel P. Schultz	Western Electric, Kearny	Specifications
10/17	F. A. DeMelio N. M. Burns	Bell Labs, Murray Hill	General discussion
10/18	J. F. Groel Trainees	Whitney Blake	DGDJ-3466 extrusion problem
10/24	J. F. Groel R. J. Turbett	Western Electric, Baltimore	Trial ocean cable run
10/26	J. F. Groel Trainees	Perth Amboy, Warehouse	Tour and DFD-0173 problems

Visitors

Various	Sales Trainees	W&C Groups	Training

1. MIL-C-3702 Wire Insulation

As reported last month Y-3755 has passed Eltra Corporation's testing against MIL-C-3702. The second step toward approval at Eltra is a successful 100,000 ft. run of wire. This is planned for sometime in November after the necessary 2,500 pounds of base has been prepared and tested at Sistersville. Product Development will assist Process R & D in the preparation and testing of this material and will be present for the wire run at Eltra's plant.

2. U. L. Class 22 Wire Insulation

The problem of surface cracking of our UL wire compound during 410°F heat aging continues to receive major attention. We have found that batches of Y-3805 compound which evidenced no surface cracking during 410°F aging tests conducted early in 1967 now do undergo surface cracking during aging in mid-1967.

While the base involved in these two tests was the same, each was modified the usual Min-U-Sil 10 just prior to testing. This has led us to suspect a change in the characteristics of the Min-U-Sil extender. To date we have found that the Min-U-Sil 10 currently being used has a pH above 8 which makes it considerably more basic than previous batches of this filler which typically run 6-6.5 pH. This lead is now being pursued to determine if the acidity of the extending filler bears any relation to the surface cracking phenomenon.

1. Competitive Resin Analysis

This project has been temporarily delayed awaiting promised resin samples.

E. B. Harris

2. Coleman Wire and Cable, River Grove, Illinois

The resin sample has been received and work will begin on evaluating R3M and S-409 in Coleman's 105° wire insulation application.

E. B. Harris

3. Cerro Wire and Cable, Maspeth, New York

Based on the performance of blends 60 and 46 of QSAN-7, Blend 89 was chosen for future trial at the subject customer. The choice was made on fines level, dry time, median particle size and electricals. Although Blend 89 was good in these properties, it was appreciably slower fluxing than the two previous blends. Because fluxing characteristics are quite critical to Cerro's operation, another blend, number 87, was also reserved for testing by the Tarrytown Laboratory and a trial run by Cerro. Thus, two blends, 89 and 87, will be shipped to the customer in 2,000 pound, bagged quantities.

E. B. Harris

4. General Cable Corporation, New York, New York

QSAN-7, B-46 and 89, have been evaluated, using General Cable's test procedures, for dry time, fluxing characteristics, resin and dry blend flow and fisheyes. Blend 46 was chosen as representative of current production; Blend 89 is exceptionally good on fines level and dry blendability. A presentation of our findings will be made to the customer at which time they will begin their own evaluation.

E. B. Harris

5. Flexol 63

Again, no progress in evaluating oil resistance in TW wire.

E. B. Harris

PVC Compounds for Wire and Cable
Bound Brook (F.A.DeMelio)
October 1967

QFD-9509 - Modification for Reynolds

We have modified QFD-9509 to improve the retention of elongation properties after air oven aging. Laboratory tests on a recent production of Natural to which we added 0.8% A-111 red colorant were very satisfactory. We have recommended that Reynolds evaluate this product.

H. J. Pazinski

PVC Resins, General
South Charleston (J.J.Brezinski)
October 1967

Dry Blends Via a Water-Slurry Process

The water-slurry process has been successfully employed in the laboratory to prepare large "dry blend" agglomerates using a vinyl wire compound formulation provided by Mr. H. J. Pazinski of the Bound Brook Laboratory. When the formulation was employed without a polymeric "agglomerating" agent, the dry blend contained fines and showed no substantial increase in the size of the original resin particles.

In the presence of polycaprolactone diols of molecular weight ranging from 1250 to 2800 or in the presence of polycaprolactone ranging in approximate molecular weight of 10,000 to 350,000, a significant increase in the size of the particles was observed. The agglomerates formed were of about the same size as the samples provided to the Bound Brook Laboratory by O. Barlocker.

Most of the agglomerated particles were more friable (easily reduced to powder by finger pressure) than the O. Barlocker samples. However, the agglomerates formed using polycaprolactone diols 540 and 560 (m. w. of approximately 1250 and 2050 with hydroxyl value of 90 and 56, respectively), the agglomerates were significantly tighter and approached the strength of the O. Barlocker products.

The successful preparation of the agglomerates requires predispersion of all formulation ingredients (other than the resin) into a homogeneous mix. In the successful experiments, the mix was added to the resin slurry (production resin from the Bird centrifuge was employed) at about 80°C. Addition of the mix at a higher temperature resulted in smaller-sized agglomerates.

There appear to be significant differences in the process we have employed in the laboratory and that which we know presently of the O. Barlocker patented process. If these differences are borne out following further review of these patents, as well as of a related patent by ICI (British patent 1,077,230), we may have subject matter for patent consideration.

J. W. Fields, J. V. Koleske

Water Compounding Studies

In cooperative work with John Fields of the Technical Center, several water-compounding tests were made. The procedure used was one which Mr. Fields had worked our earlier, and initial attempts were made in the 10-gallon glass-lined autoclave. Centrifuged QSAN-7 from production was used, since one proposed method for using the technique was to compound in the resin production unit. Wire and cable formulations were used, substituting polycaprolactone for part of the plasticizer.

Compounding runs in the 10-gallon autoclave showed that while earlier runs using dry resin compounded well, runs which began with wet Bird resin would not sorb the additives satisfactorily. In efforts to determine the reason for this behavior, a smaller bench scale apparatus was set up and several tests carried out, but in no case was satisfactory compound produced from wet resin.

Subsequent studies carried out at the Technical Center by Mr. Fields showed that satisfactory results could be obtained if lower molecular weight polycaprolactone was used, and confirming runs in the 10-gallon autoclave are in progress.

R. J. Greer, R. C. Robinson

Polysulfone Film for EHV Cable Insulation

General Cable's laboratory has confirmed our results which showed the most recent production of polysulfone film to have excellent electrical properties. Based on these results, General Cable has requested and received 80 pounds of 5 mil PSF film for further evaluation as a power cable wrap. Because of the agreement between UCC and General Cable data it is now felt that the purchase of a Schering Bridge to monitor the dissipation factor of PSF film will not be necessary.

J. J. Helbling

A small amount of more recently produced PSF P-3500 will be converted into film to determine if the pertinent electrical properties are varying from blend to blend. Since this material (Blend 6718) is questionable with respect to contamination it may also be possible to establish some guidelines for a future contamination specification.

Design has been completed and construction begun on equipment necessary to emboss polysulfone film in-line. With this equipment it will be possible to note the effect of pressure, temperature, and position of the back-up roll during embosssing.

J. J. Helbling, H. W. Pouncy,
W. Egan

Block Copolymer Modified Polysulfone

Employing a reduced drawdown ratio, we insulated wire with the 25% solution blended PSF/block copolymer mixture. The opacity of the block copolymer modified insulation prevents us from visually noting crazes as is possible with unmodified polysulfone. Therefore, dielectric strength tests are being developed to determine to what extent crazing has occurred. Our initial tests have shown the modified material to be somewhat more resistant to crazing than natural polysulfone.

Thus far, we have observed that samples of block copolymer modified polysulfone retain more of their dielectric strength than the natural material after solvent dipping and heat aging. This trend was noted in all the environments tested to date. However, none of these samples were as good as the unimmersed and unaged specimens.

Films of the 25% solution blended modification and a recent banbury mixed 25% composition (B. P. Barth) were prepared in order to evaluate dispersion. Both seemed to be equally well dispersed.

We will try to compare the performance of both the banbury and solution blended modifications on wire. We are waiting for the 50% solution blended pilot plant material to begin optimization studies.

R. R. Porcelli

Noshay Polymer

An attempt was made to coat wire with a polysiloxane/polysulfone block copolymer submitted by A. Noshay. This was the first attempt to fabricate a silicone block copolymer by itself rather than in admixture with polysulfone. The material could not be coated on wire due to its high viscosity and the development of bubbles indicating either decompostion or volatiles. Several other experiments will be conducted on this material in order to better define its properties.

J. J. Helbling

Polysulfone (P-2350)

An unsuccessful attempt was made to coat tinsel wire with PSF P-2350 for use in a telephone retractile cord application. The inability to coat was due to the difficulty in handling the tinsel wire. Another attempt will be made after more delicate handling equipment is assembled.

A sample of PSF insulation on stranded conductor produced by Tensolite was examined to determine the reasons for difficulty in stripping the insulation from the conductor. It was determined that the high stripping force required was due to mechanical interlocking of the polymer in the strands and not due to chemical adhesion. A recommendation was made that heat stripping be used, since processing conditions will not alleviate the problem.

J. J. Helbling

A rather poor sample of AWG 30 wire insulation with P-2350 Blue was examined at the request of Haveg Super-Temp. A brief investigation indicated the possibility that Haveg may have introduced foreign matter and overheated the material during fabrication, since this same blend of P-2350 Blue, when extruded on our equipment, resulted in an acceptably insulated wire.

R. R. Porcelli

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