

gcl
To: R. R. Smith, BA-PVC, Houston

From: Diana B. Fenton, R&D, Austin
Date: October 3, 1989

Subject: FDA Approval of 5305, 5265

interoffice
communication

VISTA

After an extensive review of R&D's and environmental's FDA files, I have concluded that 5305 and 5265 are an FDA approved resins.

According to Keller & Heckman, "the FDA could never hope to write generic regulations for food packaging materials that describe and specifically clear every substance that might be a component or contaminant of the packaging material as a result of every conceivable manufacturing process that yields a suitable resin." Needless to say, the FDA adopted a basic resin doctrine that states "substances such as catalyst chain regulators, chain transfer agents, and all other materials required to produce the basic resin are considered part of the basic resin and not subject to independent regulatory consideration," (Attachment 1 Page 3). Consequently, the clearance given the basic resin automatically clears those substances which are used during the polymerization stage to produce it. It is under this doctrine that Alcotex, 2-EH, 2-Me, etc. are allowed. BPA is also considered as falling under the category of the basic resin. However, Vista chose to do extraction studies of BPA independent of the basic resin doctrine. The methanol and/or ethanol carrier for the additives is also covered under the basic resin doctrine. We do have an opinion letter from Keller and Heckman regarding the use of methanol/ethanol. (Attachment 2).

Isonox-Antioxidant-

Isonox is now being used as a kill agent and is regulated under the basic resin doctrine. As an antioxidant, Isonox had to be approved as a food additive. Isonox is approved as an antioxidant with a use level of 13.3 gal. Currently, we are using 16.0 gal as a combined kill agent/antioxidant. At 13.3 gal, no Isonox was detected in the extraction solvent. The detectable limit of Isonox in the extraction solvent is 4 ppb.

Isonox is not yet FDA approved as an antioxidant for use in flexible resin applications (Attachment 3).

Steam Stripping-

Steam stripping could be regulated under the basic resin doctrine. It is a procedure necessary to bring the polymerization process to commercial completion. Because steam stripping is done to reduce levels of VCM, which is heavily regulated, there

is no commercial alternative but to steam strip. The concern here is minute quantities of chemicals contained within the steam. According to Keller and Heckman, as a general matter "when a small quantity of a substance, usually not exceeding 0.5% of the formulation, is added to accomplish a technical objective in the polymerization process, it is considered as coming within the basic resin doctrine." (Attachment 4).

I do believe Vista should get Keller & Heckman to render an opinion on this subject. However, I feel steam stripping is contained within the basic resin doctrine.

GMS-Lubricant-

Since the drug master file was issued before our change to glycerol monostearate, our use of GMS was a concern. However, GMS is listed in the Code of Federal Regulations (CFR) as generally recognized as safe (GRAS) (Attachment 5). Because of this reason, glycerol monostearate is approved for food contact uses.

Documentation and Audits-

As I see it, this is Vista's weak area. When the FDA audited Georgia-Gulf, the area inspector was interested in documentation on how FDA allowed resins were made and segregated from non-FDA allowed resin. He was also interested in operator training and asked the operators about procedures used when making FDA allowed resins. I recommend we institute procedures to insure the use of proper raw materials, that the system is purged of non FDA allowed resin and that record keeping documentation is in place. A good way to minimize error is to produce only FDA allowed resins.

Recommendations-

- 1) Set up administrative procedures and record keeping to be used during the manufacture of FDA material.
- 2) Define the role of steam stripping. Is it an essential part of commercialization contained in the basic resin doctrine or an additional step which is not under the basic resin doctrine.

Diana B. Fenton

Diana B. Fenton

cc/att: PJK,KB,RWS
HJH,RBQ,MEO
EJM,JCL

ATTACHMENT 1

ENCLOSURE III

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February 10, 1986

Mr. Bruce Borsuk
Vista Chemical Company
P. O. Box 19029
Houston, Texas 77224

Re: FDA Status of Bisphenol-A

Dear Bruce:

* { In our December 16, 1985 letter, we recommended that, as a matter of prudence, the residual bisphenol-A (BPA) level be determined in Vista's polyvinyl chloride (PVC) resin. You have now completed this work and have informed us in a January 30, 1986 telephone conversation with Chuck Breder that the resin contains 185 parts per million (ppm) of BPA. Based on this data, and for the reasons discussed more fully below, we have no hesitation in providing our opinion that BPA can be used as a polymerization termination agent (kill agent) in the manufacture of PVC in full compliance with the Federal Food, Drug and Cosmetic Act ("Act") and all applicable Food Additive Regulations.

A. Regulatory Framework

To put our opinion into prospective, it may help to review the legal/regulatory background applicable to food contact substances. Section 201(s) of the Act defines a "food additive" in pertinent part as:

[A]ny substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its

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becoming a component or otherwise affecting the characteristics of any food . . . if such substance is not generally recognized . . . to be safe under the conditions of its intended use; except that such term does not include--

* * *

(4) any substance used in accordance with a sanction or approval granted prior to the enactment of this paragraph pursuant to this Act.

This definition is repeated in section 170.3(e) of the Food Additive Regulations which adds, again in relevant part, the following explanatory information:

A material used in the production of containers and packages is subject to the definition [of "food additive"] if it may reasonably be expected to become a component . . . directly or indirectly of food packed in the container. . . . If there is no migration of a packaging component from the package to the food, it does not become a component of the food and thus is not a food additive.

Thus, a substance that is reasonably expected to become a component of food when employed in a food contact application must be: (a) the subject of an applicable Food Additive Regulation, (b) the subject of a prior sanction or approval, or (c) deemed generally recognized as safe (GRAS). If the substance is not reasonably expected to become a component of food under the intended conditions of use, it is not a food additive, and it may be so employed without any prior action by or consultation with the Food and Drug Administration (FDA).

B. Basic Resin Doctrine

As further background information, Food Additive Regulations are all issued on the premise that substances must be evaluated (and cleared where appropriate) on a generic rather

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than a proprietary basis. In the case of plastics resins, as long as the basic resin is: (a) listed in a regulation or otherwise cleared, (b) manufactured in accordance with good manufacturing practices, and (c) complies with any applicable extraction requirements, then the resin is covered by that regulation--even though different manufacturers may make the resin by different processes.

FDA stated many years ago that a "basic resin" is the material that comes out of the polymerization kettle, i.e., a basic resin is the product that results when the polymerization process has been carried to commercial completion. Substances such as catalysts, chain regulators, chain transfer agents, and all other materials required to produce the basic resin are considered part of the basic resin and not subject to independent regulatory consideration. Thus, the clearance afforded the basic resin automatically clears those substances which are necessarily used during the polymerization stage to produce it. We are enclosing relevant portions of a report to the Food / Packaging Materials Committee of The Society of the Plastics Industry, Inc. (SPI), in December of 1966. The report covers a presentation by an FDA spokesperson in which the "basic resin" doctrine was addressed.

The basic resin doctrine merely reflects the practical reality that FDA could never hope to write generic regulations for food packaging materials that describe and specifically clear every substance that might properly be a component or contaminant of the packaging material as a result of every conceivable manufacturing process that yields a suitable resin. Since trace quantities of these "unregulated" substances are not perceived to present a public health hazard, FDA has wisely chosen not to subject such substances to the burdensome pre-clearance provisions of section 409 of the Act that apply to food additives.

On the other hand, the basic resin doctrine does not apply to substances [adjuvants] added to the basic resin in order to prepare a technologically useful plastic packaging material but not essential to the polymerization process itself. Thus, stabilizers, plasticizers, pigments, lubricants, and the like, which may be added to a basic resin to facilitate its further processing or to affect the technological properties of the final plastic product, must be considered as matters separately from the clearance afforded the basic resin.

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C. FDA Status of BPA

Turning now to a consideration of the use of BPA as a kill agent, it is, as described above, considered part of the basic PVC resin and, as such, is of no regulatory concern. The fact that its use also seems to convey some thermal and color stability characteristics to the final resin can be considered to be an advantageous side effect. Nevertheless, the basic resin doctrine clearly permits the intended use of BPA.

As a matter of prudence, you have conducted tests and informed us that Vista's PVC resin contains 185 parts per million (ppm) of residual BPA. Using this information, we have made several very conservative assumptions to calculate the maximum potential level of BPA in the daily diet resulting from food-contact articles prepared from such a resin. These assumptions are: (a) no BPA is lost during subsequent high heat mixing and calendaring of the resin; (b) the maximum thickness of the resulting calendared sheet will be 30 mils (0.030 inches); and (c) less than 5% of the residual BPA will migrate to food under the most severe conditions of use (Section 176.170, Table 2, Condition of Use E, room temperature filled and stored).

These assumptions are considered conservative because, firstly, some loss of BPA will very likely occur during subsequent high heat processing to yield lower residual levels in the final product. Secondly, most food contact surfaces will be thinner than 30 mils and less BPA will be available for migration from such articles. Finally, when tin stabilizers are used in PVC at a level of 2% (20,000 ppm), less than 0.01% migrates to food. Thus, our use of a 5% migration factor represents a large conservatism.

Using the above assumptions, we have calculated that BPA would not be detected in the diet using an analytical method sensitive to 50 parts per billion (ppb). These calculations are contained in a separate memorandum by Chuck Breder which is enclosed for your files. Such calculations can also be used to estimate the maximum potential BPA concentration in the daily diet arising from PVC food-contact articles of different thicknesses and from other PVC resins containing different BPA residual levels.

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Besides being covered by the basic resin doctrine it is unlikely that BPA will become a component of food under its intended conditions of use in rigid and semi-rigid contact articles. Accordingly, it can be employed in full compliance with the Act and all applicable Food Additive Regulations. By making calculations similar to those shown in the enclosed memorandum, and by assuming that all of the BPA migrates to food because migration from plasticized articles is generally higher, it can also be shown that no BPA will be detected in the diet in contact with flexible PVC films of 3 mils or less (30% plasticizer) using an analytical method sensitive to 50 ppb. Thus, PVC flexible films can also be employed in full compliance with the Act and all applicable Food Additive Regulations.

We trust you will find that we have been responsive to your request for our opinion concerning the FDA status of BPA for use as a kill agent in the manufacture of PVC. If you should have any questions, or if there is any other way we may be of help, please do not hesitate to contact me.

Cordially yours,



Peter L. de la Cruz

Enclosure

cc: William L. McClain, Esquire
R. Phillip Carey, Esquire

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ATTACHMENT 2

VEV-144824

RECEIVED

AUG 21 87

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August 18, 1987

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William L. McClain, Esq.
Vista Chemical Company
15990 North Barker's Landing Road
P. O. Box 19029
Houston, Texas 77224

Re: Ethanol Carrier for BPA

Dear Bill:

This letter is intended to confirm our discussion on August 17, 1987 concerning the use of ethanol as a carrier for bisphenol A (BPA) in the manufacture of polyvinyl chloride (PVC). Vista previously used methanol as a carrier for BPA, which acts as a reaction-stopping agent.

As we have discussed previously, the BPA and its carrier fall within the basic resin doctrine for this application. Since less ethanol is used than methanol, your specific question was whether the denaturant in the ethanol posed any regulatory problem if the PVC was used in food contact applications.

I discussed this matter with Dr. Charles V. Breder, one of our staff scientists. Dr. Breder indicated that ethanol presents less toxicological concern than methanol. As for the denaturant, he noted that denaturants specified by the Bureau of Alcohol, Tobacco and Firearms (ATF) are both miscible in ethanol and have a similar boiling point. ATF's goal is to prevent the easy separation of the denaturant from the alcohol. In this instance, the similar boiling points means that the

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denaturant should be removed together with the ethanol during the post-polymerization stripping process. Since denaturants comprise only a small portion of the ethanol, that even further reduces the probability that the denaturant would be present in the finished food contact article. Although the use of ethanol here is covered by the basic resin doctrine, we consider it prudent to sample the finished resin from the initial production to confirm that the denaturant is being removed from the PVC.

If you have any comments or questions or if we can be of any further assistance, please let me know.

Cordially yours,



Peter L. de la Cruz

ATTACHMENT 3

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[A]ny substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food . . . if such substance is not generally recognized . . . to be safe under the conditions of its intended use; except that such term does not include --

* * *

(4) any substance used in accordance with a sanction or approval granted prior to the enactment of this paragraph pursuant to this Act.

This definition is repeated in Section 170.3(e) of the Food Additive Regulations which adds, again in relevant part, the following explanatory information:

A material used in the production of containers and packages is subject to the definition if it may reasonably be expected to become a component . . . directly or indirectly of food packed in the container . . . If there is no migration of a packaging component from the package to the food, it does not become a component of the food and thus is not a food additive.

Thus, a substance that is reasonably expected to become a component of food when employed in a food contact application must be (a) the subject of an applicable Food Additive Regulation, (b) the subject of a prior sanction or approval, or (c) deemed generally recognized as safe (GRAS). If the substance is not reasonably expected to become a component of food under the intended conditions of use, it is not a food additive, and it may be so employed without any prior action by or consultation with FDA.

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FDA has not provided definitive objective criteria for determining when a substance in a food packaging material may reasonably be expected to become a component of food. Nevertheless, guidance is available from at least two different past occurrences.

The first event relates to the draft of a proposal circulated by FDA as its response to wide-spread criticisms offered by the food packaging industries at the National Conference for Indirect Additives held in Washington in February of 1968. This so-called "Ramsey proposal" would have acknowledged in a regulation the propriety of the use, without the prior promulgation of food additive regulations, of substances that contribute no more than 0.05 ppm (50 ppb) to contacted food, components of articles used in contact with dry, non-fatty food, and substances employed as components of articles intended for repeated use in contact with bulk quantities of food. This would have applied to all substances except those known to pose some special toxicological concern, e.g., a heavy metal, a known carcinogen, or something that produced toxic reactions at levels of 40 ppm or less in the diet of man or animals. We are enclosing a copy of this proposal for your ready reference. (Although never formally adopted, the standards were deemed scientifically acceptable.)

Further clarification of the meaning of the term "food additive" was provided by the United States Court of Appeals in Monsanto v. Kennedy, 613 F.2d 947 (D.C. Cir. 1979). In this case, FDA argued that any contact of a substance with food must result in some transfer to the food and thus made the substance at issue in the case, acrylonitrile/styrene copolymer, a food additive. The Court stated:

Congress did not intend that the component requirement of a "food additive" would be satisfied by . . . a mere finding of any contact whatever with food For the component element of the definition to be satisfied, Congress must have intended the Commissioner to determine with a fair degree of confidence that a substance migrates into food in more than insignificant amounts.

613 F.2d 947, 948 (D.C. Cir. 1979).

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Monsanto v. Kennedy has been cited as authority for the Food and Drug Administration's own adoption of what has come to be called the *de minimis* concept since 1979; i.e., FDA has used the case as support for decisions it has made that go so far as permitting carcinogenic substances to remain on the market where the amounts expected to become a component of food have been found to be of no toxicological significance. This was most recently evidenced by the Agency's decision to permit the continued use of methylene chloride, a known carcinogen, in decaffeinating coffee (50 Fed. Reg. 51551; Dec. 18, 1985). It is obvious that if the de minimis concept endorsed by the Court in Monsanto v. Kennedy is useful to FDA to justify permitting this use of a carcinogen in food, the de minimis doctrine must certainly be applicable to toxicologically innocuous, indirect additives.

Status of Isonox 132

With your letter, you provided results of extraction tests conducted on rigid PVC plaques containing known concentrations of Isonox 132. These tests involved exposing 35-mil plaques made with 900 and 1800 parts per million (ppm) of Isonox 132 to n-heptane at 120°F for 10 hours. At the end of this time, the solvent was concentrated under a nitrogen stream, made up to a known concentration, and analyzed by gas chromatography/flame ionization detection (GC/FID) spectrometry. No Isonox 132 was detected in the solvent. Because n-heptane as a fat-simulant is a far more aggressive extractant than water, this same "not-detected" conclusion can be applied to aqueous extractants.

Additional tests were conducted by adding known quantities of Isonox 132 to the test solution and analyzing by the same GC/FID method to determine the sensitivity and recovery of the method. In this way, it was determined that the lower limit of sensitivity of the analytical method was equivalent to approximately 4 ppb of Isonox in the solvent, after applying a correction factor of 5 in accordance with accepted FDA practice for heptane extraction data. Moreover, validation studies carried out with known concentrations of Isonox 132 in the solvent demonstrated a high level of recovery for the analytical method. On the basis of these data, it is

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apparent that when used as described to us, Isonox 132 may not reasonably be expected to become a component of food. Thus, we have no hesitation in providing our opinion that Isonox 132 may be used in rigid PVC and that such use may properly be said to comply with the Act and all applicable FDA Regulations.

Our comfort factor in providing this opinion is increased by the knowledge that Isonox 132 is currently regulated for use in food packaging adhesives at 21 C.F.R. § 175.105 and by the fact that the antioxidant is known to be of a low order of toxicity. These factors add to the assurance that any minute, undetected quantity of Isonox 132 that might conceivably enter the diet from the use of the additive in PVC would certainly be generally recognized as safe.

We trust you will find this letter fully responsive to your request for our assistance. Should any questions remain, or if we may be of help in any other way, please do not hesitate to let us know.

Cordially yours,



Jerome H. Heckman

ATTACHMENT 4

VEV-144833

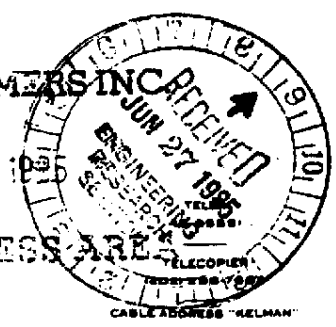
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*ADMITTED IN NEW YORK AND VIRGINIA ONLY

June 14, 1985

C: JF, HDG, DW4, WHMS,
DEM, PAS, SRS, JHAI
(JTF)

Bruce Borsuk
Vista Chemical Company
15990 N. Barker's Landing Road
Houston, Texas 77225

Re: FDA Status of PVC Resins

Dear Bruce:

I very much enjoyed my discussion with you and Phil Carey concerning the Food and Drug Administration (FDA) status of certain polyvinyl chloride resins produced by Vista as well as establishing drug master files and medical device master files. Since this is the first time I have had an opportunity to deal with you, I thought you might find the enclosed background memorandum on Keller and Heckman to be of interest.

During our discussion you indicated an interest in FDA's basic resin doctrine. FDA has always used the term "basic resin" to mean the product that results when a polymerization process has been carried to commercial completion. The necessary presence in the basic resin of substances such as initiators, chain transfer agents, surfactants, their residues, and residual monomers had been considered clear when the basic resin was regulated. Consequently, basic resin regulations do not deal with these substances except in those few cases where a limitation is required. As examples of the application of this policy, the following basic resin regulations do not specify or limit the initiators, catalysts or other like materials; 21 C.F.R. §§ 177.1310 (ethylene-acrylic acid), 177.1315, 177.1500 (nylon), and 177.1520 (olefins). In contrast, a few regulations impose limitations on resin components where deemed necessary for special reasons; 21 C.F.R. §§ 177.1020 (acrylonitrile-butadiene-styrene), 177.1030 (ABS methyl methacrylate), and 177.1640 (polystyrene).

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What we refer to as the basic resin doctrine is part of the "folklore" of FDA practice in the sense that it is not embodied in an explicit Agency regulation or policy statement. Rather, it is derived from long-standing informal FDA guidance. As an example, I am enclosing a 1966 letter and a 1968 transcript which contain pertinent FDA statements. As a general matter, when a small quantity of a substance, usually not exceeding 0.5% of the formulation, is added to accomplish a technical objective in the polymerization process, we normally consider it as coming within the basic doctrine resin.

I look forward to receiving the specific information on the resins of concern and will be in touch once we've had an opportunity to review their composition. At that point, we can establish a course of action and schedule a meeting if needed. In the interim, if you have any comments or questions or if I can be of any assistance on this or any other matters, please give me a call.

Cordially yours,

Peter

Peter L. de la Cruz

Enclosures

cc: P. Carey, Esquire
W. McClain, Esquire

VEV-144835

For starters

Commentary by Sid Gross

NPE without HOF

By all preview accounts, this month's National Plastics Exposition is going to be a blockbuster. However, one event will be missing from the agenda: induction rites to the Plastics Hall of Fame. I won't go so far as to say that that's like staging the Olympics without opening ceremonies. Still, it's a void.

And now the good news. The Hall has not been abandoned. A dedicated group of industry figures (including some important SPE members) is at work even now to restore it to its former glory. If all the hours they've put in so far are any clue, they'll pull it off. Stay tuned.

Going in circles on recycling

Do you remember a project called "Prolonging the life cycle of plastics?" Of course you don't. The results were not particularly memorable.

However, it might be well to recall that effort because, once again, we're seeking a solution to our solid-waste problem...and taking the very same path that led nowhere before.

"Prolonging the life cycle" was launched about six years ago, at a time of real concern about threatening oil shortages. It was funded by the Department of Energy to the tune of around \$50,000, and it was administered by the Plastics Institute of America. Funding supported university research on such topics as compatibilization, depolymerization, and biogenetic consumption.

The projects yielded some term papers, but as to any real impact...zero would be about right. Admittedly, \$50,000 isn't much of a commitment. But zero is zero.

Currently, funds are being raised from the private sector for new research on recycling, this time with a more limited scope of bottles. And once more we have to ask ourselves if this is really the right route. It is very likely that there will be a number of academically interesting findings, but will they advance measurably our efforts to manage solid waste?

Jack Milgrom, managing director of Walden Research Inc., commented at a recent SPI meeting that there isn't as much need to look into the technological challenges of recycling as there is in the doing of it. We know how to wash the

bottles, separate base cups and closures, remove labels, grind up the plastic, etc. What we don't know is how to collect, process, reuse, and get the recycled material into the stream of commerce...profitably.

The fact is, when recycling becomes profitable, it happens automatically. Everyone knows what to do. PET bottles are already being recycled at a rate of 100 million pounds a year (about 20% of total PET bottle production), primarily in those states that have deposit laws. And polypropylene battery cases are being recycled. In both cases, the recycling business—based on straightforward technology—is profitable all around.

How do we expand profitability beyond these two products? That's the challenge.

Incineration, where the plastics component of solid waste can make an important fuel contribution, looks like a most practical solution...if we can get to assured emission control. Now there's a research topic worthy of a crash program.

How to approach the FDA: Don't

This is the 10th anniversary of the 1975 FDA proposal to ban rigid and semi-rigid PVC food-contact packaging. During these ten years, the ban has never been put into effect nor has the proposal been withdrawn, despite general agreement that PVC is now fine for food packaging. While there have been rumors since late last year that the proposal would be withdrawn soon, at this writing the matter is still pending. Colorants for use in food-contact plastics remain in a similar administrative limbo...27 years after passage of the Food Additives Amendment.

In 1984, the agency re-cleared acrylonitrile/styrene after only 7 1/2 years of pondering.

It is plain that the speed with which FDA makes up its mind is clearly tectonic (like the speed at which continents move).

How do you deal with such delays without having your business grind to a halt while you're waiting for your problem to be solved? Says SPI counsel Jerome H. Heckman, "don't go near it (the agency) unless there is no other way."



Modern Plastics, June 1985 5

VEV-144836

ATTACHMENT 5

VEV-144837

VISTA PVC 5415 RESIN

CONFIDENTIAL

Confidential Product Formulation

- | | |
|---|------------------|
| 1. Polyvinyl chloride homopolymer | 99.82 to 99.989% |
| 2. Calcium Stearate
(21 C.F.R. 184.1229) | 0.001 to 0.5% |
| 3. Butylated hydroxytoluene
(21 C.F.R. 181.24) | 0.01 to 0.15% |

Description

Vista 5415 PVC resin is a general purpose PVC homopolymer which can be used in either extrusion, calendering or injection molding processes for rigid and flexible products.

Applications

The uniform absorption of high levels of plasticizer, low gel content, high clarity and excellent heat stability of formulations based on Vista 5415 resin allow it to be used in many diverse applications.

The relatively high molecular weight of Vista 5415 PVC resin makes it particularly suitable for flexible applications requiring good physical properties and their retention on aging.

The combination of optimum physical properties and processing allows the use of plasticized dryblend formulation in most applications.

Properties	Typical
ASTM D 1755 Classification	GP-5-15300
Specific Viscosity (0.4 g in 100 ml Nitrobenzene at 25° C)	0.42
Inherent Viscosity ASTM D 1243-66T (Method A)	1.02
Bulk Density (g/cc) (lb/cu ft)	0.50 32
Volatiles, %	0.3
Particle Size % on 40 Mesh % through 200 Mesh	nil <5.0

VEU-144838

VISTA PVC 5465 RESIN

CONFIDENTIAL

Confidential Product Formulation

- | | | |
|----|--|------------------|
| 1. | Polyvinyl chloride homopolymer | 99.82 to 99.989% |
| 2. | Calcium Stearate
(21 C.F.R. 184.1229) | 0.001 to 0.5% |
| 3. | Butylated hydroxytoluene
(21 C.F.R. 181.24) | 0.01 to 0.15% |

Description

Vista 5465 PVC resin is a general purpose high molecular weight homopolymer for calendering, extrusion and injection molding where the development of maximum physical properties is desired. The production of Vista 5465 is uniquely designed to produce a PVC resin having a correct balance of properties. Its molecular weight is sufficiently high to give the quality of "toughness" to the finished article while the melt viscosity is sufficiently low to allow for ease of manufacture.

Applications

Vista 5465 PVC resin is particularly suitable for use in flexible applications where the development and retention of maximum physical properties are desired.

The uniform absorption of high levels of plasticizer, low gel content, high clarity, excellent heat stability and high molecular weight of Vista 5465 allow it to be used in many diverse and demanding applications. They include calendering, injection molding (60A durometer), extrusion of sheeting, wire and cable, and flexible profile formulations.

VEU-144839

CONFIDENTIAL

5465

Properties	Typical
ASTM D 1755 Classification	GP-6-15300
Specific Viscosity (0.4 g in 100 ml Nitrobenzene at 25° C)	0.46
Inherent Viscosity ASTM D 1243-66T (Method A)	1.12
Bulk Density (g/cc) (lb/cu ft)	0.47 30
Volatiles, %	0.3
Particle Size % on 40 Mesh % through 200 Mesh	nil <5.0

VEV-144840