PARALOID™ K-175 Lubricating Processing Aid

Description

PARALOID™ K-175 lubricating processing aid is an acrylic polymer that functions as both an external lubricant and a processing aid in Vinyl. Its acrylic composition enables PARALOID K-175 processing aid to provide external lubrication without imparting the incompatibility often found in Vinyl compounds containing conventional lubricants. PARALOID K-175 processing aid is a valuable ingredient in clear Vinyl formulations for applications such as blow-molded containers and calendered or extruded sheet. Opaque Vinyl formulations containing PARALOID K-175 processing aid are used for siding, high-flow injection-molded parts, pipe fittings and pipe and conduit.

PARALOID K-175 processing aid offers a unique combination of performance benefits in processing and in the resulting properties of rigid Vinyl parts. PARALOID™ K-175 processing aid can also be used in plasticized Vinyl compounds to contribute the same general benefits as in rigid Vinyls. Because of its ready dispersibility, PARALOID K-175 processing aid is often used as both a processing aid and a unique lubricant in semi-rigid AND highly plasticized Vinyl compounds. Since achieving metal release while avoiding exudation is more difficult in plasticized Vinyl, another benefit of PARALOID K-175 processing aid in such systems is to provide good lubrication without exuding to the surface of finished parts. This is an important consideration because many plasticized Vinyl articles are post-decorated by printing, topcoating or laminating to other materials.

PARALOID K-175 processing aid can also be employed advantageously in processing polymers other than Vinyl when high temperatures encountered in processing or fabrication require an external lubricant that does not bloom or exude at service temperature or during storage.

Physical Description

Chemical Description: Acrylic-based polymer

Appearance: PARALOID™ K-175 processing aid is a free-flowing white powder

Typical Physical Properties[1]

Property	Unit of Measure Conditions	Value
Bulk Density (loose)	Grams/cc	0.51 g/cc
Screens Analysis	% on 30 Mesh % through 325 Mesh	0 15
Specific Gravity		1.05
Refractive Index	η_d 25°	1.5191
Solubility in Acetone, THF and Toluene	%	100

[1]These do not constitute specifications.

Performance Properties in Rigid Vinyl

The lubricity of a hot polymer melt has a strong effect on its thermal stability. Excellent release from metal surfaces greatly reduces the parting (shear) forces applied to the melt and results in improved thermal stability as a consequence of reduced friction and lower melt temperature. The dynamic thermal stability of formulations can be tested by observing release time on a two-roll mill or measuring the torque during processing and decomposition in a Haake or Brabender chamber.

Performance Benefits of PARALOID™ K-175 Processing Aid

Process Benefits

- Increased output rates
- Improved flow
- Improved thermal stability
- Less scrap
- Reduced downtime for roll or mold cleanup

Part Performance

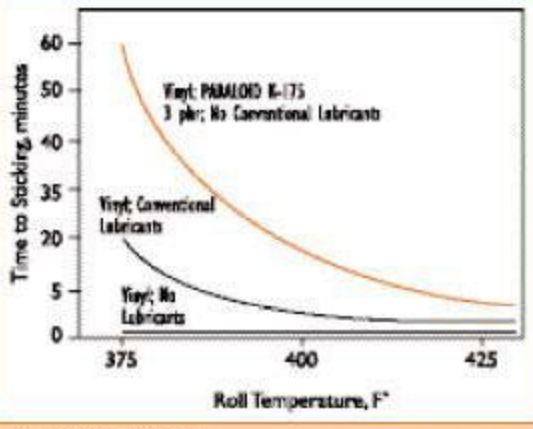
- High clarity and brilliance
- Better parts appearance
- Elimination of difficulties in post-finishing
- Enhanced post-decorative adhesion
- Better weldline impact strength of injection-molded parts
- Increased toughness in highly filled extrusions
- Increased surface tension for printability

Release on a Two-Roll Mill

Figure 1 plots the release time obtained with 3 phr of PARALOID™ K-175 processing aid at 375°-425°F. In contrast, unlubricated formulations stick immediately at 375°F and conventional lubricants are ineffective above 400°F.

Table 1 shows the measurements of roll release and thermal stability at 425°F of a Vinyl formulation containing 0 to 3 phr of PARALOID K-175.

FIGURE 1
DYNAMIC THERMAL STABILITY RELEASE TIME ON TWO-MILL ROLL AT 375°-425°F



FORMULATION A	parts
Vinyl (K=61)	100.0
PARALOID K-175	0–3.0
ADVASTAB TM-181FS	2.0
ADVALUBE E-1005	0.8
ADVALUBE E-2107	0.2

TABLE I
Release Time and Dynamic Thermal Stability at 425°F

	PARALOID™ K-175, phr			
	0	1	2	3
Roll Release				
at 1 minute	Poor	Good	Excellent	Excellent
at 3 minutes	Poor	Fair	Excellent	Excellent
Stability on Rolls				
Color Time, minutes	1	1.5	1.5	1.75
Color at 3 minutes	Dark Yellow	Yellow	Yellow	Light Yellow

Formulation	Parts
Vinyl (K=61)	100
PARALOID™ K-17	0.0–3.0
ADVASTAB™ TM-181FS	2
ADVALUBE™ F-1005	0.8
ADVALUBE E-2107	0.2

Table II demonstrates that PARALOID™ K-175 processing aid reduces or eliminates the effect of shear rate on release time at 385°F.

TABLE II
Effect of Shear Rate on Release of Vinyl PARALOID™ K-175

Mill Roll Speed front/rear roll	Time to Sticking at 385°F, minutes PARALOID K-175, phr	
rpm	0	3
20/20	13.5	30
30/20	11	25
40/20	8	33

Formulation A—same as in Table I

Release and Stability on a Two-Roll Mill and Brabender Plasti-Corder

Table III lists results on dynamic thermal stability obtained on a Brabender Plasti-Corder. Measurements of degradation time in the Brabender equipment demonstrate a significant advantage for PARALOID™ K-175 processing aid over conventional lubricants. The activity of the stabilizers has more influence in the Brabender test than on a mill.

Those data points in Table III marked “no internal lubricant” signify the omission of ADVALUBE™ F-1005 and ADVALUBE E-2107. The absence of internal lubricant accounts for the difference in temperature and the deterioration of thermal stability, especially in formulations without PARALOID K-175 processing aid.

TABLE III
Dynamic Thermal Stability at 385°F and Sticking Time on Mill at 400°F

PARALOID K-175 phr	Internal Lubricant	Average Equilibrium Torque m-g	Equilibrium Temperature °F	Degradation Time, Minutes	Time to Stick on Mill at 400°F, Minutes
0	Yes	1650	386	24	1
3	Yes	1650	386	49	17
0	No	1500	390	17	1
3	No	1700	390	31	17

FORMULATION A—same as in Table 1.
Brabender Plasti-Corder, 375°F, 60 rpm, #6 roller head

Good release is necessary to prevent hangup and melted Vinyl stagnation in extruders and dies that can lead to premature degradation of the resin.

Clarity

PARALOID™ K-175 processing aid is an excellent Vinyl lubricant that has no adverse effects on clarity. This performance contrasts sharply with conventional lubricants that increase haze when incorporated into Vinyl compounds.

Table IV compares the clarity/release balance of several lubricant systems in Formulation A, a general purpose clear Vinyl formulation. An attempt was made to equal the excellent release provided by PARALOID K-175 processing aid by means of two commercial external lubricants. The external lubricants impaired clarity at levels far below those needed to match the release obtained with PARALOID K-175 processing aid.

TABLE IV
Effect of Lubricants on Clarity and Release

Base Compound	+	Lubricants	Lubricants phr	Release Rating on Mill at 425°F	Clarity Transmission of White Light, %	Clarity Haze, %
Base Formulation A		ADVALUBE™ E-210	0.2	Poor	87.5	6.9
Base Formulation A + more ADVALUBE E-2107		ADVALUBE E-2107	1.5	Good	51.8	35.9
Base Formulation A + Polyethylene Wax		ADVALUBE E-2107 Polyethylene Wax	0.2 1.0	Good to Excellent	72.5	15.1
Base Formulation A + PARALOID™ K-175		ADVALUBE E-2107 PARALOID K-175	0.2 3.0	Excellent	87.0	4.0

Base Formulation A	PHR
Vinyl (K=61)	100
ADVASTAB™ TM-181FS	2.0
ADVALUBE™ F-1005	0.8

Processability

In addition to acting as a lubricant, PARALOID™ K-175 processing aid improves the processing characteristics of Vinyl. Compounds modified by this polymer display greater hot melt strength and hot elongation, better homogeneity, and better fluidity than those without PARALOID K-175 processing aid. When processed on a two-roll mill, formulations containing 3 phr PARALOID K-175 processing aid exhibit a fluid rolling bank, well-knit edges, and a smooth glossy surface. In contrast, unmodified formulations appear crumbly at the edges, and the material between the rolls is so non-homogeneous that it does not merit the term “rolling bank.” Improved processing with PARALOID K-175 processing aid provides better surfaces, stronger and more homogeneous fabricated parts, and greater latitude in selecting conditions for commercial production.

As Table V shows, incorporating PARALOID K-175 processing aid has little effect on the melt viscosity of Vinyl with or without lubricants. These results supplement the data on average torque in the Brabender Plasti-Corder given in Table III.

Table V
Effect of PARALOID™ K-175 on Melt Viscosity

PARALOID K-175 phr	Lubricant	Melt Viscosity, poise
0	Yes	5085

3.0	Yes	4870
0	No	5590
3.0	No	5520

FORMULATION A—modified as indicated
Conditions—Sieglaff McKelvey Rheometer at 400°F/1000 sec.$^{-1}$
Material milled 4 minutes at 350°F, then granulated.

Plateout

PARALOID™ K-175 processing aid helps prevent plateout on the surfaces of processing and takeoff equipment. Reduced plateout results from the homogeneity of the fluxed stock and the efficient lubricating action of PARALOID K-175 processing aid. The polymer also reduces deposition in die lips during extrusion.

Table VI
Kayeness Rheometry Data for PARALOID™ K-175 Processing Aid in Vinyl Siding Capstock Formulation

K-175 PHR – 0 Shear Rate (1/Sec)	Sample #1 KL145-1 Viscosity (Poise)	200°C Shear Stress (dyne/cm^2)
100	28643	2864287
500	9951	4975259
1000	6845	6485025
2000	4296	8592589
K-175 PHR – 0.5 Shear Rate (1/Sec)	**Sample #2 KL145-2 Viscosity (Poise)**	**200°C Shear Stress (dyne/cm^2)**
100	28335	2833452
500	9873	4936711
1000	6277	6277409
2000	3994	7987714
K-175 PHR – 1.0 Shear Rate (1/Sec)	**Sample #3 KL145-3 Viscosity (Poise)**	**200°C Shear Stress (dyne/cm^2)**
100	26538	2653751
500	9327	4663431
1000	6057	6057399
2000	3979	7957238

FORMULATION B
Vinyl Siding Capstock Formulation

	PHR
Vinyl Resin (K=66-67; i.v.=0.92)	100
ADVASTAB™ TM-3412	1.0
Paraffin Wax 165	1.0
Calcium Stearate	1.3
Oxidized Polyethylene	0.1
TiO_2	10.0
PARALOID™ KM-377	5.0
PARALOID K-175	—

PARALOID™ K-175 processing aid functions both as a lubricant and a processing aid in Vinyl formulations. As a lubricant, it eliminates sticking of the Vinyl melt to the extruder screws and die or to the calender rolls. However, as a processing aid, it doesn't add to the melt viscosity of the Vinyl formulation as indicated in the graph, which

actually shows a slight reduction in viscosity over a wide range of shear rates when PARALOID™ K-175 processing aid is added to the formulation.

PARALOID™ K-175 Processing Aid Applications

Vinyl Film and Sheet

PARALOID™ K-175 processing aid is suitable for calendering, providing enhanced metal release. With the need to increase temperature on the final calender rolls, conventional internal lubricants are not efficient enough and tend to plate out. PARALOID K-175 processing aid enhances metal release while improving clarity and reducing plate out.

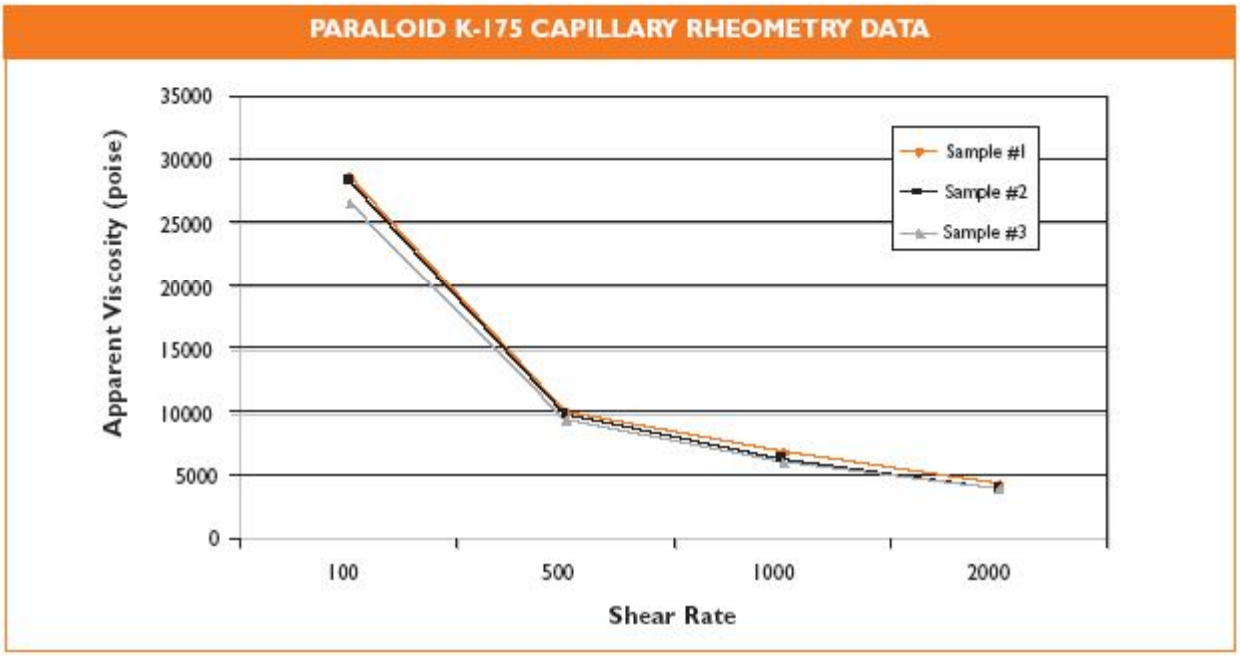
Blow-Molded Clear Vinyl Bottles

PARALOID™ K-175 processing aid is particularly well-suited to blow-molding and other end-use applications requiring clear Vinyl formulations. When high lubricant levels are needed to increase production rates and reduce downtime caused by degradation, PARALOID K-175 processing aid can be used advantageously without detracting from clarity and surface appearance. Moreover, the addition of PARALOID K-175 processing aid gives sparkle—an optical property difficult to quantify, but desirable in clear packaging.

Processors have reported the following benefits when they use PARALOID K-175 processing aid in commercial blow-molding operations:

1. Cost Savings

- Reduction of overall daily scrap rate by 50% or more in a tin-stabilized bottle for cosmetics.
- Long, virtually trouble-free runs in continuous machine operation with almost no downtime, except for normal cleanup. (For example, continuous operation for 2 weeks compared to only 8 hours obtained with formulations having no PARALOID K-175 processing aid).
- Reduction of 5-10% in wall thickness with no decrease in impact strength as measured by bottle drop height.



2. Enhanced Aesthetics

- Excellent gloss, transparency, and color.
- Almost complete elimination of black particles in bottles.

PARALOID™ K-175 processing aid is compliant with U.S. FDA Regulation 21CFR178.3790 which regulates rigid and semi-rigid Vinyl food-contact articles.

Formulations vary because each compounder must formulate to match the equipment needs and performance requirements of individual customers. The following formulation can serve as a useful starting point, subject to adjustment:

TABLE VII
Clear Blow-Molded Containers

Starting Point Formulation (phr)	
Vinyl (K=58)	100
PARALOID™ BTA-733ER	10.0 – 12.0
PARALOID K-175	0.5 – 1.0
PARALOID K-120ND	1.5
ADVASTAB™ TM-181FS (Food Grade Methyltin Stabilizer)	1.2 – 1.5
ADVALUBE™ F-1005	1.0
ADVALUBE E-2107	0.2
Toner (1% in Vinyl)	0.06

Formulating Tips for Clear Container Applications

Lubricants: The choice of lubricants has an important influence on clarity and processibility. Moreover, because of its refractive index, replacement of lubricants with PARALOID™ K-175 processing aid often improves the optical properties. To prevent over-lubrication, reduce the amount of conventional external lubricant when PARALOID K-175 processing aid is added.

Processing Aids: These are needed to impart good melt homogeneity and hot melt strength. Using PARALOID™ K-175 additive as a processing aid gives good gloss, good surface appearance, and good production rates. On some machines, however, substituting 0.5 phr PARALOID K-120ND processing aid for the same amount of PARALOID K-175 processing aid may be necessary to optimize gloss and surface properties by eliminating melt fracture. PARALOID K-175 processing aid shows excellent dispersibility in formulations based on Vinyl resins with a wide range of molecular weights.

TABLE VIII
Film and Sheet Formulations

Below are starting point formulations for extruded and calendered film and sheet. In general, the formulating tips for clear containers should be followed in adjusting these formulations.

EXTRUDED (Single-Screw Machine)—Starting-Point Formulation (phr)

	Clear	Opaque
Vinyl (K=59-61)	100	100
PARALOID™ BTA-730	8–12	—
PARALOID BTA-753ER	—	6-10
PARALOID K-120ND	2.0	—
PARALOID K-175	1.5	1.5
PARALOID K-125	—	1.5
ADVASTAB™ TM-181FS (Methyltin Stabilizer)	2.0	2.0

Calcium Stearate	—	2.0
ADVALUBE™ E-2100	0.2	—
ADVALUBE F-1005	0.6	—
Paraffin Wax (165°C)	—	0.7
Toner	As Needed	—
Pigments	—	As Needed

CALENDERED—Starting-Point Formulation (phr)

	Clear	Opaque
Vinyl (K=59)[1]	100	100
PARALOID™ BTA-730	8–12	—
PARALOID BTA-753ER	—	6–10
PARALOID K-120ND (or PARALOID K-125)	1.0 (0.5	1.0 (0.5)
PARALOID K-175	1.5	1.5
ADVASTAB™ TM-181FS (Methyltin Stabilizer)	1.0–2.0	1.0–2.0
ADVALUBE™ E-2100	0.2	0.2
ADVALUBE F-1060L	0.7	0.7
Toner	As Needed	—
Pigments	—	As Needed

[1]or Vinyl Chloride/Vinyl Acetate Copolymer (intrinsic viscosity 0.7).

PARALOID™ K-175 Processing Aid in Building Products Applications

Vinyl Siding and Window Profiles

In the twin-screw extrusion of Vinyl siding and window profiles, PARALOID™ K-175 processing aid can play an important role in the processing performance of the Vinyl formulation. PARALOID K-175 processing aid imparts excellent release from dies, coextrusion dual-manifold dies and feed blocks, and other potential Vinyl sticking areas in the extruder. This capability is especially significant during high output rate extrusions in which high back pressure and high shear forces increase the melt temperature of the Vinyl formulation as it passes through the extruder.

TABLE IX
Vinyl Siding Capstock & Window Profile Formulations

Starting-point formulations for twin-screw extruded Vinyl siding capstock and window profiles are:

	PHR
Vinyl Siding Capstock Formulation	
Vinyl Resin (K=66-67; i.v.=0.92)	100
ADVASTAB™ TM-3412	1.0 – 1.2
Paraffin Wax 165	1.0
Calcium Stearate	1.3
Oxidized Polyethylene	0.1
TiO_2	10.0
PARALOID™ KM-334 or KM-377	5.0
PARALOID K-175	0.5

Alternative Multi-functional Additive Selections:	
PARALOID™ KM-5450	4.0–4.5

Alternative Tin Stabilizers:
ADVASTAB™ TM-181FS, TM-186

Vinyl Window Profile Formulation	
Vinyl Resin (K=66-67; i.v.=0.92)	100
ADVASTAB TM-181FS	1.2
ADVALUBE™ B-3310	1.0
ADVALUBE E-2100	0.6
Calcium Stearate	0.8
Paraffin Wax 165	0.5
Oxidized Polyethylene	0.15
$CaCO_3$ (Ultra-Fine, Treated)	5.0
TiO_2	9.0
PARALOID™ KM-334	5.0
PARALOID K-120ND	1.0
PARALOID K-175	0.5

Alternative Multi-functional Additive Selections:	
PARALOID™ KM-X100 Pro	5.0–5.5

Alternative Tin Stabilizers:
ADVASTAB™ TM-181FS, TM-186

Alternative Lubricant Package:	
ADVALUBE™ B-3314/ADVAWAX 280	2.7/0.5

Vinyl Pipe and Conduit

In the manufacture of Vinyl pipe and conduit, cost cutting measures are often applied. A typical approach to reduced costs is the addition of mineral fillers, typically calcium carbonate. For example, $CaC0_3$-filled formulations are used in Vinyl telephone conduit as shown in Table X. PARALOID™ K-175 processing aid is added to facilitate processing and dispersion of the filler.

Another approach to reduce pipe production costs is to decrease the unit weight of pipe by coextruding a low density, cellular Vinyl core enclosed with outer and inner layers of solid Vinyl. Pipe made for a drain, waste, and vent (DWV) application is typically produced with a cellular core to achieve 20-35% weight reduction depending on processing aid and blowing agent level.

PARALOID K-175 processing aid plays a key role in DWV pipe by reducing the possibility of the Vinyl melt adhering to the metal surfaces in the coextrusion feed block and die body during manufacture. PARALOID K-175 processing aid contributes to the achievement of high extrusion rates and prolonged run times without polymer sticking and hang-up. A typical DWV pipe formulation for the cellular core is shown in Table X.

PARALOID™ K-175 Processing Aid in Injection Molding Applications

Although injection-molded Vinyl pipe fittings are used extensively, the acceptance of injection-molded Vinyl parts for other applications was once delayed by problems associated with the flow and thermal stability of the compounds. The development of Vinyl formulations containing performance modifiers (PARALOID™ KM-334, PARALOID BTA-753ER, and PARALOID K-175) eliminated these difficulties. As a result, a variety of molded products, including thin-walled parts and pipe fittings, can be made readily to take advantage of the attractive balance of properties offered by Vinyl compounds.

TABLE X
Typical Vinyl Pipe and Conduit Formulations

Vinyl Telephone Conduit Formulation	
	Twin Screw
Vinyl Resin (K=66-67; i.v.=0.92)	100 PHR
ADVASTAB™ TM-694	0.4
Calcium Stearate	0.8
Paraffin Wax (165°F)	1.2
TiO_2	1.0
PARALOID™ K-175	0.75
PARALOID KM-334	2.0
Calcium Carbonate	20

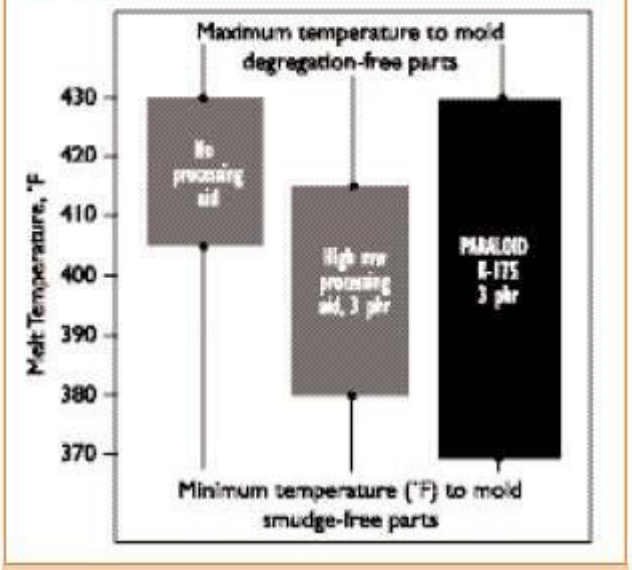
Co-extruded Vinyl Foam Core Pipe Formulation for Drain, Waste, Vent (DWV)	
Vinyl Pipe Grade Resin	100 PHR
Azodicarbonamide	0.3
ADVASTAB™ TM-900F	0.8
Calcium Stearate	0.7
WAX 165	1.4
$CaCO_3$ (Ultra-Fine)	5.0
TiO_2	0.75
PARALOID™ K-175	1.0
PARALOID K-400	3.0

Benefits

PARALOID™ K-175 processing aid imparts the following benefits in injection molding:

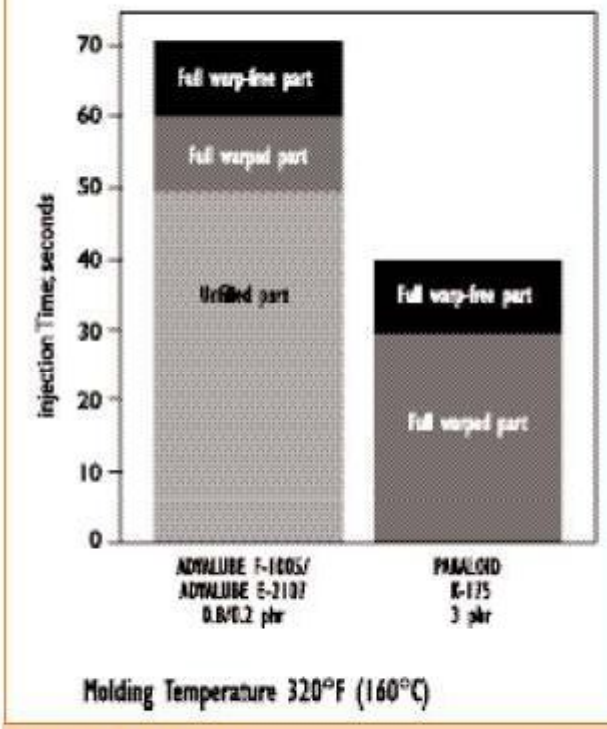
- Contributes to excellent smudge-free appearance at lower molding temperatures.
- Reduces the tendency of the melt to undergo shear or velocity burning at high temperatures or high rates (Figure 2).
- Gives shorter cycle times and higher output rates (Figure 4).
- Improves thermal stability during the molding of regrind material.
- Improves the physical properties of parts made with high proportions of regrind; the incorporation of at least 50% or more regrind is feasible.
- Lowers tendency of Vinyl to stick to hot metal surfaces and provides excellent release in machinery up to 425°F.
- Imparts excellent flow during mold filling and increases impact strength of parts, especially in weldline regions.
- Does not impair clarity of molded parts formulated for clear applications.

FIGURE 2
EFFECT OF PARALOID K-175 PROCESSING AID ON MOLDING RANGE OF VINYL



FORMULATION A	phr
Vinyl (K=55)	100.0
PARALOID K-175	0–3.0
ADVASTAB TM-181FS	2.0
ADVALUBE F-1005	0.8
ADVALUBE E-2107	0.2

FIGURE 3
EFFECT OF PARALOID K-175 PROCESSING AID ON MOLDING CYCLE



FORMULATION A	phr
Vinyl (K=61)	100.0
PARALOID K-175	0–3.0
ADVASTAB TM-181FS	2.0
ADVALUBE F-1005	0.8
ADVALUBE E-2107	0.2

Two of the preceding benefit statements require discussion. The first relates to the cycle—the total time necessary to fill the mold and cool the material in the cavity, together with the time the mold remains open. A goal of molders is to maximize the number of parts made in a unit of time. One means of doing this is to shorten the cycle. Figure 3 represents an experiment which studies the effect of lubricants on the flow of Vinyl melts, which are more viscous at lower temperatures, and on the dimensional stability of the parts. The injection pressure time is varied to allow observation of differences in melt viscosity, friction between the melt and metal surfaces, and melt homogeneity. A formulation yielding acceptable parts at shorter injection pressure times would achieve the goal of increased productivity. Figure 3 demonstrates that PARALOID™ K-175 processing aid allows faster filling of the mold (lubricant function) and results in warp-free parts in less time and at lower temperature (processing aid function). This combination of performance features gives PARALOID K-175 processing aid its superiority over conventional lubricants and helps increase productivity.

The other statement concerns the strength of fittings in the weldline region. The weldline, an imperfection caused by separation and subsequent rejoining of the plastic melt, is considered the weakest section of a part. PARALOID K-175 processing aid facilitates the weldline fusion of Vinyl. Vinyl fittings made with and without PARALOID K-175 processing aid were tested for Tup C falling dart impact strength in the weldline region with the following result:

TUPC Falling Dart Impact Strength

PARALOID™ K-175, phr	0	1.5
ft.-lb to break	1.5	6

Despite this demonstrable improvement in local impact strength, PARALOID™ K-175 processing aid is not a true impact modifier. The increased impact strength is brought about by improved melt flow and homogeneity during the filling of the mold.

TABLE XI
Typical Injection Molding Formulations

Vinyl Pipe Fitting Formulation	
	Type I*
Vinyl Resin (K=57; i.v.=0.68)	100 PHR
ADVASTAB™ TM-181FS	1.5
Calcium Stearate	1.2
Paraffin Wax (165°F)	1.0
Oxidized Polyethylene	0.1
PARALOID™ K-120ND	1.0
PARALOID K-175	0.5
PARALOID™ BTA-753ER	1.0
TiO_2	1.0
$CaCO_3$	5.0
ASTM D-1784 * = Cell Class 12454/13454	

Vinyl Pipe Fitting Formulation	
	Type II**
Vinyl Resin (K=57; i.v.=0.68)	100 PHR
ADVASTAB™ TM-181FS	1.5
Calcium Stearate	1.2
Paraffin Wax (165°F)	1.0
Oxidized Polyethylene	0.1
PARALOID K-120ND	1.0
PARALOID K-175	0.5
PARALOID™ BTA-753ER	3.0
TiO_2	1.0
$CaCO_3$	3.0
ASTM D-1784 ** = Cell Class 14333	

Vinyl Electrical Box (Injection Molding)	
Vinyl (K=55-58; i.v.=0.65-0.73)	100 PHR
ADVASTAB™ TM-181FS	2.0
CaSt	1.0
Paraffin Wax 165	0.6
PARALOID™ K-125	0.4
PARALOID K-175	1.2
TiO_2	1.5
PARALOID BTA-753ER (1)	8-10
$CaCO_3$ (optional) (2)	5.0

(1) The level of BTA-753ER will depend on the required impact strength at both high and low temperatures.

(2) The addition of $CaCO_3$ will depend on the required balance of impact strength and cost.

Recommended Use Levels

The use level will depend on the required performance in a particular matrix. Please refer to the preceding formulation charts for guidance or contact The Dow Chemical Company technical service.

Standard Packaging

The standard package is either a unitized pallet of 50 x 50 lb. bags (2500 lb. net) or a unitized pallet of 2 x 1000 lb. bags (2000 lb. net). Please check with your account representative for specific package availability as some packages are dependent upon density and demand of material.

Storage and Handling
(see MSDS for details)

Standard recommended storage conditions are as follows:

- Store indoors, protected from weather (moisture)
- Temperature should not exceed 60°C
- Protect from ultraviolet light
- With stretch hood or stretch wrap intact (if applicable)

Unopened (if material is opened, it should not be left exposed and should be used within one month); ambient temperature preferred.

When stored correctly in the original packaging, the shelf life is:

2.5 years from date of manufacture

Safe Handling Information

Avoid high concentrations of dust in the air and accumulation of dust on equipment. An airborne dust of this material can create a dust explosion. When handling and processing this material, local exhaust ventilation may be required to control dust and reduce exposure to vapors. To prevent dust explosions, employ bonding and grounding for operations capable of generating static electricity. Dispose by placing powder in airtight bags. Incinerate or landfill at a permitted facility in accordance with local, state and federal regulations.

Material Safety Data Sheets (MSDS)

Material Safety Data Sheets are available outlining hazards and safe handling methods. Contact The Dow Chemical Company for copies of the MSDS for this product and for other handling information.

The Dow Chemical Company Plastics Additives Solutions Provider Product Range	
ACRYLIGARD™	Weatherable Acrylic Capstock Resins
ADVALUBE™	Specialty Lubricants
ADVAPAK™	Stabilizer/Lubricant One-Packs
ADVASTAB™	Thermal Stabilizers
ADVAWAX™	Specialty Waxes
PARALOID™	Impact Modifiers
PARALOID	Processing Aids
PARALOID	Acrylic Multi-functionals and Specialties
PARALOID	Additives for Engineering Resins
SURECEL™	All Acrylic Foam Cell Stabilizers

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