



PRODUCT DATA

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RHEOCHEM™ PVC lubricants have been recognized as the leading brand of customized wax blends in the rigid PVC industry for over 20 years.

Honeywell's broad portfolio of specialized lubricants offers chemistries that include paraffin and hydrocarbon waxes, fatty acid esters and amides, specialty stearates, and oxidized or non-oxidized low molecular weight polyethylenes.

Our highly skilled chemists and engineers have many years of industry experience in vinyl processing and manufacturing. Honeywell's technical expertise coupled with creativity in the customization of lubricants provide improved processing in a full range of vinyl products.

RHEOLUB™ PARAFFIN AND HYDROCARBON LUBRICANTS

Paraffin and hydrocarbon waxes are the most cost effective and efficient primary lubricants used in rigid PVC. Due to their low cost and high efficiency, these waxes are widely used in PVC pipe, vinyl siding, profiles and injection molding compounds. Paraffin and other hydrocarbon lubricants typically provide good metal release characteristics and are classified as “external” lubricants. In rigid PVC compounds, they delay fusion causing more of the energy required for fusion to be gained through heat transfer rather than through screw shear.

Paraffin and hydrocarbon waxes are composed only of carbon and hydrogen atoms joined together to form long chain molecules. These molecules are primarily straight chained with varying degrees of branching. The product performance and properties of the different grades of wax depend on the molecular weight and proportion between straight chained and branched molecules. For superior performance in PVC compounds it is important that the paraffin and hydrocarbon lubricants be carefully selected for consistent molecular structure and properties suitable for PVC compounds, processes and products.



Honeywell is a major lubricant supplier to large and small diameter pipe manufacturers for applications ranging from potable water to electrical conduit.

The following RHEOLUB™ Paraffin and Hydrocarbon Lubricants are specially formulated for use in PVC applications:

RL-145 – A lower melting, lower lubricity paraffin wax suitable for semi-rigid PVC compounds.

RL-165 – A blend of hydrocarbon waxes formulated to meet the needs of the PVC pipe industry.

RL-165 Code 010 – A high performance paraffin wax designed for applications where consistent performance under high shear conditions is critical.

RL-185 – A higher carbon number distribution, higher melting point paraffin lubricant that is well suited to rigid PVC compounds requiring improved metal release at high melt temperatures or improved surface finish properties.

RL-250 – A high performance synthetic hydrocarbon wax with a more consistent molecular structure than that found in refined paraffin waxes. Applications for use include those with a need for high performance under high shear conditions.

RHEOLUB Paraffin and Hydrocarbon Lubricants can be formulated to develop custom materials to satisfy individual customer needs. These materials can be incorporated into Rheochem SMART-LUB™ Lubricant Systems and SMART-PAK™ Total Lubricant Packages.

FOR MORE INFORMATION CALL TOLL FREE AT 1-800-222-0094

PRODUCT DATA

Products	RL™-145	RL-165	RL-165 code 010	RL-185	RL-250
PVC Pipe		•			•
Vinyl Siding		•	•	•	•
Profile Extrusion			•	•	•
Injection Molding	•	•			
Custom PVC Compounding	•	•	•	•	•
Congealing Point	145°F (63°C)	155°F (68°C)	160°F (71°C)	190°F (88°C)	162°F (72°C)
Viscosity @ 210°F (99°C)	5.1 cSt	6.6 cSt	7.2 cSt	7.5 cSt*	8.5 cSt
Acid Number (mg KOH/g)	N/A	N/A	N/A	N/A	N/A
Specific Gravity	0.91	0.91	0.91	0.91	0.91
Physical Form	Prills	Prills & Pastilles	Prills	Prills	Prills
Color	White	White	White	White	White
NSF/PPI** Status	Not Listed	Listed	Listed	Not Listed	Listed
Usage Level Range	0.75–1.50 phr†	0.80–1.50 phr†	0.80–1.50 phr†	0.80–1.50 phr†	0.80–1.50 phr†

*Viscosity at 240°F (116°C)

**NSF International/Plastics Pipe Institute

†parts per hundred resin


SPECIALTY STEARATES AND ESTERS

RHEOLUB™ Specialty Stearates and Esters include fatty acid esters and melt processable calcium stearate made in-situ with blended waxes. Blends can be custom formulated to meet specific needs.

Melt processable specialty stearates are versatile lubricants that provide a unique combination of properties. They may be used in place of, or in addition to, calcium stearate in most rigid PVC formulations. When mixed with paraffin waxes and/or ester lubricants, calcium stearate normally has a gelling effect on many rigid PVC lubricant systems which dramatically increases viscosity. RHEOLUB Specialty Stearates and Esters reduce this effect by forming a homogeneous, non-gelling lubricant system. In comparison to similar formulas containing calcium stearate, PVC compounds containing RHEOLUB Specialty Stearates have superior processing and excellent flow characteristics.

Specialty Stearates and Esters:

- Are non-dusting and easy to handle.
- Have excellent film formation and metal release characteristics.
- Reduce plate-out and vacuum chamber discharge.
- Have improved compatibility with PVC and micro-ingredients.



Honeywell is a major lubricant supplier to the vinyl siding industry for capstock and substrate formulations.

RHEOLUB Specialty Stearates and Esters include the following products:

RL-710—A complex ester lubricant which provides good mold and metal release characteristics and helps to moderate melt temperatures during extrusion.

RL-720 – A complex ester lubricant combining high molecular weight for stability and high PVC compatibility to promote flow.

RL-830 – A balanced combination of fatty acid esters that moderates melt temperatures and improves melt flow.

PS-1650 – A non-dusting, low-cost hydrocarbon wax and calcium stearate combination which can be used as a replacement for calcium stearate and part of the hydrocarbon lubricant.

RL-1800 – A combination of in-situ calcium stearate and paraffin wax.

Specialty Esters – A family of fatty acid based waxes that promote PVC melt flow while maintaining physical properties and minimizing plate-out by providing lubrication across the spectrum of internal/external functionality.

RHEOLUB Specialty Stearates and Esters provide a broad range of lubricant functionality to satisfy individual customer needs. These materials can be incorporated into Rheochem SMART-LUB™ Lubricant Systems and SMART-PAK™ Total Lubricant Packages.

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PRODUCT DATA

Products	RL™-710	RL-720	RL-830	PS-1650	RL-1800
PVC Pipe		•	•	•	•
Vinyl Siding	•	•	•	•	•
Profile Extrusion	•	•	•		
Injection Molding	•		•	•	•
Custom PVC Compounding	•	•	•	•	•
Congealing Point	130°F (54°C)	140°F (60°C)	135°F (57°C)	N/A	N/A
Viscosity @ 240°F (116°C)	50 cSt	15 cSt	8 cSt	100 cSt	200 cSt
Acid Number (mg KOH/g)	12	25	5	22	18
Specific Gravity	0.88	0.88	0.88	0.95	0.95
Physical Form	Prills	Prills	Prills	Prills	Prills
Color	Tan	Tan	Light Tan	Light Tan	Tan
NSF/PPI* Status	Not Listed	Pending	Not Listed	Not Listed	Listed
Usage Level Range	0.30–0.50 phr†	0.30–1.0 phr†	0.50–1.50 phr†	0.80–2.50 phr†	0.65–1.15 phr†

*NSF International/Plastics Pipe Institute †parts per hundred resin

A-C® POLYETHYLENES

A-C Polyethylenes offer a variety of low molecular weight polyethylene homopolymers and oxidized polyethylenes for use in PVC operations. They principally act as external lubricants but also provide a variety of other benefits.

High-density oxidized polyethylenes are very efficient external lubricants that speed fusion and improve metal release in rigid extrusion systems. Other benefits include increased melt homogeneity which results in improved dimensional stability of the extruded product and increased production rates. High-density oxidized polyethylenes also improve weld line strength in injection molding applications and improve metal release in conventional and hot runner systems.

Low-density polyethylenes are efficient external lubricants that help to maintain premium physical and aesthetic properties of the extrudate under high shear operating conditions. Low-density oxidized polyethylenes provide good metal release and increased gloss, while low-density non-oxidized polyethylenes provide good external lubrication and fusion delay.



Honeywell has made ground-breaking advances in the design of lubricants which enhance the fence and rail manufacturing process for this exciting growth business.

A-C® Polyethylenes include the following:

High-Density Oxidized Polyethylenes

A-C 307A – High viscosity, low acid number oxidized polyethylene, which is very efficient at promoting fusion and providing a reduced gloss finish in extruded articles.

A-C 316A – Low viscosity, high acid number oxidized polyethylene which combines fusion promotion with metal release and dispersion effects.

Low-Density Oxidized Polyethylenes

A-C 629A – Oxidized polyethylene providing excellent external lubrication and improved gloss.

A-C 680A – Oxidized polyethylene providing excellent external lubrication in applications in which lower gloss is desired.

Low-Density Non-oxidized Polyethylenes

A-C 6A – Higher crystallinity, low molecular weight polyethylene providing moderate external lubrication and improved gloss.

A-C 617A – Lower crystallinity, low molecular weight polyethylene providing superior external lubrication, fusion delay and improved gloss.

A-C Polyethylene products offer a range of low molecular weight polyethylene homopolymers and oxidized polyethylenes. These materials can be incorporated into SMART-LUB™ Lubricant Systems and SMART-PAK™ Total Lubricant Packages.

FOR MORE INFORMATION CALL TOLL FREE AT 1-800-222-0094

PRODUCT DATA

Products	A-C® 307A	A-C 316A	A-C 629A	A-C 680A	A-C 6A	A-C 617A
PVC Pipe	•	•	•	•	•	•
Vinyl Siding	•	•	•	•	•	•
Profile Extrusion	•	•	•	•	•	•
Injection Molding	•	•	•	•	•	•
Custom PVC Compounding	•	•	•	•	•	•
Drop Point	284°F (140°C)	284°F (140°C)	214°F (101°C)	226°F (108°C)	223°F (106°C)	214°F (101°C)
Viscosity @ 284°F (140°C)	85,000 cps*	8,500 cps*	200 cps	250 cps	375 cps	180 cps
Acid Number (mg KOH/g)	7	16	15	16	N/A	N/A
Specific Gravity	0.98	0.98	0.93	0.93	0.92	0.91
Physical Form	Powder	Powder	Powder	Powder	Powder	Powder
Color	Off White	Off White	Off White	Off White	White	White
NSF/PPI** Status	Listed	Listed	Listed	Not Listed	Not Listed	Not Listed
Usage Level Range	0.05–0.2 phr†	0.05–0.3 phr†	0.1–0.5 phr†	0.1–0.5 phr†	0.1–0.5 phr†	0.1–0.5 phr†

*Viscosity at 302°F (150°C) **NSF International/Plastics Pipe Institute †parts per hundred resin

SMART-LUB™ LUBRICANT SYSTEMS

SMART-LUB Lubricant Systems are created by combining carefully selected paraffin and hydrocarbon waxes with precise dosages of secondary lubricants to produce multi-functional, specially engineered products that are highly efficient and easy to use. SMART-LUB Lubricant Systems may contain a variety of paraffin and hydrocarbon waxes, polyethylene waxes, fatty acid esters, fatty acid amides, and other ingredients that can be optimized to provide the fusion, flow and metal release characteristics required in most rigid PVC applications.

SMART-LUB products are designed to provide increased efficiency in rigid PVC extrusion processes by combining several “micro-ingredients” into one lubricant system reducing the probability of weighing errors during compounding. Increased batch to batch consistency in the PVC compounding process results in more efficient extrusion operations due to reduced upsets and adjustments. In addition, Honeywell lubricant technology goes into every SMART-LUB product and can provide substantial improvements in extrusion rates and product quality.

SMART-LUB Lubricant Systems:

- Are non-blocking, non-dusting and easy to handle.
- Maximize polyethylene wax dispersion.
- Improve batch to batch consistency.
- Are very well suited for use in automated blending systems.
- Reduce inventory levels, storage space requirements, and carrying costs.

Honeywell has developed a series of specialty lubricant products designed for demanding window and door profile extrusion.



Rheochem offers the following SMART-LUB product classes:

RL-300 Products – Melt blends of paraffin and oxidized polyethylene waxes.

RL-400 Products – Combinations of hydrocarbon waxes and low molecular weight oxidized polyethylene waxes.

RL-500 Products – Combinations of hydrocarbon waxes and oxidized polyethylene waxes of low and high molecular weights.

RL-600 Products – Complex mixtures of hydrocarbon waxes, polyethylene waxes, fatty acid esters, and fatty acid amides that can be customized to meet individual needs.

SMART-LUB Lubricant Systems are available as standardized products or in customized formulations designed to achieve peak performance in high shear or high output applications.

FOR MORE INFORMATION CALL TOLL FREE AT 1-800-222-0094

PRODUCT DATA

Products	RL™-315	RL-410	RL-517	RL-615
PVC Pipe	•	•	•	•
Vinyl Siding	•	•	•	•
Profile Extrusion	•	•	•	•
Injection Molding				
Custom PVC Compounding	•	•	•	
Congealing Point	165°F (74°C)	164°F (73°C)	220°F (104°C)	222°F (106°C)
Viscosity @ 210°F (99°C)	12.5 cSt	13 cSt	60 cSt*	25 cSt**
Acid Number (mg KOH/g)	1.6	1.5	2.5	2.1
Specific Gravity	0.91	0.91	0.92	0.92
Physical Form	Prills	Prills	Prills	Prills
Color	Slightly Yellow	Slightly Yellow	Slightly Yellow	Slightly Yellow
NSF/PPI*** Status	Listed	Listed	Listed	Listed
Usage Level Range	0.70–1.50 phrt†	0.70–1.65 phrt†	0.70–1.75 phrt†	1.00–1.75phrt†

*Viscosity at 240°F (116°C)

**Viscosity at 260°F (127°C)

***NSF International/Plastics Pipe Institute

†parts per hundred resin

SMART-PAK™ TOTAL LUBRICANT PACKAGES

SMART-PAK Total Lubricant Packages are designed to provide all the lubrication required (including calcium stearate) in rigid PVC compounds in one easy to handle package.

Wide ranges of standard and customized lubricant compositions are available to provide the lubricant balance that satisfies your plant's specific requirements.

SMART-PAK Total Lubricant Packages:

- Increase batch to batch consistency reducing line adjustments and reducing scrap rates.
- Increase melt consistency, fusion control, metal release and compound dry-flow resulting in better production rates and improved dimensional stability.
- Reduce extruder amperage increasing production efficiency.
- Improve melt temperature control enhancing surface appearance and reducing screw marks and wavy pipe walls.



Honeywell is continually developing innovative lubricant and additive technology for solid vinyl and Wood Plastic Composite decking alternatives.

SMART-PAK Total Lubricant Packages:

MLP-1000 Products – Complete lubricant systems designed to improve knit line, reduce splay and increase stability in conventional and hot runner PVC injection molding systems.

TLP-2000 Products – All the paraffin wax, calcium stearate and oxidized polyethylene lubricants necessary for most twin screw PVC pipe operations. TLP-2000 products may also be used in vinyl siding and window profile compounds.

FLP-3000 Products – Special lubricant systems for highly filled PVC pipe formulations. FLP-3000 products are also used in cellular PVC extrusion and filled vinyl siding substrate formulations.

TLP-4000 Products – All the paraffin wax, calcium stearate, oxidized polyethylene wax and fatty acid esters necessary for many twin screw vinyl siding and window profile formulations.

A-C® OptiPak™ Products – Lubricants and additives for both PVC and Polyolefin based woodfiber composites providing increased extrusion rates, improved appearance, enhanced physical properties and reduced water absorbency.

Premium PVC lubricants and years of formulating expertise go into every SMART-PAK Total Lubricant Package. Packages can be custom designed to meet the specific needs of individual customers' products and equipment. Total Lubricant Packages can be reformulated to continually maximize efficiency in changing plant environments.

FOR MORE INFORMATION CALL TOLL FREE AT 1-800-222-0094

PRODUCT DATA

Products	MLP-1880	TLP-2030	TLP-2620	FLP-3540	FLP-3550	TLP-4005
PVC Pipe		•	•	•	•	
Vinyl Siding		•	•	•		•
Profile Extrusion						•
Injection Molding	•					
Custom PVC Compounding	•	•	•		•	
Congealing Point	N/A	N/A	N/A	N/A	N/A	N/A
Viscosity @ 240°F (116°C)	65 cSt*	30 cSt	70 cSt	110 cSt	275 cSt	110 cSt
Acid Number (mg KOH/g)	12	10	9	19	31	19
Specific Gravity	0.96	0.93	0.93	0.95	0.96	0.93
Physical Form	Prills	Prills	Prills	Prills	Prills	Prills
Color	Slightly Yellow	Slightly Yellow	Slightly Yellow	Slightly Yellow	Slightly Yellow	Slightly Yellow
NSF/PPI** Status	Not Listed	Listed	Listed	Not Listed	Not Listed	Not Listed
Usage Level Range	2.0–2.5 phr†	1.40–2.20 phr†	1.65–2.30 phr†	3.00–3.50 phr†	3.00–3.5 phr†	2.00–2.50 phr†

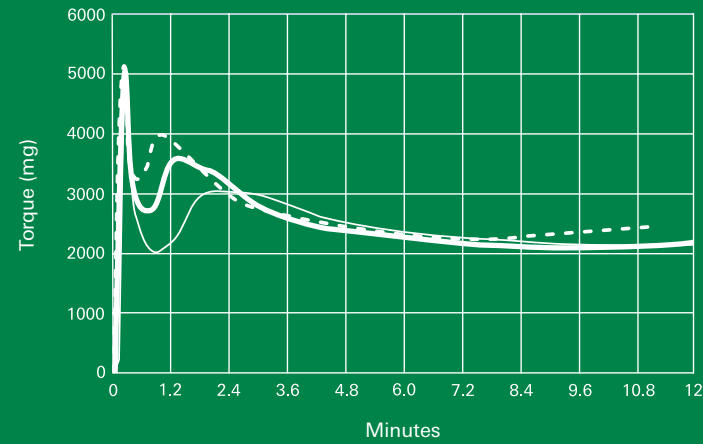
*Viscosity at 260°F (127°C)

**NSF International/Plastics Pipe Institute

†parts per hundred resin

PERFORMANCE OF SMART-PAK™ TOTAL LUBRICANT PACKAGES IN PVC CAPSTOCK

TORQUE RHEOMETRY TABLE

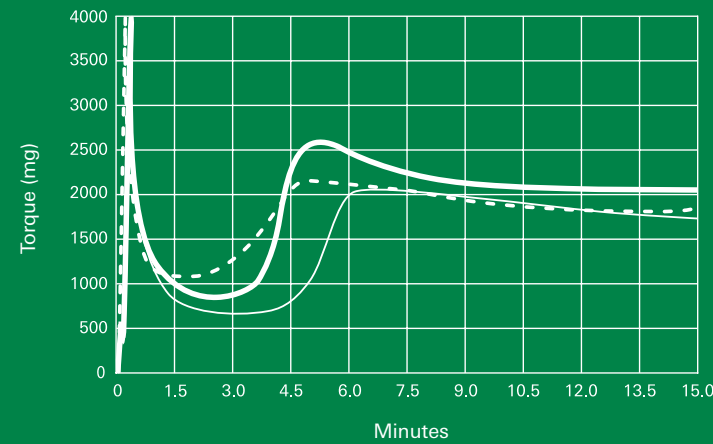


- 1. TLP high shear
- 2. TLP medium shear
- 3. TLP low shear

This graph depicts the versatility of our **SMART-PAK** Total Lubricant Packages which allows processors to choose the type of fusion required for their specific extrusion equipment.

PERFORMANCE OF SMART-PAK™ TOTAL LUBRICANT PACKAGES IN HIGHLY FILLED PVC SEWER PIPE

TORQUE RHEOMETRY TABLE



- 4. NSF Pressure Pipe Formation
- 5. High Filled FLP-3540
- 6. High Filled Conventional Lubricant System

The fusion time of the FLP 3540 formulation is similar to that of the NSF pressure pipe formulation. The higher fusion torque of the FLP 3540 formulation assures sufficient mixing to achieve good physical properties.

The longer fusion time and reduced fusion torque associated with the conventional lubricant system could result in poor physical properties or the loss of vacuum at the extruder vent.

FORMULATIONS

Ingredient	1	2	3
PVC Resin	100	100	100
Siding Grade Tin Stabilizer	0.4	0.4	0.4
Process Aid	0.5	0.5	0.5
Impact Modifier	4	4	4
TiO2	10	10	10
CaCO3	2	2	2
TLP high sheer	2.65		
TLP medium sheer		2.65	
TLP low sheer			2.65

Conditions for 1, 2 and 3: Bowl Temperature, 374°F (190°C); RPM 60; Charge 68 gms

FORMULATIONS

Ingredient	4	5	6
PVC Resin	100	100	100
Pipe Grade Tin Stabilizer	0.4	0.4	0.4
TiO2	1	1	1
CaCO3	5	40	40
TLP-2030	2.1		
FLP-3540		3	
CaST			1.1
RL165			1.7
A-C® 629A			0.2

Conditions for 4: Bowl Temperature, 374°F (190°C); RPM 60; Charge 65 gms

Conditions for 5 and 6: Bowl Temperature, 374°F (190°C); RPM 60; Charge 70 gms