When to Add Polymeric Additives for Grease

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Grease Reinforcement Mechanism [1]	Form	When to Add
Temperature Sensitive	Powder: V-207, V-211 Flake: V-4060	Add at end, with cooling oil 1 – 3 hours of mixing T > 80˚C
Any Liquid Grease Product	Liquid: V-4004A, V-4051, V-4270, V-508F (except V-191 / V-191M)	
Hydrogen Bonding	Pellet: V-508S	Add at end, with cooling oil 1 – 3 hours of mixing T > 100˚C
Reactive	Pellet: V-4020 Flake: V-4040P	Add before alkali for best results
Tackifiers	Liquid: V-191 / V-191M, V-176, PARATAC, V-178	After milling; preferably after deaeration

Best practice is ultimately determined by the formulator and will vary according to the grease type, base oil, and manufacturing equipment. Higher temperatures may be required to solubilize solids in high viscosity and/or Group III / IV base oils – use the minimum elevated temperature possible to solubilize the polymer within 1 – 3 hours.

All grease polymers will also function when added as a post-treatment or top treat.

Grease Reinforcement Mechanisms:[1]

1) Temperature Sensitive: Semi-crystalline olefin or high styrene copolymer forms a rigid interlocking structure to reinforce the grease thickener network.
   - Best for calcium sulfonates, V-207 is recommended.
2) Hydrogen Bonding: Strong polar attractions between the polymer and the grease thickener improve mechanical strength.
   - Best for bio-based, V-508F is recommended.
3) Reactive: A multifunctional reactive group cooordinates the metal ion (Li, Ca, Al) and complexes hydroxyl groups on 12-HSA.
   - Best for soap-based grease like lithium complex, V-4020 is recommended.

[1] For more on 'Grease Reinforcement Mechanisms', see: ""*A Study of Polymer Additives in Mineral and Vegetable Oil-based Greases*", Functional Products Inc., 2011