penreco®



A BETTER WAY TO FORMULATE

SYNERGEL®

PERFORMANCE GELS

Penreco® has developed a unique system for thickening and gelling hydrocarbon fluids for various industrial applications. Synergel® rheology modifying gels are clear, colorless, and oil soluble carriers that provide exceptional stability and formulation flexibility.

BENEFITS & ATTRIBUTES

- Mineral oil or solvent gelled with styrenic block copolymer
- Transparent gel structure
- Reduced processing and heat requirements
- Adjustable viscosity range and suspension
- Effective in a wide range of industrial applications

APPLICATIONS

- Lubricants & Metalworking Fluids
- Paints & Coatings
- Adhesives, Sealants & Elastomers
- Household & Industrial Care Products

penreco®

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To request a sample, visit penreco.com.

CALUMET

SYNERGEL®

SOLVENT AND MINERAL OIL GELS

TYPICAL PROPERTIES

Product	Base Material	Viscosity	Saybolt Color	Flash Point (typical)	Specific Gravity @ 25 °C (typical)
SYNERGEL® M 500	Light Mineral Oil NF	47,000 - 57,000 cPs (D2983 @ 25 °C)	27 min	>300 °F (D92)	0.8450
SYNERGEL® M 750	Light Mineral Oil NF	67,000 - 83,000 cPs (D2983 @ 25 °C)	27 min	>300 °F (D92)	0.8450
SYNERGEL® M 1600	Light Mineral Oil NF	132,000 - 198,000 cPs (D2983 @ 25 °C)	27 min	>300 °F (D92)	0.8450
SYNERGEL® MR 500	USP Mineral Oil	38,000 - 53,000 cPs (D2983 @ 25 °C)	27 min	>300 °F (D92)	0.8780
SYNERGEL® LVP 100	Low Vapor Aliphatic	Typical 35,000 cPs (D2983 @ 25 °C)	25 typical	200 °F (D93)	0.7950
SYNERGEL® SA V50	Isoparaffinic Aliphatic	30,000 - 60,000 cPs (D2983 @ 25 °C)	25 typical	145 °F (D93)	0.7680
SYNERGEL® SC V50	Isoparaffinic Aliphatic	40,000 - 60,000 cPs (D2983 @ 25 °C)	27 min	200 °F (D93)	0.8170
SYNERGEL® VM&P	VM&P Naphtha	40,000 - 50,000 cPs (D2983 @ 25 °C)	20 min	60 °F (D56)	0.7410
SYNERGEL® MS 500	Mineral Spirits	Typical 43,500 cPs (D2983 @ 25 °C)	28 min	100 °F (D56)	0.7650
SYNERGEL® HB125	Light Mineral Oil NF	115 - 135 SUS (D2161 @ 100 °F)	20 min	>300 °F (D92)	0.8450

WHY FORMULATE WITH SYNERGEL

VERSATILITY

- Compatible with a wide range of low polarity ingredients
- Broad range of viscosity profiles
- Ease of incorporation in post batch modifications

PERFORMANCE

- Enhanced lubrication
- Excellent flexibility
- Adjustable suspension properties

STABILITY

- Anhydrous self-preserving formulation base
- Heat processed and micro-filtered
- Exceptional product and emulsion stability

COST EFFECTIVE & FORMULATION FRIENDLY

- Efficient delivery system
- Reduces amount of structuring agent required in a formulation
- Simplifies formulation while enabling efficient processing

All Synergel products are processed in a segregated and dedicated area of a FDA Registered Drug Establishment. However, Synergel products are NOT food/pharmaceutical grade products.

- cGMP standards
- ISO 9001:2015
- FDA Registered Drug Establishment

With a wide range of customization, the range of possibilities are nearly endless. If you are interested in a gelled system for one of these products or have an idea of your own, please contact your Penreco sales representative and our technical experts will be happy to find a solution that's right for you.

SYNERGEL®

LUBRICANT AND METALWORKING FLUIDS

Synergel HB125 and **Synergel MS** were used as structured base for a sprayable gel lubricant spray that meets or exceeds the performance of a leading gel lubricant spray on the market.

Formulation

PHASE	INGREDIENT (GLS_SF_OG_CS_1)	TRADE NAME	SUPPLIER	WT. %
1	Gelled Hydrocarbon	**Synergel HB125**	Calumet	33.00
1	Heavy Mineral Oil	**Drakeol 600**	Calumet	30.00
1	Gelled Light Hydrocarbons	**Gelled Mineral Spirits (18 K cP)**	Calumet	30.00
1	Complete Gear Oil Additive Pkg	Functional GA-614	Functional Products	3.00
1	Ca Soap of Oxidized Petrolatum	Oxguard 55	RBM Chemical	2.00
1	Gelled Ca Sulfonate in Oil	CalSul 180	RBM Chemical	2.00

Viscosity @ 25 °C, spindle RV-1, 20 RPM = 228 cPs
Stable after 3 months accelerated aging at 45 °C
PMCC Flash Point = 120 °F

Procedure

1. Add ingredients in order while stirring gently at room temperature, ensuring homogeneity after each addition.

*Products listed in bold are supplied by Calumet.

Performance Testing

Synergel® Gelled Lubricant Spray is a stable, substantive lubricant formulation with anti-wear, extreme pressure, anti-corrosion, and drip resistance equal to or better than a leading commercial benchmark.

SAMPLE	4-BALL WEAR SCAR DIAMETER (MM) ASTM D4172	4-BALL EP WELD LOAD (KG) ASTM D2783	SALT CORROSION 24-HR RUST (%) ASTM B117	DRIP RESISTANCE SAMPLE RETAINED (%)
Synergel® Gelled Lubricant Spray	0.40	250	0	17
Leading Commercial Benchmark	0.39	250	0	11



This formula is distributed by Calumet Refining, LLC (“Calumet”), only for the purpose of promoting the use of mineral oil, petrolatum, and Synergel as components of secondary cosmetic products that are manufactured by Customers of Calumet and for no other purpose. Full Disclaimer and Limitation of Liability available at https://penreco.com/formulationdisclaimer

SYNERGEL®

HOUSEHOLD AND INDUSTRIAL CARE PRODUCTS

FURNITURE POLISH

Synergel HB125 was used to structure gelled oil and solvent systems for Adhesive Remover & Furniture Polish. The Synergel Furniture Polish had equal or greater refractive index (RI) as a market leading product, and both had a RI close 1.5 which demonstrated that both products could enhance the natural beauty of wood by creating deep a lustrous finish.

Formulation

PHASE	INGREDIENT	TRADE NAME	SUPPLIER	WT. %
1	Gelled hydrocarbon	**Synergel HB 125**	Calumet	88.75
1	Soft wax	**300 Soft Wax**	Calumet	5.00
2	Limonene	D-Limonene	TCI	5.00
2	Fragrance	Orange Oil	Spectrum	1.00
2	Color Solution	1% Solvent Orange 60 in Synergel HB 125	Alfa/Calumet	0.25

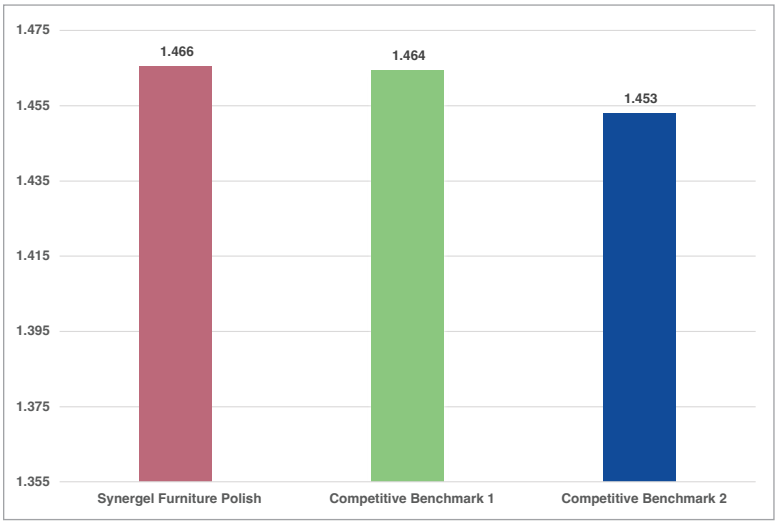
Viscosity @ 25 °C, spindle RV-1, 30 RPM = 34 cPs
Stable after 3 months accelerated aging at 45 °C

Procedure

1. Add HB 125 and Soft Wax to mixing vessel then warm and stir to dissolve Soft Wax.
2. Allow mixture to cool to approximately 40 °C.
3. Add remaining ingredients in order with continuous stirring to dissolve.

*Products listed in bold are supplied by Calumet.

Refractive Index



The Refractive Index which correlates to the shine or gloss of the product, was measured at 25 °C for the Synergel Furniture Polish formulation and two competitive benchmark products. Synergel Furniture Polish showed comparable or greater predicted shine versus leading competitors on the market.

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SYNERGEL®

HOUSEHOLD AND INDUSTRIAL CARE PRODUCTS

ADHESIVE REMOVER

Synergel HB125 was the primary structurant and solvent base for Synergel Adhesive Remover. This formula performed well in a demonstration vs. leading commercial benchmark which measured the ease of removing an adhesive label from a glass surface.

Formulation

PHASE	INGREDIENT	TRADE NAME	SUPPLIER	WT. %
1	Gelled hydrocarbon	**Synergel HB 125**	Calumet	78.80
1	Ether Alcohol	Diethylene Glycol Monobutyl Ether	TCI	15.00
1	Limonene	D-Limonene	TCI	3.00
1	Fragrance	Orange Oil	Spectrum	2.00
1	Triglycerol monooleate	I-MUL PGO 31K	Ivanhoe Industries	1.00
1	Color Solution	1% Solvent Orange 60 in Synergel HB 125	Alfa/Calumet	0.15
1	Color Solution	1% Solvent Red 18 in Synergel HB 125	Alfa/Calumet	0.05

Viscosity @ 25 °C, spindle RV-1, 30 RPM = 25 cPs
Stable after 3 months accelerated aging at 45 °C

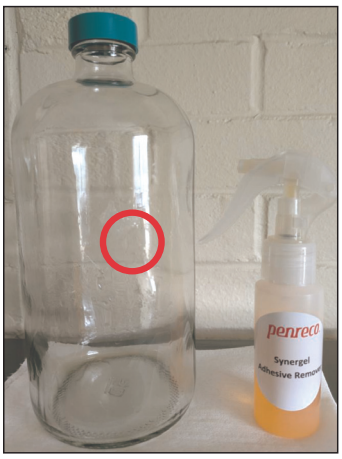
Procedure

1. Add ingredients in order to the mixing vessel at RT.
2. Mix sufficiently to dissolve after each addition.

*Product listed in bold is supplied by Calumet.

Performance Testing

1. Apply product to adhesive label
2. Leave product on label for 5 min
3. Wipe of product
4. Remove label with fingers
5. Repeat steps 1 – 4 if necessary
6. When remaining label is too small to remove using fingers, use a metal spatula



Synergel Adhesive Remover



Commercial Benchmark

penreco®

Formulating Lasting Partnerships

With Products Designed for Life

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