






Rubber Assembly Lubricants

What are they?
How to improve your assembly operations, increase quality and reduce injuries.

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Presenter Overview

International Products Corporation (IPC), incorporated in 1923, manufactures specialty chemicals. IPC has over 30 years experience making and selling precision cleaners and formulated lubricants to industry.

Company Headquarters

IPC is proud to have been awarded the Frost & Sullivan 2012 North American Automotive Assembly Lubricant Product Leadership Award.

All products are manufactured in the U.S.A. at their New Jersey headquarters and are available worldwide.

Distributor Locations

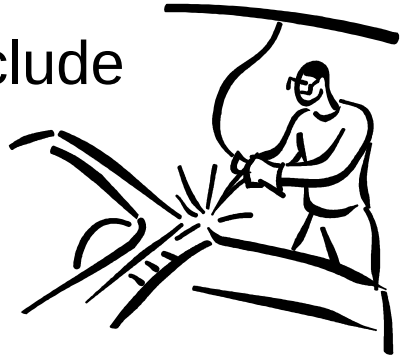
International Products Corporation is an ISO 9001:2008 Certified Company

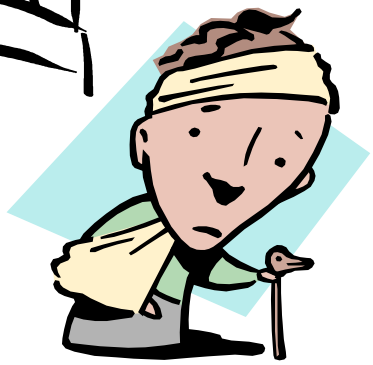
Today's Agenda

1. Why use an Assembly Lubricant
2. What an Effective Rubber Lubricant Provides
3. How Assembly Lubricants Work
4. Industries and Applications
5. What to Consider in Choosing a Lubricant
6. Commonly Used Rubber Lubricants
7. Formulated Lubricants
8. Comparison Chart
9. Lubricant Efficiency Chart
10. Lubrication Over Time Chart
11. Lubrication vs. Drying Time Chart
12. Sample Tests
    a) Elastomer Compatibility
    b) Mineral Oil -vs- P-80
    c) Results of Antifreeze Compatibility
13. Closing
14. Questions

Why Use Rubber Assembly Lubricants

- Rubber materials are inherently difficult to install, remove, or otherwise manipulate – even when wet
  - Common Assembly Problems Include
    - Rolling O-rings
    - Uneven cuts
    - Misaligned parts
    - Damaged parts
    - Sore muscles, worker injury
      - Repetitive Stress Injury (RSI)





A Rubber Lubricant Should:

Reduce Installation Force

- Reduce surface tension
- Slide parts into place easily, providing a tight fit

Achieve Closer Fits

- Design lower tolerance parts
- Increase torque installation
- Temporary lubrication only – resulting in a tight fit

Improve Product Performance

- Reduce or eliminate damage to parts

Increase Production Rates

- Allow for faster, more productive assembly

Avoid Injuries

- Avoid musculoskeletal, slippage, and repetitive stress related injuries
- Safe to handle

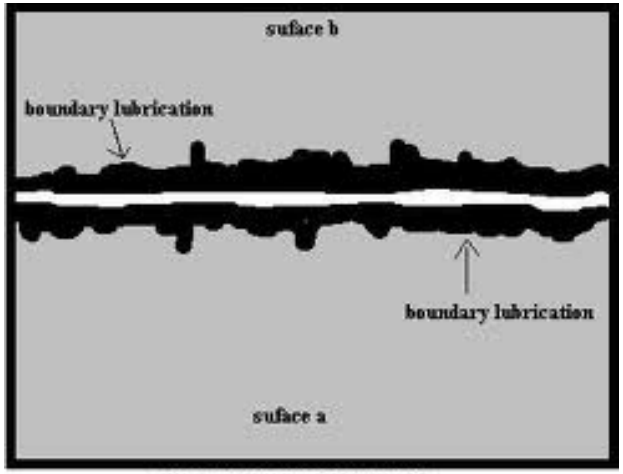
Reduce Rejects

- Must be compatible with surfaces and liquids with which it may come in contact
- No shrinking, softening, swelling, crazing or rusting
- Should dry without residue when properly applied

Environmentally Friendly, Easy Disposal

How Assembly Lubricants Work

- Theory:
  - Hydrodynamic Lubrication
    - Thin film of lubricant rests between two surfaces
      - Separates surfaces
    - Lubricant fills in gaps, holes, etc. of each surface
    - Lubricant allows surfaces to slide across each other



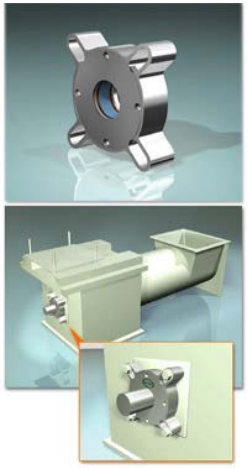
BOUNDARY LUBRICATION

Industries that benefit from Rubber Assembly Lubricants

- **Agricultural equipment**
- **Aircraft**
- **Appliance**
- **Automotive / Truck**
- **Construction equipment**
- **Food & Beverage**
- **Locomotive**
- **Marine**
- **Personal Care Product Packaging**
- **Pump**
- **Recreational equipment & vehicles**
- **Tool assembly**
- **Wastewater**
- **…and many others**

Typical Assemblies

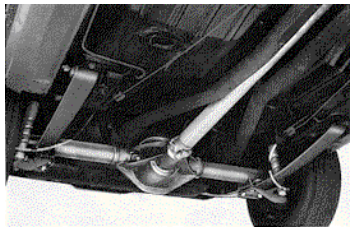
- Belts
- Boots
- Bumpers
- Bushings
- Diaphragms
- Fasteners
- Foam grips
- Gaskets
- Grommets
- Hoses
- Insulators
- Mounts
- O-rings
- Plugs
- Rubber moldings
- Seals
- Sleeves
- Threaded connectors
- Tires
- Rubber washers
- Wire harnesses
- …And hundreds of other rubber and soft plastic parts

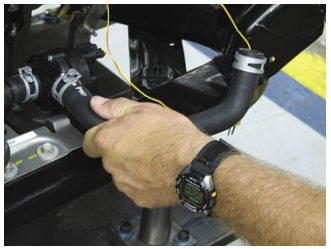




Products Manufactured with Rubber Lubricants









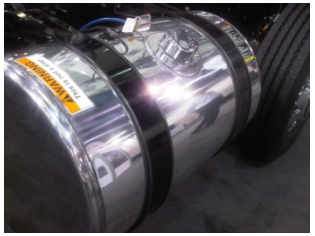








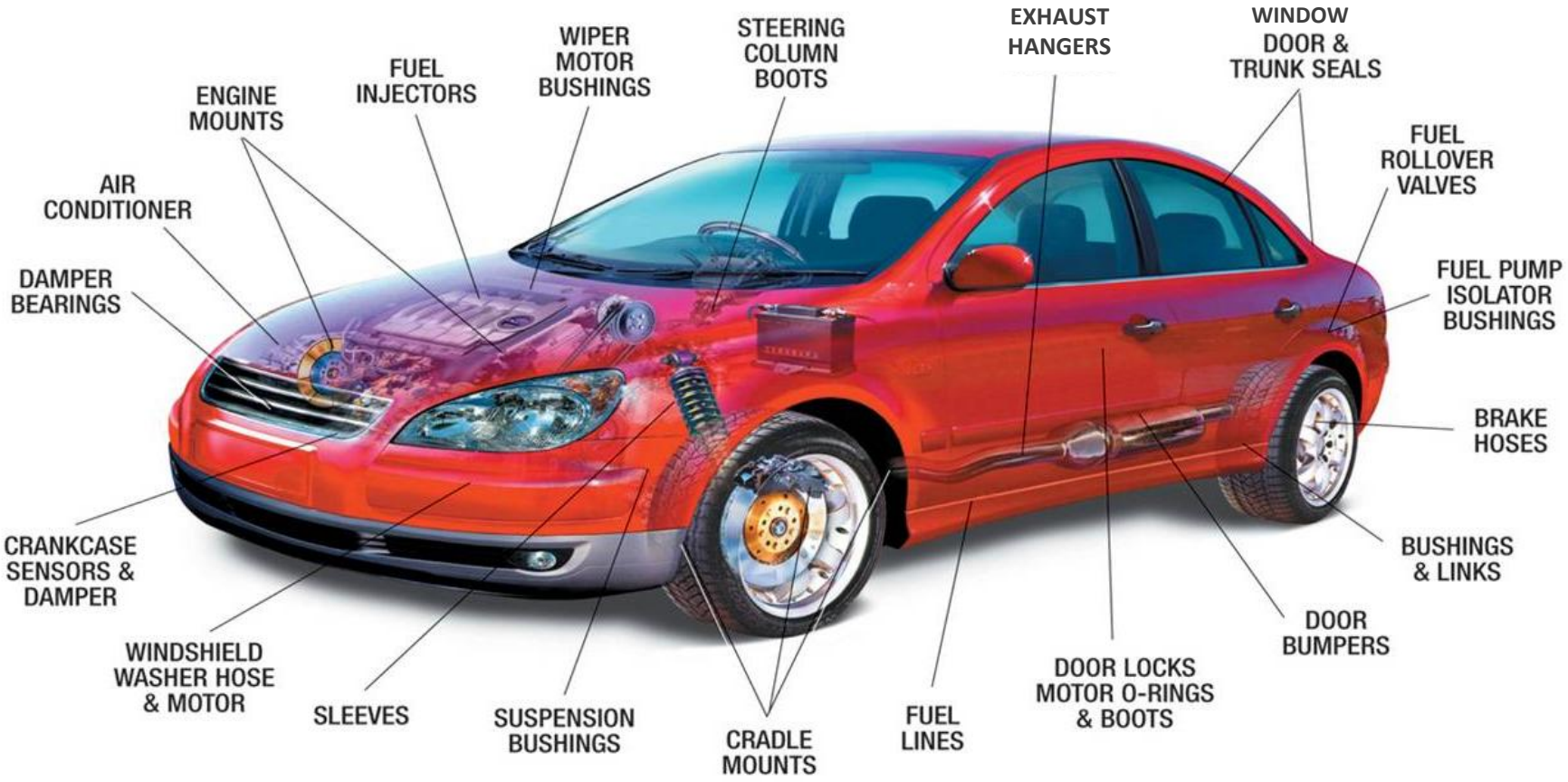




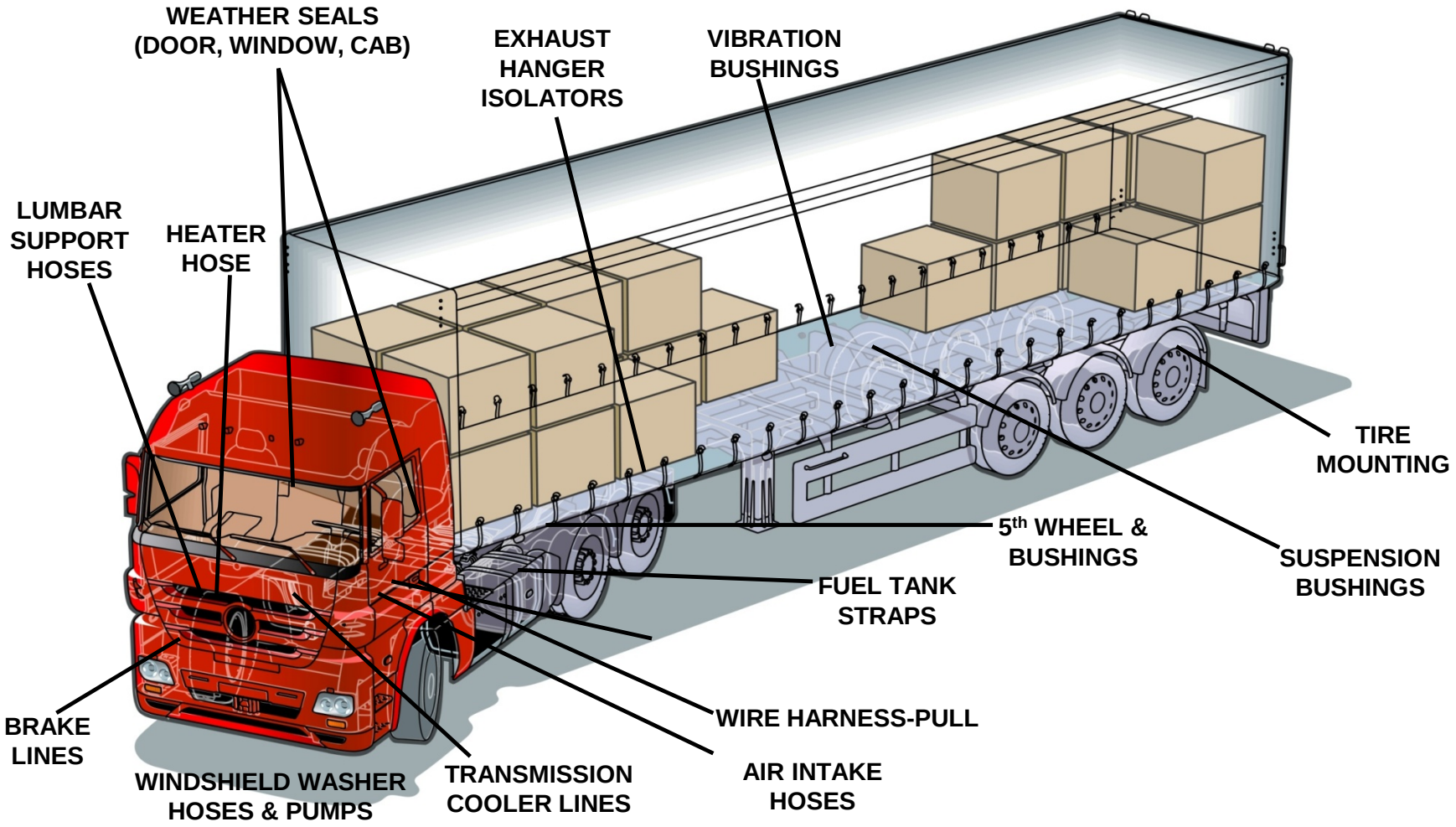
Temporary Rubber Assembly Lubricants

International Products CORPORATION

Typical Automotive Assembly Applications



Typical Truck Assembly Applications



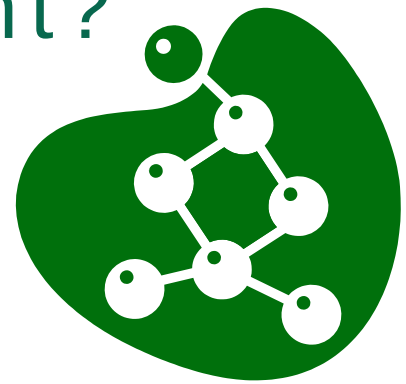
Items to Consider when Choosing a Lubricant

- Surface compatibility
  - Metals
  - Elastomers
  - Plastics
- Dry time
- Lubricant conductivity
- Chemical composition concerns

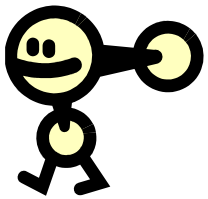
Types of Commonly Used Lubricants

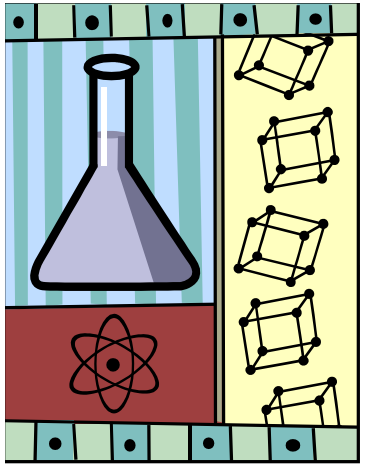
- **Soap and Water**
- **Alcohol**
- **Kerosene**
- **Silicone**
- **Petroleum Oil**
- **Petroleum Jelly**
- **New, ester based, biodegradable choices**

Why Use a Specially Formulated Temporary Rubber Lubricant?

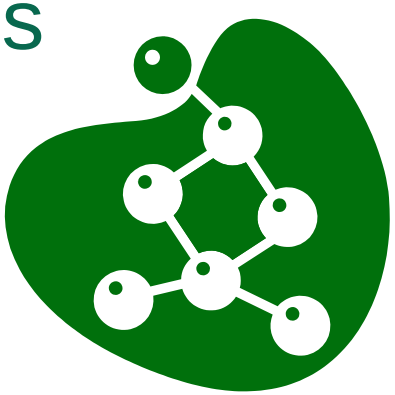


- Consistent Composition
- Low Impurities
- Green Chemistry
- Favorable Compatibility
  - Petroleum-based products have a tendency to swell certain rubbers and damage plastics
  - Soap and water can cause corrosion and future slippage when wet
  - Silicon interferes with coating and painting

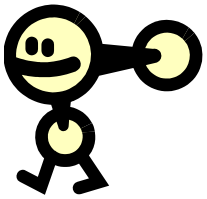


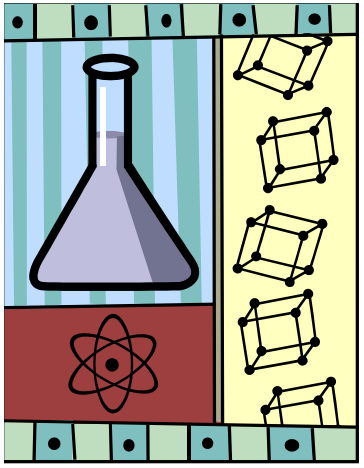


Formulated Temporary Rubber Assembly Lubricants



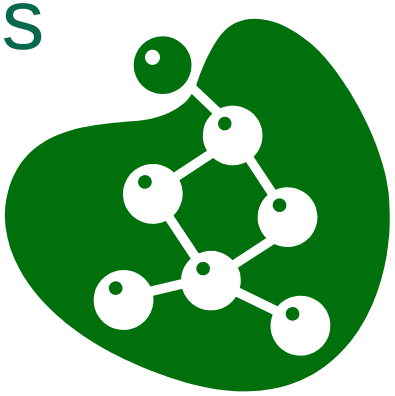
- ***Why esters?***
  - Molecular structure is conducive to lubrication
    - Structurally flexible functional groups; C-O-C bonds can rotate easier than other functional groups
  - Performance over volume – a little goes a long way
  - Do not fluoresce
    - Improving leak test results

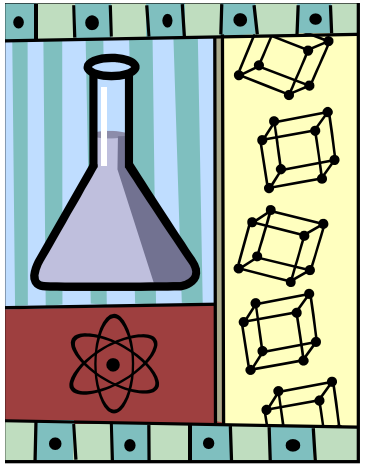


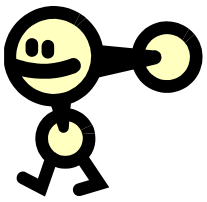


Formulated Temporary Rubber Assembly Lubricants

- ***Innovative Emulsion Technology***
  - *Synthetic esters blended with water*
- ***Why an emulsion?***
  - Synergy!
    - Emulsion has better lubrication than esters by themselves
    - Reduces surface tension of rubber to allow esters to get into all of the nooks and crannies of the rubber
    - Allows a *thin* layer of esters to coat the rubber for hydrodynamic lubrication
    - Temporary lubrication – Once water evaporates, ester film absorbs into elastomer





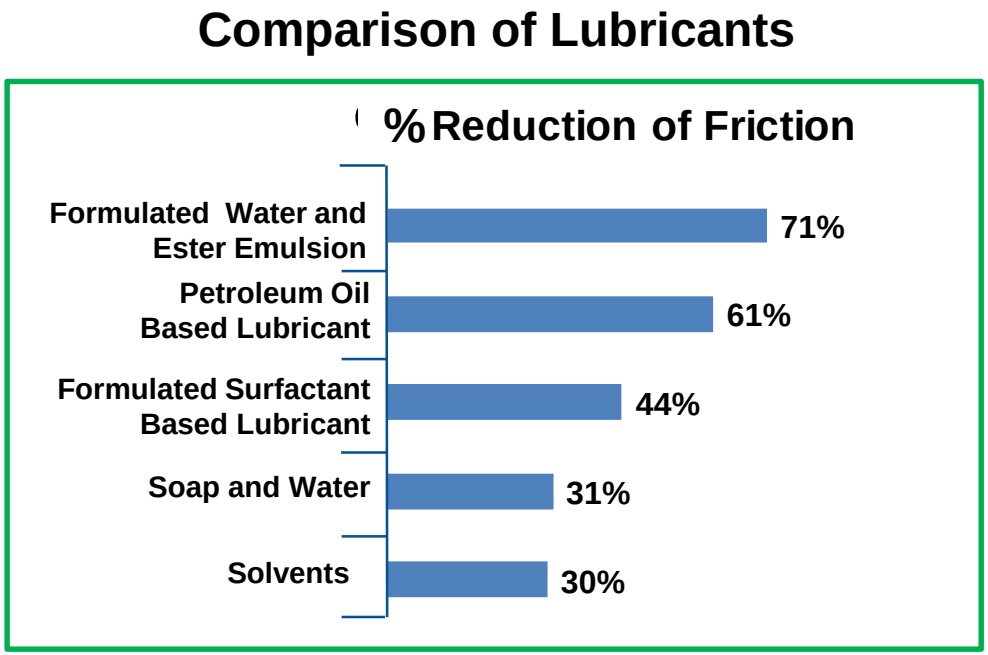


Comparison Chart

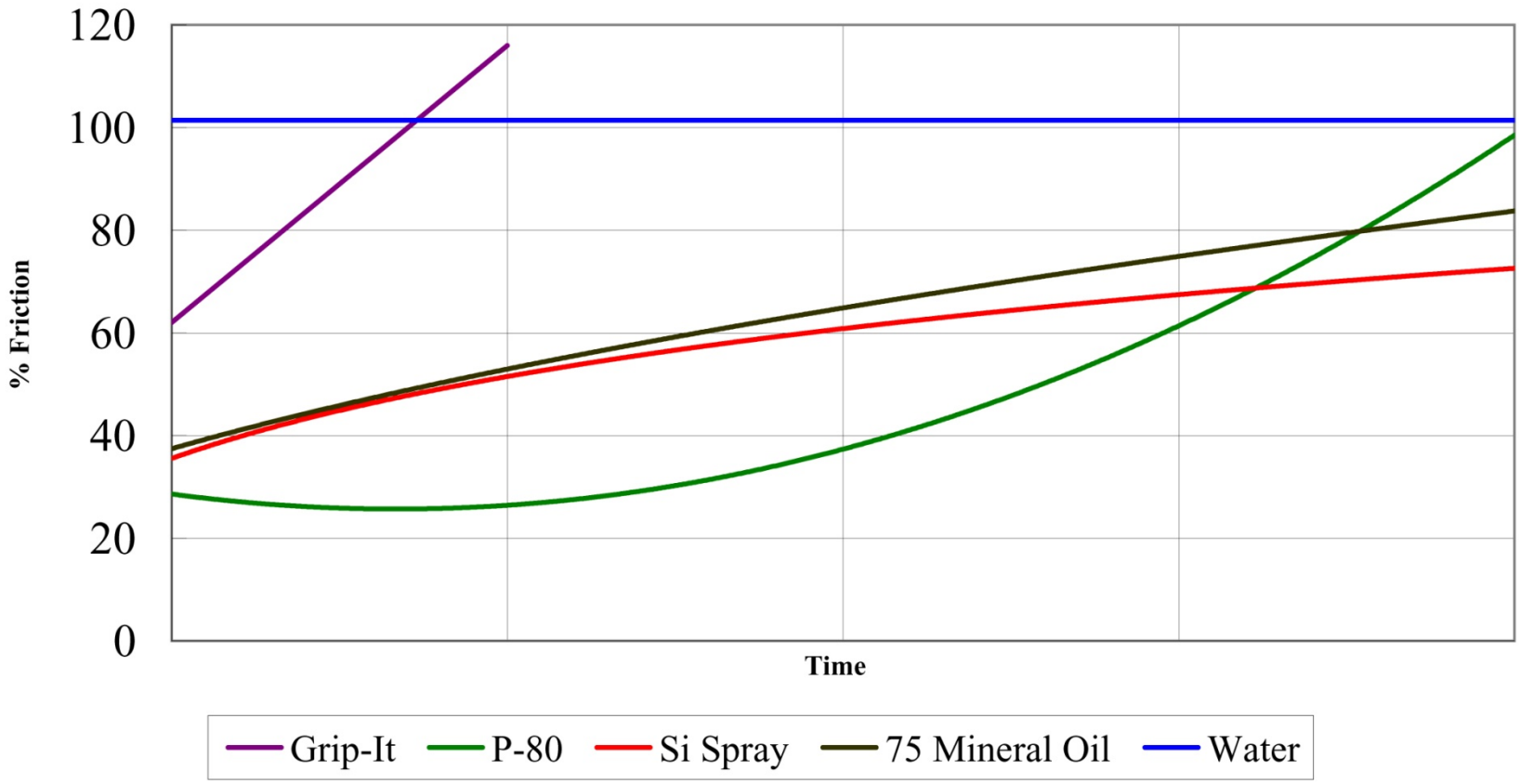
ESTER BASED TEMPORARY RUBBER ASSEMBLY LUBRICANTS	TRADITIONAL RUBBER ASSEMBLY LUBRICANTS
Provide lubricity and reduce friction.	Provide lubricity and reduce friction.
Temporary lubrication, once dry will not reactivate, resulting in tight fitting parts.	Continual lubrication, can reactivate in presence of water – resulting in problems with quality and consistency of finished product.
Will not dry out rubber or corrode metal parts.	Can dry out rubber and corrode metal parts.
Any residue is non-conductive.	Many additives are conductive.
Non flammable, negligible VOCs.	May contain VOCs. May be flammable.
Excess lubricant washes away easily.	In some cases may be difficult to wash away excess lubricant.
Compatible with elastomers and plastics. Will not swell rubber.	May not be compatible with elastomers and plastics. Can swell rubber.
Treated surfaces can be coated and painted afterwards.	May interfere with downstream coating and painting processes.
Environmentally friendly and non-hazardous.	Environmental and health hazards can exist.

Efficiency of Lubricants

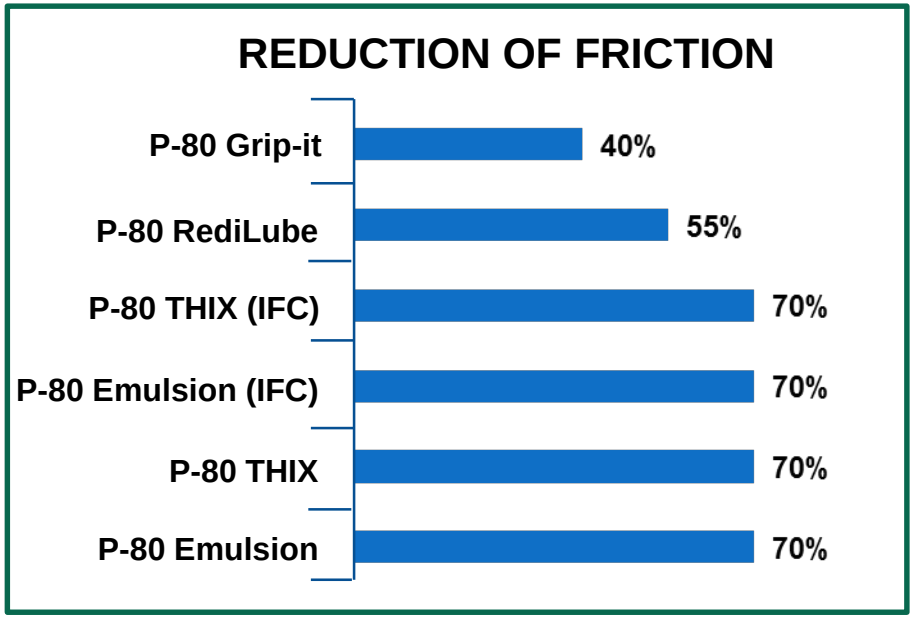
- Solvents (e.g. alcohol) Provide poor lubrication, are flammable with high VOCs and are a safety risk
- Soaps and detergents provide a nominal amount of lubricity
- Petroleum distillates lubricate, but are often not compatible with surfaces – and are not temporary
- Ester technology provides excellent reduction in friction, temporary lubrication, environmental and worker safety

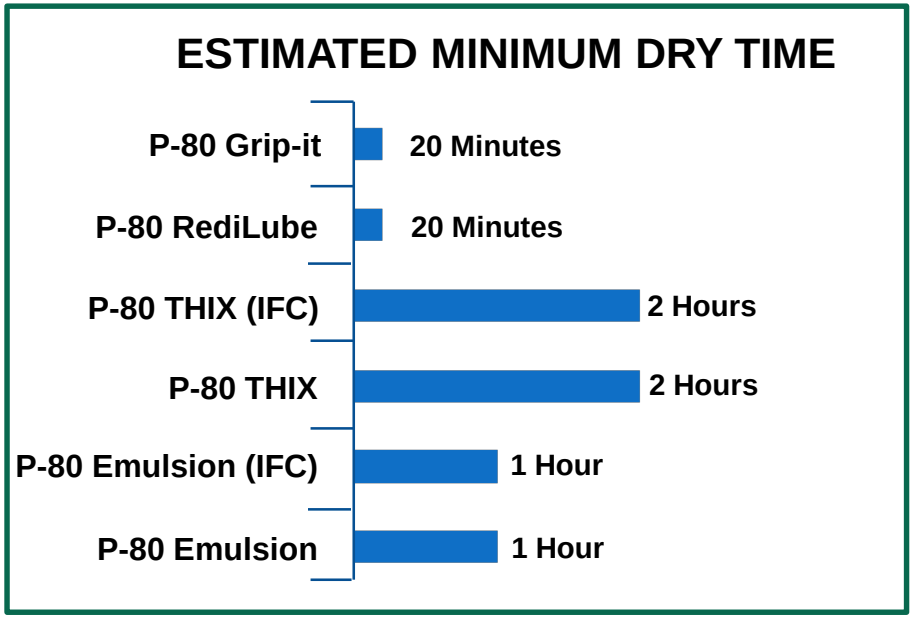


Lubrication over time chart



Lubrication -vs- Drying Time





Choose an Experienced Lubricant Manufacturer

- Tests Available
  - Metal Compatibility – ASTM F483
  - Elastomer Compatibility – ASTM D471
  - Plastic Compatibility – ASTM D543
  - Lubrication Tests
    - Force Gauges
      - In-house tests using control samples and customer's assembly components
    - Coefficient of Friction
      - Several ASTM test methods
  - Chemical Compatibility
    - Gasoline, power steering fluid, antifreeze, etc.

Rubber Assembly Lubricant Elastomer Compatibility-ASTM D471

Elastomer Compatibility of P-80® Temporary Assembly Lubricants — Room Temperature (25° C)

CONCLUSION: P-80 Lubricants were found compatible with all elastomers tested.

	% SWELL (mm)																			
	Buna-N			Neoprene			Butyl			EPDM			Viton			Silicone			Natural Rubber		
	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours
P-80 A	4.601 ± 0.004	0.8%	1.1%	2.114 ± 0.012	1.4%	1.9%	3.172 ± 0.012	0.1%	-0.2%	2.103 ± 0.004	0.2%	0.4%	2.309 ± 0.026	0.1%	0.1%	3.145 ± 0.008	0.2%	0.2%	3.034 ± 0.005	1.3%	2.5%
P-80 B	4.601 ± 0.009	1.3%	2.0%	2.124 ± 0.022	1.2%	2.7%	3.132 ± 0.011	0.0%	0.0%	2.117 ± 0.005	0.3%	0.3%	2.290 ± 0.032	-0.3%	-0.3%	3.145 ± 0.006	0.6%	0.6%	2.942 ± 0.009	2.2%	2.3%
P-80 C	4.626 ± 0.004	0.5%	0.8%	4.812 ± 0.008	0.7%	1.1%	3.146 ± 0.005	0.3%	0.4%	4.402 ± 0.006	0.4%	0.3%	2.273 ± 0.039	0.2%	0.1%	3.159 ± 0.001	0.5%	0.6%	2.997 ± 0.002	0.3%	1.5%
P-80 D	4.602 ± 0.006	1.0%	1.5%	4.801 ± 0.007	0.3%	1.2%	3.142 ± 0.008	0.5%	0.5%	4.457 ± 0.009	0.9%	1.0%	2.194 ± 0.012	-0.3%	0.0%	3.161 ± 0.008	-0.3%	-0.9%	3.057 ± 0.028	0.1%	0.2%
Water	4.583 ± 0.008	0.1%	0.3%	2.149 ± 0.023	0.3%	1.1%	3.192 ± 0.004	-0.2%	-0.3%	2.103 ± 0.009	-0.2%	0.1%	2.290 ± 0.016	0.0%	0.0%	3.153 ± 0.008	0.1%	0.6%	2.926 ± 0.028	0.1%	0.8%
Mineral Oil	4.613 ± 0.016	0.5%	2.2%	2.136 ± 0.008	2.1%	3.4%	3.186 ± 0.004	2.2%	4.0%	2.107 ± 0.012	6.1%	10.7%	2.316 ± 0.061	0.1%	0.4%	3.147 ± 0.004	4.1%	7.4%	3.084 ± 0.027	11.3%	18.0%

Test data is for comparison purposes only. Individuals should conduct their own tests for compatibility verifications. Please contact International Products Corp. for compatibility information on any elastomer not shown.

Initial measurements: Thickness (mm) ± Standard Deviation
22-hour & 70-hour measurements: % Change of Initial Measurement

Elastomers
Buna-N, (Nitrile), Mil-R-3065, ½"x ½"x¼"; Neoprene, ASTM D2000, Type BC, ½"x ½"x ¼"; Butyl, ASTM D2000, Type BA, ½"x ½"x ¼"; EPDM, Ethylene Propylene Diene Methylene, ASTM D2000, Type HK, ½"x ½"x ¼"; Viton, (Fluorocarbon), ASTM D2000, Type HK, ½"x ½"x ¼"; Silicone, FDA Silicone, Type ZZ-R-765-E, Class 2A & B, 50A Durometer

Temporary Rubber Assembly Lubricants

Elastomer Compatibility of P-80® Temporary Assembly Lubricants — Room Temperature (25° C)

% HARDNESS - Shore A Durometer

	Buna-N			Neoprene			Butyl			EPDM			Viton			Silicone			Natural Rubber		
	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours
P-80 A	53.3 ± 0.5	-1.4%	-4.2%	61.5 ± 0.6	-0.8%	-2.4%	69.3 ± 0.5	-0.7%	-0.7%	67.5 ± 0.6	-1.5%	-2.2%	76.5 ± 0.6	-0.7%	-0.7%	57.3 ± 0.5	-3.1%	-3.9%	39.0 ± 1.6	-5.8%	-12.8%
P-80 B	53.5 ± 0.6	-0.9%	-2.8%	63.0 ± 1.4	-1.6%	-4.4%	69.5 ± 0.6	0.4%	-0.4%	67.5 ± 1.0	-0.4%	-0.4%	75.0 ± 0.0	0.0%	0.0%	58.5 ± 0.6	-4.7%	-4.7%	41.5 ± 0.6	-10.8%	-13.3%
P-80 C	52.7 ± 0.6	-1.9%	-3.2%	60.7 ± 0.6	-3.3%	-5.0%	68.7 ± 0.6%	1.0%	1.9%	60.7 ± 0.6%	0.6%	-0.6%	76.0 ± 1.0	0.4%	0.0%	58.3 ± 0.6	-1.1%	-6.9%	37.7 ± 0.6	-3.5%	-9.7%
P-80 D	53.0 ± 1.9	-0.4%	-7.9%	59.5 ± 1.0	0.3%	-6.7%	66.2 ± 0.8	0.5%	0.2%	59.8 ± 1.0	-2.2%	-5.2%	75.7 ± 0.5	-0.5%	-4.6%	54.5 ± 0.5	-4.2%	-6.8%	32.7 ± 0.8	-9.8%	-6.7%
Water	52.8 ± 1.0	0.5%	-1.0%	62.3 ± 0.5	-2.0%	-2.4%	67.8 ± 0.5	1.5%	0.0%	66.5 ± 0.6	2.6%	1.5%	75.5 ± 0.6	0.0%	2.3%	55.0 ± 0.8	-0.9%	-0.5%	37.5 ± 0.6	0.0%	-2.0%
Mineral Oil	52 ± 0	-2.4%	-7.2%	61.8 ± 0.5	-6.1%	-8.9%	68.5 ± 1.0	-1.5%	-5.8%	67.8 ± 0.5	-10.0%	-17.0%	75.8 ± 0.5	-0.3%	-0.3%	57 ± 0	-9.2%	-10.1%	37.3 ± 0.5	-26.2%	-33.6%

% MASS (g)

	Buna-N			Neoprene			Butyl			EPDM			Viton			Silicone			Natural Rubber		
	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours	Initial	22 Hours	70 Hours
P-80 A	4.3295	0.2%	0.5%	1.7618	1.0%	1.9%	2.6885	0.0%	-0.1%	1.9116	0.1%	0.2%	2.6809	0.1%	0.1%	2.5017	0.2%	0.3%	2.0444	1.0%	2.1%
P-80 B	4.0706	0.4%	1.0%	2.0452	1.5%	3.1%	2.6052	-0.1%	0.1%	1.8907	0.4%	0.9%	2.5579	0.1%	0.1%	2.3628	0.2%	0.3%	2.117	1.2%	2.5%
P-80 C	4.2189	0.4%	0.7%	3.9617	0.9%	1.8%	2.6039	-0.3%	-0.2%	3.412	0.0%	0.0%	2.3972	0.1%	0.1%	2.4154	0.5%	0.8%	2.0644	1.2%	2.3%
P-80 D	3.9975	1.0%	2.3%	4.0651	1.3%	3.5%	2.6615	0.3%	0.7%	3.4659	0.8%	1.8%	2.9	0.2%	0.4%	2.7102	0.4%	0.6%	1.7355	3.5%	7.1%
Water	4.174	0.2%	0.3%	2.0998	0.5%	1.3%	2.7467	0.0%	0.0%	1.9275	0.1%	0.1%	3.0248	0.1%	0.1%	2.5843	0.1%	0.1%	2.0149	0.8%	1.5%
Mineral Oil	4.0877	1.3%	2.4%	1.6717	3.5%	6.5%	2.7360	3.4%	6.6%	1.4655	12.9%	26.1%	2.9116	0.0%	0.0%	2.5404	12.4%	15.0%	1.9761	33.3%	64.7%

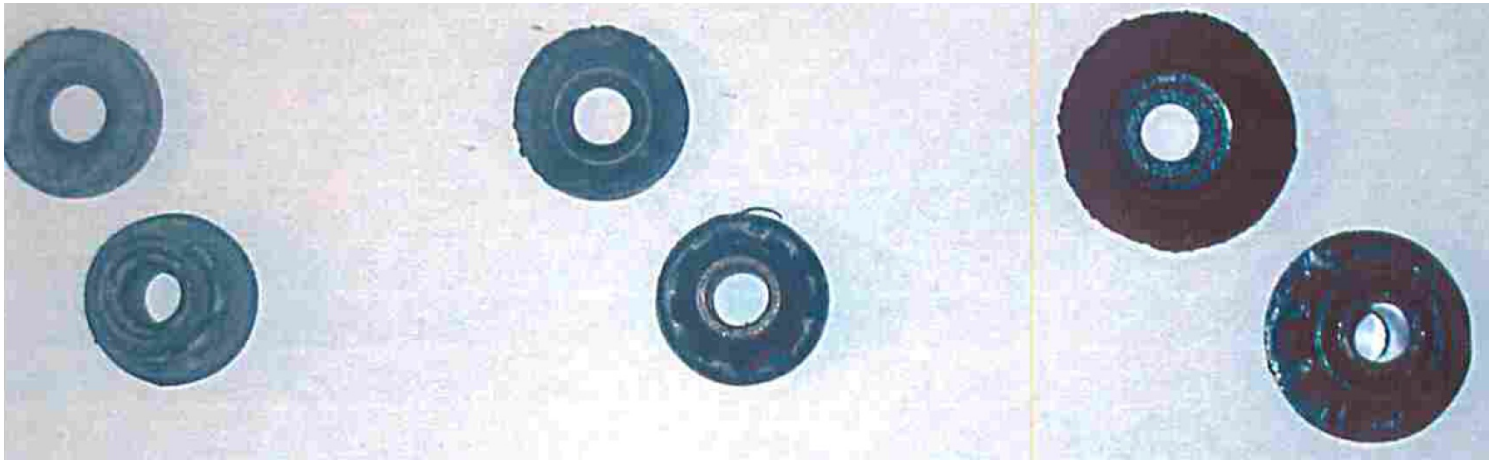
Test data is for comparison purposes only. Individuals should conduct their own tests for compatibility verifications. Please contact International Products Corp. for compatibility information on any elastomer not shown.
Test Method: ASTM D471-79 (1991).

Temporary Rubber Assembly Lubricants

Rubber Assembly Lubricant -vs- Mineral Oil Photos

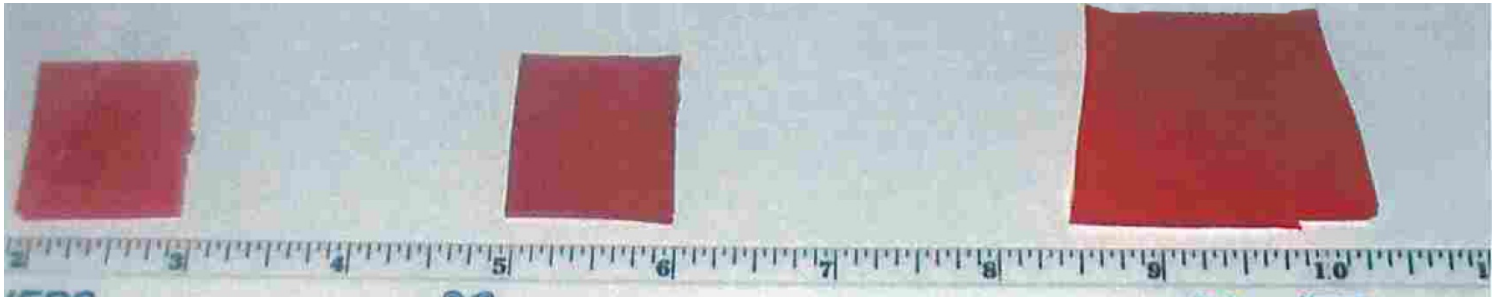
Engine Mounts Compatibility (96 hours at 85° C)

Tap Water **Formulated Rubber Assembly Lubricant** **100 Sus Mineral Oil**

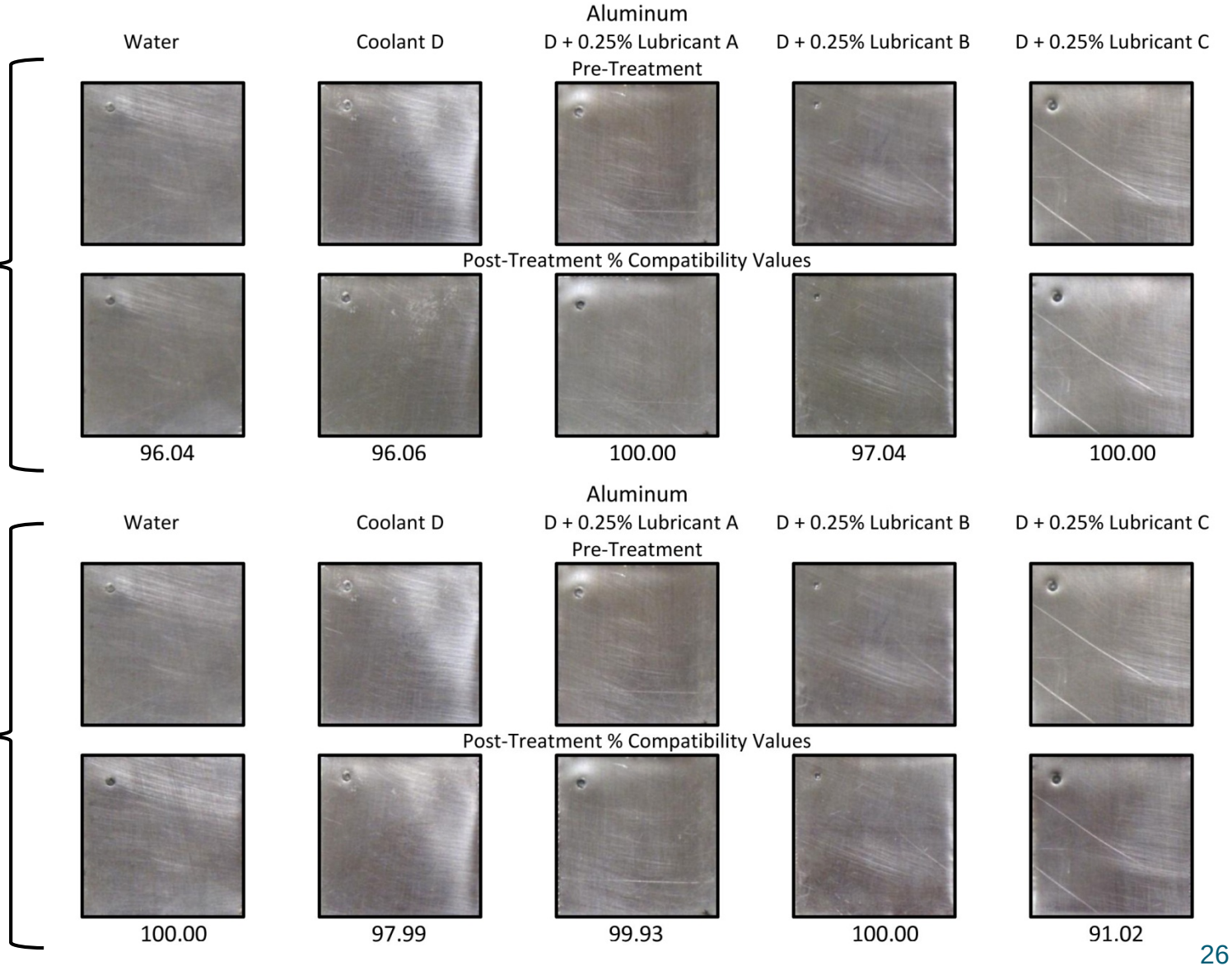


Natural Rubber Compatibility (72 hours at 85° C)

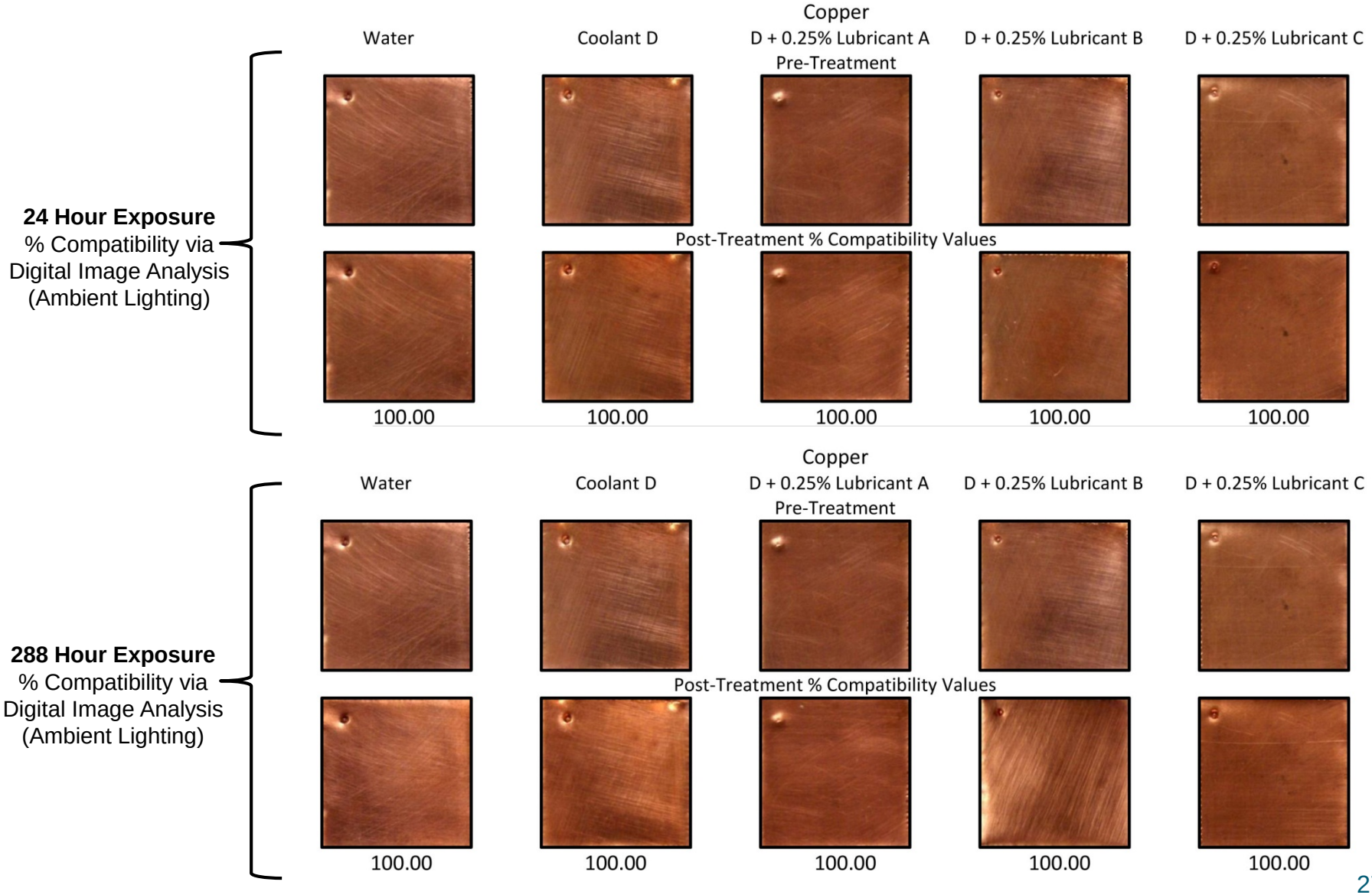
Tap Water **Formulated Rubber Assembly Lubricant** **100 Sus Mineral Oil**



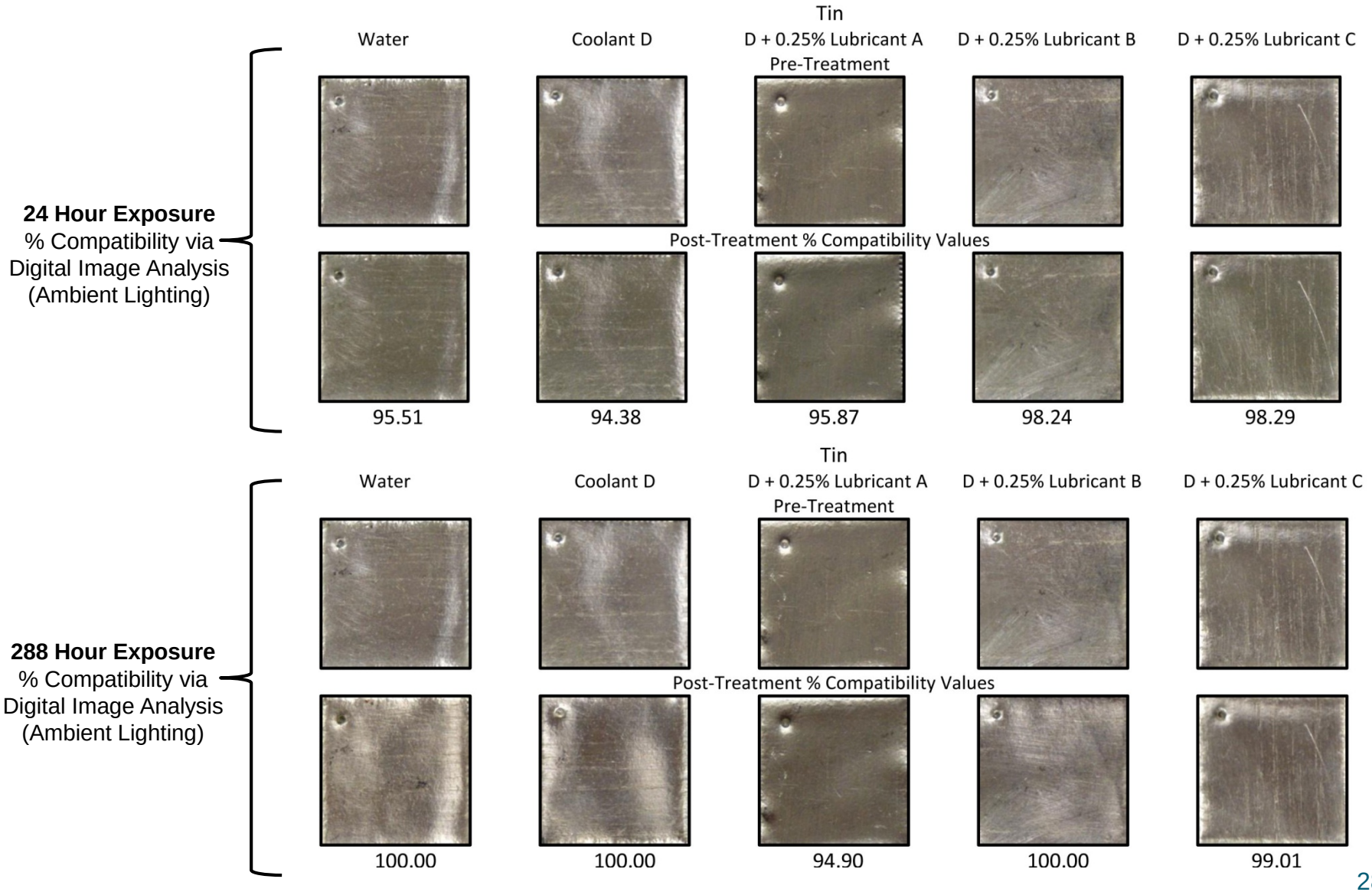
Rubber Assembly Lubricant and Antifreeze Metal Compatibility Studies



Rubber Assembly Lubricant and Antifreeze Metal Compatibility Studies



Rubber Assembly Lubricant and Antifreeze Metal Compatibility Studies



Rubber Assembly Lubricant and Antifreeze Metal Compatibility Studies

Results for the UV spectral analysis are presented in figures 1, 2 & 3 below. From these results it can be seen that the addition of 0.01% and 0.025% Lubricant A had no effect on the UV profile of Coolant D. With the addition of 0.25% Lubricant A to Antifreeze D the absorption profile of the A/D mixture increases by approximately 0.3 absorbance units, however no shifts in the peaks of the absorption profile are observed (figure 1). This increase is primarily due to the turbidity of the Lubricant A in the A/D mixture. This mixture becomes translucent rather than remaining transparent as exhibited by neat Coolant D. No new or spurious peaks were observed in any of the absorption profiles.

When 0.01%, 0.025% and 0.25% of either Lubricant B or C are added to Coolant D there are no substantial differences between the neat Coolant D profile and the B/D and the C/D mixtures (figures 2 & 3 respectively). No new or spurious peaks were observed in any of the absorption profiles.

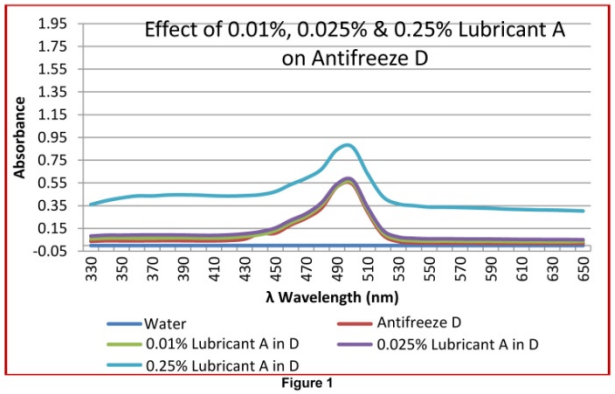


Figure 1

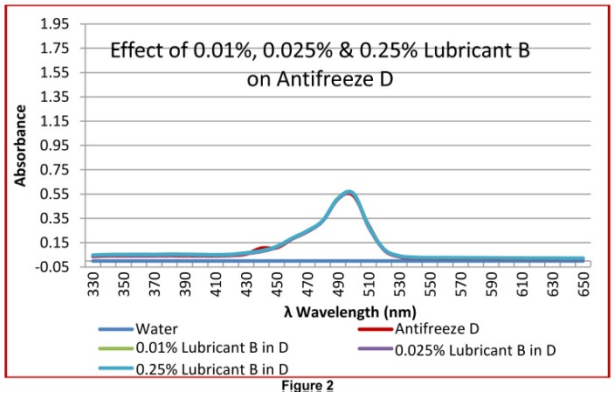


Figure 2

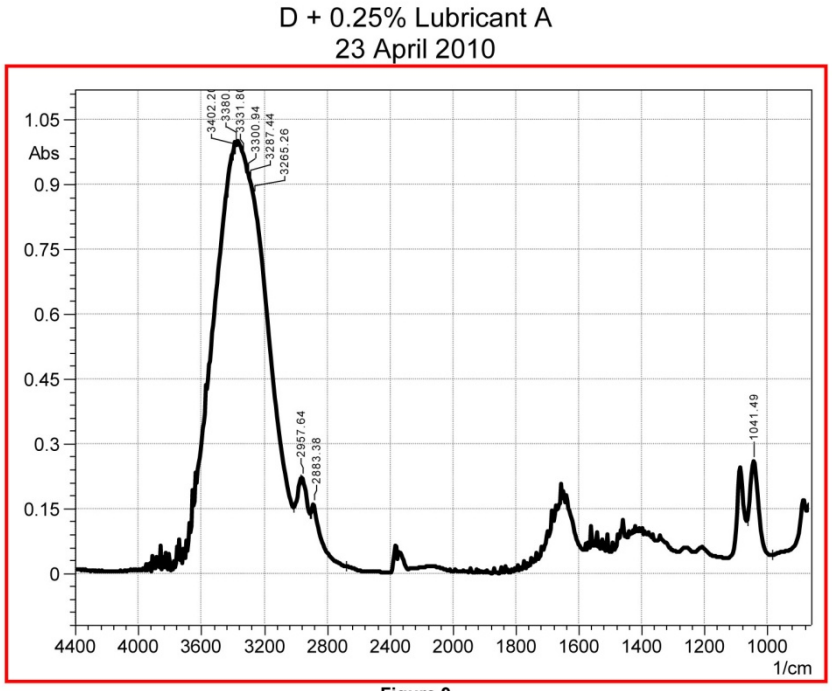


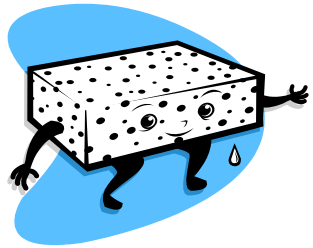
Figure 9

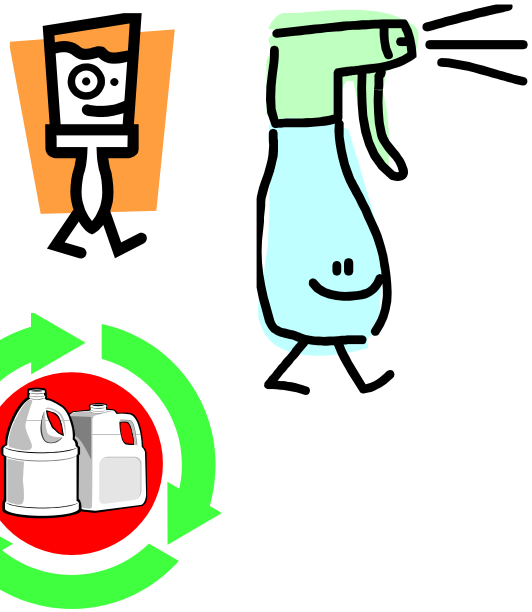
Number	Peak	Intensity	Corrected Intensity	Base (H)	Base (L)	Area	Corrected Area
1	1041.49	0.26	0.16	1063.67	982.66	10.47	4.17
2	2883.38	0.16	0.03	2905.56	2680.87	14.43	0.83
3	2957.64	0.22	0.02	2967.28	2906.53	11.38	0.74
4	3265.26	0.87	0.01	3267.19	3014.53	120.71	0.96
5	3287.44	0.91	0.00	3288.40	3268.15	18.12	0.10
6	3300.94	0.93	0.00	3301.91	3289.37	11.53	0.04
7	3331.80	0.97	0.00	3333.73	3302.87	29.40	0.14
8	3380.98	1.00	0.01	3388.70	3378.09	10.56	0.06
9	3402.20	0.97	0.01	3434.98	3399.30	33.42	0.37

Table 6

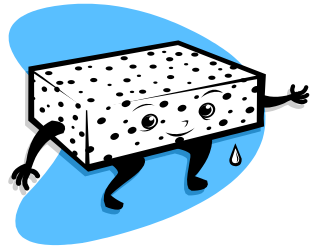
Summary of Formulated Temporary Rubber Assembly Lubricants

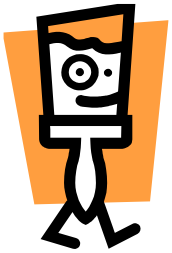
- **Contain no Silicones**
- **Contain no petroleum distillates**
- **Have excellent surface compatibility**
- **Have low metals content**
- **Will not harm adjacent surfaces –** glass, wood, metal, etc.
- **Are safe to use and dispose of**
- **Are ergonomically beneficial**
- **Excess easily removed with soap and water**

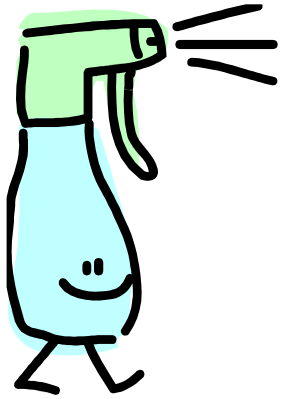




- **Are versatile:**
  - **Work with a variety of application methods –** manual or automatic, with bath, brush, sponge, spray or squirt techniques
  - **Manage volume applied**
  - **Select proper lubricant based upon orientation and timing of application –** *(e.g. overhead, out of reach, behind dashboard)*
  - **Select proper lubricant based upon porosity of material**
  - **Ready to use –** no mixing or diluting required

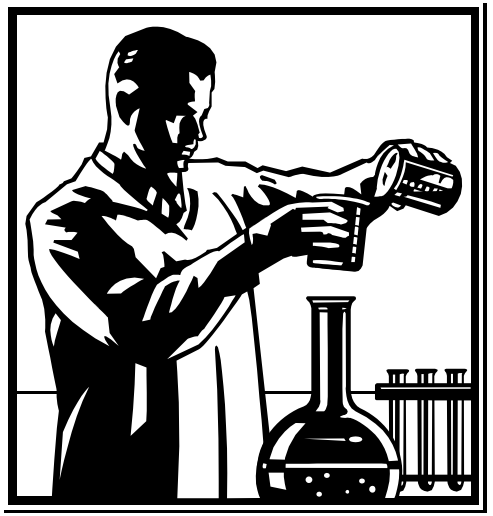






Technology of International Products Corporation's Formulated Lubricants

- Liquid & Thixotropic formulas
- Water-based Products
- Solvent-free Products
- Negligible Volatile Organic Compounds (VOC)
- Biodegradable Products



Formulated Lubricants offer many benefits

- Superior performance
- Excellent compatibility
- Quality assurance
- Consistency

Specialty Manufacturers

- Technical know-how and experience
- On site laboratory available for product performance and compatibility testing

Closing

- Why temporary lubricants are ideal for rubber assembly
  - Tight fitting parts; once dry lubrication is gone
  - Fewer rejects
  - Quality control and testing ensure ingredient consistency and purity to always meet anticipated performance
  - Safe to use
    - Non-toxic
    - Handling
    - Disposal
  - Excellent surface compatibility
  - Fewer injuries
  - Technical support & data
  - NSF Certified H1 formulations for incidental food contact applications are available





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Thank you!