Polywater® Plus Silicone™ NN Enhanced Lubricant

American Polywater® Corporation

TECHNICAL SPECIFICATION

Description:

Polywater® Plus Silicone™ NN Lubricant is a high-performance, specification-grade, cable pulling lubricant. Lubricant NN provides superior tension reduction and is suitable for all types of cable pulling. It has primarily been used for long pulls of heavy cable. In this type of pulling, its superior tension reduction and continued lubrication while pulling through water are well documented.

Polywater® Plus Silicone™ NN is suitable for use with factory lubricated duct. It continues to lubricate under high sidewall pressure forces in conduit bends. Lubricant NN is slow drying. The residue is a thin, slippery film that retains its slip for months after use.

Polywater® Plus Silicone™ NN is a semi-gel that pours thickly. While it can be applied by hand, it is best to pour or pump the lubricant into the duct system.

Friction Testing:

Lubricity: Polywater® Plus Silicone™ NN Lubricant shows superior friction reduction on a variety of jacket types. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007" (polywater.com/FTable.pdf). Values are averages based on cable jacket and conduit materials from multiple manufacturers.

Cable	Conduit			
Jacket	HDPE	PVC	Steel	FRP
LLDPE	.05	.11	.13	.13
PVC	.08	.09	.13	.10
CPE	.08	.10	.20	.15
XLPE	.07	.08	.13	.14
PP	.07	.05	.07	.10

Coefficient of friction data on additional or specific cable jackets or conduits came be obtained from American Polywater Corporation.

Product Benefits:

- Lubricates through water-filled duct
- Superior friction reduction
- Suitable for factory lubricated conduits
- Clean and non-staining
- Temperature stable
- Specification grade

End Use:

Suitable for all types of cable installations, including:

- Water-filled ducts
- Multiple bends, high sidewall pressure
- Heavy transmission cable
- Long underground pulls
- High conduit fill

Cable Compatibility:

Tensile and Elongation:
LLDPE, HDPE, PP, XLPE, CPE, and PVC cable jacket materials aged in Polywater® Plus Silicone™ NN per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Polyethylene Stress Cracking:
Polywater® Plus Silicone™ NN shows no stress cracking on LLDPE, MDPE, or HDPE cable jacket when tested per IEEE Standard 1210[1].

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Cable Approvals:
Polywater® Plus Silicone™ NN is approved and used by many cable manufacturers. Contact American Polywater for further information.

Field Data:
Polywater® Plus Silicone™ NN has been specified and used on many long, heavy cable installations. Side-by-side comparison pull tension data is available. Contact American Polywater for details.

[1] *IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.*

Physical Properties:

Property	Result
Appearance:	Cream-colored, thickly pourable gel
Wax and Grease Content:	None
Non-Volatile Solids (%):	3.5
VOC Content:	10 gms/L 200 gms/L (wintergrade)
Viscosity:	13,000 – 20,000 cps @10rpm
pH:	7.5 – 9.0

Performance Properties:

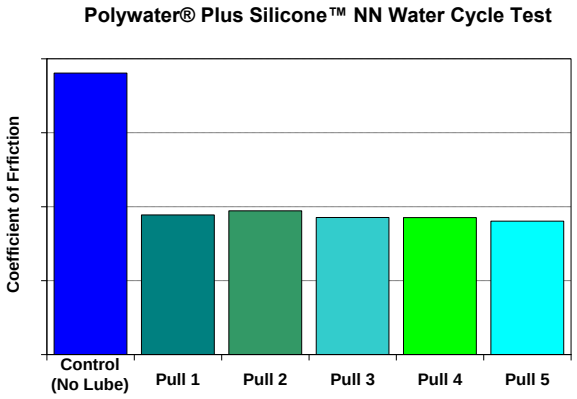
Coatability:
Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Polywater® Plus Silicone™ NN will wet out evenly on cable jacket surfaces. It will not bead up or rub off of the jacket sample. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into the Polywater® Lubricant NN, then withdrawn and held vertically, will retain at least 15 grams of Polywater® Lubricant NN for one minute at 70° F (21° C).

Friction Reduction through Water:
Friction Reduction through Water is a measure of a lubricant's function through water.

Polywater® Plus Silicone™ NN will not show a significant increase in friction coefficient when tested with five water change cycles as described below.

A cable coated with Polywater® Plus Silicone™ NN Lubricant shall be pulled through HDPE duct wrapped 420° around a three-foot diameter cylinder[2]. The conduit shall be filled with tap water. Twenty-five pounds of back tension shall be put on the cable and the pulling tension measured and friction coefficient calculated as described in the Telcordia test procedure[2]. After each pull (cycle) the conduit shall be cleaned and the water changed. The same cable shall be used for the following cycle. The cable shall not be re-lubricated between cycles.



Actual data from the test (above) shows no change in friction coefficient through five water change cycles.

[2] *Telcordia test procedure TR-TSY-00356 Sections 4.1.3 and 4.1.4*

Application Properties:

Application Systems:
Polywater® Plus Silicone™ NN Lubricant has a semi-gel consistency and can be thickly poured into the conduit or feeder tube.

Polywater® Plus Silicone™ NN can also be pumped directly into the conduit or onto the cable using the Polywater® LP-3 or LP-D5 specialty lubricant pumps. Pumps allow hands-free transfer and consistent application of lubricant. Polywater's low-shear pumps will not change the gel character of NN lubricant. The LP-3 and LP-D5 pumps support lubricant application rates of 1 to 3 gallons (4 to 11 liters) per minute.

Pull-Planner™ Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

A wintergrade version (WNN) *is also available for use during installation work below freezing.*

Temperature Use Range:
Polywater® NN:
20° F to 120° F (-5° C to 50° C).
Polywater® WNN (wintergrade version):
-20° F to 120° F (-30° C to 50° C)

Temperature Stability:
Polywater® NN (or WNN) will not phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C).

Clean-Up:
Polywater® NN (or WNN) is non-staining. Complete clean-up possible with water.

Storage and Shelf Life:
Store Polywater® NN (or WNN) in a tightly sealed container away from direct sunlight. Lubricant shelf life is one year.

Directions for Use:

Polywater® Plus Silicone™ NN Lubricant can be poured or pumped directly onto the cable as it enters the conduit.

To prelubricate for long or difficult pulls, pour Polywater® Plus Silicone™ NN Lubricant into the conduit before the pull begins and spread with a mandrel or a swab on the winch line during the pull. For long horizontal pulls, place as much as two-thirds of the recommended quantity of lubricant into the conduit for prelubrication.

Directly lubricate the cable jacket as it enters the conduit for the entire length of the pull.

Clean-up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity

$$Q = K \times L \times D$$

Where:
Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
K = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and jacket hardness
(Increase quantity for stiff, heavy cable)

Conduit type and conditions
(Increase quantity for old, dirty, or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

Model Specification:

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater® Plus Silicone™ NN Lubricant. The cable pulling lubricant shall provide a low coefficient of friction on a wide variety of cable jacket materials. The lubricant shall leave a low solids residue of less than 4.0%.

The lubricant shall be compatible with the cable jacket material. Cable jacket compatibility shall be tested by the IEEE 1210, Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable. The lubricant shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

The lubricant shall not show a significant increase in friction coefficient over five water change cycles when tested through a water-filled duct via Telcordia test procedure TR-TSY-00356 Sections 4.1.3 and 4.1.4. The cable shall not be re-lubricated during the test.

Order Information:

Cat #	Package Description
	Regular
NN-35	1-quart squeeze bottle (.95 liter)
NN-128	1-gallon pail (3.78 liter)
NN-320	2 ½-gallon jug (9.6 liter)
NN-640	5-gallon pail (18.9 liter)
	Wintergrade
WNN-35	1-quart squeeze bottle (.95 liter)
WNN-128	1-gallon pail (3.78 liter)
WNN-320	2 ½-gallon jug (9.6 liter)
WNN-640	5-gallon pail (18.9 liter)

Lit-NNTech/rev000

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ 3000 Software

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