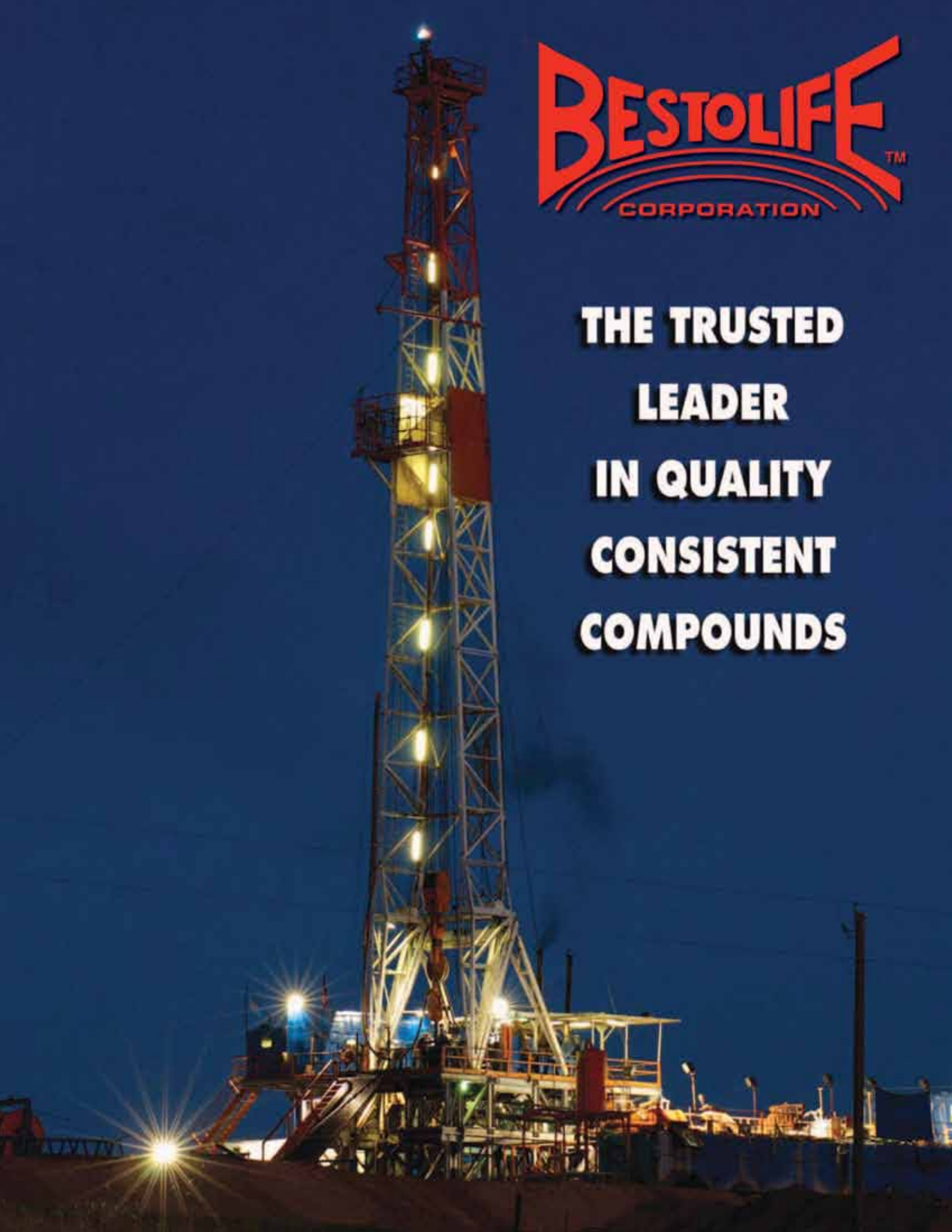
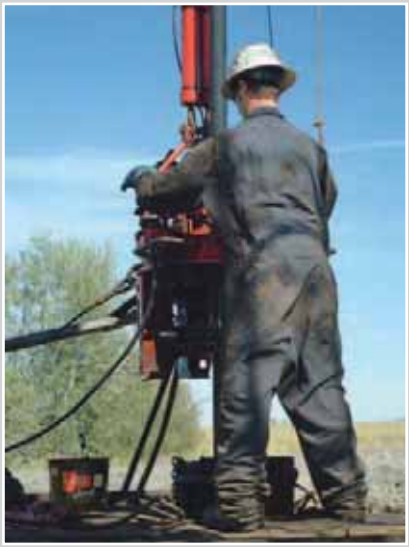

BESTOLIFE™
CORPORATION
THE TRUSTED
LEADER
IN QUALITY
CONSISTENT
COMPOUNDS



Oil and gas – vital aspects of the world economy. For over 80 years, Bestolife has served the petroleum industry as the premiere thread compound manufacturer, dedicated to producing the finest quality products for every drilling situation.

Bestolife founder I.H. Grancell created the first thread compound to combat galling, seizing and downhole makeup. Grancell named his compound 'Bestolife 270® - and it quickly became the premiere thread compound throughout oil patch.

From that successful compound, Bestolife moved to create specific solutions for other unique environments. Bestolife created C-55® for percussion rock drilling, and the innovation didn't stop there. From metallic compounds for extreme pressure and temperature to metal-free compounds to meet environmental regulations, Bestolife maintains to this day a diverse line-up of superior products - each ready to make a difference on your next project.

The motto at Bestolife has remained constant since the 1930s: No matter the drilling condition, Bestolife has the solution.

BESTOLIFE™ CORPORATION

TABLE OF CONTENTS

HELPFUL GUIDES

What is the purpose of a friction factor?

The thread compound friction factor is used to correct the make up torque required for rotary shouldered connections. The make up torque calculations for rotary shouldered connections in API 7G were based on lead based thread compounds, which have a friction factor of 1.0. Many thread compounds manufactured today are not lead based and do not have friction factors equal to 1.0.

To determine the amount of torque required to make up a connection; multiply the friction factor by the torque required for the connection found in API 7G. For example, the make up torque for drill pipe with 5 ½ x 31/4 NC50 tool joints is 21,914 ft-lb. If the friction factor is 1.1, the required torque to make up the connection would be 21,914 x 1.1 = 24,105 ft-lb.

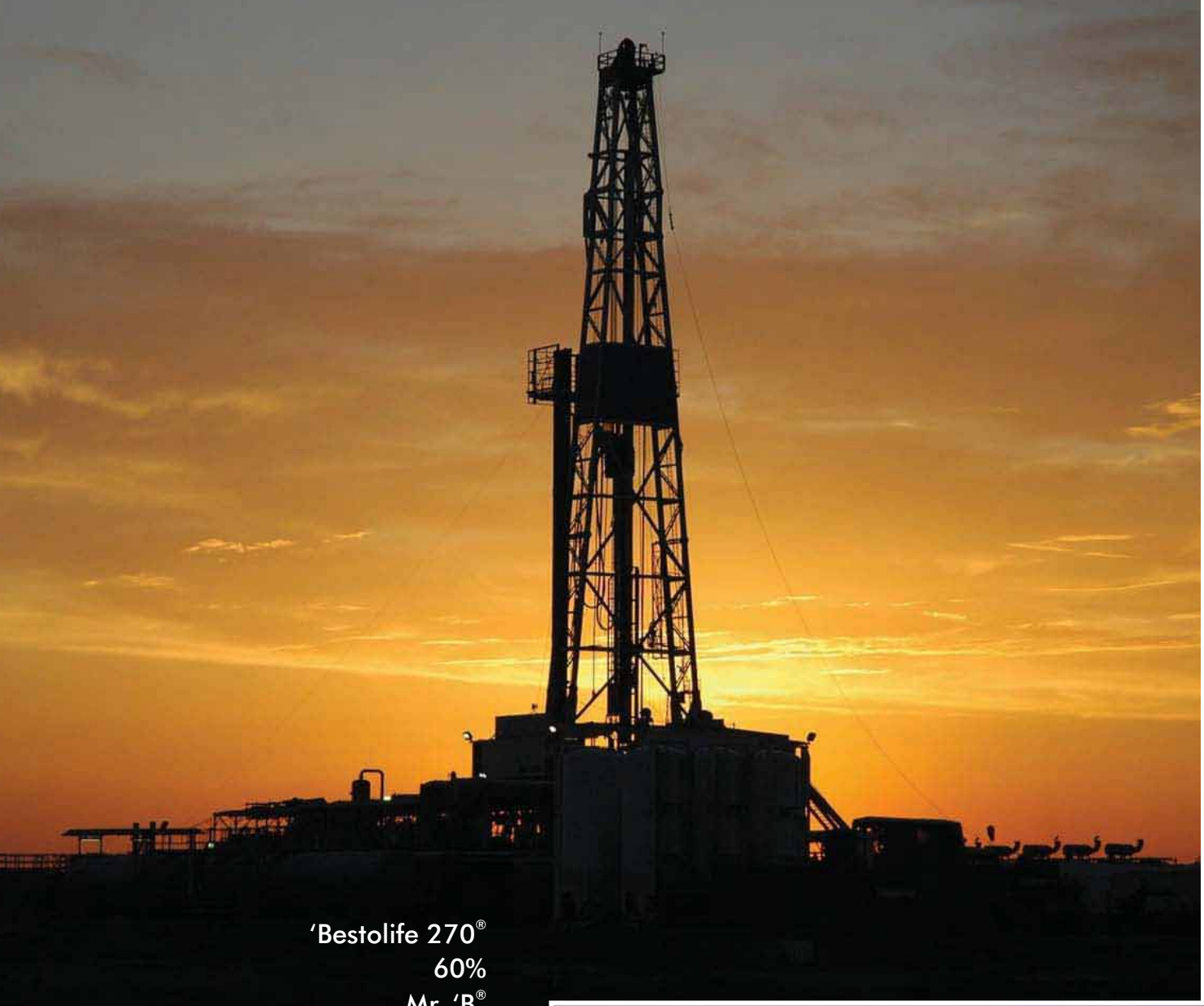
The same holds true in areas where the friction factor is less than 1. In the example above, for compounds with a friction factor of .9, the required torque would be 21,914 x .9 = 19,723 ft-lb.

Friction factor information for Bestolife products can be found on the specification sheets, or call your Bestolife sales representative at 800-527-9452.

What about my application?

Every application has its own characteristics, varying from large to small, with environmental conditions from high temperatures to high humidity, arctic blasts to desert heat. Bestolife caters to your specific needs. All of our compounds are available in a wide range of container sizes: plastic pails, sized from one gallon to five gallon, metal pails where plastic is unsuitable. For smaller jobs, Bestolife copper compounds comes in tubes or small containers with applicator lids. For long term locations, Bestolife can furnish your compounds in bulk containers.

Bestolife has a formulation to suit any environmental condition, any criteria you may need to meet. Our compounds include special additives to accommodate your particular situation. Whenever your application or conditions may change, Bestolife is there to serve your evolving needs. Contact your Bestolife sales representative for the latest information about container size availability and compounds for your special conditions. Remember, no matter the drilling situation, there's a Bestolife solution.



'Bestolife 270®
60%
Mr. 'B®
ZN40
ZN50
ZN60
White Collar
Black Jack
Copper Supreme Special Blend®
Copper Supreme Special®
CBLF HT
Cal Bronze®
Cal Bronze® Lead Free
Copper Joint
Copper Joint Lead Free
"3010"® Ultra
"4010" NM
"4040" NM
"3010"®NM Special
"3000"®
GGT-RSC HT

RECOMMENDED DOPING PROCEDURES FOR ROTARY SHOULDERED CONNECTIONS

The following is Bestolife's recommendations for the application and use of our thread compounds on rotary shouldered connections:

1. **Compound Preparation and Contamination:**
   Upon opening the container, the product should be stirred with either a dope brush or other suitable device to reblend any oil separation or settling of the component solids that may have occurred during shipment and storage. This is particularly critical for high density materials such as lead and zinc, and for high temperature (>90ºF) storage conditions. Care should be taken that after opening the container, no contamination of the compound in the container occurs, i.e. drilling fluids, water, dirt and other debris. In no instance should any material such as diesel fuel, kerosene, motor oil, etc. be added to the compound to improve the ease of application. Contamination or adulteration can change the friction factor of the compound and also degrade the galling resistance properties.

2. **Connection Surface Preparation:**
   All connection contact surfaces should be cleaned and free of drilling fluids and any other contaminant residues prior to the application of the compound. Drilling fluids contain a large amount of various types of solids and cutting residues that when mixed with the thread compound can substantially change the friction factor of the thread compound and consequently, the amount of make-up for a given applied torque. The solids that are present in drilling fluids and muds, can promote galling and will degrade the galling resistance properties of the thread compound. Polymer-based mud systems can leave residues on the connection that will adversely affect the adherence of a compound. A substantial amount of water will also make it difficult for the compound to adhere to the connection surfaces. A small amount of moisture in most cases is unavoidable and will not affect compound performance.

3. **Compound Application:**
   The thread compound should be applied liberally and uniformly to the entire contact surface of both the pin and box. The practice of slapping a "gob" of pipe dope on one side of the pin or box and depending on the pipe rotation during make-up to distribute the compound over the connection surface, is not sufficient. The compound must be worked into the thread roots and should completely cover the shoulder surfaces. If the pins are doped while tripping or when the pipe is on a rack, care should be taken to ensure that when the string is stood up on the rig floor prior to running, that the compound does not pick up contaminants (e.g. dried mud, cuttings, etc.) off the rig floor. Ideally, protectors should be installed on the pins after doping and then removed just prior to stabbing on the rig floor. This practice would eliminate a source of compound contamination and also reduce pin nose damage when the pipe is stood up.

4. **Connection Break-In / Nonmagnetic Materials:**
   A break-in procedure should be established for new or just-refaced connections. This procedure should consist of 2-3 low torque, slow-speed make-ups at 50-75% of your final make-up torque prior to running. This practice will burnish and work harden the connection surfaces prior to applying full contact stress and will greatly improve their resistance to galling. Nonmagnetic materials such as monels and martensitic chromes are extremely galling prone. Depending on your operating conditions, a 60% lead-based compound may be required to resist galling damage with these materials. Lead is particularly effective for galling resistance because of its inherent lubricity and the ability to "smear out" and plate on the connection contact surfaces during make-up.

SPECIFICATION SHEET

'Bestolife 270®

Patented Thread Compound for Rotary Shouldered Connections

COLOR	Black
PENETRATION	290 - 310 (ASTM D 217)
WEIGHT/GALLON	19.6 pounds/gallon
DROPPING POINT	350°F/177°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	10°F/-12°C
SERVICE RATING	500°F/260°C
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Over 60% metallic lead and other nonmetallic additives

'Bestolife 270® is a patented formulation containing over 60% pure metallic lead and special nonmetallic additives. This premium compound provides maximum protection of drill collars, drill pipe and all threaded connections, except oxygen lines. 'Bestolife 270® provides a stable seal under all conditions and is not attacked by H_2S or drilling fluids. Meets the requirements of API RP SPEC 7: "Specification for Rotary Drill Stem Elements".

Recommended for drill collars, tool joints, casing, tubing, pipe joints, studs, bolts, nuts and screws, gaskets, high temperature flange connections, pumps, exhaust lines and pipeline connections.

*API RP 7A1: "Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections"
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

'BESTOLIFE 270® MEETS ALL APPLICABLE API AND IADC STANDARDS.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

60% LEAD BASE

Economical, Lead-Based Compound
For Rotary Shouldered Connections

COLOR	Gray - black
PENETRATION	290-310 (ASTM D 217)
WEIGHT/GALLON	19.6 pounds/gal
DROPPING POINT	350ºF/177ºC (typ)
FLASH POINT	385ºF/196ºC (min)
BRUSHABLE TO	10ºF/-12ºC
SERVICE RATING	500ºF/260ºC
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	60% metallic lead and other nonmetallic additives

Bestolife 60% Lead Base is an economical lead base compound designed for use on drill collars, drill pipe, and other threaded connections. It will provide performance comparable to other more expensive drill collar compounds at a very competitve cost. Bestolife 60% Lead Base contains 60% pure metallic lead blended with other nonmetallic additivies in a high quality base grease. It is not affected by H_2S or drilling fluids. Meets the requirements of API RP SPEC 7: “Specification for Rotary Drill Stem Elements”.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

BESTOLIFE 60% LEAD BASE MEETS ALL APPLICABLE API AND IADC STANDARDS.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

Bestolife PB Black

Economical, Lead-Based Compound
For Rotary Shouldered Connections

COLOR:	Gray - Black
PENETRATION:	290-310 (ASTM D217)
DENSITY	18.3 pounds/gallon
DROPPING POINT:	350ºF/177ºC (typ)
FLASH POINT:	385ºF/196ºC (typ)
BRUSHABLE TO:	10ºF/-12ºC
SERVICE RATING:	500ºF/260ºC
TORQUE FACTOR:	1.0 (per API RP 7A1)*
CONTAINS:	Metallic lead and other non-metallic additives

Bestolife PB Black is an economical lead base compound designed for use on drill collars, drill pipe, and other threaded connections. It will provide performance comparable to other more expensive drill collar compounds at a very competitve cost. Bestolife PB Black contains pure metallic lead blended with other non-metallic additivies in a high quality base grease. It is not affected by H_2S or drilling fluids. Meets the requirements of API RP SPEC 7: “Specification for Rotary Drill Stem Elements”.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

BESTOLIFE PB BLACK MEETS ALL APPLICABLE API AND IADC STANDARDS.

A MATERIAL SAFETY DATA SHEET IS AVA ILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

MSDS: 513G

SPECIFICATION SHEET

Mr. 'B®

Lead-Based Thread Compound for Tool Joints and Casing

COLOR	Black
PENETRATION	290-310 (ASTM D 217)
WEIGHT/GALLON	12.7 pounds/gallon
DROPPING POINT	350°F/177°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	10°F/-12°C
SERVICE RATING	500°F/260°C
TORQUE FACTOR	1.0 (per API RP 7A1)*
	1.1 (relative to API Modified)†
CONTAINS	Lead, graphite and other nonmetallic additives

Mr. 'B® is a junior version of 'Bestolife 270®, containing finely powdered metallic lead. Special nonmetallic additives cushion joints and enhance high temperature properties. Provides economical protection for drill pipe, casing and pipeline connections of every type (except oxygen). Like 'Bestolife 270®, Mr. 'B® is not attacked by H_2S or drilling fluids.

*API RP 7A1: "Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections"
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

†The proper field torque for all API casing and tubing connections should be determined by following the procedures outlined in API RP 5C1: "Recommended Practice for Care and Use of Casing and Tubing".

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

ZN40

Zinc-Based Thread Compound for All Rotary Shouldered Connections

COLOR	Gray
PENETRATION	290 - 310 (ASTM D 217)
WEIGHT/GALLON	13.5 pounds/gallon
DROPPING POINT	350°F/177°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	10°F/-12°C
SERVICE RATING	350°F/177°C
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Zinc and other nonmetallic additives

Bestolife ZN40 is a zinc-based thread compound made with finely powdered metallic zinc. It contains 40% zinc as well as H_2S and oxidation inhibitors. Meets the requirements of API RP SPEC 7: “Specification for Rotary Drill Stem Elements”.

Recommended for tool Joints, drill collars, and drilling and coring bits.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

BESTOLIFE ZN40 MEETS ALL APPLICABLE API AND IADC STANDARDS.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

ZN50

Zinc-Based Thread Compound for All Rotary Shouldered Connections

COLOR	Gray
PENETRATION	290 - 310 (ASTM D 217)
WEIGHT/GALLON	15.0 pounds/gallon
DROPPING POINT	350°F/177°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	10°F/-12°C
SERVICE RATING	350°F/177°C
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Zinc and other nonmetallic additives

ZN550 is a zinc-based thread compound made with finely powdered metallic zinc. It contains 50% zinc as well as H_2S and oxidation inhibitors. Meets the requirements of API RP SPEC 7: “Specification for Rotary Drill Stem Elements”.

Recommended for tool joints, drill collars, and drilling and coring bits.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

BESTOLIFE ZN50 MEETS ALL APPLICABLE API AND IADC STANDARDS.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

ZN60

Zinc-Based Thread Compound for All Rotary Shouldered Connections

COLOR	Gray
PENETRATION	290 - 310 (ASTM D 217)
WEIGHT/GALLON	16.3 pounds/gallon
DROPPING POINT	350°F/177°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	10°F/-12°C
SERVICE RATING	350°F/177°C
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Zinc and other nonmetallic additives

ZN60 is a zinc-based thread compound made with finely powdered metallic zinc. It contains 60% zinc as well as H_2S and oxidation inhibitors. Meets the requirements of API RP SPEC 7: “Specification for Rotary Drill Stem Elements”.

Recommended for tool joints, drill collars, and drilling and coring bits.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

BESTOLIFE ZN60 MEETS ALL APPLICABLE API AND IADC STANDARDS.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

WHITE COLLAR

Thread Compound For Drill Collars and Tool Joints

COLOR	Light gray
PENETRATION	300 - 320 (ASTM D 217)
WEIGHT/GALLON	11.4 pounds/gallon
DROPPING POINT	350°F/177ºC (typ)
FLASH POINT	385°F/196ºC (min)
BRUSHABLE TO	10°F/-12ºC
SERVICE RATING	500°F/260ºC
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Zinc oxide, Teflon®, and other nonmetallic additives

White Collar is an effective, yet economical drill collar compound that can be used in a wide range of drilling conditions. The combination of zinc oxide and a high percentage of Teflon® provides both enhanced sealing and galling resistance in a compound that can be used on both new and worn connections. White Collar includes a high level of extreme pressure and anti-wear additives that will help to reduce collar wear and damage that results in expensive re-works. White Collar is not affected by H_2S or other corrosive environments

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

BLACK JACK

Lead-Free Thread Compound For Drill Pipe

COLOR	Black
PENETRATION	300 - 320 (ASTM D 217)
WEIGHT/GALLON	11.9 pounds/gallon
DROPPING POINT	350°F/177ºC (typ)
FLASH POINT	385°F/196ºC (min)
BRUSHABLE TO	10°F/-12ºC
SERVICE RATING	350°F/177ºC
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Zinc oxide, graphite, Teflon® and other nonmetallic additives

Black Jack is an effective yet economical tool joint compound that can be used in a wide range of drilling conditions. It combines the proven sealing performance and galling resistance of zinc oxide, graphite, and Teflon® in a compound that also provides superior adherence and wash-out resistance even under the most severe conditions. Black Jack can be used on both new and worn connections. Contains oxidation and H_2S inhibitors.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

COPPER SUPREME SPECIAL BLEND ®

Non-Lead/Non-Zinc Thread Compound

COLOR	Dark copper
PENETRATION	300 - 320 (ASTM D 217)
WEIGHT/GALLON	10.2 pounds/gallon
DROPPING POINT	500ºF/260ºC (typ)
FLASH POINT	385ºF/196ºC (min)
BRUSHABLE TO	15ºF/-9ºC
SERVICE RATING	600ºF/316ºC
TORQUE FACTOR	1.1 (per API RP 7A1)*
CONTAINS	Copper flake, synthetic and amorphous graphite, and other nonmetallic additives

Copper Supreme Special Blend has been developed as an answer to the environmental restrictions and exposure concerns associated with the use of lead and zinc drill collar/tool joint thread compounds. It contains copper flake combined with a proprietary blend of amorphous and synthetic graphites, along with oxidation and H_2S inhibitors, in a high temperature base grease. In addition to the galling and seizing protection provided by the solids, it also contains a soluble extreme pressure package that is surface active (adheres to metal surfaces) and helps to provide the load carrying capability required by the high bearing stresses present in rotary shouldered connections. Copper Supreme Special Blend has a torque correction factor of 1.1 (10% additional torque required) which will provide additional resistance to down-hole make-up as compared to lead or zinc compounds. It applies easily in a wide range of temperatures and conditions, is resistant to wash-out and will not harden or bleed excessively in storage.

RECOMMENDED FOR all drilling applications (rotary-shouldered connections), including high temperature environments. Also effective for use on open gear jackup legs.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

Copper Supreme Special Blend® Plus

Non-Lead/Non-Zinc Thread Compound for Rotary Shouldered Connections

COLOR	Dark copper
PENETRATION	300 - 320 (ASTM D 217)
WEIGHT/GALLON	10.2 pounds/gallon
DROPPING POINT	500°F/260°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	15°F/-9°C
SERVICE RATING	600°F/316°C
TORQUE FACTOR	1.1 (per API RP 7A1)*
SALT SPRAY, ASTM B117	2500 Hours, minimum
CONTAINS	Copper flake, synthetic and amorphous graphite, and other nonmetallic additives

Copper Supreme Special Blend® Plus contains copper flake combined with a proprietary blend of amorphous and synthetic graphites, oxidation, corrosion, and H_2S inhibitors, in a high temperature base grease. In addition to the galling and seizing protection provided by the solids, it also contains a soluble extreme pressure package that is surface active and helps to provide the load carrying capability required by the high bearing stresses present in rotary shouldered connections. Copper Supreme Special Blend® Plus has a torque correction factor of 1.1 (10% additional torque required) which will provide additional resistance to down-hole make-up as compared to lead or zinc compounds. The corrosion inhibitor it contains allows it to act as running and storage compound providing extended protection against corrosion. It applies easily in a wide range of temperatures and conditions, is resistant to wash-out, and will not harden or bleed excessively in storage.

Recommended for all drilling applications (rotary-shouldered connections), including high temperature environments. Also effective for use on slides, jacking systems, cantilever type rigs and assemblies.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

MSDS 476G

SPECIFICATION SHEET

COPR Geothermal Plus

Non-Lead/Non-Zinc Thread Compound

COLOR	Dark copper
PENETRATION	300 - 320 (ASTM D 217)
WEIGHT/GALLON	10.4 pounds/gallon
DROPPING POINT	550°F/288°C (typ)
FLASH POINT	460°F/238°C (min)
BRUSHABLE TO	-40°F/-40°C
SERVICE RATING	650°F/343°C
TORQUE FACTOR	1.1 (per API RP 7A1)*
CONTAINS	Copper flake, synthetic and amorphous graphite, and other nonmetallic additives

Copr Geothermal Plus has been developed to withstand extremely high temperature with its “no melt” thickener. It contains copper flake combined with a proprietary blend of amorphous and synthetic graphites, along with oxidation and H_2S inhibitors, in a high temperature base grease. In addition to the galling and seizing protection provided by the solids, it also contains an extremely high temperature synthetic base oil that resists evaporation and sticks to steel surfaces under all environmental conditions and helps to provide the load carrying capability required by the high bearing stresses present in rotary shouldered connections. Copr Geothermal Plus has a torque correction factor of 1.1 (10% additional torque required) which will provide additional resistance to down-hole make-up as compared to lead or zinc compounds. It applies easily in a wide range of temperatures and conditions, is resistant to wash-out and will not harden or bleed excessively in storage.

RECOMMENDED FOR all drilling applications (rotary-shouldered connections), including high temperature environments. Also effective for use on open gear jackup legs.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

Copr 99

Non-Lead/Non-Zinc Thread Compound for Rotary Shouldered Connections

COLOR	Copper
PENETRATION	310 - 330 (ASTM D 217)
WEIGHT/GALLON	9.9 pounds/gallon
DROPPING POINT	350°F/177°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	10°F/-12°C
SERVICE RATING	500°F/260°C
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Copper, graphite and other nonmetallic additives

Copr 99 meets or exceeds environmental restrictions and exposure concerns associated with the use of lead and zinc drill collar/tool joint thread compounds. It contains copper flake combined with a proprietary blend of graphite and other solids in a high quality lubricating base grease. Galling and seizing protection are provided by the solids which have the load carrying capability required to support the high bearing stresses that are present in rotary shouldered connections. Copr 99 has a torque correction factor of 1.0 which is the same as found with lead or zinc compounds. It applies easily in a wide range of temperatures and conditions. Copr 99 is resistant to wash-out and will not harden or bleed excessively in storage.

Recommended for all drilling applications (rotary-shouldered connections). Also effective for use on slides, jacking systems, cantilever type rigs and assemblies.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

CBLF - HT

Non-Lead/Non-Zinc Thread Compound for Rotary Shouldered Connections

COLOR	Dark copper
PENETRATION	300 - 320 (ASTM D 217)
WEIGHT/GALLON	10.2 pounds/gallon
DROPPING POINT	500ºF/260ºC (typ)
FLASH POINT	385ºF/196ºC (min)
BRUSHABLE TO	15ºF/-9ºC
SERVICE RATING	600ºF/316ºC
TORQUE FACTOR	1.1 (per API RP 7A1)*
CONTAINS	Copper flake, synthetic and amorphous graphite, and other nonmetallic additives

CBLF - HT has been developed as an answer to the environmental restrictions and exposure concerns associated with the use of lead and zinc drill collar/tool joint thread compounds. It contains copper flake combined with a proprietary blend of amorphous and synthetic graphites, along with oxidation and H_2S inhibitors, in a high temperature base grease. In addition to the galling and seizing protection provided by the solids, it also contains a soluble extreme pressure package that is surface active (adheres to metal surfaces) and helps to provide the load carrying capability required by the high bearing stresses present in rotary shouldered connections. CBLF - HT has a torque correction factor of 1.1 (10% additional torque required) which will provide additional resistance to down-hole make-up as compared to lead or zinc compounds. It applies easily in a wide range of temperatures and conditions, is resistant to wash-out and will not harden or bleed excessively in storage.

RECOMMENDED FOR all drilling applications (rotary-shouldered connections), including high temperature environments. Also effective for use on open gear jackup legs.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

MSDS 486G

SPECIFICATION SHEET

Cal Bronze®

All-Purpose Compound for Rotary Shouldered Connections, Casing and Tubing

COLOR	Copper - black
PENETRATION	300 - 320 (ASTM D 217)
WEIGHT/GALLON	11.7 pounds/gallon
DROPPING POINT	350°F/177°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	10°F/-12°C
SERVICE RATING	500°F/260°C
TORQUE FACTOR	1.0 (per API RP 7A1)*
	1.1 (relative to API Modified)†
CONTAINS	Lead, copper, zinc, graphite and other nonmetallic additives

Bestolife Cal Bronze®is an economical all purpose drill pipe and drill collar compound developed for hot, rugged, corrosive drilling conditions. Finely powdered lead, copper, zinc and special non-metallic additives absorb stresses and enhance high temperature properties. Contains H_2S and corrosion inhibitors.

Recommended for drill collars in light to medium duty drilling, drill pipe, and for casing and tubing connections requiring a high temperature / high pressure thread compound.

*API RP 7A1: "Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections"
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

†The proper field torque for all API casing and tubing connections should be determined by following the procedures outlined in API RP 5C1: "Recommended Practice for Care and Use of Casing and Tubing".

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

Cal Bronze® Lead Free

Multipurpose Thread Compound for Drill Pipe and Drill Collars In Light-To-Medium Duty Drilling
NSF Registered †

COLOR	Copper - black
PENETRATION	310 - 330 (ASTM D 217)
WEIGHT/GALLON	10.2 pounds/gallon
DROPPING POINT	350°F/177°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	10°F/-12°C
SERVICE RATING	500°F/260°C
TORQUE FACTOR	1.1 (per API RP 7A1)*
CONTAINS	Copper, graphite and other nonmetallic additives

Cal Bronze® Lead Free is a lead and zinc free compound that can be used in a wide range of oil field drilling applications as well as water well drill pipe, casing or line pipe. Cal Bronze® Lead Free provides the excellent sealing properties of lead and zinc in a compound that contains no toxic materials that exceed the current maximum allowable EPA limits for solid waste. The copper flake, graphite, and extreme pressure additives provide the resistance to galling and seizing necessary for rotary-shouldered connections. Contains oxidation and H_2S inhibitors. Cal Bronze® Lead Free has obtained registration from NSF, National Sanitation Foundation.†

*API RP 7A1: "Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections"
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

† NSF Registration No. 141560 Category Code: H2

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

COPPER JOINT

Copper-Based Compound for Use On Rotary Shouldered Connections

COLOR	Dark copper
PENETRATION	330 - 320 (ASTM D 217)
WEIGHT/GALLON	10.9 pounds/gallon
DROPPING POINT	350ºF/177ºC (typ)
FLASH POINT	385ºF/196ºC (min)
BRUSHABLE TO	10ºF/-12ºC
SERVICE RATING	500ºF/260ºC
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Copper, lead, graphite and other nonmetallic additives

Bestolife Copper Joint is a copper, lead, and graphite based compound that seals and protects threaded connections in both high temperatures and high pressures. It can be used on casing and tubing connections as well as drill pipe and collars. Contains H_2S inhibitors.

RECOMMENDED FOR drill collars, tool joints, tubing, fishing tools, line pipe connections, flange connections, gaskets and seals

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

COPPER JOINT LEAD FREE

Non-Lead/Non-Zinc Thread Compound for Rotary Shouldered Connections

COLOR	Dark copper
PENETRATION	310 - 330 (ASTM D 217)
WEIGHT/GALLON	10.2 pounds/gallon
DROPPING POINT	350°F/177ºC (typ)
FLASH POINT	385°F/196ºC (min)
BRUSHABLE TO	10°F/-12ºC
SERVICE RATING	500°F/260ºC
TORQUE FACTOR	1.1 (per API RP 7A1)*
CONTAINS	Copper, graphite and other nonmetallic additives

Copper Joint Lead Free has been developed as an answer to the environmental restrictions and exposure concerns associated with the use of lead and zinc drill collar/tool joint thread compounds. It contains copper flake combined with a proprietary blend of amorphous and synthetic graphites in a high quality lubricating base grease. In addition to the galling and seizing protection provided by the solids, it also contains a soluble extreme pressure package that is surface active (adheres to metal surfaces) and helps to provide the load carrying capability required by the high bearing stresses present in rotary shouldered connections. Copper Joint Lead Free has a torque correction factor of 1.1 (10% additional torque required) which will provide additional resistance to down-hole make-up as compared to lead or zinc compounds. It applies easily in a wide range of temperatures and conditions, is resistant to wash-out and will not harden or bleed excessively in storage.

RECOMMENDED FOR all drilling applications (rotary-shouldered connections). Also effective for use on open gear jackup legs.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET
"3010"® ULTRA

Nonmetallic Thread Compound
for Rotary Shouldered Connections

COLOR	Black
PENETRATION	320 - 350
WEIGHT/GALLON	10.4 pounds/gallon
DROPPING POINT	310º F/154º C
FLASH POINT	330º F/166º C
BRUSHABLE TO	-49º F/-45º C
SERVICE RATING	400º F/204º C
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Amorphous and synthetic graphite and other nonmetallic additives

3010 ULTRA has been developed and formulated to address the environmental concerns and costs, related to the use of thread compounds for rotary shouldered connections that contain high percentages of heavy metals, such as lead, copper, and zinc. It is a development of the proven Bestolife "3000" ® formulation with enhanced low temperature application/adherence properties designed for use in the coldest, wettest operating conditions, such as encountered in the North Sea, Nova Scotia, Newfoundland, the South Atlantic, Alaska, and Sakhalin Island.

Like compounds that contain lead, zinc, and copper, 3010 ULTRA has the ability to prevent galling of contact surfaces (including non-magnetic materials) under high bearing loads and to form a continuous gasket between the shoulders of a rotary connection during make-up. This is achieved through the innovative combination of a variety of amorphous and synthetic graphite based materials, as first used in "3000" ®, interacting to form a seal when compressed between the shoulders during make-up to provide performance properties equal to the very best heavy metal compounds. This gasket-like seal prevents connection wash-out, even under high internal fluid pressures and the combined loading of directional drilling, to provide maximum protection in the toughest conditions.

3010 ULTRA applies easily to cold wet connections exposed to seawater in ambient temperatures as low as -49° F/-45° C and yet provides optimum protection in the deepest, hottest holes. The grease in 3010 ULTRA will provide lubrication and protection to 400° F /204° C and the solids will protect to 1000° F/538° C.

RECOMMENDED FOR all drilling applications (rotary shouldered connections), including high temperature environments. Also effective for use on open gear jackup legs.

*API RP 7A1: "Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections".
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER. DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

MSDS 379G

SPECIFICATION SHEET

"3010"®NM Special

Nonmetallic Thread Compound for Rotary Shouldered Connections

COLOR:	Black
PENETRATION:	320 - 350
WEIGHT / GALLON:	10.7 pounds / gallon
DROPPING POINT:	310 ℉ / 154 ℃
FLASH POINT:	330 ℉ / 166 ℃
BRUSHABLE TO:	-49 ℉ / -45 ℃
TORQUE FACTOR:	1.0 (per API RP 7A1)*
CONTAINS:	Amorphous and synthetic graphite, and other nonmetallic additives

Bestolife "3010"®NM Special is the third generation of the highly successful Bestolife "3000"® family of compounds designed and developed to address the environmental concerns, related to the use of thread compounds for rotary shouldered connections, in ecologically sensitive areas of the world such as the North Sea, Nova Scotia, Newfoundland, the South Atlantic, Alaska, and Sakhalin Island.

Bestolife "3010"®NM Special combines the excellent low temperature application properties of Bestolife 3010 Ultra with superior downhole galling resistance and enhanced ecotoxicological properties to provide the ideal drill-string solution for all rotary shouldered connections applications (drill pipe / tool joints / drill collars), irrespective of offshore drilling location. Also suitable for use on proprietary, metal to metal seal casing and tubing connections.

- ✓ Applies easily to cold wet connections exposed to seawater in ambient temperatures as low as -49 ℉ / -45 ℃ and yet provides optimum protection in the deepest hottest holes. Will provide lubrication and protection to 400 ℉/204 ℃ and the solids will protect to 1000 ° F/538 ℃.
- ✓ Has the ability to prevent galling of contact surfaces (including non-magnetic materials) under high bearing loads and to form a continuous gasket between the shoulders of a rotary connection during make-up. This is achieved through the innovative combination of a variety of amorphous and synthetic graphite based materials, as first used in "3000"®, interacting to form a seal when compressed between the shoulders during make-up to provide performance properties equal to the very best heavy metal compounds. This gasket-like seal prevents connection wash-out, even under high internal fluid pressures and the combined loading of directional drilling, to provide maximum protection in the toughest conditions.
- ✓ Meets the performance requirements of many proprietary, metal to metal seal casing and tubing connections.
- ✓ Approved for running all VAM connections in Carbon and 13% Cr. steels, except *DINO* VAM and Big Omega.
- ✓ Meets the current and future [2007] OSPAR Commission Harmonised Mandatory Control Scheme regulations for the protection of the marine environment of the North-East Atlantic / North Sea. It is registered for use in the UK as a DTI/CEFAS OCNS Category E Chemical through to 2008, and in Norway as a Category 9, Colour Category Yellow Pipe Dope. Registered in the Danish Produktregistret with PR-No. (Product Registration Number) 1796806. Registered in the Netherlands 23-01-2006 (05/TR/4/00919).

***API RP 7A1: "Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections"**
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIALS SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

MSDS: 483G

SPECIFICATION SHEET
"3000"®

Nonmetallic Thread Compound For Rotary Shouldered Connections

COLOR	Black
PENETRATION	320 - 350 (ASTM D 217)
WEIGHT/GALLON	10.2 pounds/gallon
DROPPING POINT	500°F/260°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	15°F/-9°C
SERVICE RATING	600°F/316°C
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Amorphous and synthetic graphites, and other nonmetallic additives.

Bestolife "3000"® has been developed and formulated to address the environmental concerns and costs, related to the use of thread compounds for rotary shouldered connections that contain high percentages of heavy metals such as lead and zinc. The performance benefit of lead and zinc is not only the ability to prevent galling of contact surfaces under high bearing loads, but also the ability to form a continuous metallic gasket as the metal powder is compressed between the shoulders of a rotary connection during make-up. This gasket-like seal prevents connection wash-out even under high internal fluid pressures and the combined loading of directional drilling. Bestolife "3000"® is the first totally nonmetal drilling compound to effectively provide both of these critical performance requirements. This is achieved through the innovative combination of a variety of amorphous and synthetic graphite-based materials that interact to provide performance properties similar to heavy metal-based compounds. The performance of "3000"® is further enhanced through the use of a premium quality, high temperature base grease. This compound has a low environmental impact, coupling with a high level of extreme pressure performance without containing any heavy metal compounds.

*API RP 7A1: "Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections"
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

"4010" NM

Nonmetallic Thread Compound for Rotary Shouldered & Premium Self-Sealing Casing/Tubing Connections

COLOR	Gray
PENETRATION	300 – 330
WEIGHT/GALLON	10.4 pounds/gallon
DROPPING POINT	550 ºF/288 ºC
FLASH POINT	396 ºF/202 ºC
BRUSHABLE TO	-40 ºF/-40 ºC
FRICTION (TORQUE) FACTOR	1.0 (per API RP 7A1)*(1)
SALT SPRAY	1500 hrs. min. (ASTM B117)
CONTAINS	Graphite, nonmetallic additives

Bestolife "4010" NM is the fourth generation of the highly successful Bestolife family of compounds designed and developed to address the environmental concerns, related to the use of thread compounds for rotary shouldered and premium connections, in ecologically sensitive areas of the world, such as the North Sea, Nova Scotia, Newfoundland, the South Atlantic, Alaska, and Sakhalin Island.

Bestolife "4010" NM combines the excellent low temperature application properties of Bestolife **3010 Ultra** with superior downhole galling resistance and enhanced ecotoxicological properties to provide the ideal drill-string solution for all rotary shouldered (drill pipe/tool joints/drill collars) and many proprietary premium self-sealing casing/tubing connection applications, irrespective of offshore drilling location.

- Applies easily to cold wet connections exposed to seawater in ambient temperatures as low as -40 ℉/- 40 ℃ and yet provides optimum protection in the deepest, hottest holes. Will provide lubrication and protection to 600 ℉/316 ℃ and the solids will protect to 1,000 ℉/538 ℃.

- Has the ability to prevent galling of contact surfaces (including non-magnetic materials) under high bearing loads and to form a continuous gasket between the shoulders of a rotary connection during make-up. This is achieved through the innovative combination of graphite and other non-toxic materials, which interact to form a seal when compressed between seals, threads, and shoulders during make-up to provide performance properties which are equal to the very best heavy metal compounds. This gasket-like seal prevents connection wash-out, even under high internal fluid pressures and the combined loading of directional drilling, to provide maximum protection in the toughest conditions. Also effective for use on slides, jacking systems, catilever type rigs and assemblies

- Meets the performance requirements of many proprietary metal-to-metal seal casing/tubing and high interference connection designs in Carbon Steel, 13 Cr., Super-Chrome and Duplex Steels.

- Approved make-up dope for VAM connections made of Carbon Steel, 13% CR Steel, Super 13% CR and CRA (except Dino VAM, Big and some specific connections developed for customers)

- Conforms with ISO/DIS 13678 and API RP 5A3

- Provides superior protection for the threaded connections of OCTG's during transit and long term storage.

- Meets the current OSPAR Commission Harmonised Mandatory Control Scheme (HOCNF) regulations for the protection of the marine environment of the North-East Atlantic/North Sea. Is registered for use in the UK/Netherlands as an OCNS Group E Chemical and in Norway as a Colour Category Yellow Pipe Dope. Registered in the Danish Produktregistret with PR-No. (Product Registration Number) 2068624.

***(1) API RP 7A1: "Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections"**
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

MSDS 504G

SPECIFICATION SHEET

"4040" NM

Nonmetallic Thread Compound for API 8 Round & Buttress, Rotary Shouldered & Semi-premium & Premium Self-Sealing Casing / Tubing Connections

COLOR	Gray
PENETRATION	320 – 350
WEIGHT/GALLON	10.4 pounds/gallon
DROPPING POINT	550 ºF/288 ºC
FLASH POINT	396 ºF/202 ºC
BRUSHABLE TO	-40 ºF/-40 ºC
FRICTION (TORQUE) FACTOR	1.0 (per API RP 7A1)*(1) (Drill-string connections) 1.0 (per API RP 5A3) (relative to API Modified)*(2)
SALT SPRAY	1000 hrs. min (ASTM B117)
CONTAINS	Graphite, nonmetallic additives

Bestolife 4040 NM is the fifth generation of the highly successful Bestolife family of compounds designed and developed to address the environmental concerns, related to the use of thread compounds for rotary shouldered and premium connections, in ecologically sensitive areas of the world, such as the North Sea, Nova Scotia, Newfoundland, the South Atlantic, Alaska, and Sakhalin Island.

Bestolife 4040 NM combines the excellent low temperature application properties of Bestolife 3010 Ultra with superior downhole galling resistance and enhanced ecotoxicological properties to provide the ideal drill-string solution for all rotary shouldered (drill pipe/tool joints/drill collars) and many proprietary premium self-sealing casing / tubing connection applications and API connections, irrespective of offshore drilling location.

- ✓ Applies easily to cold wet connections exposed to seawater in ambient temperatures as low as -40 ℉/-40 ℃ and yet provides optimum protection in the deepest, hottest holes. Will provide lubrication and protection to 600 ℉/316 ℃ and the solids will protect to 1,000 ℉/538 ℃.

- ✓ Has the ability to prevent galling of contact surfaces (including non-magnetic materials) under high bearing loads and to form a continuous gasket between the shoulders of a rotary connection during make-up. This is achieved through the innovative combination of graphite and other non-toxic materials, which interact to form a seal when compressed between seals, threads, and shoulders during make-up to provide performance properties which are equal to the very best heavy metal compounds. This gasket-like seal prevents connection wash-out, even under high internal fluid pressures and the combined loading of directional drilling, to provide maximum protection in the toughest conditions. Also effective on slides, jacking systems, cantilever type rigs and assemblies

- ✓ Meets the performance requirements of many proprietary metal-to-metal seal casing / tubing and high interference connection designs in Carbon, 13 Cr., Super-Chrome and Duplex steels.

- ✓ Conforms with ISO/DIS 13678 and API RP 5A3

- ✓ Provides superior protection for the threaded connections of OCTG's during transit and long term storage.

- ✓ Will meet or exceed the current OSPAR Commission Harmonised Mandatory Control Scheme (HOCNF) regulations for the protection of the marine environment of the North-East Atlantic/North Sea.

*(1) API RP 7A1: "Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections"
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

*(2) The proper field torque for all API casing and tubing connections should be determined by following the procedures that are outlined in API RP 5C1: "Recommended Practice for Care and Use of Casing and Tubing".

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

MSDS 527G

SPECIFICATION SHEET

GGT-RSC High Temp

Nonmetallic Thread Compound for Rotary-Shouldered Connections
NSF Registered†

COLOR	Black
PENETRATION	300 - 320 (ASTM D 217)
WEIGHT/GALLON	10.7 pounds/gallon
DROPPING POINT	500° F/260° C (typ)
FLASH POINT	385° F/196° C (min)
BRUSHABLE TO	15° F/-9° C
SERVICE RATING	600° F/316° C
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Synthetic and amorphous graphite, and other nonmetallic additives

GGT-RSC High Temp has been developed as an economical answer to the environmental restrictions and exposure concerns associated with the use of drilling compounds that contain heavy metals, such as lead and zinc. It contains a high percentage of amorphous and synthetic graphites, as well as other inert solids, in a high temperature base grease. In addition to the galling and seizing protection provided by the solids, GGT-RSC High Temp also contains a soluble extreme pressure package that is surface active (adheres to metal surfaces) and helps to provide the load-carrying capability required by the high-bearing stresses present in rotary-shouldered connections. It applies easily in a wide range of temperatures and conditions, is resistant to wash-out, and will not harden or bleed excessively in storage. It is recommended for light-to-medium duty drilling. GGT-RSC HT has obtained registration from NSF, National Sanitation Foundation.†

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

† NSF Registration No. 141561 Category Code: H2

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

"2000"®
"2000"® NM
2010NM Ultra
API Modified
72733
72732
Zn18
OCTG
Metal Free
GGT
PTC
PTC-ST
Fiberseal
"4010" NM
"4040" NM

RECOMMENDED DOPING PROCEDURES FOR CASING/TUBING CONNECTIONS

1. **Compound Preparation and Contamination:**

   Upon opening the container, the product should be stirred with either a dope brush or other suitable device to re-blend any oil separation or settling of the component solids that may have occurred during shipment and storage. Care should be taken that after opening the container, no contamination of the compound in the container occurs, i.e. drilling fluids, water, dirt and other debris. In no instance should any material such as diesel fuel, kerosene, motor oil, etc. be added to the compound to improve the ease of application.Contamination or adulteration can change the friction factor / torque factor of the compound and also degrade the galling resistance properties.

2. **Connection Surface Preparation:**

   Tube Mill, Threading, Inspection and Pipe yard Operations: Connection surfaces should be free of moisture and contaminants (including storage compounds) prior to the application of thread compound, whether it is intended for storage only or also as a "running" compound. All corrosion effects are the result of an electrolytic process that requires both water and dissolved ions (chlorides, sulfides, sulfates, and other dissolved ions) to serve together as an electrolyte. Most corrosion inhibitors are "surface active", meaning that these active molecules will attach themselves to the metal surfaces preventing access by the contaminants that cause corrosion. If those contaminants are present on the threaded surface prior to application of the thread/storage compound, they will be trapped against the surface and corrosion will occur. Simply drying the surface with compressed air will not be sufficient. When the moisture evaporates, any dissolved contaminants will remain on the surface. To remove moisture and contaminants, a de-watering fluid/corrosion inhibitor can be applied to threaded surfaces. Immediately prior to compound application, any excess de-watering fluid/corrosion inhibitor on threaded surfaces should be removed.

   Running Offshore: All tubular connections should be thoroughly cleaned (including removal of storage compound) and dried at the rig prior to inspection and application of thread compound. Care must also be taken to ensure that the cleaning process does not cause environmental pollution.

3. **Compound Application:**

   After the connection is clean and dry, inspect and remove any brush bristles left on the threads/seals from cleaning process. Apply a light, even coating of thread compound over the entire thread and seal areas of the pin and box, leaving the thread form clearly visible. The practice of slapping a "gob" of pipe dope on one side of the pin or box and depending on the pipe rotation during make-up to distribute the compound over the connection surface, is not sufficient. The compound must be worked into the thread roots and should completely cover the entire thread and seal areas of the pin and box. If the pins are doped when the pipe is on a rack, care should be taken to ensure that when the string is stood up on the rig floor prior to running, that the compound does not pick up contaminants (e.g. dried mud, cuttings, etc.) off the rig floor. Ideally, protectors should be installed on the pins after doping and then removed just prior to stabbing on the rig floor.

Good handling, cleaning and thread compound application procedures are key elements for a successful make-up job.

SPECIFICATION SHEET

“2000” ®

High-Pressure / High-Temperature Thread Compound for Casing, Tubing, and Line Pipe

COLOR	Black - copper
PENETRATION	310-330 (ASTM D-217)
WEIGHT/GALLON	10.4 pounds/gallon
DROPPING POINT	350°F/177ºC (typ)
FLASH POINT	385°F/196ºC (min)
BRUSHABLE TO	10°F/-12ºC
SERVICE RATING	500°F/260ºC
TORQUE FACTOR	0.90 (relative to API Modified)*
CONTAINS	Inert nonmetallic solids and <4% copper

Bestolife “2000”® is a non-lead, non-zinc alternative to API Modified. Extensive controlled testing, including full-scale make and breaks and sustained gas pressure tests, has demonstrated that “2000”® ***conforms with ISO 13678 and API RP 5A3.*** “2000”® will meet or exceed the listed performance objectives in ISO 13678 and API RP 5A3**.** The major solid components are a proprietary blend of nonmetallic materials that are inert to chemical attack, such as occurs in sour gas environments and with CO_2 injection, and stable to temperatures in excess of 500°F. Bestolife “2000”® also addresses one of the major concerns in pipe yards and threading operations today - rejects due to pitting and corrosion. In a 700 hour salt fog spray test, “2000”® has demonstrated corrosion protection that exceeds the performance of the leading storage compound in the industry. The results of these tests show that Bestolife “2000”® is not only an excellent “running” compound but can also provide superior protection during long term storage (contact manufacturer for application requirements).

*The proper field torque for all API casing and tubing connections should be determined by following the procedures outlined in API RP 5C1: “Recommended Practice for Care and Use of Casing and Tubing”.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

"2000"® NM

High-Pressure, High-Temperature Thread Compound for Casing, Tubing, and Line Pipe

COLOR	Black
PENETRATION	310 - 330 (ASTM D-217)
WEIGHT/GALLON	10.2 pounds/gallon
DROPPING POINT	350℉/177 °C (typ)
FLASH POINT	385℉/196 °C (min)
BRUSHABLE TO	10℉/-12 °C
SERVICE RATING	500℉/260 °C
TORQUE FACTOR	0.90 (Relative to API Modified)*

Bestolife "2000"® NM is the ***nonmetal*** alternative to API Modified. It is based on the proven formulation of regular grade Bestolife "2000"®, the industry standard that has been used by every major pipe threader and manufacturer in the U.S. since 1990. Bestolife "2000"® NM ***conforms with ISO 13678 and API RP 5A3.*** It will meet or exceed the listed performance objectives in ISO 13678 and API RP 5A3 as well as the requirements of API Specification 5CT. The major solid components of Bestolife "2000"® NM are a proprietary blend of nonmetallic materials that are inert to chemical attack, such as occurs in sour gas environments and with CO_2 injection, and are stable to temperatures in excess of 500℉. It also addres ses one of the major concerns in pipe yards and threading operations today - rejects due to pitting and corrosion. In a 700 hour salt fog spray test, the base grease and additive package utilized in Bestolife "2000"® NM has demonstrated corrosion protection that exceeds the performance of the leading storage compound in the industry. The results of these tests show that Bestolife "2000"® NM is not only an excellent "running" compound but can also provide superior protection during long term storage.

*The proper field torque for all API casing and tubing connections should be determined by following the procedures outlined in API RP 5C1: "Recommended Practice for Care and Use of Casing and Tubing".

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

“2010” NM Ultra

Non-metallic Thread Compound for Casing, Tubing and Line Pipe Connections

COLOR	Black
PENETRATION	320 - 350 (ASTM D-217)
WEIGHT/GALLON	10.7 pounds/gallon
DROPPING POINT	310℉/154℃ (typ)
FLASH POINT	330℉/166℃ (min)
BRUSHABLE TO	-49℉/-45℃
TORQUE FACTOR	0.90 (relative to API Modified)*
SALT SPRAY	2,000 hrs, min (ASTM B117)
CONTAINS	Amorphous and synthetic graphite, and other nonmetallic additives.

“2010” NM Ultra was developed to address the environmental concerns and costs, related to the use of thread compounds for casing, tubing and line pipe connections that contain high percentages of heavy metals, such as lead, copper and zinc. The improvement of proven industry standard Bestolife “2000”® and “2000”®NM with enhanced low temperature application/adherence properties has resulted in formulations designed for use in the coldest, wettest operating conditions, like those found in the North Sea, Nova Scotia/Newfoundland and the South Atlantic.

“2010” NM Ultra, the *non-metal* alternative to API Modified, ***conforms with ISO 13678 and API RP 5A3.*** “2010” NM ULtra will meet or exceed the listed performance objectives in ISO 13678 and API RP 5A3, as well as the requirements of API Specification 5CT. It is equally suitable for use with premium, self-sealing connections. The major solid components of “2010” NM Ultra are an innovative combination of non-metallic materials that are inert to chemical attack, such as occurs in sour gas environments and with CO2 injection, and stable to temperatures in excess of 400℉/204℃.

“2010” NM Ultra applies easily to cold wet connections exposed to seawater in ambient temperatures as low as -45℃/49℉ and yet delivers optimum performa nce in all types of wells. The grease in 2010 NM Ultra will provide lubrication and protection to 400℉/204℃ and the solids will protect to 1000℉/538 ℃.

“2010” NM Ultra exceeds 2,000 hours in ASTM B117 salt spray corrosion test.

Recommended for all casing, tubing and line pipe applications.

*The proper field torque for all API casing and tubing connections should be determined by following the procedures outlined in API RP 5C1: “Recommended Practice for Care and Use of Casing and Tubing”.

A MATERIALS SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

API Modified

High-Pressure / High-Temperature Thread Compound for Casing, Tubing, and Line Pipe

COLOR	Black - copper	
PENETRATION	310 - 330 (ASTM D 217)	
WEIGHT/GALLON	15.8 pounds/gallon	
DROPPING POINT	350°F/177°C (typ)	
FLASH POINT	385°F/196°C (min)	
BRUSHABLE TO	0°F/-18°C	
SERVICE RATING	500°F/260°C	
TORQUE FACTOR	1.0	
CONTAINS (wt. %)	Powdered graphite	18.0±1.0
	Lead powder	30.5±0.6
	Zinc dust	12.2±0.6
	Copper flake	3.3±0.3

Bestolife API Modified meets or exceeds the performance requirements and objectives outlined in API Recommended Practice 5A3* and conforms to ISO 13678. The use of this superior thread compound protects against connection galling during make-up and break-out, prevents leakage at temperatures in excess of 300°F, and withstands pressure to 10,000 psi. Bestolife API Modified resists water absorption, resists disintegration and volume changes, and will not harden, dry out, evaporate or oxidize. It contains H_2S and corrosion inhibitors to resist pitting and discoloration of threaded surfaces during field use and storage.

*API Recommended Practice 5A3: “Recommended Practice on Thread Compounds for Casing, Tubing, and Line Pipe”; first edition, October 1, 1996

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SPECIFICATION SHEET

Bestolife 72733

High-Pressure / High-Temperature Thread Compound for Casing, Tubing, and Line Pipe

COLOR	Black - copper
PENETRATION	310 - 340
WEIGHT/GALLON	15.8 pounds/gallon
DROPPING POINT	350°F/177ºC
FLASH POINT	385°F/196ºC
BRUSHABLE TO	0ºF/-18ºC
SERVICE RATING	500ºF/260ºC
TORQUE FACTOR	1.0
CONTAINS	Graphite, lead, zinc, copper

Bestolife 72733 exceeds the performance requirements and objectives outlined in API RP 5A3*, obsolete API BUL 5A2, and conforms to ISO 13678. This superior thread compound protects connections against galling during make-up and break-out, prevents leakage at temperatures in excess of 300ºF, and withstands pressure to 10,000 psi. Bestolife 72733 resists water absorption, disintegration and volume changes, and will not harden, dry out, evaporate or oxidize. It contains special corrosion inhibitors to resist pitting and discoloration of threaded surfaces during field use and storage.

*API Recommended Practice 5A3: “Recommended Practice on Thread Compounds for Casing, Tubing, and Line Pipe”; Second Edition, July 2003

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
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SPECIFICATION SHEET

Bestolife 72732

High-Pressure / High-Temperature Thread Compound for Casing, Tubing, and Line Pipe

COLOR	Black - copper
PENETRATION	310 - 340
DENSITY	15.8 pounds/gallon
DROPPING POINT	350°F/177ºC
FLASH POINT	385°F/196ºC
BRUSHABLE TO	0ºF/-18ºC
SERVICE RATING	500ºF/260ºC
TORQUE FACTOR	1.0
CONTAINS	Graphite, Lead, Zinc, Copper

Bestolife 72732 exceeds the performance requirements and objectives outlined in API RP 5A3*, obsolete API BUL 5A2, and conforms to ISO 13678. Shell has discontinued making Shell 72732, but has entrusted the Shell 72732 formulation to Bestolife. Therefore, Bestolife 72732 will continue to be available for connections that require Shell 72732. This superior thread compound protects connections against galling during make-up and break-out, prevents leakage at temperatures in excess of 300ºF, and withstands pressure to 10,000 psi. Bestolife 72732 resists water absorption, disintegration and volume changes, and will not harden, dry out, evaporate or oxidize.

*API Recommended Practice 5A3: “Recommended Practice on Thread Compounds for Casing, Tubing, and Line Pipe”; Second Edition, July 2003

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SPECIFICATION SHEET

ZN18

Zinc-Based Thread Compound for Storage and Light Duty Use

COLOR	Gray
PENETRATION	300 - 320 (ASTM D 217)
WEIGHT/GALLON	12.5 pounds/gallon
DROPPING POINT	350°F/177°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	10°F/-12°C
SERVICE RATING	350°F/177°C
CONTAINS	Zinc and other nonmetallic additives

ZN18 is a zinc-based thread compound developed to resist corrosion, pitting, and discoloration on all threaded connections subjected to long-term storage. ZN18 will also provide galling and seizing protection for threaded connections used in light duty applications. Contains 18% powdered metallic zinc, as well as H_2S, rust and corrosion inhibitors.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

OCTG

Lead-Free Alternative to API Modified for Casing, Tubing and Line Pipe

COLOR	Black-copper
PENETRATION	300-320 (ASTM D 217)
WEIGHT/GALLON	14.5 pounds/gallon
DROPPING POINT	350°F/177ºC (typ)
FLASH POINT	385°F/196ºC (min)
BRUSHABLE TO	10°F/-12ºC
SERVICE RATING	350°F/177ºC
TORQUE FACTOR	1.0 (relative to API Modified)*
CONTAINS	Zinc, graphite, copper and other nonmetallic additives

OCTG is a lead free alternative to API Modified. OCTG meets or exceeds the performance requirements of API RP 5A3 and conforms to ISO 13678. The blend of zinc, copper and graphite in OCTG resists galling and seizing while the high solids content (>60% by weight) will effectively seal all API threaded connections. It contains oxidation and H_2S inhibitors.

*The proper field torque for all API casing and tubing connections should be determined by following the procedures outlined in API RP 5C1: "Recommended Practice for Care and Use of Casing and Tubing".

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

Metal Free

Nonmetallic Thread Compound
for API OCTG and BTC

COLOR	Black
PENETRATION	310 - 330 (ASTM D 217)
WEIGHT/GALLON	10.2 pounds/gallon
DROPPING POINT	350° F/177° C (typ)
FLASH POINT	385° F/196° C (min)
BRUSHABLE TO	10° F/-12° C
SERVICE RATING	500° F/260° C
TORQUE FACTOR	0.9 (relative to API Modified)*
CONTAINS	Synthetic and amorphous graphite, Teflon®, and other nonmetallic additives

Metal Free is an economical, nonmetallic thread compound developed to meet or exceed the performance objectives of API RP 5A3 when used on API OCTG and Buttress connections and conforms to ISO 13678. It contains a proprietary blend of synthetic and amorphous graphites and fine Teflon® powder that is inert to chemical attack. Metal Free will protect against galling and thread damage and seal effectively to pressures as high as 10,000 psi and temperatures in excess of 300°F. It contains no toxic materials that exceed the regulatory limits established by the EPA or by the California hazardous waste regulations.

Recommended for all API casing, tubing, line pipe, and Buttress connections

*The proper field torque for all API casing and tubing connections should be determined by following the procedures outlined in API RP 5C1: “Recommended Practice for Care and Use of Casing and Tubing”.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

GGT

Nonmetallic Thread Compound for Water Well Casing, Pump Columns, Pipe Storage, and Light Duty Drilling Applications

COLOR	Black
PENETRATION	310 - 330 (ASTM D 217)
WEIGHT/GALLON	10.2 pounds/gallon
DROPPING POINT	350°F/177ºC (typ)
FLASH POINT	385°F/196ºC (min)
BRUSHABLE TO	10°F/-12ºC
SERVICE RATING	500°F/260ºC
TORQUE FACTOR	1.0 (per API RP 7A1)*
CONTAINS	Graphite and other nonmetallic additives

Formulated primarily for water well casing and pump columns, GGT contains a high percentage of graphite and other inert solids that provide thread protection and sealing over a wide range of conditions and temperatures. The high quality base grease provides both corrosion protection and water resistance. GGT's excellent sealing properties, thermal stability and resistance to corrosion and water washout, make it an ideal thread sealant and lubricant for any threaded connection where contact bearing stresses are not extreme. GGT will adhere to wet surfaces, will apply readily over a wide range of temperatures and will not harden with exposure or age. Contains no heavy metals such as lead, zinc or copper.

*API RP 7A1: “Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections”
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

PTC

Nonmetallic Thread Compound
for Premium, Self-Sealing Connections

COLOR	Black
PENETRATION	320 - 340 (ASTM D-217)
WEIGHT/GALLON	9.2 pounds/gallon
DROPPING POINT	500ºF/260ºC (typ)
FLASH POINT	385ºF/196ºC (min)
BRUSHABLE TO	15ºF/-9ºC
SERVICE RATING	600ºF/316ºC
TORQUE FACTOR	0.8 (relative to API Modified)*
CONTAINS	Synthetic graphite, Teflon® and other nonmetallic additives

PTC is a nonmetallic thread compound developed specifically for premium, self-sealing connections. It contains a proprietary blend of synthetic graphite and fine Teflon® powder that is inert to chemical attack and protects against galling of high alloy steels. The reduced solids content and small particle sizing of PTC will not interfere with proper seal face contact. PTC is formulated with a high temperature base grease which will provide lubrication at temperatures in excess of 500°F.

*Value obtained on NEW VAM® connection. Torque factor may vary for different connection designs.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

PTC-ST

Nonmetallic Thread Compound
for Premium, Self-Sealing Connections

COLOR	Black
PENETRATION	320 - 340 (ASTM D-217)
WEIGHT/GALLON	9.2 pounds/gallon
DROPPING POINT	350°F/177°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	10°F/-12°C
SERVICE RATING	500°F/260°C
TORQUE FACTOR	0.8 (relative to API Modified)*
CONTAINS	Synthetic graphite, Teflon® and other nonmetallic additives

PTC-ST is a nonmetallic thread compound developed specifically for premium, self-sealing connections. It contains a proprietary blend of synthetic graphite and fine Teflon® powder that is inert to chemical attack and protects against galling of high alloy steels. The reduced solids content and small particle sizing of PTC-ST will not interfere with proper seal face contact. PTC-ST is formulated with a “low bleed” corrosion resistant base grease that will provide long-term corrosion protection in field storage when applied according to manufacturer’s recommendations.

*Value obtained on NEW VAM® connection. Torque factor may vary for different connection designs.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

FIBERSEAL

Non-Lead Thread Compound for Fiberglass Pipe

COLOR	Light gray
PENETRATION	300 - 320 (ASTM D 217)
WEIGHT/GALLON	11.4 pounds/gallon
DROPPING POINT	350°F/177ºC (typ)
FLASH POINT	385°F/196ºC (min)
BRUSHABLE TO	10°F/-12ºC
SERVICE RATING	500°F/260ºC
TORQUE FACTOR	1.0 (relative to API Modified)*
CONTAINS	Zinc oxide, Teflon®, and other nonmetallic additives

FiberSeal is an effective, yet economical thread compound that has been developed specifically for fiberglass pipe connections. The combination of zinc oxide and a high percentage of Teflon®, provides both enhanced sealing and increased resistance to thread damage on both new and used connections. FiberSeal includes a high level of extreme pressure and anti-wear additives that will help to reduce thread wear and damage. The performance properties of FiberSeal are not affected by sour gas environments or by CO_2 injection.

*The proper field torque for all API casing and tubing connections should be determined by following the procedures outlined in API RP 5C1: “Recommended Practice for Care and Use of Casing and Tubing”.

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SPECIFICATION SHEET

"4010" NM

Nonmetallic Thread Compound for Rotary Shouldered & Premium Self-Sealing Casing/Tubing Connections

COLOR	Gray
PENETRATION	300 – 330
WEIGHT/GALLON	10.4 pounds/gallon
DROPPING POINT	550 ºF/288 ºC
FLASH POINT	396 ºF/202 ºC
BRUSHABLE TO	-40 ºF/-40 ºC
FRICTION (TORQUE) FACTOR	1.0 (per API RP 7A1)*(1)
SALT SPRAY	1500 hrs. min. (ASTM B117)
CONTAINS	Graphite, nonmetallic additives

Bestolife "4010" NM is the fourth generation of the highly successful Bestolife family of compounds designed and developed to address the environmental concerns, related to the use of thread compounds for rotary shouldered and premium connections, in ecologically sensitive areas of the world, such as the North Sea, Nova Scotia, Newfoundland, the South Atlantic, Alaska, and Sakhalin Island.

Bestolife "4010" NM combines the excellent low temperature application properties of Bestolife **3010 Ultra** with superior downhole galling resistance and enhanced ecotoxicological properties to provide the ideal drill-string solution for all rotary shouldered (drill pipe/tool joints/drill collars) and many proprietary premium self-sealing casing/tubing connection applications, irrespective of offshore drilling location.

- Applies easily to cold wet connections exposed to seawater in ambient temperatures as low as -40 ℉/- 40 ℃ and yet provides optimum protection in the deepest, hottest holes. Will provide lubrication and protection to 600 ℉/316 ℃ and the solids will protect to 1,000 ℉/538 ℃.

- Has the ability to prevent galling of contact surfaces (including non-magnetic materials) under high bearing loads and to form a continuous gasket between the shoulders of a rotary connection during make-up. This is achieved through the innovative combination of graphite and other non-toxic materials, which interact to form a seal when compressed between seals, threads, and shoulders during make-up to provide performance properties which are equal to the very best heavy metal compounds. This gasket-like seal prevents connection wash-out, even under high internal fluid pressures and the combined loading of directional drilling, to provide maximum protection in the toughest conditions. Also effective for use on slides, jacking systems, catilever type rigs and assemblies

- Meets the performance requirements of many proprietary metal-to-metal seal casing/tubing and high interference connection designs in Carbon Steel, 13 Cr., Super-Chrome and Duplex Steels.

- Approved make-up dope for VAM connections made of Carbon Steel, 13% CR Steel, Super 13% CR and CRA (except Dino VAM, Big and some specific connections developed for customers)

- Conforms with ISO/DIS 13678 and API RP 5A3

- Provides superior protection for the threaded connections of OCTG's during transit and long term storage.

- Meets the current OSPAR Commission Harmonised Mandatory Control Scheme (HOCNF) regulations for the protection of the marine environment of the North-East Atlantic/North Sea. Is registered for use in the UK/Netherlands as an OCNS Group E Chemical and in Norway as a Colour Category Yellow Pipe Dope. Registered in the Danish Produktregistret with PR-No. (Product Registration Number) 2068624.

***(1) API RP 7A1: "Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections"**
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

MSDS 504G

SPECIFICATION SHEET

"4040" NM

Nonmetallic Thread Compound for API 8 Round & Buttress, Rotary Shouldered & Semi-premium & Premium Self-Sealing Casing / Tubing Connections

COLOR	Gray
PENETRATION	320 – 350
WEIGHT/GALLON	10.4 pounds/gallon
DROPPING POINT	550 ºF/288 ºC
FLASH POINT	396 ºF/202 ºC
BRUSHABLE TO	-40 ºF/-40 ºC
FRICTION (TORQUE) FACTOR	1.0 (per API RP 7A1)*(1) (Drill-string connections) 1.0 (per API RP 5A3) (relative to API Modified)*(2)
SALT SPRAY	1000 hrs. min (ASTM B117)
CONTAINS	Graphite, nonmetallic additives

Bestolife 4040 NM is the fifth generation of the highly successful Bestolife family of compounds designed and developed to address the environmental concerns, related to the use of thread compounds for rotary shouldered and premium connections, in ecologically sensitive areas of the world, such as the North Sea, Nova Scotia, Newfoundland, the South Atlantic, Alaska, and Sakhalin Island.

Bestolife 4040 NM combines the excellent low temperature application properties of Bestolife 3010 Ultra with superior downhole galling resistance and enhanced ecotoxicological properties to provide the ideal drill-string solution for all rotary shouldered (drill pipe/tool joints/drill collars) and many proprietary premium self-sealing casing / tubing connection applications and API connections, irrespective of offshore drilling location.

- ✓ Applies easily to cold wet connections exposed to seawater in ambient temperatures as low as -40 ℉/-40 ℃ and yet provides optimum protection in the deepest, hottest holes. Will provide lubrication and protection to 600 ℉/316 ℃ and the solids will protect to 1,000 ℉/538 ℃.

- ✓ Has the ability to prevent galling of contact surfaces (including non-magnetic materials) under high bearing loads and to form a continuous gasket between the shoulders of a rotary connection during make-up. This is achieved through the innovative combination of graphite and other non-toxic materials, which interact to form a seal when compressed between seals, threads, and shoulders during make-up to provide performance properties which are equal to the very best heavy metal compounds. This gasket-like seal prevents connection wash-out, even under high internal fluid pressures and the combined loading of directional drilling, to provide maximum protection in the toughest conditions. Also effective on slides, jacking systems, cantilever type rigs and assemblies

- ✓ Meets the performance requirements of many proprietary metal-to-metal seal casing / tubing and high interference connection designs in Carbon, 13 Cr., Super-Chrome and Duplex steels.

- ✓ Conforms with ISO/DIS 13678 and API RP 5A3

- ✓ Provides superior protection for the threaded connections of OCTG's during transit and long term storage.

- ✓ Will meet or exceed the current OSPAR Commission Harmonised Mandatory Control Scheme (HOCNF) regulations for the protection of the marine environment of the North-East Atlantic/North Sea.

*(1) API RP 7A1: "Recommended Practice for Testing of Thread Compound for Rotary Shouldered Connections"
NOTE: Due to operation and equipment variables, this value may require adjustment based on field experience.

*(2) The proper field torque for all API casing and tubing connections should be determined by following the procedures that are outlined in API RP 5C1: "Recommended Practice for Care and Use of Casing and Tubing".

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

MSDS 527G

SPECIFICATION SHEET

2020

Nonmetallic Thread Compound for API Eight-Round and Buttress Connections

COLOR:	Black - copper
PENETRATION:	310-330 (ASTM D-217)
WEIGHT/GALLON:	10.0 pounds/gallon
DROPPING POINT:	350℉/177ºC
FLASH POINT:	385℉/196ºC
BRUSHABLE TO:	10℉/-12ºC
SALT SPRAY, ASTM B117	1500 Hours
SERVICE RATING:	500℉/260ºC
TORQUE FACTOR:	0.90 (relative to API Modified)*
CONTAINS:	Graphite, Teflon®, and other nonmetallic additives

Bestolife 2020 is an economical, nonmetallic thread compound developed to meet or exceed API RP 5A3 when used on API eight-round or buttress connections and conforms with ISO 13678. The major solid components are a proprietary blend of nonmetallic materials that are inert to chemical attack, such as occurs in sour gas environments and with CO_2 injection, and stable to temperatures in excess of 500 ℉. Bestolife 2020 also addresses one of the major concerns in pipe yards and threading operations today: rejects due to pitting and corrosion. In a 1500 hour salt fog spray test, 2020 has demonstrated corrosion protection that exceeds the performance of some leading storage compounds. The results of lab tests indicate that Bestolife 2020 is not only an excellent “running” compound but can provide superior protection during long term storage.

*The proper field torque for all API casing and tubing connections should be determined by following the procedures outlined in API RP 5C1: “Recommended Practice for Care and Use of Casing and Tubing”.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

Copper Rock
C-55®
Supr Copr
Copr Plus
Copr Plus Pumpable
Eco-Sil
BWR
BWR Premium

BESTOLIFE THREAD COMPOUND USAGE CHART

DRILL COLLAR & TOOL JOINT SIZE	COMPOUND OZ/PIN	JOINTS* PINS/GAL
4 1/2"	2.75	51
5"	3.00	46
5 1/2"	3.75	42
6 5/8"	4.25	34
7"	5.50	30
7 5/8"	7.25	23
8 5/8"	9.00	17
9 5/8"	9.50	14

TUBING SIZE	COMPOUND OZ/PIN	JOINTS* PINS/GAL
2 3/8"	0.66	194
2 7/8"	0.80	160
3 1/2"	0.88	128
4"	1.12	114

CASING SIZE	COMPOUND OZ/PIN	JOINTS* PINS/GAL
4 1/2"	1.88	68
5"	2.09	61
5 1/2"	2.30	55
6 5/8"	2.76	46
7"	2.93	44
7 5/8"	3.19	40
8 5/8"	3.61	35
9 5/8"	4.03	32
10 3/4"	4.50	28
11 3/4"	4.92	26
13 3/8"	5.60	23
16"	6.70	19
18 5/8"	7.79	16
20"	8.37	15

*When applying compound to one LT&C pin or box, filling root to crest.

- For short thread, multiply by 0.25.
- If both pin and box are doped, multiply compound ounces by two or divide pins/gallon by two.

Industrial Products

Copper Rock Non Lead/Non Zinc Thread Compound for Rock Drill Steel Joints, Couplings and Bits Recommended for coal drilling, percussion rock drilling, blast hole drilling, all rotary joints, road construction, logging, mining, pneumatic drilling and track drills.	**C-55®** Lead Based Thread Compound for Rock Drill Steel Joints, Coupling and Bits Recommended for coal drilling, percussion rock drilling, blast hole drilling, all rotary joints, road construction, logging, mining, pneumatic drilling and track drills.
Supr Copr Non Lead/Non Zinc Anti Seize/Thread Compound for High Temperature Applications Recommended for drill collars, tool joints, all rotary shouldered connections, tubing and fishing tools. Suitable for use on all threaded and flanged connections, studs, bolts, screws.	**Cal Bronze Lead Free** Multipurpose Thread Compound for Light to Medium Drilling A copper compound widely used in oilfield applications, and NSF registered for waterwell drilling applications. NSF Registration Number 141560
Copr Plus Non Lead/Non Zinc Thread Compound for Rotary Shouldered Connections Recommended for all rotary shouldered connections. Excellent for drilling applications in cold, wet environments.	**Copr Plus Pumpable** Non Lead/Non Zinc Thread Compound for Rotary Shouldered Connections Recommended for all rotary shouldered connections. Pumpable formulation for drilling applications in cold, wet environments.
GGT RSC HT Non-Metallic Thread Compound for Rotary Shouldered Connections A non-metallic compound widely used in oilfield applications, and NSF registered for waterwell drilling applications. NSF Registration Number 141561	**Eco-Sil** Non-Metallic/Non-Hydrocarbon Thread Compound for Monitor Wells and Core Sampling Eco-Sil is a silicone based compound, highly recommended for applications where metallics and hydrocarbons are not permitted.
BWR High Quality Wire Rope and Hawser Lubricant Recommended to extend the life of wire rope in marine, oilfield and industrial applications	**BWR Premium** High Quality Wire Rope and Hawser Lubricant Improved formulation to extend life of wire rope by forming an outer protective film as well as lubricating inner strands and sheaves
Moly G Multi-purpose, Molybdenum Disulfide Grease	**Valve Lubricants** Bestolife 650 and 650MT Plug Valve Lubricant/Sealant

For more information on Bestolife industrial products, contact your sales representative or visit our website, www.bestolife.com.

Bestolife products can be used in a variety of applications and conditions, therefore the products can be tailored to meet your needs. Bestolife compounds are available in a wide range of container sizes, plastic pails from 1 gallon to 5 gallon. Metal pails are available when plastic is not suitable. For the little jobs, small containers of a copper compound with applicator lids, and even tubes are available to meet your needs. For your long term applications, Bestolife can furnish your compounds in large bulk containers.

For the times when your conditions vary, Bestolife has a formulation that meets or exceeds your requirements. Whether it is high temperature or high pressure, arctic blast or desert heat, Bestolife offers their products with the special additives needed to meet your criteria.

Whenever your application and/or conditions change, keep in mind, Bestolife is there to accommodate your requirements. Contact your sales representative for container size availability or your special condition and experienced personnel will supply you with the right solution for your needs. Your sales representative can be reached by phone at 800-527-9452 or by email at sales@bestolife.com

BSC
Bee-Lok
Pail Opener
Dope Brush

RECOMMENDED THREAD COMPOUND APPLICATION PROCEDURES FOR LONG-TERM STORAGE

The following is Bestolife's recommendations for the application and use of our thread compounds when applied to tubulars prior to long term storage:

1. Control of Process Conditions:

⇒ There are a variety of process conditions that accelerate the corrosion and pitting of threaded surfaces. They include:

- Composition and type of cutting fluids and hydrostatic test fluids
- Contaminants such as chlorides and sulfides in process fluids
- pH of process fluids
- Bacterial growth in process fluids

These factors must be addressed, monitored, and controlled or no post process treatment for long-term storage will be totally effective.

2. Thread Surface Preparation and Contamination:

⇒ Connection surfaces should be free of moisture and contaminants prior to the application of any compound, whether it is intended for storage only or also as a "running" compound. All corrosion effects are the result of an electrolytic process that requires both water and dissolved ions (chlorides, sulfides, sulfates, and other dissolved ions) to serve together as an electrolyte. Most corrosion inhibitors are "surface active", meaning that these active molecules will attach themselves to the metal surfaces preventing access by the contaminants that cause corrosion. If those contaminants are present on the threaded surface prior to application of the thread/storage compound, they will be trapped against the surface and corrosion will occur. Simply drying the surface with compressed air will not be sufficient. When the moisture evaporates, any dissolved contaminants will remain on the surface. To remove moisture and contaminants, a dewatering fluid/corrosion inhibitor can be applied to threaded surfaces. Immediately prior to compound application, any excess dewatering fluid/corrosion inhibitor on threaded surfaces should be removed.

3. Compound Application:

⇒ The primary difference in the functional properties of storage-only compounds and compounds with storage capabilities (hybrid compounds) is in one of their physical properties, viscosity. Storage compounds are more fluid than running compounds and as a result, the method of application used is not a critical factor. When applied, storage compounds flow readily around the thread surface and when a thread protector is installed, they flow easily between the clearances. Running compounds, however, are fairly stiff and contain a high volume of solid materials. Care must be taken to apply a uniform coating over a threaded surface. Also, when the compound is applied to the pin end and the protector is installed, the protector will push the compound away from the pin nose and in most cases will leave voids that will

(continued)

RECOMMENDED THREAD COMPOUND APPLICATION PROCEDURES FOR LONG-TERM STORAGE (cont'd)

allow moisture to enter between the protector and the threaded surface. In order to assure that there is a even distribution of running compound under the protector and that voids near the pin end are eliminated, it is recommended that a small amount of compound be applied to the inside of the pin protector prior to installation. This will cause compound to be forced both directions inside the protector as it is being installed. Ideally, there should be a small amount of excess compound extruded from both ends of the protector, the pin nose and at the base of the threads. This excess material will seal off the protector from ambient moisture, preventing water from entering and becoming trapped between the protector and the threaded surface. If thread compound and screw-on test caps are used for hydrostatic testing, the compound that is contaminated with the hydrostatic test fluid must be removed and the thread surfaces cleaned, as described above, prior to the final application of any storage or hybrid compound.

1. Thread Protectors:

⇒ Thread protector material and design can have a significant influence on the incidence of pitting and corrosion in long-term storage. One major drawback to the metal protectors, that were widely used more than ten to fifteen years ago, was that they would promote corrosion if there was moisture under the protector because the composition of the protector metal was different from the metal of the pipe body. Metals in contact that have different composition cause a difference in electrolytic potential that accelerates the corrosion process. Most protectors currently being used are either all plastic or plastic/metal composites. These types of protectors prevent dissimilar metals from coming in contact and resulting electrical potential problems. However, these protector types have no control over expansion or contraction due to changes in ambient temperatures. The difference in the thermal coefficient of expansion between plastic and steel is significant. Plastics commonly used in protectors, such as polyethylene, polypropylene, and polyurethane can have a thermal coefficient, as much as 10 times that of steel. Even in composite protectors, the difference can be substantial. During the normal daily temperature cycle that pipe in storage is routinely exposed to, the temperature of the pipe body can fluctuate by more than 75°F (42°C). This temperature cycling results in a "pumping" action when the protector expands and then contracts at a much greater rate than the steel pipe body. If there is any moisture present due to rainfall or condensation in contact with the protector/pipe interface without a positive seal (either by mechanical means or excess compound), then that moisture will work its way under the protector and eventually promote corrosion regardless of which compound is applied.

Another factor in thread protector design is the clearances between the protector and the pipe threads. The clearances must be large enough to allow the compound to distribute evenly over the contact surface without wiping off or removing the compound as the protector is installed. But at the same time, there must be a positive seal either supplied by the compound or the protector to prevent moisture from getting between the protector and the pipe surface. Elimination of moisture between contacting surfaces is of primary importance since this moisture can cause "crevice" corrosion. If materials that promote corrosion (water, contaminants, and other ions) are confined between two surfaces in tight contact (crevice) the reaction products generated will not be able to dissipate and will increase the ion concentration (contaminants) in the electrolyte (water) and greatly accelerate the corrosion process.

SPECIFICATION SHEET

BSC

Long Term Storage Compound For All Threaded Connections

COLOR	Off-White
PENETRATION	310-340 (ASTM D 217)
WEIGHT/GALLON	8.1 pounds/gal
DROPPING POINT	350°F/177°C (typ)
FLASH POINT	385°F/196°C (min)
BRUSHABLE TO	10°F/-12°C
SERVICE RATING	350°F/177°C
ASTM B117 Salt Spray Test	4000 hours (min)
CONTAINS	Corrosion & oxidation inhibitors and polymers

BSC (Bestolife Storage Compound) is a long term storage compound designed to protect all types of threaded surfaces from rust and corrosion caused by exposure to different types of atmospheric and environmental storage conditions. Salt spray tests comparing this compound with other commercially available storage compounds have proved the superior corrosion resistance of BSC.

BSC applies easily in all working conditions and will not run off or “bleed” at high temperatures. To assure a good seal and protect against galling threads, all storage compounds should be cleaned off before a thread compound is applied. Thread compounds can become liquid and run off connections causing sealing and galling problems, when they are incompatible with storage compounds.

A MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM THE MANUFACTURER.
DO NOT USE ON OXYGEN LINES OR IN OXYGEN ENRICHED ATMOSPHERES.

SPECIFICATION SHEET

Bee Lok

Bee Lok is an economical two component epoxy system designed to replace welding for locking casing joints on the bottom lengths. It contains 25% metallic zinc, which aids sealing and reduces joint galling. This product is effective in preventing joint loosening. Each kit contains a base resin, catalyst, and an applicator.

The catalyst is emptied into the base epoxy resin and thoroughly mixed. The applicator (flat knife) is used to cover the male threads with the mixture. Then the connection is made up. The pot life of the mixture is 75 minutes under normal conditions. The cure time is 24 hours. Connections can be broken by heating the joint from 500º - 600º F.

Casing OD (inches	**Approx usage** (Connections per 8 oz kit)
4 1/2	10
5 1/2	6
6 5/8	4
7 5/8 - 9 5/8	3
10 3/4 - 13 5/8	2

Kit Size	**Per case**	**Shipping Wt**
8 oz	12	9#
16 oz	6	9#

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MSDS 293G

SPECIFICATION SHEET

Dope Brushes

- Standard #2
- Bristles designed for uniform application of compound
- 12” Heavy duty wooden handles
- Plastic hand guards
- Packaged 12 per case
- 36” Handled brush available for HDD application

SPECIFICATION SHEET

Plastic Pail Opener

- 3 Tool-in-one
- Opens 1, 2, 3-1/2, and 5 gallon plastic pails
- Plastic pail lid cutter
- Equipped with hammer face to reattach lid
- Light weight aluminum design

Product Comparison Chart

Bestolife™	Jet-Lube®	National	Wilson	Wooley	Baker	OCR	Topco
'Bestolife 270 ®		270					
60% Lead Base	Kol'r-King®	60% Lead Base	W960	ThreadBoss 60		226	All Star
Mr 'B ®		Mr O					Nucote
Zn40, 50, 60	Z-40™, Z-50™, Z-60™	ZN50, 60	W650, W660	Booger Butter	Zee 50, 60	Zn50, 60	Zincote (50)
White Collar				Wooley White			
Black Jack				Wooley Black			
Copper Supreme Special Blend							
Copper Supreme Special Blend Plus							
Copr 99	LBX		HE-80				
CBLF-HT	Jet Lube-21®, Kopr Kote®						
Cal Bronze ®		Cal Bronze		MultiBlend			
Cal Bronze ® Lead Free				Copper Cover Eco	Copper G IV		
Copper Joint		Copper Top	Copper Lube				
Copper Joint Lead Free		Copper Top Lead Free	Copper Lube Lead Free	Copper Cover Prem.	No Lead Irish Copper	220, 221	Cop-r-lube
4010 NM	NCS-30®ECF™, Seal-Guard™ ECF™						
4040 NM	Run-N-Seal®ECF™						
3010 Ultra							
3000 ®	Pow'r-Kote®						
DCP							JWW
GGT-RSC HT	Kov'r-Kote®					236	
2000 ®							
2000 ® NM							
2010 NM Ultra							Green Seal II
API Modified	API	API	WAPIM	API		300	API
Zn18							
OCTG		OCTG	Lead Free	Company Man	B Seal No Lead	306	NLC Modified
Metal Free	Run-N-Seal®	Metal Free	W Metal Free	Non Metallic	Baker T Seal	318, 338	
GGT							
PTC	Enviro-Safe®					325	
PTC-ST							
Fiberseal	TF-15®						Topco Seal
BSC	Korr-Guard™						
Copr Rock							
C55 ®							
Supr Copr		Copr Lube					
Copr Plus							
Copr Plus Pumpable							
Eco-Sil	Well-Guard®						
Moly G		Moly	Moly			Moly	
Bee Lock	Jet-Lok® II				Baker Lok	Liqui-Lok	

- The proper field torque for all API casing and tubing connections should be determined by following the procedures outlined in API RP 5C1: "Recommended Practice for Care and Use of Casing and Tubing."

- API and IADC tables for drill collars and drill pipe are minimum torque values. Bestolife recommends an additional 10-15% torque beyond the minimum torque specified by these tables be applied, to ensure maximum performance and protection when using Bestolife copper compounds.

- Special container sizes are available for most compounds. Contact manufacturer for availability of thermal and arctic grades (minimum order quantities apply).

Warning:
All Bestolife thread compounds contain organic oils and greases that may cause skin disorders. Some products contain lead and other metals that may be a poison hazard if handled improperly. Refer to the Material Safety Data Sheet available from the manufacturer) for proper handling procedures. Clean up spills immediately and keep product away from children, animals and their environment. Do not use these products on oxygen lines or in oxygen enriched atmospheres.

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Rev. 4

ISO 9001:2000 Certificate Number FM40099
ISO 14001:2008 Certificate Number OHS539995
ISO 14001:2004 Certificate Number EMS76146
ISO 18001:2007 Certificate Number OHS53995
Member of National Ground Water Association
NSF Certification on Select Products

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