Lubrication 123 for Steel Wire Ropes

Oceanic Offshore are the specialist in wire rope. Naturally, we offer only the best solutions…

Wire rope complements an important aspect of many machines, structures and applications.

It is comprised of several continuous wire strands helically wound around a central core. There are many kinds of wire rope designed for different applications.

The core can be made of steel, fibre rope or even plastics.

Wire ropes are basically identified by several parameters including size (dimensions), grade of steel, coating, lay, the number of strands and the number of wires in each strand.

(These are further discussed on pages of this catalogue.)

A typical strand and wire classification is 6x19. This is a rope made up of six strands with 19 wires in each strand. Different strand sizes and arrangements allow for different degrees of rope flexibility and resistance to crushing and abrasion. Small wires are better suited to being bent sharply over small sheaves. Large outer wires are preferred when the cable will be rubbed or dragged through abrasives.

There are three types of cores. An Independent Wire Rope Core – IWRC, is normally a 6x7 wire rope with a 1x7 wire strand core resulting in a 7x7 wire rope. As to being steel component, an IWRC have a higher tensile and bending breaking strength than that of a fiber core rope, and, a high resistance to crushing and deformation.

A Wire Strand Core – WSC, has a single wire strand as its core instead of a multi-strands wire rope core. WSC ropes are high strength and are used mostly as static or standing ropes.

Wire ropes also have Fiber Cores - FC. Fiber core ropes were traditionally made with sisal rope, but may also be made with plastic materials. The fiber core ropes have less strength than steel core ropes. Fiber core ropes are quite flexible and are used in many overhead crane applications, however, with advanced technologies today, manufacturers of special high performance wire rope have made many improvements to their designs to give their ropes near such characteristics of flexibility despite having steel cores.

The lay of a wire rope is the direction that the wire strands and the strands in the body twist. There are four common lays: right lay, left lay, regular lay and langs lay. In a right lay rope, the strands twist to the right. A left lay rope twists to the left. A regular lay rope has the wires in the strands twisted in the opposite direction from the strands of the rope. In a langs lay rope, the twist of the strands and the wires in the strands are both twisted the same way. Langs lay ropes are said to have better fatigue resistance due to the flatter exposure of the wires.

Wire ropes are made mostly from high carbon steel for strength, versatility, resilience, availability and cost consideration. Wire ropes can be uncoated or galvanized.
Wire Rope Lubrication

Lubricating wire ropes is not as easy as it may seem, this is regardless of the construction and composition.

Wire rope lubricants have two principal functions:

1. To reduce friction as the individual wires move over each other, internally as well.
2. To provide corrosion protection and lubrication in the core and inside wires, and on the exterior surfaces.

There are generally two types of wire rope lubricants, penetrating and coating.

1. Penetrating lubricants contain a petroleum solvent that carries the lubricant into the core of the wire rope then evaporates, leaving behind a heavy lubricating film to protect and lubricate each strand.
2. Coating lubricants penetrate slightly, sealing the outside of the wire rope from moisture, reducing wear, consistent fretting within, abrasion and corrosion from contact with external surface.

Both types of wire rope lubricants are commonly being used today. It is important to note that most wire ropes fail from the inside, as such, it is important to ensure that the centre core receives sufficient lubrication.

A recommended approach in which lubricant to use is ideally a penetrating lubricant, which is used to saturate the core, following with a coating to seal and protect the outer surface. Wire rope lubricants can be petrolatum, asphaltic, grease, petroleum oils or vegetable oil-based. Considerations must also be taken whether the compound is environmentally friendly.

Petrolatum compounds, with the proper additives, provide excellent corrosion and water resistance. In addition, petrolatum compounds are translucent, allowing the technician to perform visible inspection. However, petrolatum lubricants are liable to drip off at higher temperatures but maintain their consistency well under cold temperature conditions.

Asphaltic compounds generally dry to a very dark hardened surface coating, which makes visual inspections difficult and could be messy. They are good for extended long-term storage but will crack and become brittle in cold climates. Asphaltic are generally the coating type.

Various types of greases are used for wire rope lubrication. These coating types penetrate partially but usually do not saturate into the rope core. Common grease thickeners used include sodium, lithium, lithium complex and aluminum complex soaps. Greases used for this application generally have a soft semi-fluid consistency. They coat and achieve partial penetration if applied with pressure lubricators.
Petroleum and vegetable oils products penetrate best and are the easiest to apply. The additive compound of these penetrating types gives them excellent saturation into the core and performs well as a wear and corrosion resistance agent. The fluid property of oil type lubricants with a good application medium such as a pressure lubricator, helps to wash the rope to remove abrasive external contaminants.

Methods adopted by Oceanic Offshore – New wire rope

- Pressure Injected
- Sprayed On
- Brushed On

Methods adopted by Oceanic Offshore – Used wire rope – (where applicable)

- Heavily soiled
- Pressure Induced & cleaning chamber
- Lubricated

If a wire is dirty or has accumulated layers of hardened lubricant or other contaminants over time, it must be cleaned with a wire brush and petroleum solvent, compressed air or steam cleaner before re-lubrication. The wire rope must then be dried and lubricated immediately to prevent rusting.

Field lubricants can be applied by spray, brush, dip, drip or pressure induced. Lubricants are best applied at a drum or sheave where the rope strands have a tendency to separate slightly due to bending to facilitate maximum penetration to the core. If a pressure induced application is used, the lubricant is best applied to the rope under slight tension in a straight condition.

Oceanic has the capabilities to “renew” heavily soiled wire with specialized equipment for fuss free, quick process.

Wire ropes are lubricated during the manufacturing process. If the rope has a fiber core centre, then the fiber will normally be lubricated with a petrolatum or mineral oil base lubricant. The core will absorb the lubricants and functions as a reservoir for prolonged lubrication while in service.

If the rope has a steel core centre, the lubricant, oil or grease type, is pumped in a stream just ahead of the die that twists the wires into a strand. This allows complete coverage of all the wires.

After the wire is placed in service, re-lubrication is required due to losses of the original lubricant from wire rope movement such as loading, bending and stretching. The fiber core wires will dry out over time due to heat from evaporation, and often absorb moisture. Field re-lubrication is necessary to minimize corrosion, protect and preserve the rope core and wires, and thus extend the service life of the wire rope.
Wire rope usage:-

Wire ropes are common presence in many applications, including marine towing lines, mooring, lifting, cranes, elevators, drilling rigs, suspension bridges and cable stayed structures. Each application requires a specific need for the type and properties of wire rope required. All wire ropes, regardless of the application, will perform efficiently, last longer and provide greater value when properly maintained.

Oceanic Offshore recommends using premium wire rope grease “CLAREGUARD GRL” based on the fact that the lubricant exceeds most applications discussed in great perspective. Our on field experience and studies have noted that a longer wire rope life can be obtained by using penetrating lubricants, either alone or when used together with a coating lubricant.

A good penetrating lubricant increases performance with the ability to displace water and contaminants while replacing them with oil, which reduces the wear and corrosion throughout the rope.

Controlling the critical wire rope wear factors:-

Wear by abrasion occurs on both the inside and outside of wire ropes. Individual strands inside the rope move and rub against one another during daily operations, creating internal “two body” abrasive wear. The outside of the wire rope accumulates dirt and contaminants from surface contacts such as sheaves and drums. These cause “three body” abrasive wear. The combination of the abrasive factors erodes away the wires and strands, both internal and external. Abrasive wear usually reduces rope diameter and can result in core failure and internal wire breakage. Penetrating wire rope lubricants reduce abrasive wear inside the rope and wash off the external surfaces to remove contaminants and dirt.

In comparison, premium lubricants such as Oceanic’s recommended “CLAREGUARD GRL” brings about savings in wire rope replacement costs - downtime, labor and capital costs, as compared to the added cost of the lubricants. Our clients have realized the importance of using good wire rope lubrication and have gained huge advantages in terms of efficiency, life span, performance, serviceability over those who purchase the lowest priced lubricants, or none at all, while replacing ropes on a much more frequent time frame.

Oceanic stocks and recommends:-

Premium quality range products:-

The “CLAREGUARD GRL” is an imported lubricant proudly manufactured by RS Clare & Co Ltd from the United Kingdom.

Clare history back dates since 1748, as a reputed manufacturer of premium quality lubricants and grease, accepted by various oil majors as the preferred choice product.

High quality range products:-

The "OCEANIC IMPERIAL LUB" is an imported lubricant proudly manufactured by Royal Mfg. Co. with affiliates Troco Oil, USA.

Troco history back dates since 1914, as a reputed manufacturer of high quality lubricants and grease.
SAFETY DATA SHEET
Clareguard GRL

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

PRODUCT NAME
Clareguard GRL

PRODUCT NO.
D0469

APPLICATION
Lubricant.

SUPPLIER
R S Clare & Co Ltd (UK) / United Resources

Distributor/Agent
Oceanic Offshore Engineering Pte Ltd
14 Jalan Tukang Singapore 619253
Tel: (+65) 6262 8662 Fax: (+65) 6898 1728
www.oceanicoffshore.com.sg

2 HAZARDS IDENTIFICATION

Not regarded as a health or environmental hazard under current legislation.

3 COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Name</th>
<th>EC No.</th>
<th>CAS-No.</th>
<th>Content</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESIDUAL OILS (PETROLEUM), SOLVENT-DEWAXED, BASE OIL, UNSPECIFIED</td>
<td>263-166-0</td>
<td>64742-63-7</td>
<td>50-70%</td>
<td>-</td>
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</tbody>
</table>

The Full Text for all R-Phrases are Displayed in Section 16

4 FIRST-AID MEASURES

INHALATION
Provide rest, warmth and fresh air.

INGESTION
DO NOT INDUCE VOMITING! Immediately rinse mouth and provide fresh air.

SKIN CONTACT
Wash the skin immediately with soap and water.

EYE CONTACT
Promptly wash eyes with plenty of water while lifting the eye lids. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA
Use fire-extinguishing media appropriate for surrounding materials.

SPECIFIC HAZARDS
Carbon dioxide (CO2). Carbon monoxide (CO).

6 ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS
Spilt product presents a significant slip hazard. Avoid exposure of product to sources of ignition.

ENVIRONMENTAL PRECAUTIONS
Prevent entry of hot material into drains, sewers and watercourses.

SPILL CLEAN UP METHODS
Scrape or shovel up and transfer to suitable containers. Clean affected area.

7 HANDLING AND STORAGE
Clareguard GRL

STORAGE PRECAUTIONS
Store at ambient temperature.

8 EXPOSURE CONTROLS/PERSOINAL PROTECTION

<table>
<thead>
<tr>
<th>Name</th>
<th>Sol</th>
<th>LT - ppm</th>
<th>LT - mg/m³</th>
<th>ST - ppm</th>
<th>ST - mg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESIDUAL OILS (PETROLEUM), SOLVENT-DEWAXED, BASE OIL - UNSPECIFIED</td>
<td>GES</td>
<td>3 mg/m³ (Oil mist)</td>
<td>10 mg/m³ (Oil mist)</td>
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</table>

INGREDIENT COMMENTS
WEL = Workplace Exposure Limits

PROTECTIVE EQUIPMENT

ENGINEERING MEASURES
Provide sufficient ventilation during operations which cause vapour formation.

HAND PROTECTION
Use suitable protective gloves if risk of skin contact.

EYE PROTECTION
Wear approved safety goggles.

OTHER PROTECTION
Wear appropriate clothing to prevent any possibility of skin contact.

HYGIENE MEASURES
Wash at the end of each work shift and before eating, smoking and using the toilet.

9 PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>APPEARANCE</th>
<th>Grease</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLOUR</td>
<td>Black</td>
</tr>
<tr>
<td>ODOUR</td>
<td>Characteristic</td>
</tr>
<tr>
<td>RELATIVE DENSITY</td>
<td>0.85 - 0.9520</td>
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<tr>
<td>FLASH POINT (°C)</td>
<td>&gt;230 (Closed cup)</td>
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</table>

10 STABILITY AND REACTIVITY

STABILITY
Stable under normal temperature conditions.

CONDITIONS TO AVOID
Sources of Ignition.

HAZARDOUS POLYMERISATION
Will not polymerise.

MATERIALS TO AVOID
Strong oxidising substances.

HAZARDOUS DECOMPOSITION PRODUCTS
Inhaling gases/vapours/fumes of: Carbon dioxide (CO₂), Carbon monoxide (CO).

11 TOXICOLOGICAL INFORMATION

INHALATION
Low volatility makes inhalation unlikely at ambient temperatures.

INGESTION
May cause Nausea, vomiting, Diarrhoea.

SKIN CONTACT
Unlikely to cause harm on brief or occasional contact.

EYE CONTACT
Irritating to eyes.
Clareguard GRL

12 ECOLOGICAL INFORMATION

ECOTOXICITY
Not regarded as dangerous for the environment.

13 DISPOSAL CONSIDERATIONS

DISPOSAL METHODS
Dispose of waste and residues in accordance with local authority requirements.

14 TRANSPORT INFORMATION

ADR CLASS
Not classified for transportation.

15 REGULATORY INFORMATION

RISK PHRASES
NC Not classified.

SAFETY PHRASES
NC Not classified.

UK REGULATORY REFERENCES

EU DIRECTIVES
System of specific information relating to Dangerous Preparations. 2001/58/EC.

STATUTORY INSTRUMENTS
Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 (CHIP3)

APPROVED CODE OF PRACTICE
Classification and Labelling of Substances and Preparations Dangerous for Supply.

GUIDANCE NOTES
Workplace Exposure Limits EH40, CHIP for everyone HSG(108).

16 OTHER INFORMATION

REVISION DATE
17-09-2007

REV. NO./REPL. SDS GENERATED
02

RISK PHRASES IN FULL
NC Not classified.

DISCLAIMER

The information provided only relates to the product or material specified and does not apply if used in combination with other materials. The data sheet gives information to the best of RS Clare & Co Ltd knowledge and awareness as of the date of issue. If you have purchased the product for supply to a third party for a use at work, it is your duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. If you are an employer, it is your duty to inform your employees and others who may be affected by any of the hazards described in this sheet and any precautions which should be taken.
Oceanic Imperial Lube

Oceanic Imperial Lube is a premium heavy duty grease which is specially formulated for a variety of very demanding applications. High quality, fully refined base stocks provide natural oxidation stability. Specialized additives provide a chemical barrier protecting lubricating parts against rust and corrosion.

Qualities:

- Provide a wide range of operating temperature from -20ºF to over 550 ºF allowing it to perform in even extreme duty applications.
- Adheres strongly to wire ropes or metal surfaces forming an effective film which resists cracking or flaking.
- High water-resistant and will not wash-out even with boiling water or steam.
- Lengthens service life and provides an extended safety factor to wire ropes.
- Retains its flexibility and adhesion even at low or high temperatures.

Applications:

- Lubrication of all kinds of wire ropes, anchor chains, hoist cables, etc.
- Long term protection of metal cable against rust and corrosion.
- Excellent as an open gear or heavy duty general purpose grease.

TYPICAL ANALYSIS

Colour : Dark Grey
Thickener : Bentone
NLGI Grade 2
Texture Smooth
Penetration 265 – 295
Dropping Point ºF None
% Oil Separation 0 – 0
Viscosity @ 100 ºF SUS 2500
Viscosity @ 210 ºF SUS 168

Biodegradation : Base oil component – Expected to be inherently biodegradable.
Eco-toxicity : Material – Not expected to be harmful to aquatic organisms.

Detailed Material Data Sheet is available upon request. Kindly contact Oceanic for assistance.