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Guide to rope re-lubrication of ropes for ropeway

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Aim of this practical guide

Aim of this practical guide is the re-lubrication of the ropes for ropeway during operation. It is known from a wide variety of investigations on this subject that re-lubrication, if properly performed, is able to increase the lifetime of the ropes, thanks to its protection effect against fretting.

This guide is aimed at ropeway manufacturers and operators, giving practical indications and recommendations on the methods in order to carry out a proper re-lubrication. Topics addressed are: portions of the rope where apply the re-lubrication, in which periods of the year, in which way to apply it and with kinds of lubricants. The guide gathers the state of the art in this subject.)

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Guide to rope re-lubrication of ropes for ropeway

1. Foreword

This practical guide is intended for ropeway manufacturers and operators. It gathers the state of the art for practical re-lubrication of ropes for ropeway during operation.

2. Vocabulary

- To Lubricate is to apply a lubricant in or on a rope. Lubrication aims at prolonging the lifetime of a rope by reducing the internal friction phenomena and often at the same time by protecting it against corrosion. Lubrication is divided into:
 - Main lubrication : this is the lubrication done by the cable manufacturer during the manufacturing process. Other names are: production lubrication or initial lubrication.
 - Re-lubrication : this is the lubrication done by the operator on the rope after it has been manufactured, while it is under operation.
- To dress a rope is to apply a product aiming at protecting the rope's external layer against corrosion.

The present document deals with the re-lubrication process.

3. Why re-lubricate ?

Tests have been made [1] showing important enhancement of the lifetime through re-lubrication.

In the field of ropeways, it is often possible to reach the service life needed without re-lubricating. Yet, due to tough operation conditions, some ropes of ropeways have a short lifetime. In those cases, re-lubrication is very advisable. This is the case of:

- Bending areas of track ropes
- Bending areas of tension ropes

- Hauling ropes and carrying-hauling ropes whenever working under tough conditions (e.g. short installations, corrosive environment)

European standards do not enforce re-lubrication to operators : re-lubrication is not a safety issue, it is a mere choice of the operator, including convenience for the skiers and economical elements.

4. When to re-lubricate ?

It is hard to tell beforehand when a rope will need lubricant, since it depends on many factors. But if it is decided to re-lubricate, then re-lubrication should be regular. The rope must never be dry of lubricant.

Typical re-lubrication periods are:

- annually, for stranded ropes
- permanently for locked coil ropes

5. How to re-lubricate ?

The rope should be cleaned before re-lubrication.

During the re-lubrication, the temperature should be over 10°C and the weather not be wet.

When the re-lubrication period is long and more re-lubricant is applied than the rope can absorb, it must be allowed to dry for 10 hours after re-lubrication. After drying, the rope should be allowed to work under nominal conditions for a while before re-admitting public on the installation. In the case of carrying-hauling ropes or hauling ropes, a braking test should be made after re-lubrication.

Several methods may be used :

- Dropping : 1 drop every 5 meters, or 30 grams per cubing meter
- Brushing : punctual application or permanent capillarity brush
- Specific rotating devices exist that provide the exact amount needed of lubricant at the correct place for stranded ropes : for example the wire rope re-lubricating equipment made by the company JOSSI - UTTIGENSTRASSE 25 - CH 3138 – UETENDORF

When re-lubrication concerns a whole stranded rope, the place to lubricate should be chosen carefully. Lubrication should occur at places where the rope bends, so as to foster good penetration and avoid critical places (drive sheave).

Hence, one should lubricate before a deviation sheave located after the drive sheave (except in case of torsion equilibrium problems on the drive sheave, in which case one should re-lubricate on sheaves). Such sheave may be found in drive stations for bicable ropeways. Otherwise, for chairlifts, one should lubricate before the return sheave.

On the splice, the tails should not be re-lubricated and the tucks should be re-lubricated.

6. What lubricant to use ?

The choice of the lubricant is a manufacturer's issue (rope or ropeway). Due to the extensive number of checks that must be made before one can safely use a lubricant, an operator should not choose by himself.

These checks include :

- The DIN 21385 and DIN 53621 requirements (friction coefficient between lubricated rope and linear required to provide safe transmission at the drive sheave, compatibility between lubricant and linear, breaking point, soluble acids ratio, etc°). these requirements are imposed EN 12385-8 for stranded ropes.
- The ISO 43646 requirements, imposed by EN 12385-9 for locked coil ropes.
- Compatibility with original lubricant
- Compatibility with core, steel and galvanization
- Qualification of grip, clamps, chapeau de gendarme, track rope break on lubricated rope, sheave lining
- Non toxicity

Unfortunately, today, no lubricant has the advantage of being biological rebuilt. However, one should pay attention to the product being suitable for outdoor uses, and avoid using more lubricant than needed.

The attention is drawn to solvents often mixed with lubricants to obtain re-lubricants of suitable fluidity. Contrarily to the lubricants, these solvents have not usually been tested for compatibility with the original lubricant, liners or grips. Of course, the solvent is supposed to disappear quickly, yet problems have already occurred in the past. It seems that the solvent disappears quicker if the re-lubricant is spread in spray than when the re-lubricant is brushed onto the surface of the rope.

Below is a list of commonly used lubricants in the world or ropeways. Some of their usual uses are mentioned. This list is not exhaustive. It must not be used without preliminary examination by a competent person (see above).

Lubricant manufacturer	Name of the product	Usual use
ASEOL		
CASTOR OIL		
ELASKON	SK-U	Primary lubricant
	20 BB	Primary lubricant
	NKBB	Re-lubricant
EUROL	TWL	Glue
	TW Fluid	Dressing – re-lubricant
KLUBER		
NYROSTEN	T55-13-20510	Track ropes

	T – 5513 F	Hauling ropes
SHELL	ENSIS H	Primary lubricant
	ENSIS T	Dressing
	TELUS 32	Dressing
YORK		

7. References

1. [1] The influence of lubrication on the fatigue behavior of locked coil ropes flexed over roller chains – G.A. Kopanakis – J. Woodtli – OIPEEC Round table Delft 1003
2. General considerations and recommendations for the lubrication of steel wire ropes for transportation by rope – M. Clayton – G. Paolini – 1968 : available on OITAF's web site.
3. Expectations regarding rope lubrication today – George A.Kopanakis : OITAF-NACS meeting – 2004 - Vail - USA