Supplement to the manual - WAVE SWINGER

Replacement Lifting Cables

Note:
Due to quality problems on the single wires of the Wave Swinger Lifting Cables has Zierer decided in October 2010 to design an improved replacement lifting cable. The design of the replacement lifting cable was reviewed and approved by the TÜV Süd / Germany.
Improvements/Changes:

- Nominal rope diameter: 17mm
- Nominal strength 1960 N/mm2
- Cable end with special cable fitting

Pls. read and follow following instructions thoroughly:

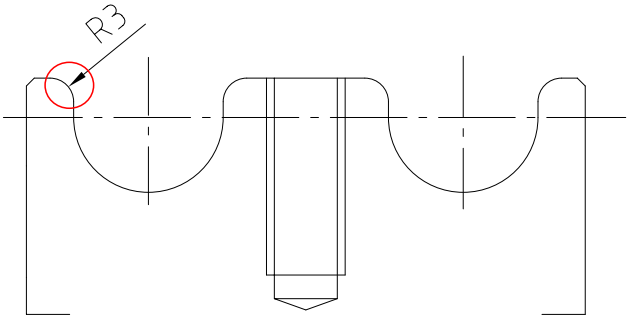
1) Cable Instruction for Installation:

Remove the cable ties
Roll out every wire rope completely before assemble and visually inspect for any damages!
When installing the cables, pay attention to the marked colour lines on the thimbles, those must be in line

Before installing the cable inspect the rib treads of the guide pulleys with the attached radius gauge (r = 9,5mm), using the light gap method, every time the lifting cables are replaced. When a rib tread deviates from the contour of the radius gauge the respective guide pulley must be replaced as well. Tolerances are not permissible, since these can again cause deformation of the new wire rope and lead to wire breaks at an accelerated rate.

1.1) Adaption of pulley grooves – NEW RECCOMENDATION

You have purchased a set of high performance lifting cables. In order to reach the specified operating period, it is necessary to smoothen the pulley grooves of your wave swinger as shown in the drawing:



Smoothening of the edges can be done using either sand paper or grinding tools. Keep in mind to only use soft abrasives on power tools in order not to harm the pulley's existing groove structure.

1.2) Lubrication – NEW RECCOMENDATION

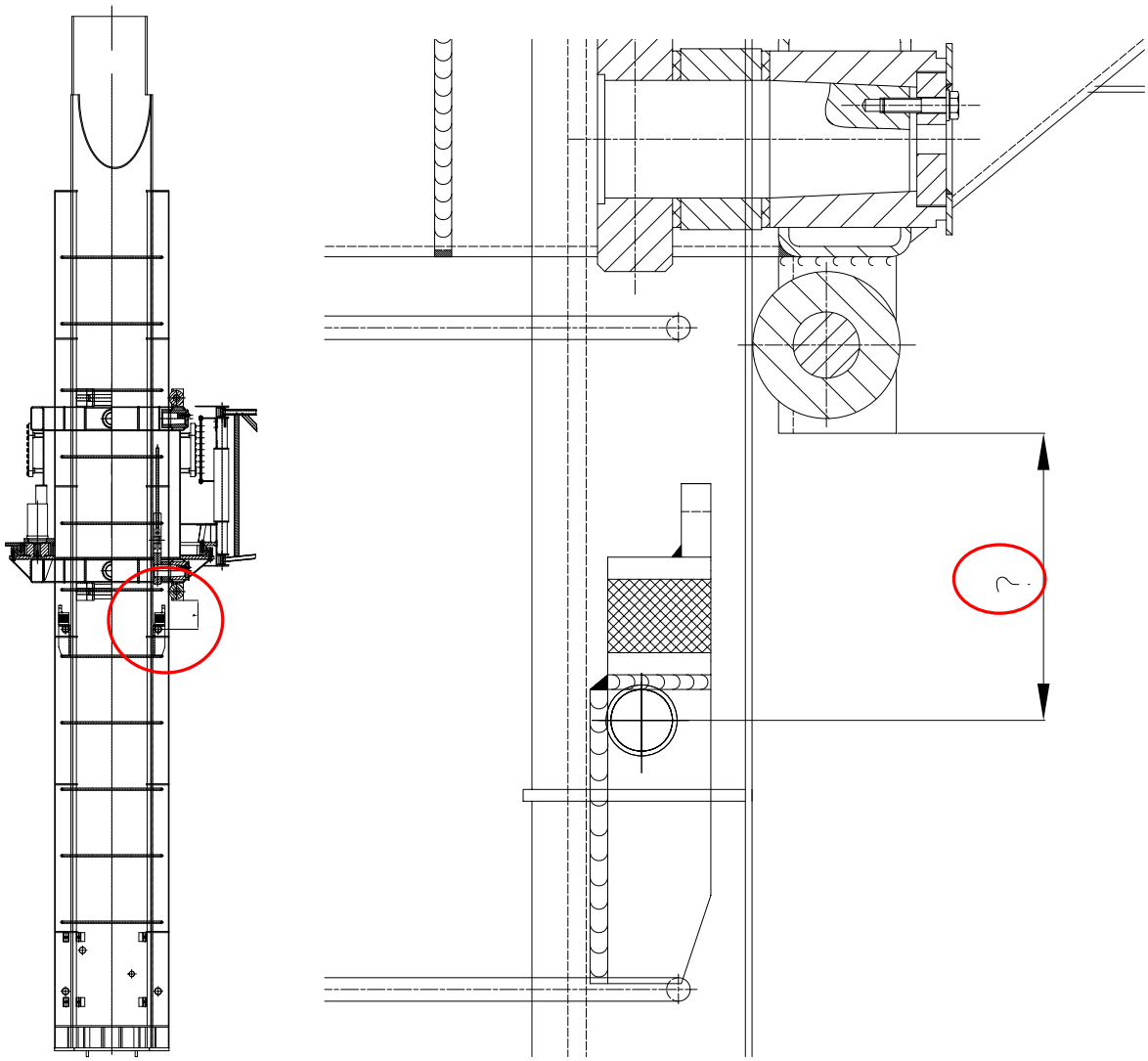
To provide a smooth, wear-free transmission between cable and pulley, we strongly recommend the use of lubricants. Keep in mind to only use lubricants that are non-corrosive and provide the demanded viscosity. Personnel handling lubricants shall be familiar with the safety data sheet, using the mentioned equipment.

Lubrication should be checked in an interval of 4 weeks and applied if necessary, depending on the ride's operation time. Do not switch lubricants during a cable's lifecycle to avoid resinification.

Lubricants may be harmful to environment, animals and personnel – for a responsible operation avoid excessive use, remove surpluses and dispose old lubricants as mentioned in the attached safety notes.
ZIERER recommends the use of special cable lubricants i.e. **Pfeifer RL-S** or similar.

1.3) Slack Span - NEW RECCOMENDATION

Slack span among the lifting cables may decrease their lifetime. In order to reach the specified service intervals, it is necessary to ensure the basket is not resting on the support clamps while in load/unload position.The ride can be checked for slack span by taking the measurement mentioned below:



The measurement shall be within 25mm to 50mm (1 inch to 2 inch) for proper operation. In case of exceeding the interval, please contact ZIERER for further instructions.

2) Inspection / Maintenance of lifting cables:

In accordance with DIN 15 020, and TÜV Bayern it is mandatory to have both sets of lifting cables magnaflux tested or have them replaced at least every two years of operation

In addition, these cables have to be checked over the entire length daily for wire breaks, corrosion, abrasion, structural abnormalities or deformation and may have to be replaced at even shorter intervals if necessary.

In addition, the cable end with the special cable fitting needs to be checked daily for extraction of the rope from the pressed sleeve of the cable fitting. A control ring is pressed onto the cable with a distance of 30mm +/- 0,2mm to the upper edge of the cable fitting for easy inspection with a special gauge

3) Replacement State

3.1) Wire breaks

Wire breaks will occur after a certain running period and then emerge increasingly fast.

a) The replacement state of wear based upon wire breaks is reached, when in any location within of a length of d x 6 (in this case 102mm) 9 wire breaks or

within of a length of d x30 (in this case 510mm) 18 wire breaks are visible.

b) At the appearance of wire break clusters the wire rope is to be discarded immediately.

c) By fracture of a wire strand the wire rope is to be discarded immediately.

3.2) Corrosion

Corrosion occurs particularly in corrosive environment, e.g. sea climate. Wire ropes stored outdoors for longer periods will also corrode.

Corrosion of the outer wires can easily be noticed by visual inspection. Corrosion of wires not visible from the outside can be hardly detected.

Both the static breaking strength as well as the stability of the wire rope become reduced by corrosion due to corrosion pits and reduction of the metallic cross section.

The replacement state of wear based on corrosion is reached, when in any location the cable diameter has decreased by 10% compared to the nominal size, even though there are no visible wire breaks.

3.3) Abrasion

Abrasion of the wires occurs as "internal abrasion" due to the movements of strands and wires against each other by bending of the wire rope and as "external abrasion" due to movement between wire rope and pulley. A dusty environment increases the abrasion.

Both the static breaking strength as well as the stability of the wire rope become reduced by abrasion, due to fretting pits and reduction of the metallic cross section.

The replacement state of wear based on abrasion is reached, when on any location the cable diameter is decreased by 10% compared to the nominal size, even though there are no visible wire breaks.

3.4) Structural Changes

Strain on the wire rope during operation causes structural changes, which reduce the rope diameter.

The replacement state of wear based on such structural changes is reached, when over a longer stretch the cable diameter has decreased by 15% compared to the nominal size, even though there are no visible wire breaks.

3.5) Deformation

Deformations of the wire rope are visible changes in the rope structure. Deformation usually generates a destabilization of the rope structure, at least near the deformed area.

When a wire rope is visibly deformed an exchange of the lift cable sets is recommended, as the destabilization of the rope structure also means an increased abrasion. the consequential damage leads to an accelerated rate of wire breaks, which are crucial for the replacement state of wear.

4) Appendix

- Gauge for pulley and rope extraction from cable fitting
- Material and Test certificates