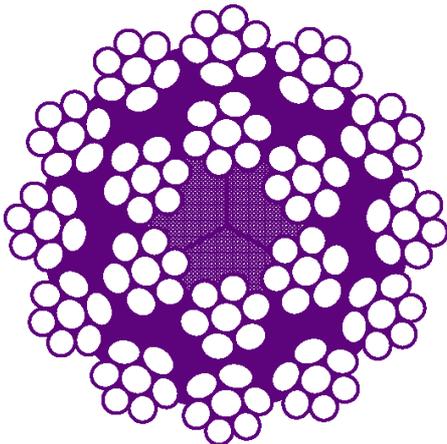
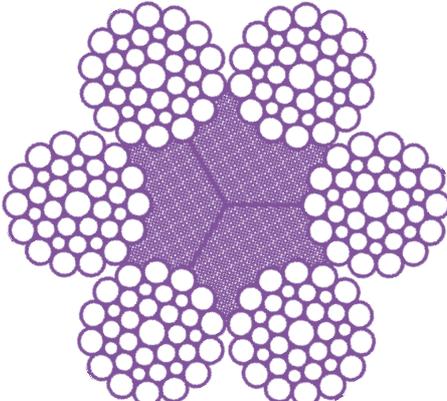


The use of a correct wire rope with a swivel can produce cost savings. Dipl.-Ing **Roland Verreet** at Wire Rope Technology, Aachen explains why.

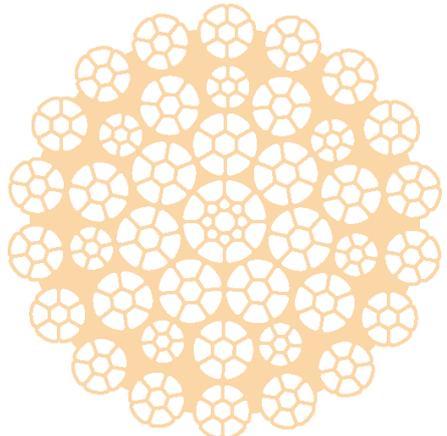
Let's twist again



18 x 7 semi-rotation resistant wire rope



6 x 36 non-rotation resistant wire rope



Casar Powerlift rotation resistant wire rope

Should you use a swivel at the end of a wire rope? It might prevent block twisting, on the other hand it might reduce the rope's breaking strength or cause wire fatigue.

Normally, if the hoist block of a crane twists under load, the wire rope you are using is not sufficiently rotation-resistant for your purpose. If, however, the hoist block is stable under load and only twists in an unloaded condition, this normally means your wire rope is sufficiently rotation-resistant, but it has been twisted and now wants to regain its non-twisted state by twisting the block.

An experienced crane operator would free the rope end, let the twist out and attach the rope again to the crane. If the twist had been brought into the rope during its production or during its installation, this procedure might have cured the problem forever. But if the rope had been twisted by the crane itself, the problem might come back after a few lifts only. You might then spend a few hours every week letting the twist out of your rope. The other option would be to buy a swivel which will continuously do this for you. But wait, not every rope may be operated with a swivel.

Whether you may not, whether you may or whether you even should operate your rope with a swivel depends on the rotation characteristics of the rope you are using. Three different categories can be distinguished:

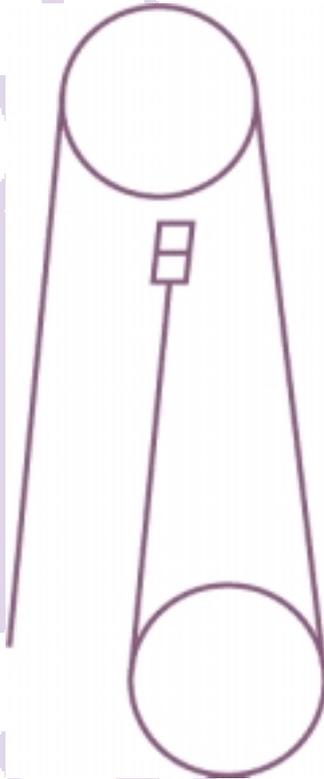
- non-rotation-resistant wire ropes (e.g. all 6- and 8-strand ropes)
- semi-rotation-resistant wire ropes (e.g. 18 x 7, 19 x 7, Dyform 18 etc.)
- rotation-resistant wire ropes (e.g. Casar Starlift, Casar Eurolift, 34 LR etc.)

If you are using a non-rotation-resistant wire rope (e.g. a 6- or 8-strand rope) or a semi-rotation-resistant wire rope (e.g. 18 x 7, 19 x 7, Dyform 18 etc.), you may not attach it to a free-spinning swivel. Every single time you picked up a load, the wire rope would unlay by rotating the swivel, thereby reducing its breaking strength by 20% to 40%. After unloading it would rotate back into its original condition, but the lift itself would be performed with a drastically reduced design factor. For example, your reeving system might have been designed with a design factor of 4.5. While your rope is being operated in an unlayed condition, the design factor might be reduced to below 3.

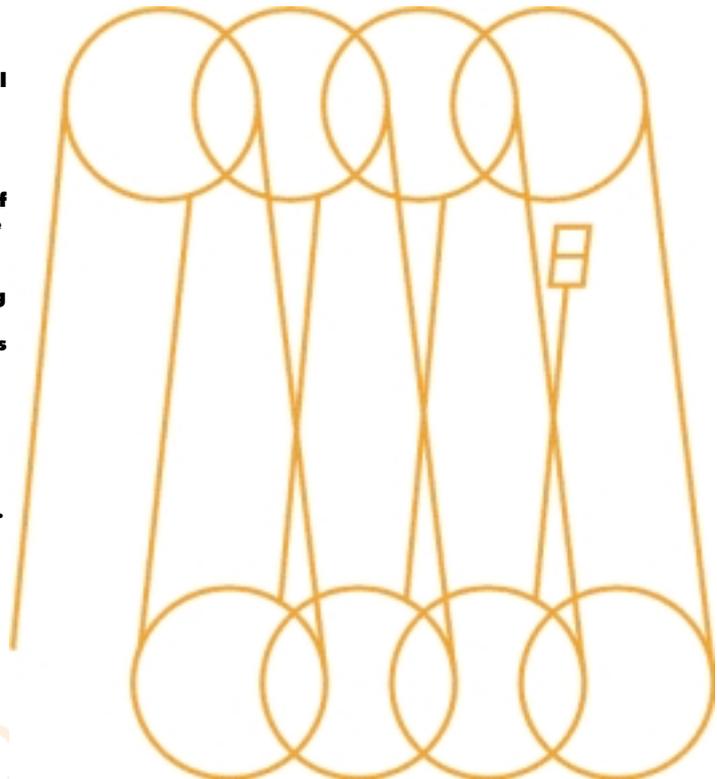
So what, you might think, that is still safe enough. But there is more bad news to come: The rotation of the wire rope, combined with the tension-tension stresses during loading and unloading, will severely fatigue the wire rope, reducing its breaking strength even further. Prof. R. Chaplin at the University of Reading simulated the conditions in the laboratory. He found that under the combined effect of rotation and tension-

ROPES

In a two-part reeving, the swivel will keep 1 part (50 % of the number of falls) free of twist. Any twist remaining in the other fall can be removed completely by lifting and lowering the block.



In an 8-part reeving, the swivel will keep 1 part (12.5 % of the number of falls) free of twist. Any twist remaining in the other falls can only partly be removed by lifting and lowering the block.



6-strand wire ropes achieved between 6 and 12% only (!) of the fatigue life they achieved under tension-tension without rotation. For your crane this could mean that your wire rope might fail prematurely without warning.

On the other hand, rotation-resistant wire ropes (e.g. Casar Starlift, Casar Eurolift, Dyform 34 LR etc.) may be operated with a free-spinning swivel. These ropes would not unlay at the swivel when picking up a load, and they would therefore not suffer increased fatigue or a reduction in breaking strength. Your lift would be just as safe as without the swivel.

Rotation-resistant wire ropes should be operated with a swivel: If these ropes had been twisted during their production

or during their installation, the twist might leave the reeving system via the swivel during the first few lifts. And even if these ropes are continuously twisted by the crane itself, the block will remain stable: the twist will leave the reeving system via the swivel.

But how can you find out if your rope is non-rotation-resistant, semi-rotation-resistant or rotation-resistant? Unfortunately there is neither a commonly accepted definition nor a test procedure. Here is a proposal:

- A rope is rotation-resistant if under a load corresponding to 10% of its minimum breaking strength a rope length of 150 times the nominal rope diameter will rotate less than 20°.
- A rope is semi-rotation-resistant if under a load corresponding to 10% of its minimum breaking strength a rope length of 150 times the nominal rope diameter will rotate between 20° and 180°.
- A rope is non-rotation-resistant if under a load corresponding to 10% of its minimum breaking strength a rope length of 150 times the nominal rope diameter will rotate more than 180°.

So ask your rope supplier to perform the following test: Make a sling with two loops at the end, the length between the loops being 150 times the rope diameter.

Example: The free length of a 20mm rope should be 3m. Attach one loop to a crane hook which should be secured against rotation. Attach the other loop to a load of 10% of the rope's breaking strength. Mark the position of the load on the ground, then lift it. If the load rotates by more than 180°, the rope is non-rotation-resistant. If it rotates between 20° and 180°, it is semi-rotation-resistant. If it rotates by less than 20°, it is rotation-resistant and may be used with a swivel.

Modern mobile cranes are all equipped with excellent rotation resistant ropes which would benefit a lot from operating with a swivel. So why do crane manufacturers not supply a swivel when delivering the crane?

Crane manufacturers say that you will lose lifting height when using a swivel. That is right, your lifting height will be reduced from e.g. 48m to 47.8m. Is that really a problem?

And crane manufacturers say that swivels cost money. That is also correct: an end connection with a built-in swivel costs £250 more than the rigid version. That is certainly a lot of money. But we also have to see these figures in proportion: the crane costs £250 000, and so the swivel would increase the total cost by only 0.1 %. But it would save you 80% of your headaches. ■

Single fall lifting

If the rope is not attached to a swivel, it will rotate the swivel hook.

This has a detrimental effect on breaking strength and fatigue life. So you should never use non-rotation-resistant or semi-rotation-resistant ropes for lifting unguided loads with a single fall. In some countries (e.g. Germany) this is even forbidden by law.