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English Version

Fahrbericht:

Volvo:

FH mit Doppelkupplungsgetriebe

ladungssicherung.de

Infos für die Praxis:

- Mercedes-Benz: PPC zum Nachrüsten
- 100 Jahre: MAN Lkw und Busse
- Achtung: Diesel-Diebstähle
- Gefahrgut-Transport: Schriftliche Weisungen
- VEDA: Aktuelles von den Autohöfen

Schwerpunkt-Thema:

Ladungssicherung

Die Zukunft hat begonnen:

Renault:

Maxity Elektro mit Brennstoffzelle

Load securing:

Pre-tensioning Force

Load securing with lashing systems – this type of securing is widely used. Attaching the lashing straps is tried and tested practice, it is, however, more difficult to decide if there are sufficient straps. The principle is easy: I press the load onto the cargo area surface, increase the friction, and the friction keeps the load in place. The question remains, how high is the pressure of the lashing straps used, i.e. their pre-tensioning force, and is it really enough.

If you want to secure a load by lashing, you should be able to answer three questions:

1. What securing force has to be achieved to prevent any sliding of the load.

2. What friction is generated between the load and the contact area, so what friction coefficient is my starting point?

3. How much pre-tensioning force is required to secure the load, and so sufficiently increase the friction?

Securing Force

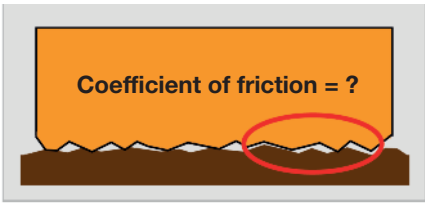
The theoretical answer to the first question is easy, as it is provided by the norms for load security. According to this the load must be secured against sliding as follows: to 80% of its weight in the direction of travel, and to 50% to the sides and rear.

In theory this means that the securing force to be achieved has to correspond to this mass force.

If in practice the load is to be secured by lashing, this means, that the load must be pressed so hard onto the cargo area until the force of friction is so great that it prevents the load from sliding. How much contact force is needed for this, i.e. how much pre-tensioning force the lashing system must generate, can be calculated in individual cases.

Friction

The answer to the second question is a bit more difficult, as the applicable coefficient of friction of the existing material combination (e.g. wood on wood) can only be guessed roughly.



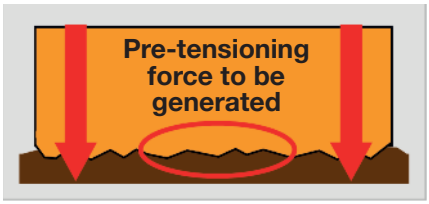
Of course there are tables, which contain the various coefficients of friction for different material combinations.

Even if these values were reliably calculated, the measurements took place using similar cargoes on similar cargo areas. Similar is not identical; however for everyday use these values are very helpful.

Pre-tensioning Force

The answer to the third question seems easy, but it is not. Approaches to solving this, i.e. to determine the actual pre-tensioning force acting on the load, are many and varied but are they also practical?

This is not about which standard pre-tensioning force is given for the lashing equipment used. (Example according to the identification label S_{TF}= 500 daN), but rather, what pre-tensioning force is really acting on the load.



This again depends on, which ratchet is used and with what force it is tightened, as well as on the lashing angle.

Normative Standards

Basically the value given as S_{TF} on the identification label (e.g. 500 daN) is also accepted as the value, which was reached in practice. But in reality this is only the case when, a hand force of exactly 50 daN is applied to the tensioning device.

If the hand force is greater than 50 daN, a higher value may be accepted as the pre-tensioning force, than on the identification label as S_{TF} (e.g. 500 daN).

This value must however be proven by a subsequent measurement. The question is how can one determine this in practice.

Practical Attempts

Some people think, that the lashing strap has only been tightened sufficiently, when the ratchet cannot be turned any more.

This opinion has no basis in fact whatsoever.

Others pluck a lashing strap like a guitar string. A high tone indicates good pre-tensioning; a lower tone indicates poor pre-tensioning. This method is of course also imprecise, but at least it enables one to determine whether any tension at all is present in the strap.

Finally it remains to be said that these kinds of "test" can give, if at all, only a very simple indication of the tension in the strap. Of course they are inaccurate and therefore cannot replace measurement.

Preload Force indicators

Few users are aware that there are preload force indicators available. Hardly anyone has had one in their hands and tested them and if at all then probably during training or during a thorough roadside traffic check.

In everyday use these devices are hard to find although various preload force indicators have for many years been produced by various manufacturers.

The reason depends as almost always on the purchase price, because it can cost several hundred euros depending on the actual model. Besides this the first models were also inaccurate, latterly however they have been greatly improved.

One cannot calibrate these devices as such, which is not down to the device itself but rather to the fact that the lashing straps to be measured are always in a varying condition (dry, wet, warm, cold, new or old).

One of these devices however can at least be calibrated, which means that the indicator is very accurate.

The early devices were quite primitively constructed.

The measurement is not indicated as a value, but is given rather as a range (e.g.: 250 to 500 daN).

In this device a bolt becomes visible. On this bolt there are several different coloured rings. With the help of the visible rings and their colours one can read off the preload measurements in a table.

Newer devices have a digital indicator and one can accurately read the preload measurements in the display (e.g. 667 daN).

In addition the thickness of the lashing strap to be measured and its length to be measured can be adjusted which will improve the precision of the measurement.

The latest devices of this manufacturer are relatively small. They are considerably lighter and they require a lot less storage space than their predecessors. In addition, these devices can be calibrated and the values indicated are very accurate.

One thing however which is the same in these three preload force indicators; they are all attached to the strap and are activated by moving a lever .That means that, one must first buy one and then always have it ready for use.

Furthermore it's easy to leave the device lying somewhere. The carrier can leave it on the cargo platform of some transport vehicle or the driver can leave it somewhere in the warehouse of a carrier. The person finding it will indeed be pleased, but for the owner it turns out to be a very costly consignment.

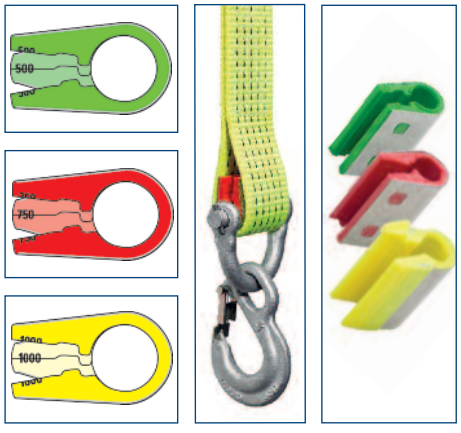
TFI: Small, light and always in its place

So one can describe the Tension Force Indicator (TFI) from the point of view of a user, for this tension force indicator always remains in place, because it is a "fixed component" of the lashing system.

With the unique TFI one can quickly and directly find out the pre-tension force introduced into the lashing strap. The principal on which the TFI works is surprisingly simple. While the lashing strap is being tensioned, it increasingly presses the initially open jaws of the TFI together. When the jaws of the TFI are completely closed, it shows the maximum determinable pre-tensioning force e.g. 750 daN (red TFI).

It could not be easier. In the ideal case there are two TFIs in a fixed lashing strap. One TFI is directly attached together with the short lashing strap to the ratchet, while the second TFI is to be found with the hook on the long end of the lashing strap, the so-called loose end.

Developing the TFI has provided a unique aid which indicates the applied pre-tensioning force quickly and reliably at any time. Using the optimum pre-tensioning force thus provides evidence for secure loading which will stand up to checks by the carrier as well as the police. At the same time the number of lashing straps can be reduced, which means saving both time and lashing straps whenever loading with lashing systems is required.



There are three differently coloured TFI. The green TFI shows pre-tensioning forces up to 500 daN, the red one goes to 750 daN, and the yellow one goes as far as 1000 daN.

Fotos and Graphics: SpanSet

An example from every-day practice

Two of the same articulated lorries of a carrier company have been loaded with an identical cargo with a weight of 22t each. The friction co-efficient is $\mu = 0{,}3$. The load stands as a tight fit to the headboard but does not fill the width of the cargo area. The load is secured with lashing straps, and each of the 13 pairs of lashing points is equipped with a lashing strap and a long-handled ratchet with an S_{TF} of 500 daN each.

Edge protectors are used, and the lashing angles are 60° each. Each driver is a fine strapping fellow and tightens each ratchet with all his strength.

Soon after both have tightened all ratchets they are stopped by the police. Calculating load security according to VDI 2700 part 2 says that for securing the load by lashing it down each one should have applied 19 lashing straps rather than the 13 they actually used.

The argument of one of the drivers that he tightened the lashing straps with a lot more force than normal is ignored because neither the police nor the driver can measure the actual applied pre-tensioning force.

As the driver is not equipped with any more lashing straps, the vehicle has to be abandoned, because the 13 lashing straps he used only allowed him to secure 15.2t and not 22t of this load.

Also the argument of the other driver that he tightened the lashing straps with much more force than normal is initially ignored.

But then he realises that he has already been equipped with the new lashing straps with a red TFI. When he shows them to the police they realise that all TFI are completely pressed down and indicate 750 daN each.

A re-calculation of load security shows that these 13 lashing straps are sufficient for securing the load by lashing it down, and the driver can continue his journey.

Conclusion:

Load securing is changing, these changes apply to the measures taken by the driver as well as to checks carried out by the carrier or the police. Establishing the actual pre-tensioning force during a road check plays an important part here. Lashing systems that have been acquired from specialised dealers have reached a very high quality standard and can provide a very high pre-tensioning force.

A high pre-tensioning force in the lashing system means security! But only, if this has been proven, by measuring it, can this be accepted in roadside checks. That's why it pays off to invest in pre-tensioning force measuring systems rather than losing money in fines.

Alfred Lampen