MARCH 2014
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A KHL Group publication

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Bolsters or turntables

FIGURE 1

The topic this month in our regular how-to series is an explanation of bolsters or turntables and ways to implement them for transporting long loads. MARCO VAN DAAL reports

A bolster or turntable is a device, or rather a set of devices, that allows long loads to be transported on two transporters, with a relatively short length, instead of one single transporter with a length (almost) equal to the load. Such a transport is also referred to as a dolly transport. The turntables or bolsters allow the transporters to pivot underneath the load to negotiate turns and corners and, to a certain extent, deal with super elevation and articulation as well as inclines and declines.

A turntable (this is the name that will be used in the remainder of this article) consists of two parts. There is a lower part secured to the transporter. This is called the Lower Fixed Part (LFP). The movable or rotating upper part that is secured to the load, is called the Upper Rotating Part (URP). The URP rotates about the centre of the whole assembly. The two parts are held in place by a pin or a ball bearing. The contact area between the URP and the LFP is lubricated with grease or oil to allow the rotating motion with minimal friction.

ABOUT THE AUTHOR

Marco van Daal has been in the heavy lift and transport industry since 1993. He started at Mammoet Transport from the Netherlands and later with Fagioli PSC from Italy, both esteemed companies and leading authorities in the industry. His 20-year plus experience extends to five continents and more than 55 countries. It resulted in a book *The Art of Heavy Transport*, available at: www.khl.com/books/the-art-of-heavy-transport/

Van Daal has a real passion for sharing knowledge and experience – the primary reason for the seminars that he frequently holds around the world. He lives in Aruba, in the Dutch Caribbean.

Turntable design

There are three basic turntable designs. The simplest consists of two steel plates with a pin in the centre. No articulation in either direction is possible (except the amount allowed, by crushing, of the plywood between the saddle and plate). This is the A-type turntable.

The B-type is a turntable with sliding shoes and a centre pin. Articulation in the longitudinal direction of the load is in the shoes. It allows the URP of the turntable to pivot.

Turntables with sliding shoes and a (load carrying) ball bearing are of the C-type. On these types of turntable it is sometimes possible to remove the sliding shoes (on one of the turntables) and have the load suspended solely on the ball bearing.

In FIGURE 1 the LFP and the URP of the A-type turntable can be easily recognised. The lower chains hold the LFP secured to the transporter and the long chains, together with the welded steel clips, secure the URP to the load.

FIGURE 2 illustrates the difference between type A and type B turntables. The pivoting sliding shoes and the rotating pin are visible between the LFP and the URP. Even though it appears that the centre pin may carry some load, this is not the case. The URP pivots on the centre pin which is allowed a free vertical movement (to a certain extent) in the hole of the LFP.

The turntable in FIGURE 3 is a C-type. In the centre of the turntable the ball bearing can be indicated. This ball bearing allows >

FIGURE 2

FIGURE 3

FIGURE 4

articulation in all directions. It makes the C-type the most versatile of turntables.

There is, however, unpredictability in the C-type turntable, for the one that has both shoes in contact with the sliding ring. The loads on the shoes and the centre ball bearing are statically undetermined and loads can shift (about the ball bearing) quickly from one shoe to another shoe. This can be nerve-wrecking to a less experienced operator. The centre pin of the B-type turntable is not load bearing and, therefore, does not have this problem.

There is a common disadvantage of the B-type and C-type turntables. During a transport both operators, of the front and rear transporters, are aiming to maintain their transporter level. They are trying to keep their pressures equalised and could herewith be 'fighting' the other operator on uneven roads or under ground. Such transports should be carried out by operators that know each other in terms of how they will act and react.

C-type turntables, since the ball bearing is load carrying, can have the sliding shoes removed from one of the turntables. This eliminates the 'fighting each other' scenario as the transporter, where the sliding shoes are removed, can now freely articulate underneath the load. A transporter that does not have the sliding shoes removed, is that way to maintain the level of the load. FIGURE 4 shows a transport where the sliding shoes have been removed from the rear turntable.

About using turntables

Although turntables are available in various models they all follow one of the above design concepts.

When using two turntables, both with two shoes in contact with the sliding ring, you have effectively created a 4-point suspension scenario. As known, a 4-point suspension is prone to overloading on one point. The same applies to turntables.

FIGURE 5

To avoid this overloading a 3-point suspension turntable was invented. This consisted of one turntable with two shoes in contact with the sliding ring and one turntable with just the centre ball bearing. In practice, however, this 3-point suspension method is not being used as much as the 4-point suspension method.

When using the 4-point suspension method (sliding shoes on both turntables in place), it is common to use turntables that have an overcapacity and that overloading is not, or less of, a concern during the execution of the transport. The hydraulic pressures of both transporters have to be continuously monitored and the operators should have contact with each other. As a dolly transport is normally carried out with low velocity, there is ample time for corrections.

Another aspect of attention is the loading impact of the turntable on the transporter. By definition, the turntable is imposing a point load (a concentrated load) onto the transporter deck and this needs to be within the capacity of the transporter. In case the point load is too concentrated, load spreaders can be used to lengthen the loading area.

FIGURE 5 shows a turntable on a double set of load spreaders, in this case the transporter was subject to a concentrated point load that was beyond the capacity of the transporter. FIGURE 6 is the transport where the turntables from Figure 3 and Figure 5 are used. The front transporter required additional load spreading that can be seen on Figure 6. Between the 3rd and 4th axle the load spreading starts and between the 9th and 10th axle it stops. The rear transporter did not require any load spreading as this transporter has a higher bending moment.

Next month's article will be about dolly transport execution and what to look for to avoid things going wrong. ■

NOTE: Every effort is made to ensure the accuracy of the contents of these articles. If you find any mistakes, a brief notification and explanation would be appreciated.

FIGURE 6