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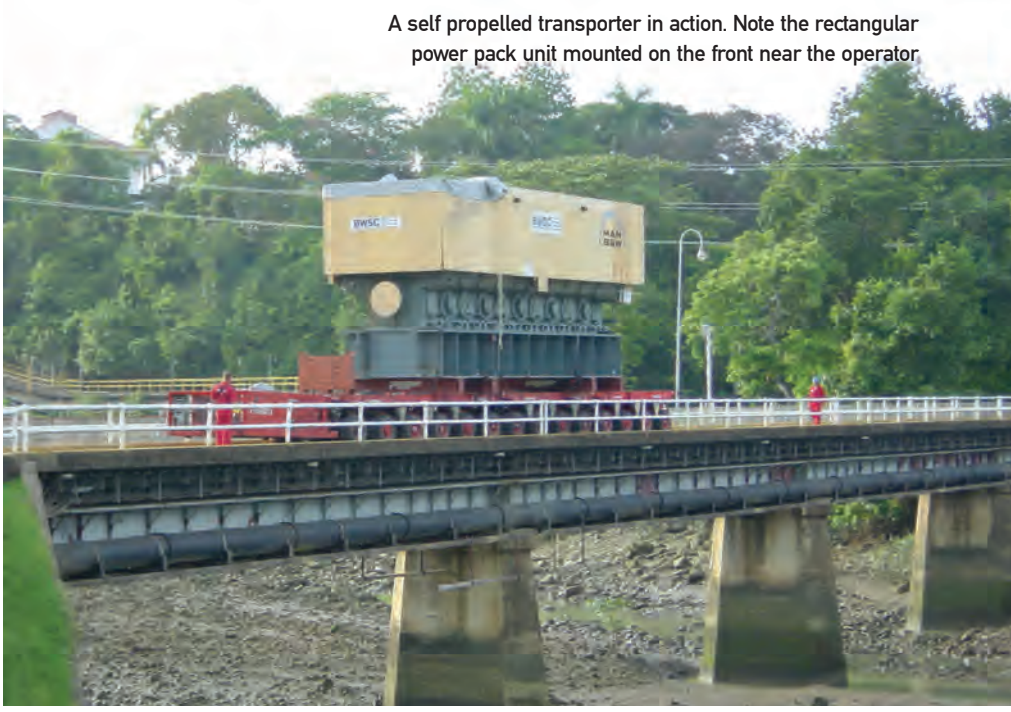
THE MAGAZINE FOR EQUIPMENT USERS AND BUYERS

The second of *IC*'s new series of practical how-to articles aimed at improving safety in heavy transport and lifting operations. Here MARCO VAN DAAL explains the various types of specialized transport equipment and the terminology used in its reference



A self propelled transporter in action. Note the rectangular power pack unit mounted on the front near the operator

After the beginning

As professionals in our business we sometimes become blind to the fact that not everybody possesses the same knowledge when it comes to the terminology of equipment. This article makes an attempt to differentiate between the various different types of specialized transport equipment and explains why it is named the way it is.

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, with his wife and daughters.

In terms of naming equipment, a starting point is in hydraulic platform transporters versus trailers. I am a great believer in addressing the hydraulic platform transporter (from now on called transporter) with its correct name and to not have them mixed up with general over the road trailers.

Let's start with a statement: *A hydraulic platform transporter distinguishes itself by the hydraulic suspension of the axles and the way these axles can be plumbed into axle groups to ensure stability.*

It is important to understand the value of the above statement and to understand that various add-ons and special features such as power packs, the modularity of these transporters, the capacity, the manoeuvrability, the steering (mechanical or electronic), the self unloading capability, and so on, by themselves do not warrant entry in the transporter category.

Prior to the development of these add-ons, the hydraulic suspension of the axles and grouping capability were, and are, the only reasons that these transporters were called a hydraulic platform transporter.

Another issue comes with the terms truck or prime mover versus power pack or power unit. Here is where the difference between a pull-type transporter and a self propelled transporter is made. It goes without saying that a pull type transporter (or pull behind transporter) is pulled by a unit of some sort – a truck or prime mover.

These prime movers are heavy duty vehicles, attached to the transporter by means of a tow bar, draw bar or pull bar or by a transporter add-on called a goose neck. Where the prime mover is attached to the transporter by a bar arrangement, counterweight is stacked on the prime mover at the rear (drive) axles to prevent the tyres from losing traction and slipping when the combination is accelerating.

Where the prime mover is attached to the transporter via a goose neck, the arrangement of counter weight is not required since part of the dead weight of the transporter and load is transferred (via hydraulic cylinders) from the transporter to the fifth wheel of the prime mover.

A self propelled transporter is not equipped with a prime mover. The transporter is therefore not pulled but it is propelled by a unit of some sort – a power pack. A power pack is a diesel engine and one or more hydraulic pumps. The diesel engine powers the hydraulic pump(s) and these pumps drive the hydraulic drive motors on the axles of the transporter. The amount of oil per interval of time (the flow) determines the speed of the drive motors and, therefore, the velocity of the transporter. The operator controls the oil flow. The number of axles that require a drive motor depends largely on the applications for which the transporter will be used. The more drive motors the higher the pulling power. >

Self propelled or not

Why are there pull type and self propelled transporters? It used to be that the ever-increasing loads to be moved were initially still pulled by a prime mover. It started, however, to pose serious limitation on the manoeuvrability and accuracy of the transport. For starters, the turning radius (especially in existing congested infrastructure areas) was often a challenge. A separate push and pull prime mover was often used to overcome the turning limitations. These kinds of exercises however slowed down the transport and added to the risk of handling heavy loads. The turning radius of a self propelled transporter, on the other hand, given its physical dimensions, is smaller than its pulled counterpart.

Another limitation of a pull type transporter is the accuracy of final positioning over, for example, anchor bolts. With a self propelled transporter, which is electronically controlled, accuracies of a few millimetres are achievable. Not necessarily impossible with pull type transporters but definitely much harder to achieve.

A pull type transport with prime mover and drawbar

A goose neck type trailer mounting with fifth wheel coupling

Axles and axle lines

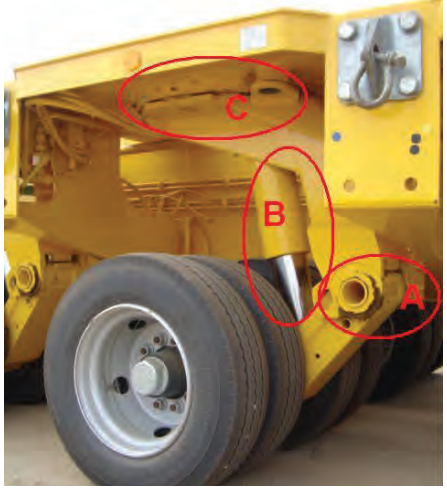
An over the road type trailer has wheel sets that attach to an axle shaft that runs across the full width of the trailer. Transporters, on the other hand, have pendulum axles. A pendulum axle is not attached to such a shaft; a shaft is simply not present on a transporter. Instead there are two independent axle assemblies, one on the left and one on the right side of the transporter. Each assembly is mounted on a turntable against the underside of the transporter deck (see C in the figure). Each pendulum axle can rotate in the horizontal plane.

The turntable holds the upper leg of the axle, which is fixed. The turntable and the upper leg are bound to make the same motion. The upper leg ends in a knee joint (see A in the figure) that joins the upper leg to the lower leg, the lower leg in turn connects to the wheel assembly. The knee joint allows the lower leg to pivot in respect to the upper leg. This pivoting motion is initiated by the hydraulic axle cylinder (see B in the figure). It is these hydraulic axle cylinders that can be plumbed into groups that form the hydraulic suspension for which transporters are so well known.

The pendulum design brings with it a possible clash in terminology. When talking about trailer axles, an axle really means one axle. When talking about pendulum axles, however, one axle in reality means two axles. For this reason the term “axle lines” was introduced. One axle line includes the pendulum axles between the left and the right sides of a transporter.

Taking turns

The steering of the pull type transporter is effected by physically connecting every axle to the next axle by means of steering rods. A plate is horizontally connected to the side of the axle, just below the turntable. The plate contains a hole pattern to which steering rods are connected from one plate to the next. Which hole is used >



Naming of parts: the knee-type joint (A), hydraulic cylinder (B) and turntable (C) elements of a pendular axle

depends on the length (number of axles) of the configuration because the holes in the plate correspond to a certain steering angle. This steering information is shown in a steering diagram that is provided by the equipment manufacturer.

As a side note it should be mentioned that a mechanically steered transporter does not always have to be a pull type transporter. Self-propelled transporters with mechanical steering are also common in the industry. The difference is that the prime mover is replaced by a power pack and a certain number of axles have to be equipped with hydraulic drive motors.

Electronic steering is only available on self propelled transporters. Instead of plates and rods, each axle has its own device to rotate it on the turntable. This can either be a set of hydraulic cylinders or a set of worm drive gears. There is no mechanical connection between the axles. Each axle receives its signal from the operator's control box, via the power pack's central processing unit (CPU) computer. This CPU ensures that each axle receives the correct signal as to how much the turntable is to rotate.

Steering difference

As mentioned above, rods do not interconnect the electronically steered axles. This means that each axle can rotate (steer) independently from any other axle, as it is not mechanically bound. This is the most important difference between electronically and mechanically steered axles. Electronically steered axles can be steered in any angle whereas mechanically steered axles are limited in steering angle.

The above limitation means that mechanically steered transporters are less manoeuvrable than electronically steered transporters. Certain transport executions may call for a steering combination that mechanically steered transporters can simply not achieve.

The connecting rods of a mechanical steering system seen through the openings in the deck

An example of such an execution is a sideways move. Sideways means that each axle is turned 90 degrees from the longitudinal transporter axis. Obviously this is a manoeuvre that mechanically steered transporters cannot make.

At best a mechanically steered transporter can crab steer or diagonally steer and simulate a sideways motion by moving forwards and backwards while alternating the steering angles in a series of direction changes. ■

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.