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Load on the lake

Following on from last month's article on load outs, this month MARCO VAN DAAL explains how to perform a load out onto a free floating barge without tidal conditions

FIGURE 1

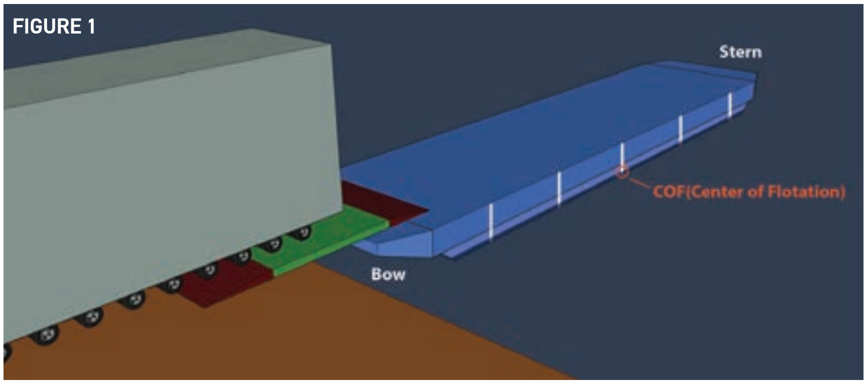
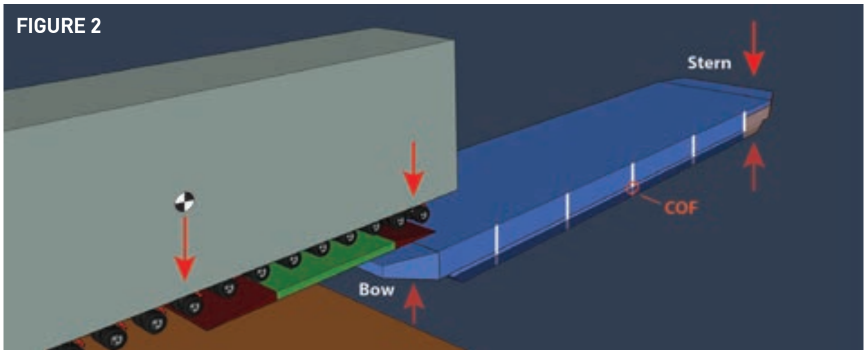


FIGURE 2



Last month we covered the load out onto a barge in an area where tidal conditions apply. Such a load out is subject to two constraints:

- load out is subject to (low) tide and is to be completed within six hours
- the rising tide provides buoyancy and reduces ballasting requirements.

So what happens in an area where tides are absent, such as on a river or lake? How is a load out performed under these conditions as there is no tide to provide the needed buoyancy. Let's review this step by step. If there is no tide, then the load out is not subject to any tidal movement. This means that the load out can be performed at any time of the day or night. Secondly, if there is no tide, then there is no reason to complete the load out within six hours as there is no falling tide after that length of time. The above are two positive aspects of performing a load out in a non-tidal area.

How do we deal with the lack of increased buoyancy from a rising tide? As with a load out in a tidal area, the first activity is to pre-ballast the barge so it lines up horizontally with the quay. See Figure 1. To keep the barge horizontally lined up with the quay we must maintain the draft at the same level as it was during its pre-ballast condition.

When the first axles roll onto the bow of the barge the draft at the bow increases. To ensure that the draft remains equal, and does not increase, weight has to be removed from the barge as the axles roll onto it. This can only be achieved by pumping out water from the bow that was pumped into the barge for pre-ballasting. For every tonne of weight that rolls onto the barge, a tonne of water has to be pumped out to keep the barge horizontally lined up with the quay. See Figure 2.

This is an interesting phenomenon as it means that the barge should hold quite a bit of water in pre-ballasted condition. Indeed, the barge should hold at least an amount of water that is equal to the weight of the cargo that is rolled onto it. Ideally, this should be a bit more as ballast tanks cannot be emptied completely. A 5 percent residual volume is a fair assumption. If there is less water in the ballast tanks than the weight of the cargo that is rolled onto the barge, you will eventually run out of water in the ballast tanks and you will not be able to complete the load out as the barge draft will increase and horizontal alignment of the barge with the quay is disturbed. This can have very serious negative effects on the load out performance.

No way out

One note needs to be made here. When in a situation where the barge ballast tanks are empty and the cargo has not yet completely rolled onto the barge, there is a way to recover from this situation. As there is no tide, it is relatively easy to roll the cargo off the barge again while filling the ballast tanks again. There are no time constraints from a tidal point of view.

As far as the hydrostatic behaviour of the barge goes, this is quite a bit easier than compared to a load out with tidal conditions as we are now dealing with only one draft. Consequently we are dealing with only one fixed centre of flotation (COF) instead of a varying COF due to varying drafts.

During the execution of a load out it is next to impossible to keep the draft at a fixed value. A load out is a dynamic process that is performed in a dynamic environment (waves, other water traffic and so on). These constant motions have an effect on the transporters; they reduce the effective usable stroke of each axle. That is why it is important to keep the barge and the quay horizontally lined up at near zero

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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 leading companies 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-infostore.com/books Van Daal has a real passion for sharing knowledge and experience and holds training seminars around the world.

trim. The transition between the barge and quay can consist of a ramp or a steel plate. Typical ramp height is 300 mm (12 inches) and this thickness results in a reduction of the effective transporter stroke. In case of a steel plate, where the typical thickness is 1.0 to 1.5 inch (25 to 37 mm) obviously has much less impact on the transporter stroke. The drawback of using steel plates is a much smaller degree of allowable barge movement in the vertical direction.

Plan for the unexpected

It is imperative that a load-out is prepared and engineered to an extent that prevents and avoids unexpected situations, for example, running out of ballast water, as mentioned above. In practice, however, a load out is not an exact science. When performing a load out onto a reasonable size barge it is not practical to aim for a draft within 10 mm or about half an inch. The dynamics of the surrounding environment simply prohibits this. Therefore, in case of using a steel ramp as the transition between the quay and the barge, the ramp is used as an indicator. As mentioned before, the barge is pre-ballasted so that it is lined up horizontally with the quay. In reality the barge is often ballasted to a few inches above the quay.

When the ramps are positioned they show an air gap between the underside of the ramp and the quay. This air gap is used as an indication of how much the cargo can be rolled onto the barge as the air gap will decrease during this motion. When the air gap has been decreased to virtually nothing it is time to let the ballast operation increase this air gap again while the transport does not move forward. With sufficient experience the rolling on to the barge and maintaining a certain air gap can be a simultaneous task.

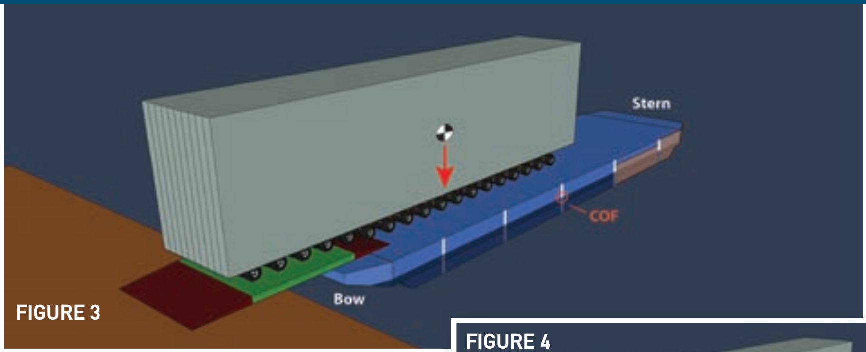

FIGURE 3

Figure 3 shows that the cargo has passed the centre of flotation (COF). In this figure it is shown that the bow still holds sufficient water for de-ballasting if there would be a deviation from the expected situation. At the same time we can see that the stern has started with de-ballasting as the cargo has passed the COF, which causes the stern to increase in draft if de-ballasting would not commence.

When the cargo has reached its final location and, assuming that the centre of gravity (COG) is lined up with the longitudinal and transverse centrelines of the barge and, assuming that the barge shape on the bow and stern is identical, the amount of ballast water in the stern and bow tanks would be identical as well.

At this point it could be stated that the load out has been successfully completed. The operation, however, has not yet been completed as the transporters still have to be removed from underneath the cargo back onto the quay. This may be seen as a minor detail but it is not always the case.

Let's assume that the cargo has been rolled onto the barge via a 300 mm (12 inch) steel ramp using self propelled modular transporter (SPMT) with a minimum deck height of 1,200 mm (48 inches) and a maximum deck height of 1,800 mm (72 inches). The cargo has been set onto sea fastening stillages of 1.65 m (66 inches). There is 1.65 – 1.2 = 450 mm (18 inches) of space left between the transporter deck and the underside of the cargo. The transporter, therefore, has this 450 mm of vertical manoeuvring space. There is also 300 mm (12 inches) of ramp height that the transporter needs to negotiate. This needs to be deducted from the available transporter suspension stroke. There is only 450 mm – 300 mm = 150 mm (6 inches) of stroke available to manoeuver the transporter from underneath the cargo back onto the quay.

As you can see, even during this part of the operation it is important that the barge is vertically lined up with the quay to be able to retrieve the transporter combination. It may even be required to ballast the barge to achieve this. See more in Figure 4.

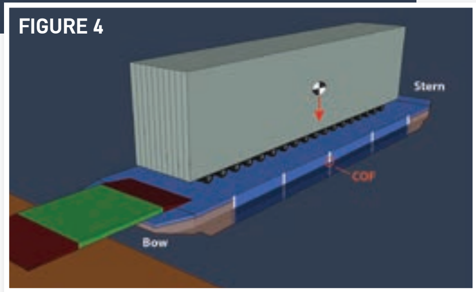

FIGURE 4