Transport of Pipeline Optimisation was announced as the winner of the IADC’s Safety Award 2017. Formulated and submitted by Maarten Tronckoe, Simon Van den Berghe and Pieter Verpoest of Jan De Nul Group, the solution improves each facet of the process involved in the transportation and handling of pipelines.

On both reclamation sites and logistics yards, dredge pipes with and without flanges are being lifted by crane and transported with trucks. In regards to securing these heavy loads to flatbeds, the conventional method does not explicitly address the task which involves workers hand-placing wooden beams beneath pipes. The award-winning safety solution begins with the use of specially-designed cradles (Dhatec) which are secured to a trailer’s flatbed to facilitate stacking. Manual adjustment to the wooden beams is no longer required, keeping workers away from heavy loads during their placement.

As for the pipe-lifting process, the precursory pipe hook has been replaced with a C-shaped alternative. Conventional metal lifting chains were subsequently exchanged for lightweight soft slings. A spreader beam is placed between the soft slings to further minimise the overall weight handled by riggers. Attached to the hooks, guidelines are then held by riggers on the ground, letting them easily manoeuvre the pipes while loading and unloading the trucks from a safe distance. The optimised process presents an ergonomic benefit for workers.

The team’s rationale for optimising the process was a proactive choice to reduce risk in everyday operations. JDN’s core business is dredging and the most important element in a project is the vessel. Therefore, the handling and transportation of pipelines is considered to be a sideline activity and is not the most risky of operations performed.

Maarten Tronckoe portrays it as common practice: ‘We’ve done it all day long and for dozens of years. Therefore it came as a surprise that improvement could have been gained in this kind of operation.’
The team’s upgrades to the lifting, stacking and securing of pipes ensures accountability that the logistics task is executed safely, a benefit to both employees and the public. In addition to increasing safety in regards to shipyard storage, crane lifting and flatbed truck securing practices, the solution heavily considers the ergonomics of the process for workers partaking in the process which takes place around the clock, all day long.

PERCEIVED PROBLEMS WITH THE CONVENTIONAL WAY

Prior to Tronckoe’s innovation, Van Den Berghe and Verpoest’s long-standing process for the transport of pipelines involved the use of metal chains which were susceptible to tangling, pipe hooks which needed to be manually positioned in and sometimes hammered out of the bolt holes in a pipe’s flanges, and wooden beams which needed to be placed by hand beneath a pipe before the pipe could be finally lowered into position and released. To stack a second layer of pipes, workers needed to climb onto the first layer of pipes to again place wooden beams. To put it simply, Maarten Tronckoe states: ‘It just felt unsafe’.

And before ultimately setting the vehicle into motion, drivers would double check their loads, taking extra time – as necessary – to secure the vehicle’s cargo rather than leaving in a rush to arrive on time to a destination. ‘If just one six-tonne pipe is not secure, it will be a big accident,’ says Tronckoe.

In addition to his own concerns, he explains: ‘In Europe, securing heavy loads on trucks in a safe manner is a top priority. Our trucks are frequently inspected because there is a lot of weight on the truck, it is an eye catcher.’ So when a truck would be randomly stopped for an inspection, drivers must prove the load is secure from top to bottom. But how safe is a wedge nailed it to the floor of the truck? And how much force can a wooden wedge with a nail driven through it actually take? The rules and regulations for securing trucks are made for standard pieces of cargo such as wooden packages and pallets. Without a legislative manual specifying how to ship multiple pipes, the team decided it could no longer settle for the degree of variability and began its search for solution with a clear explanation.

OPTIMISING WAS OPTIONAL

Although JDN had no recorded incidents or legislation violations as a result of its conventional pipeline transportation practices, the team chose to proactively eliminate the potential risks to safety. In particular, the manual placement of wooden beams and wedges beneath six-tonne pipes and climbing atop pipe stacks by workers would need to be addressed (see Figure 2).

REPLACING WOODEN BLOCKS WITH CERTIFIED CRADLES

In the first phase of loading a flatbed truck, workers would employ a timbering process, setting wooden beams and wedges between pipes to provide support to the pipe stacks on the truck’s flatbed. Pipes were placed between pairs of self-standing vertical poles
which were positioned along the perimeter edges of the flatbed. While the vertical poles would effortlessly support the lower pipe layer, once the second pipe layer was set into place, the pipe’s combined weight would visibly bend the poles outwards. Not to mention, workers needed to climb on top of the first pipe layer to again timber for the second layer of pipes. After searching for a much-needed alternative, Tronckoe stumbled across an existing product on Dhatec’s website, the System88 cradles (see Figure 8). He knew he had found something that could replace timbering and self-standing poles in JDN’s operations.

Made of low-density polyethylene (LDPE), Dhatec’s durable and flexible system can be adjusted to hold multiple pipe diameters with locking pins in a two-by-two configuration. Another benefit is the system will not damage the pipe or its coating and is suitable for use in any climate. The reusable product had already been tested by TÜV Nord Mobilität and certified according to a worldwide safety standard. ‘By using these cradles, we are 100 per cent certain we are following regulations,’ says Tronckoe. When it was time to hook off, the same problem was encountered, with workers again climbing pipes to hammer conical pins out of bolt holes. Aside from causing a bit of damage to the material of the pipes, the conical pin had a weight limitation of approximately 2.1 tonnes. Since pipes now weighed up to six tonnes, the conical pins were no longer ideal for lifting and an alternative was necessary.

Enter the C-hook (see Figure 6). With the form of a C, the hook has an open end which effortlessly encases the pipe’s flanged edge, eliminating a tedious alignment process. Similar to fishing, riggers cast the guideline to catch the hook onto the end of a pipe. When the pipe is starting to be lifted, the hook will automatically position and secure itself in the correct manner. To hook off, riggers simply pull on the guideline after the pipe is placed (see Figure 7). The new lifting hook is safer in relation to the weight of pipes. In fact, the C-hook can be used with many pipeline types and prevents the equipment from being damaged.

But the C-hook has its one disadvantage. They are more solid and as a result are more heavy for riggers to manoeuvre than its predecessor. Working with the new hooks caused some difficulties and led to feedback from the riggers which was not that positive. Therefore we looked for a more ergonomic way of working. The result of these efforts were the spreader bar and the soft slings which were for ergonomic reasons to make it easier for riggers.

**SOFT SLINGS REDUCE WEIGHT**

When loading vessels, the standard lifting tool includes steel slings – or even metal chains – because they can sustain heavy loads. These standard steel slings or chains are also quite heavy on their own. When the optimised C-hooks were attached to the metal chains at JDN’s storage yard, the overall weight of the lifting tool – while loaded with a pipeline as well as unloaded – was noticeably heavier for riggers because of the newer, heavier hooks.

As a worker prepares to move a pipeline, a bunch of lifting slings and hooks are suspended from a crane directly above the centre of the pipeline to be lifted. Since a pipeline spans 12 metres in length, a worker must pull a sling and hook apart and guide it for six metres to begin ‘fishing’ for the end of the pipeline. Three times heavier than the previous hook, the C-hook and its added weight certainly made the task more demanding for workers, especially to perform all day long.
To lighten the overall weight in workers’ hands, a soft sling was introduced (see Figure 9). Although metal chains can sustain heavier loads than soft slings, their lightweight quality presented by the textile material could comparably perform the task of lifting pipelines. With the lighter alternative in place, one concern persisted: workers must still cover a long distance of six metres to manoeuvre each sling.

**MODULAR SPREADER ELIMINATES MORE THAN TANGLES**

While dangling from a crane, four slings and their hooks become easily entangled, and the slings cannot be twisted around while lifting. Therefore a worker must first check and make sure they are untangled, pull them apart and oriented correctly before hooking them onto the pipeline’s ends, which are six metres away from the pipeline’s centre point.

**CONCLUSIONS**

The team’s upgrades to the lifting, stacking and securing of pipes ensures accountability that the logistics task is executed safely, a benefit to both employees and the public.

In addition to increasing safety in regards to shipyard storage, crane lifting and flatbed truck securing practices, the solution heavily considers the ergonomics of the process for workers partaking in the process which takes place around the clock, all day long.

Innovative elements are:
- use of Dhatec chairs to store the pipes
- use of C-shaped pipe hooks with lanyards
- lifting assembly comprised of soft slings separated by a spreader for ergonomic benefits for riggers

This solution is beneficial for other parties for lifting and transportation of pipes, both with and without flanges.

The method has already been implemented globally for lifting and transporting pipe within JDN and is in use on all JDN logistical yards and reclamation sites which require many land dredge pipes. Feedback shows users feel much safer than before and work is carried out more efficiently.