



WHAT HAPPENS WHEN INDIVIDUALS STEP UP SAFETY DURING DREDGING ACTIVITIES?

When individual employees, teams and companies view everyday processes and situations through a continuous lens of safety, they can each contribute to making all aspects of operational processes, whether on water or land, safer.

The IADC's members are committed to safeguarding their employees, continuously improving to guarantee a safe and healthy work environment.

Affirming the importance of safety

Dredging activities can be risky operations with hidden dangers amongst heavy machinery. In response, the dredging industry proactively maintains a high level of safety standards.

IADC is committed to promoting safety in the industry. A representative of contractors in the dredging industry, the global organisation encourages its own members as well as non-members participating in the global dredging industry to establish common standards and a high level of conduct in their worldwide operations. The IADC's members are committed to safeguarding their employees, continuously improving to guarantee a safe and healthy work environment and reducing the number of industry accidents and incidents to zero.

Recognising advancers of safety

The IADC conceived its Safety Award to encourage the development of safety skills on the job and reward individuals and companies demonstrating diligence in safety awareness in the performance of

their profession. The award is a recognition of the exceptional safety performance demonstrated by a particular project, product, ship, team or employees.

Eight solutions were nominated for IADC's Safety Award 2018 and each one aims to improve routine processes and situations encountered in the dredging industry.

Square tyres as fenders by Boskalis

Slips, trips and falls are considered to be the number one safety risk throughout the sector. An internal innovation event at Boskalis identified a situation on vessels to be unsafe and a solution has been conceived and implemented.



FIGURE 1

Boskalis' Magnor backhoe dredger is currently equipped with square tyre fenders and tyres are being produced for six other backhoe staircases.

Vessel-to-vessel transfer is the most critical operation for surveyors.

Regularly round tyres are placed to form a fender which is intended to protect the equipment. These fenders can form a risk during crew transfers. Therefore in an effort to support the crew and make the transfer safer, squared tyres have been installed in place of conventional round tyres. Complete with an anti-slip surface, they can be installed on all sizes of barges or multi-cats.

Cost effective, the solution is also a sustainable one since it is easy to apply and limited resources are needed for maintenance. As it is a general application, the solution can easily be used across the maritime industry, in a context even broader than dredging.

Boskalis' Magnor backhoe dredger is currently equipped with square tyre fenders and tyres are being produced for six other backhoe staircases (see Figure 1). Two sizes are currently available and further development is being done to make it fit for purpose for different equipment.

Wireless Broadband Mesh by Jan De Nul Group

Vessel-to-vessel transfer is the most critical operation for surveyors. When a vessel's survey computers needed to be updated, surveyors were required to board the vessels at sea, which is a hazardous and time-consuming activity. At Jan De Nul Group, a wireless broadband mesh was implemented on a project to reduce vessel-to-vessel transfers of surveyors.

After implementation on several projects, the system revealed to be more efficient than initially foreseen. Not only had the vessel-to-vessel transfer of surveyors been reduced drastically (see Figure 2), the survey updates could also occur faster and without delays, resulting in more operational efficiency. A part of improving efficiency also resulted in reduction of (fuel) cost and eventually lowering the environmental impact. The system is a plug-and-play outdoor Wireless broadband modem that can be easily interfaced with the vessels ICT infrastructure. Once the system is installed on a vessel for survey purposes, it can be used for a multitude of purposes as all other departments can use it for their own needs. ICT can control and update its network infrastructure,

important operational information can be exchanged smoother with the vessels and so on.

The ICT department has implemented the system by request of the survey department for its own use. Other departments or operations that see the benefit in this system can study the possibilities and perform trials on the projects where the system is already implemented. By making the system universal, it will facilitate the implementation of project-specific requirements.

The system enables faster communication overall which will lead to more efficient operations, enabling the Project Management Team to get feedback faster. In addition to interconnecting vessels and being a back-up for communication system failure, the system provides faster survey updates, security updates and software patches on board of vessels with the possibility for remote troubleshooting and problem-solving. So far, the wireless broadband mesh has decreased fuel consumption and transport cost from the transfers, and increased operational time in terms of efficiency and productivity through less survey delays for operations and avoiding operational standby.

Wireless Broadband Mesh has an initial installation cost, and fine-tuning is necessary, but the benefits transcend the initial cost by far. Further experience and development is necessary in order to continue improving the system.

Mooring ropes handles by DEME

Mooring activities are one of the activities in our sector that are considered as a high risk task. One of our employees came up with the idea of 'mooring rope handles' to make the handling of mooring ropes easier and safer.

The handles – attached to the mooring eye – are keeping the hands of the crew member out of the 'risk zone' during (un)mooring activity (see Figure 3A). These handles are inexpensive and easy to apply to existing ropes.

The use of those handles reduces the risks of injuring fingers or hands between the bollards and ropes activity (see Figure 3B).

Mooring handles could also be a solution for a more extensive group of users outside the



FIGURE 2

Wireless broadband mesh reduced the need for vessel-to-vessel transfers of surveyors, increasing both safety and efficiency.



FIGURE 3

Handles attached to a mooring rope intend to keep crew members' hands away from the risk zone during mooring activities [A] and also eliminate the need to place hands in between the mooring rope and bollard [B]. Under the umbrella of DEME's C.H.I.L.D.5 campaign, posters were hung in headquarters to increase handrail usage and proved to be highly successful [C].

dredging industry. The idea should become a new safety standard within the industry. We challenge the suppliers to provide ropes with pre-attached handles.

Safe on stairs – Use handrails by DEME

Incident trend analysis indicated some recurring incidents, with personal injury, related to the use of staircases on board of vessels. Also at the offices, staircase incidents occurred with serious consequences. The root causes of these incidents brought up the behavioral aspects and the fact that the handrails of the staircase at DEME's main personnel entrance in Zwijndrecht (Belgium), were not up to standard.

The question is: how can we persuade our personnel to give a good example and use these handrails? The opportunity was taken

to experiment with technical changes of the handrails and testing the results of the changes at the same time. The results were measured by short and simple samples during the week.

- The first technical change was the replacement of the original steel handrails by more comfortable, wooden alternatives. This resulted in an immediate usage increase of 20%.
- Since employees could walk in the middle of the stairway, without a handrail within reach, the next technical change was the installation of two additional handrails. This led to an extra improvement of almost 30%.
- After an unexpected decline in use, a simple poster campaign (see Figure 3C) was launched to introduce the public to the desired target.

The use of handrails increased up to 75% in less than a few weeks' time. Since the start of the campaign, there have been no stair-related incidents at head office.

This type of campaign can be extended to any other site or ship. Before starting a motivational campaign, however, it is necessary to check the design of the staircases and find a technical solution to accommodate safer staircase use. Technical solutions can be

- anti-slip treads,
- improved handrails,
- adequate lighting
- and reduced staircase angle where possible.

Building on the principles of DEME group's C.H.I.L.D.5 campaign, the focus on preventing staircase incidents has resulted in significant behavioral changes. It evoked better housekeeping, better maintenance and safer design (up to the safety standards) of infrastructure. At the same time the awareness of the risk of carrying heavy loads (on stairs) and ergonomics popped up spontaneously.

Debris Removal Platform by Van Oord

During dredging, debris can fill the trailing draghead of trailing suction hopper dredgers. When the suction pipe is recovered on board, debris that was stuck in the draghead will fall onto the deck. To safely be able to remove this debris, Van Oord developed an automated debris removal system to reduce the risk of personal injury (see Figure 4).



FIGURE 4

Van Oord developed its automated debris removal system in-house.

There are infinite situations which can be considered risks to safety in dredging projects.

Van Oord changed the existing technique from the manual removal of debris to an automated system, reducing the risk of personal injury from manual handling and eliminating slips and trips. A debris removal platform for its fleet of Trailing Suction Hopper Dredgers (TSHDs) has been developed, letting crew safely and easily remove debris from the deck without the use of a broom or shovel. With a hydraulic drive bulldozer blade, the debris removal platform pushes the debris over the side of a vessel. Crew can stand-up straight next to the platform as the blade pushes the debris. The debris removal platform has several safety benefits including the elimination of manual handling, use of sustainable and safe material, covered rotating parts, safety railing, no lifting and rigging operation.

Critical Operations 'Lock Out, Tag Out' by Jan De Nul Group

There are infinite situations which can be considered risks to safety in dredging projects. That's why Jan De Nul introduced a critical operations campaign to increase awareness around the most serious risks which have historically resulted in the worst incidents. These are identified as working at height, lifting operations, tasks requiring lock out and tag out, site traffic, defining no-go areas, marine navigational awareness and marine transfer of personnel.

Specifically, the critical operation 'Lock Out, Tag Out' (LOTO) contributes to safety in the sector as it is a control measure present industry-wide. Jan De Nul's critical operation LOTO campaign was approached from an operational point of view. The campaign aimed to be interesting to crew normally involved in LOTO operations and for this reason, the people involved in LOTO are presenting it in the video.

While the technique of doing LOTO is not new, the way it is communicated to the dredging projects and vessels is. The engine room departments of all vessels wrote vessel-specific LOTO manuals detailing which isolations are required for the different jobs on board.

A usual day on board of a dredging vessel was filmed, documenting the actual crew which successfully applied isolation according to the LOTO standard. The movie followed Jan De Nul's Imagine, Think, Act (ITA) framework:



imagine what should and should not happen, think of a plan and communicate with the team, and act by leading the plan. The movie was then sent to all dredging projects and vessels, and was shared on the ITA website (<https://ita.jandenu.com>) and Jan De Nul's social media accounts. Constant reminders were issued in the form of posters (see Figure 5) and the backgrounds of all of JDN's computer login screens. Elaborate training packages were also sent to all projects and vessels to increase knowledge of the LOTO procedure.

Through advance preparation of ship-specific LOTO manuals to describe which operations require which LOTO, and then through sharing of this material, awareness and safety can be increased. The risk of working on equipment is a common issue therefore applying this approach can benefit the industry.

DynaCover by Damen Dredging Equipment

Dredge pumps experience extreme forces during operation, requiring a robust piece of equipment to combat them. Failure of this connection can impact a project's efficiency



FIGURE 5

A campaign for the critical operation 'Lock Out, Tag Out' (LOTO) included constant reminders in the form of posters.



FIGURE 6

An easily-applied outer cover of Nomex protects the DynaCover from welding sparks and dirt.



FIGURE 7

Jan De Nul Group's movie *We Are ITA* is part of Imagine Think Act, a company-wide programme which aims to change culture from an operational perspective.

or in the worst case, crew. The advent of the double-walled pump improved safety and reliability, marking a major step forward compared to the formerly prevalent sheet steel pump casings. The wear-resistant casted pump casing was covered by a sheet metal outer casing which prevented the spilling of mixture while the inner pump house could be used until it disintegrated.

An alternative by Damen Dredging Equipment, the DynaCover, was fabricated and tested at full-scale. Holes were made in the inlet pipe, so when the pump was filled up, water flooded between the inner pump casing and the DynaCover. By doing so, the inner and outer pressure of the pump casing is the same, preventing the inner casing from collapsing.

The DynaCover is made from Dyneema, a material used for products such as cut-resistant gloves. With fibers produced from a polyethylene with a very high molecular weight, the material is lightweight, strong, durable and resistant against UV light, oil and sea water. An easily-applied outer cover of Nomex – a flame-resistant material worn by

firefighters and racing drivers – protects the DynaCover from welding sparks and dirt (see Figure 6).

We Are ITA by Jan De Nul Group

During the course of a project, attention and priorities can shift, but one thing is certain: safety results from successful projects and vice versa. Jan De Nul Group acknowledges that proper preparation and keeping control makes all the difference in ensuring a successful project. That's why the company conceived 'Imagine Think Act' (ITA) which has a dedicated website (<https://ita.jandenu.com/>), a *We Are ITA* movie (see Figure 7) and regular newsletter messages to employees.

A company-wide programme, ITA's strategy is to approach culture from an operational point of view and not as a safety culture. The system is self-sustaining as long as company leadership give attention to ITA as it is about how leadership is realised, risks are handled and mistakes are responded to. ITA should become part of the language that all levels speak, and through this language a culture is formed, especially since direction and

support comes from the top of the company. To put theory into practice, a challenge was introduced to vessels and projects worldwide, and teams challenged each other to show ITA on their vessel/project.

Some of the ingredients of ITA are a leadership expectations matrix, a process to provide feedback on risk management and level of operational control (Field Risk Talk (FRT)), a focus on critical operations, combined with a Stop and Rethink attitude when something doesn't go according to plan, and a culture model to grow more operational control.

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CAN A PLATFORM REDUCE RISK

OF PERSONAL INJURY
DURING DEBRIS
REMOVAL?

During dredging, debris can fill the trailing draghead of a trailing suction hopper dredger.

To safely remove debris that will fall onto the deck after recovering the draghead of a trailing suction hopper dredger, Van Oord has developed an automated debris removal system. IADC rewarded Van Oord's innovation with the IADC Safety Award 2018 during its Annual General Meeting in Budapest, Hungary.

'Learning from the past and incorporating practical experience from the field is an important part of the research into possible improvements,' proud award-winner Coen van den Berg hits off. He is a Project Engineer currently working on Van Oord's new trailing suction hopper dredger Vox Amalia. 'For every new design, we take a critical look at how we can improve safety and functionality,' he continues. At the start of the project, the team received the request to see if they could improve the way of removing debris from underneath the draghead.

In-house development

Improving the working environment is important to Van Oord. That is why its fleet is continuously being updated to the highest standards in close cooperation with specialists within Van Oord, such as those who are heavily involved in the building process. These professionals are always looking for new ways to innovate. That is why, during the design phase of new trailing suction hopper dredgers Vox Amalia and Vox Alexia, the design team focused on making these brand-new vessels even more safe and energy efficient.

The inspiration

During dredging, debris can fill the trailing draghead of a trailing suction hopper dredger. When the suction pipe is brought back on

board, debris that was trapped in the draghead will then fall onto the deck. This debris can range from large boulders to sticky clay and needs to be removed from the vessel. On large trailing suction hopper dredgers, this is traditionally done with a tilting platform (see Figure 1). A simple platform with hinges on the hull side and lifting pad eyes on the other end. By lifting one end with the crane or draghead, the accumulated debris can be transported overboard.

'There are two main operational downsides to this system,' Coen clarifies. 'You cannot use the tilting platform with the trailing

pipe in its storage position, because it will be blocked by the draghead. The second issue arises from the use of the crane to move the tilting platform. In the past, we've experienced that the use of the crane while sailing offshore was not allowed by the client. This meant that we could not move the debris overboard as usual.' To find a suitable solution, which would improve operational efficiency, the engineering team joined forces with the vessel crew. They considered several concepts and carried out a short feasibility study. It was soon decided that the use of a dozer blade would provide the best solution.

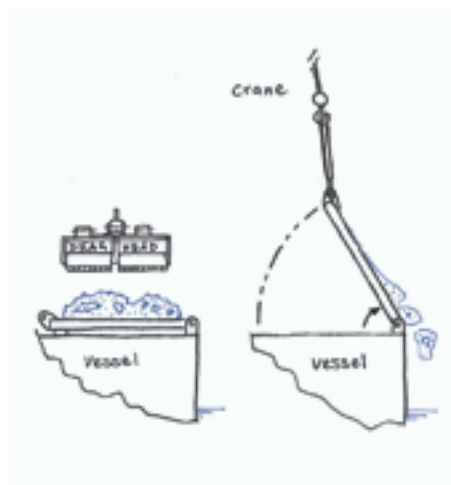


FIGURE 1

On large trailing suction hopper dredgers, a tilting platform is traditionally used to throw debris overboard.

During a ceremony at the Annual General Meeting in Budapest, Hungary, Van Oord's Debris Removal Platform was revealed as the Safety Award 2018 winner. IADC President Frank Verhoeven (left) conferred the award to Coen van den Berg (right) on behalf of Van Oord.



Do you know about a safety solution worthy of recognition? Then submit it for consideration for the Safety Award 2019! Find out how to submit nominations at www.iadc-dredging.com.

out on the draghead on a regular basis, the platform also had to act as a stable and safe working platform for the crew. After several iterations in the design phase, the Debris Removal Platform was born.

The mission

'Our mission? To create a safe, effective and fool-proof solution to move a dozer blade on deck,' Coen explains enthusiastically. 'It was great to work on the design and build of this Debris Removal Platform, as the dredging industry is normally quite traditional. Suction pipe equipment has largely remained unchanged for years. To innovate an established working method was a nice project for us. I was happy to experience that Van Oord gave us all the freedom to execute this in the best way possible.'

The challenge

Designing the ultimate solution was not a clear-cut process. The team faced various challenges. There is little height underneath the draghead and deck space is also limited. On top of this, the space underneath the draghead is one of the worst environments to place a machine, because of the seawater and debris falling from the draghead. The drive system therefore had to be robust and had to cope well with dirt. Because of the lack of space, the drive mechanism for the dozer blade was moved to the sides. A chain drive was chosen as it is robust and has a high dirt tolerance.

Safety was an integral component of the process. The requirement was that it has to be safe to operate the dozer. As work is carried

this working deck. After the vessel crew has taken out materials such as plastic, scrap, car tyres, etc., the Debris Removal Platform – powered by a hydraulically-driven dozer blade – pushes the debris over the side of the vessel.

Drive mechanism

The blade moves with the help of a chain drive on either side with a standard steel chain running between them. The chain drives are both mounted on a single shaft, which is connected to an hydraulic motor with reduction gear. This means there is no need for hydraulic synchronous control. Hydraulic power comes from the main hydraulic system on board, but can also be delivered by a standalone power pack if the installation is retro fitted. The dozer blade is fixed to the chain. Once the motor starts running, the chain pulls the dozer blade forward. When the motor rotation direction is reversed, the blade will move backward. This system is simple, needs minimal control and is dirt resistant. The rotating parts are all covered with stainless steel plates and the chain is guided in Teflon blocks. The blade can be sea fastened with pins in the inboard position. The blade itself is fitted with wear resistant plates that can be replaced. In the component choice, Van Oord used standard parts for the wheels, bearing houses and couplings.

The design

The Debris Removal Platform consists of a dozer blade that runs on rails with bogies (chassis carrying wheelsets) on either side of the platform. The rails are combined with a steel frame that keeps the working deck in place (see Figure 2). When the suction pipe is brought back on board, debris that was trapped in the draghead will fall onto



FIGURE 2

Debris falls onto a working deck consisting of a dozer blade which runs on rails with bogies [A]. A rail surrounds the working deck to keep it in place [B].

KLP® working deck

A material with high impact resistance was required for the working deck, as large boulders can fall from the draghead. Moreover, as vessel crew often have to carry out maintenance activities underneath the draghead, the working deck needed to be safe and stable. The design team set out to find a better material than the standard hardwood and selected sustainable KLP® plastic material. This is made out of recycled bottle caps, crates and agricultural plastics, has a high impact resistance and provides more grip when wet.

Safe operation

The blade is operated from a local control cabinet next to the installation. When the operator starts the movement of the blade, an audible and visual alarm sounds to inform people around the platform that it is starting to move. Continuous actuation of the button

is necessary for movement of the blade. If the operator takes his hand of the button, the blade will stop moving (dead man button).

Safety stops

A railing is installed around the platform. When the access gate is opened, the blade will automatically stop (interlock system). The blade also stops automatically on the maximum inboard and outboard positions by means of proximity switches. An additional mechanical end-stop in combination with hydraulic pressure valves serves as a backup end-stop. As a last option to stop the movement of the blade, the local control cabinet is fitted with an emergency stop.

Say yes to safety

The Debris Removal Platform will first be installed on trailing suction hopper dredger Vox Amalia, the latest addition to Van Oord's

fleet. It will be installed on all other trailing suction hopper dredgers as well at a later date. 'With the installation of the Debris Removal Platform, we have improved the working circumstances around the draghead and are one step closer towards a zero-accident organisation,' concludes Ton van de Minkelis, Staff Director QHSE. 'By taking safety into consideration in the design phase, hazardous working conditions during operations can be eliminated or significantly reduced. This is the most effective way of risk control. Working together proactively on safety with all disciplines is very important. As a global player in the marine contracting sector, safety is our license to operate. Within our "Say YES to safety" programme, we encourage everyone to demonstrate safety leadership. Continuously improving our working environment by using our ingenuity is a natural part of that!'

Safety Benefits of Van Oord's Debris Removal Platform

Elimination of manual handling

No manual handling with brooms and shovels is required. No pulling or pushing has to be done in an uncomfortable or awkward position. There is limited height under a draghead, so crew are currently working in a location that is difficult to access. They also need to bend and push or pull at the same time. These two activities together create a high risk probability that a manual handling injury will result. This will all be eliminated by installing this platform. The person involved can stand up straight next to the platform and the blade pushes the debris instead of the person doing this manually.

Sustainable and safe material used

For the working deck, sustainable KLP® plastic material (recycled bottle caps, crates and agricultural plastics) is used. Besides providing a sustainable alternative to a wooden working deck, this material has a better impact resistance and provides

more grip when wet. When working in an area with mud and water, the risk of slipping is high. By using this type of material, the probability of a person slipping or falling is low.

Rotating parts covered

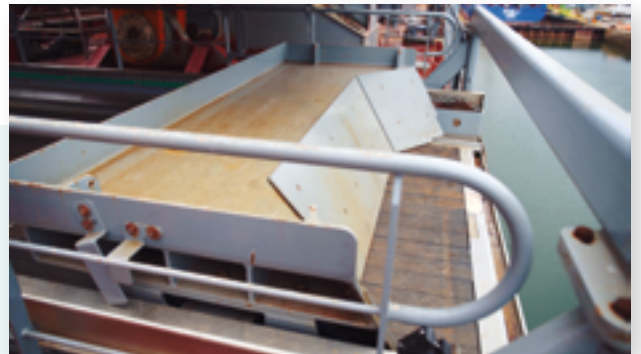
All rotating parts are covered to prevent entanglement with clothing or hands, etc.

Safe railing

The unit has its own railing with self-closing doors, which are fitted with an interlock system, and movement stops when the doors are opened.

No lifting and rigging operation

Compared with existing tilting platforms, no lifting or rigging operations with a crane are required to move the platform so that the debris can be deposited overboard.



The Debris Removal Platform consists of a dozer blade that runs on rails with bogies (chassis carrying wheelsets) on either side of the platform.