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BUILDING A PROACTIVE SAFETY CULTURE WITHIN A MARINE CONTRACTOR ORGANISATION

It is hard to imagine a time when safety was not deemed important, when Personal Protective Equipment (PPE) was not used and little was done in the way of prevention. A few decades ago, occupational health and safety was not considered as important for the vast majority of companies. Instead, incidents and emergencies were handled as they occurred, as effectively as possible given the limited technology and resources available. Today, those times have changed. This article explores the progress of health and safety in the dredging industry and QHSSE professionals, Ton van de Minkelis and Christophe Leroy share their experiences in building a proactive safety culture.

History of health and safety within the industry

Health and safety, or HSE (Health, Safety and Environment as it is now referred to) is very different today from 50 years ago. The idea of workplace HSE has advanced tenfold and continues to improve, resulting in the gradual decrease of injury incidents. Recent changes include the introduction of stricter legislation and sentencing guidelines. However, health and safety was not always a priority. What we see as the standard way of working today was not the case just a few decades ago.

Today, company cultures have evolved entirely. A specialised occupational health and safety system combined with a strong company (safety) culture are must-have elements of any organisation in order to improve the safety performance. Relating health issues to occupations and their environments goes back further than you might think. In fact, the first known instance of correlation between health and work was in the 4th century BC when Hippocrates noted lead toxicity in workers of the mining industry. Since then, there has been a long list of professionals,

physicians and researchers examining work environments and the impact they have on a human's health and well-being.

Due to rising number of incidents in the 1970s, the idea of occupational health and safety began gaining momentum. Governments around the world implemented an appropriate legislative framework to set and enforce standards that would improve the safety conditions of the workplace. Unfortunately, as is often the case, a few major catastrophes accelerated this process. First, the Seveso disaster of 1976, in which an explosion at a chemical plant in Meda, north of Milan, released a chemical cloud containing the highly toxic dioxin. Thousands of animals died and many local residents experienced health problems for decades. In 1984, more than half a million people in Bhopal, India, were exposed to toxic gas from a chemical processing plant with poorly-maintained pipes. Within a month, 80,000 people had died. And in 1988, the Piper Alpha platform in the North Sea, 190 km north-east of Aberdeen, Scotland, exploded and sank killing 165 crew on board.

The International Safety Management (ISM) code

Relevant for the dredging industry was the introduction in 1998 of the International Safety Management (ISM) code by the International Maritime Organization (IMO). The purpose of the ISM code is to provide an international standard for the safe management and operation of ships and for pollution prevention. It was born out of a series of serious shipping accidents in the 1980s. The worst of which was the roll-on/roll-off ferry Herald of Free Enterprise that capsized moments after leaving the Belgian port of Zeebrugge on the night of 6 March 1987, killing 193 of its 539 passengers and crew. The cause of this and other accidents was a combination of human error on board and management failings on shore.

> **Improving the culture can not only improve safety, but also efficiency and well-being.**

Following these catastrophes, the world began focusing on environmental health and safety more than ever before. The chemical and the oil and gas industry led the charge, establishing a set of fundamentals to help ensure product and asset safety, environmental protection and occupational health. As a result, the occupational health and safety performance in the dredging industry at the end of the 1990s was mainly driven by legislation and certain clients.

Fast forward to 2022 and the dredging industry has achieved significant progress concerning its occupational health and safety performance after having adopted the right mindset over the last decades. The changes are a result of a long journey, with the necessary "learning" hiccups along the way. As well as the key moments and changes within the industry, there has been one continuous factor over the past 50 years – the motivation and willingness to improve.

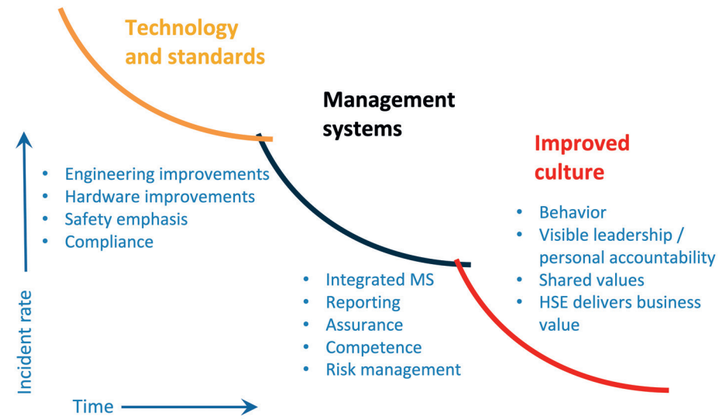

FIGURE 1

The three main shifts that improved occupational health and safety performance over the past decades.

Health and safety performance

There are three main shifts that improved occupational health and safety performance over the past decades:

1. Improvement of technology and standards.
2. Implementation of management systems.
3. Change in culture.

The theoretical scheme in Figure 1 shows how these three shifts influenced the reduction of the incident rate over time. However, it is important to note that today the three topics cannot be separated and continuous effort given to all three is necessary in order to improve even further. This is especially the case when, for example, new activities are implemented and new equipment is used such as in the renewable energy market.

Safety culture concept: Hearts and Minds model

The Hearts and Minds model originated in Shell and is based on a £20 million research programme carried out in the 1980s, 1990s and 2000s – research that is still going on today. The fundamental concept behind Hearts and Minds is that the implementation of a safety management system is the starting point to improving safety and operational performance, not the end. Through leveraging the people in an organisation, companies can improve the way tasks are performed, the conditions under which they are performed and the safety management system itself – thereby improving the "culture" of the organisation. Improving the culture can not only improve safety, but also efficiency and well-being.

> **There has been one continuous factor over the past 50 years – the motivation and willingness to improve.**

An organisation's safety culture is "the way we do things around here in respect of safety". It is a simplified way of understanding the common attitudes, beliefs and behaviours of a team, project or organisation that results in their collective approach to managing safety. Culture improvements are a way of improving safety that do not focus on individual workers, but on an organisation as a whole. Ultimately, an organisation with a high level of safety has created an environment and means that encourages and enables a safe operation.

The concept of safety culture was first introduced by the INSAG (International Nuclear Safety Group) who attributed the cause of Chernobyl Nuclear accident to a lack of safety culture. The concept of "safety culture" relates to a general concept of dedication and personal responsibility of all those involved in any safety related activity at a nuclear power plant. The Chernobyl accident was assessed with this "culture" concept and they concluded that not only those involved in the operational stage lacked an adequate safety culture, but also those involved in other stages of the lifetime of a nuclear power plant (i.e. designers, engineers, constructors, equipment manufacturers, ministerial and regulatory bodies, etc.).

Safety culture ladder

The safety culture ladder (shown in Figure 2) characterises the different levels of cultural maturity and the change process that is necessary to achieve a lasting change at the personal and organisational culture level. The various characterisations of the cultural levels help organisations to discover the gap between their present level of cultural maturity and the aspired level.

Experience shows that by using a maturity model in a transformation process people become aware of the gap between the aspired level and their current attitude and behaviour, and through several steps develop the desire to commit to the required safety behaviour.

FIGURE 2

The safety culture ladder.

At the lowest level of the ladder, we find the "pathological culture" where nobody cares to understand why accidents happen and how they can be prevented. At the highest level, the "generative culture", HSE is no longer a topic of separate discussions. HSE is totally integrated in the business and therefore part of everything that is being done. In between, there is the "reactive stage" in which a great deal of attention is given to safety after an accident has happened. In the "calculative stage", people are of the opinion that they have everything in place. They can "tick the boxes" and demonstrate that everything necessary, according to the books, is being done. In the "proactive stage", they have everything in place but are still looking for further improvements.

Conclusions

Under pressure from its offshore customers, the dredging industry took measures in the 1990s to systematically reduce the number of industrial accidents. A number of phases (see Figure 1) were completed that are comparable to other industries: 1) improvement of technology and standards; 2) implementation of management systems; and 3) culture change.

In the past decade, all major dredging companies have started a company safety programme with attention to safety awareness and behaviour with the aim of continuously improving safety performance. The overall goal being to grow towards a proactive safety culture. To achieve this goal, genuine attention from senior management is indispensable. The Hearts and Minds model offers perspective for an organisation to take feasible steps.

Gradually, safety is gaining awareness and attitude among management, employees and contractors, and companies are building a mature safety culture that ultimately influences a safe working environment in day-to-day operations.

CASE STUDY 1: SAFETY CULTURE OF VAN OORD

Since 2013, QHSE Director, Ton van de Minkelis has been involved in the safety journey of Van Oord. Responsible for continuously driving the safety culture to a higher level, he describes his experiences and the key interventions that have proven successful in continuously reinforcing safety awareness and behaviour within the organisation.

Safety in practice

In the years 2003–2010, Van Oord set up a fully integrated management system, certified at the time against the well-known international quality, environment and safety standards. It is noticeable that the number of registered accidents within the organisation increased in the first few years (Figure 3). This is explained by the fact that an organisation starting to implement an incident procedure must learn to report incidents. In general, only major incidents are reported in the initial phase involving people who suffer permanent injuries or worse. The peak in the numbers in 2007 can be explained by the fact that Van Oord executed a number of large-scale projects in the Middle East involving many foreign employees. This served as a turning point for the industry when awareness arose that procedures in themselves do not actually improve safety in day-to-day operations.

As a result, Van Oord made a start on putting the paper management system into practice. A QHSE department was set up to develop practical instructions and training tailored to the inexperienced employees who were recruited and deployed locally. In retrospect, this effort and supervision of the construction site paid off. A fact also reflected in the accident figures.

Management attention to safety

In 2011, senior management became acquainted with the Hearts and Minds model and asked an external consultancy to supervise a safety culture programme.

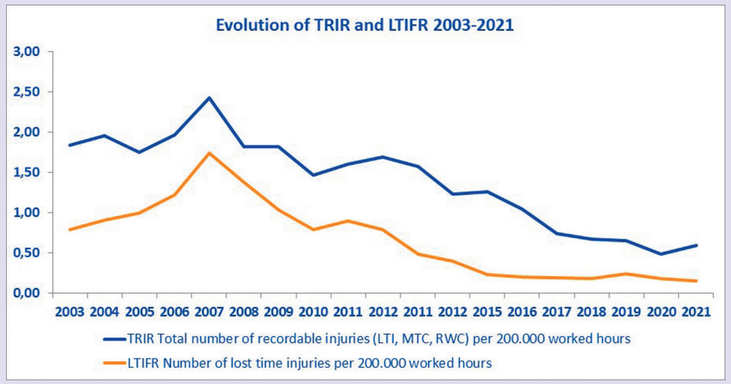

FIGURE 3

Number of personal injuries within Van Oord over the past 20 years.

Discussions were held with the top 40 executives of the organisation about their perception of safety and what ambitions they had regarding the safety performance of the company. Based on these conversations, the consultants concluded that management was, at that time, very reactive; step two on the safety culture ladder (see Figure 2). The consultants explained to senior management that their own behaviour was key for success. Whilst the result was the ambition to create a proactive safety culture, senior management realised there was a long road ahead in changing the culture. And so the decision was taken to recruit a senior QHSE professional who would be an integral part of the Management Committee.

Safety Leadership Training programme

In 2013, as the new QHSE Director, I started developing a Safety Leadership Training (SLT) programme. The content of the training, in addition to an explanation of the loss–control risk model, is focused on behaviour, leadership, exemplary behaviour and cultural factors that are important. Time is given to discuss the dilemmas encountered in practice in an interdisciplinary manner. When the programme began, the plan was to train all managers and vessel captains of the company within two years. Looking back on this first period, the active involvement of the CEO and COO was extremely important. They emphasised the importance of safety at the start of each training programme and received the improvement proposals from the group at the end of the day, which they then discussed in the evening.

Later, the target group was expanded to include all key personnel within the organisation, including staff departments. After a two year break due to the COVID-19 pandemic, the 100th SLT will be held this spring. During the course, participants are introduced to the safety culture of Van Oord and learn what is expected of them as leaders. It also provides an opportunity for people to meet new colleagues from other departments and to discover that everyone can contribute to safety from their own discipline. It became clear that the success formula of the Safety Leadership Training programme is: multidisciplinary groups of participants; time in the programme for participants to reflect on their own role as a safety leader; and that an Executive Committee member is always present to interact with participants.

Monitoring the safety culture

Safety culture is intangible and difficult to capture in objective measures. However, it is important to test a safety culture programme for its effectiveness as well as to evaluate which aspects should receive more attention in the programme. In 2014, TNO was commissioned to measure the effectiveness of the Safety Leadership Training (SLT) programme and to investigate the safety culture among the top 450 managers within the company. The survey showed that the safety culture had transformed into the calculative stage (see Figure 2). In addition, the safety behaviour of supervisors who had participated in the SLT was assessed more positively by their colleagues and direct reports.

In 2016, the measurement was repeated amongst all employees of the organisation. The awareness of the new corporate safety campaign was also measured. The results of this survey indicated that most departments and areas scored quite well on the proactive safety level. The extent to which staff feel safe to speak out and give feedback was also measured. This showed that giving feedback to each other and being open to feedback should be improved. In 2018, the decision was taken to certify the safety culture on the basis of the NEN Safety Culture Ladder (SCL) Certification Scheme. Without additional measures, Van Oord has been certified at level 4 SCL from that time on.

> **Whilst the result was the ambition to create a proactive safety culture, senior management realised there was a long road ahead in changing the culture.**

FIGURE 4

Van Oord's safety principles and life-saving rules.

Corporate safety campaign: Say YES to safety

It is important for a large company to develop an appealing safety campaign that is in line with the company values. Derived from the company values "care" and "working together", five safety principles were defined as guidance for personal behaviour expected of all Van Oord staff and contractors. The safety principles are about taking responsibility for health and safety, leading by example, giving feedback and being familiar with the procedures and reporting incidents.

Nine life-saving rules (see Figure 4) have been defined on the basis of the analyses of serious accidents from previous years. The common safety icons used in the industry were used, where possible, for the campaign materials.

Risk management

The basic principles for managing and mitigating project risks are contained in a well-organised process covered by the HSE risk management flowchart (see Figure 5). Hazard Identification and Risk Assessment, Job Safety Analyses (JSA) and Permit to Work (PtW) and the Last Minute Risk Assessment (LMRA) are used

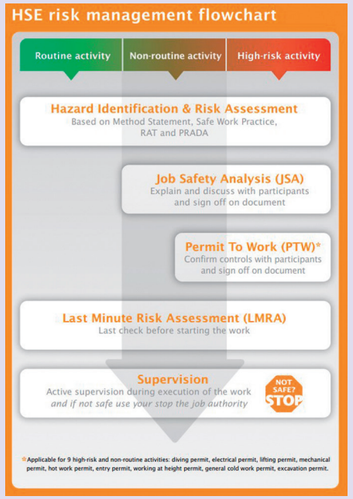

FIGURE 5

HSE risk management flowchart.

in all companies within the dredging industry. Within Van Oord, safety tools are explained in a practical training course, which is mandatory for all project employees. The success of such safety tools strongly depends on how they are used in practice. The role of the direct supervisor is therefore decisive in this regard. That is why active supervision and the openness and trust to stop the job are integrally part of the model.

New role of HSE professionals

Getting the company's HSE staff involved in the transformation of the organisation's safety culture should not be forgotten, as they too must change their approach and behaviour. An unambiguous approach and use of the safety procedures by all HSE professionals is in itself a challenge. However, if an organisation shifts to a proactive safety culture, HSE professionals must learn how best to ease the transformation process. The line/project managers will feel intrinsically responsible for safety and will demand more and different requirements from the HSE professionals on their projects. The role of HSE staff is shifting from a hand-on safety officer on site, to a sparring partner who has to provide safety/technical support in the design and project preparation phase and a more coaching role in the execution phase of a project.

Continuous attention to safety culture

Experience shows that after years of a declining trend in the number of accidents, the safety performance of Van Oord remains at a plateau (see Figure 3). This is a critical moment. It is the phase in which senior management is quite satisfied with the outcome of the culture programme. The sense of the "new" is gone and the top of the organisation is occupied with new issues that require priority, such as sustainability and digitisation.

Complacency is lurking and the chance that the safety culture will fall back is a real danger. In 2019, a number of serious accidents occurred within Van Oord in a short period. This served as a wake-up call and prompted the company to organise a large-scale safety event, the Safety News Alert. Following its success, another major event was organised in 2021 with the theme Thanks to Safety, where the subject of mental health and well-being was explicitly discussed.

Maintaining and improving the safety culture of an organisation is a long-term process. Constant attention to safety at all levels, with a focus on learning from mistakes and improving processes is necessary. In addition, training and educating newcomers is essential to the company's safety performance. It is vital that they know what is expected of them and understand the importance of their contribution to safety for the company as a whole.

CASE STUDY 2: SAFETY CULTURE OF JAN DE NUL

With over 23 years as a QHSSE specialist, Christophe Leroy has worked on many international dredging and offshore projects. He has seen many changes and transitions in the approach towards occupational health and safety in the dredging industry over that time. He shares his experiences in his role as QHSSE Manager for Jan De Nul, having built the company's safety management system and culture.

The importance of training

My first few months as QHSSE advisor working for a joint venture (JV) on an offshore project was a challenge. For a start, I was the first QHSSE advisor working on international projects for Jan De Nul Group. As a result, no one in the company was able to train or guide me in my new function, except for some external persons with oil and gas experience who had been hired for the project.

The situation today is completely different. An extensive training programme is in place for all new personnel joining the organisation. This includes an intensive four weeks familiarisation with the company, the business aspects and the management systems, etc. Training of personnel within Jan De Nul Group is continuous throughout an employee's career. It is both essential for personal development as well as for the continuous improvement of company performance.

The importance of training and education is increasing due to fact that the number of trainees is significantly on the rise. This can be attributed to several factors, such as more vessels, shorter swings (i.e. 6 weeks on/6 weeks off opposed to 2 months on/1 month off), less seafarers, more sophisticated equipment and techniques, etc.

Slowly but surely, the mentality towards occupational health and safety in the maritime industry changed.

Today, QHSSE professionals are an integral part of project teams.

Therefore, we focus on:

1. Safeguarding knowledge, following both failures and successes.
2. Sharing knowledge: on the job, but also by means of traditional classroom sessions.
3. Enhancing skills via simulation-based training, involving the use of equipment and computer software to model a real-world scenario.
4. Improving guidance and support from head office to assist the teams on board and on site.

The changing role of a QHSSE advisor

Going back to my first assignment within the company, within the JV, my tasks and responsibilities were not clear – not to me, nor to my colleagues. A QHSSE advisor was a kind of nuisance on site, an obligation under the contract with the oil and gas client and not as a benefit to improve the overall process. Some examples: The instructions that I received from the JV project management was "to keep the client satisfied with reports, without causing too much trouble for the people carrying out the work". After an incident investigation, it was stated "we use our equipment until it breaks" versus planned maintenance. On my second project, the primary tool of a QHSSE advisor was a camera to "catch people". Oil spills, large or small, were not considered as important.

Fast-forward 23 years and it's a very different story. Today, QHSSE professionals are an integral part of project teams, working together to assess and control all aspects of the works. Incidents are thoroughly investigated and preventive actions are put in place to prevent reoccurrence. Assets are subjected to rigorous planned maintenance systems. Spills of any type, large or small, are taken seriously and even more important is the mentality that "prevention is better than cure". Needless to say, the education of occupational health and safety professionals has improved tenfold over the years. For instance, in Belgium, the Masters programme in Prevention and Environmental Management, which did not exist 20 years ago, is widely popular and a huge success.

Occupational health and safety ambitions and subsequent performance used to be client or audit driven. However, slowly but surely, the mentality towards occupational health and safety in the maritime industry changed. The initial support to do so came from oil and gas clients, as well as government legislation. At a later stage, renewable energy clients also set the standards. QHSSE in general became more professional and had a larger contribution on the safe way of working. Companies now have the maturity to define their own values and ambitions. Companies strive for a high safety performance because it is important for themselves, not because a client or auditor asks them to do so.

Safety standards and certification

Besides the influence of clients, the implementation of the ISM code on board of vessels resulted in a large shift in mentality and performance. When I started in 1999, all but a few vessels of the Jan De Nul fleet had gone through the complete process of ISM certification. One of my tasks was to assist the last remaining vessels for their intermediate audit. During the preparation of these vessels, it was obvious that safety management systems were not sufficiently organised or implemented on board. For example, regarding fire drills, fire suits were found in original packaging, there were no assigned firefighting teams and crew had not even been trained on how to put on the fire suits.

The situation today is that the implementation of a safety management system as per ISM has been a huge lever to raise the safety performance on vessels. This includes creating safe working practices and working environments, making suitable safeguards against potential risks and continuously improving the safety management skills of personnel, as well as the development of emergency response plans for both safety and environmental protection. By adopting the Offshore Vessel Management and Self-Assessment (OVMSA), Jan De Nul aims for the higher level of safety.

In the 1990s, many large companies were already ISO9001-certified. The standard for

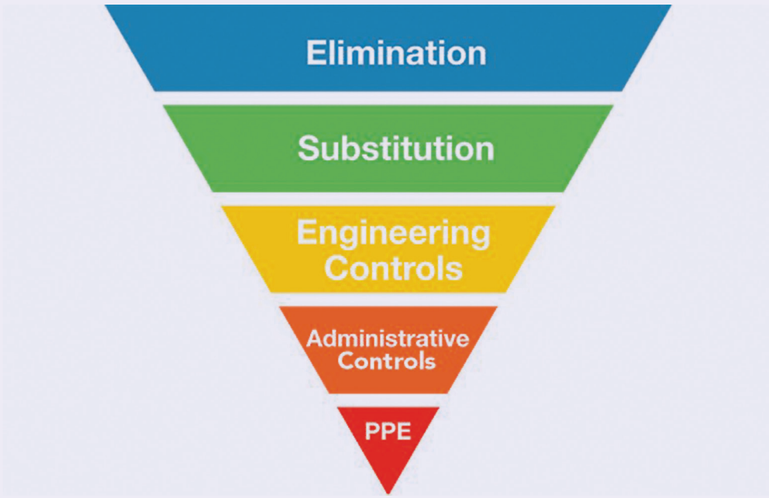

FIGURE 6
Hierarchy of controls.

Quality Management Systems was first published in 1987. In 1996, two standards were released covering management systems for occupational health and safety (OHSAS 18001 – today known as ISO 45001) and environmental (ISO 14001). While implementing these standards, the focus was often "how to pass the next audit" and procedures were adopted "because the auditor raised a non-conformity".

The implementation and follow-up of a management system is very much incorporated in today's daily business as it keeps us from deviating. Improvements are made to adopt one integrated management system instead of various management systems that co-existed next to each other. There is a wide range of audits and inspections. Every week, audits are performed by external parties, such as authorities, clients, certification bodies or internally. The number of safety drills per year is more than 1,000.

Safety by design

Planning the work and dealing with risks was more a matter of paperwork in the old days. Risks were often mitigated by defining the correct Personal Protective Equipment (PPE). Employees were not too much involved when risks and mitigating actions were defined. Today, as part of the Plan-Do-Check-Act circle, risks and opportunities are assessed during every step of the process, from company and project level to Last Minute Risk Assessment (LMRA) on the work floor.

Dealing with risks brings us to the hierarchy of control pyramid (as shown in Figure 6), which is a system for controlling risks in the workplace. It is a step-by-step approach to eliminating or reducing risks and ranks risk controls from the highest level of protection and reliability through to the lowest and least reliable protection. Eliminating the hazard and risk is the highest level of control in the hierarchy, followed by reducing the risk through substitution, isolation and engineering controls, then through administrative controls. Reducing the risk through the use of PPE is the lowest level of control.

Today, safety awareness is such that PPE is only the last resort and safety by design – that aims to anticipate and prevent harm that might occur while using equipment rather than trying to implement remedies after the harm has occurred – is the start of each new project.

A way to build strong employee buy-in is to involve them in the process from day one. Establishing a safety committee with employees from all areas of the organisation provides a forum for different opinions and issues. Some examples are the on board safety committees and the safety awareness programme Image-Think-Act (ITA) and its ambassadors through whom a two-way communication concerning safety issues are addressed.

As the scheme in Figure 3 shows, the incident trend in Van Oord decreased, until a certain bottom was reached. All systems were in place but serious accidents still occurred all too often and other actions next to improving the management system were required.

Unfortunately, also within Jan De Nul Group, we reached that moment in 2014 when two serious incidents occurred within a short period. The conclusion was that no additional procedures were required but the culture and awareness of people had to be improved. Also in this respect, the oil and gas sector paved the way with the Hearts and Minds model. It took a long time before everyone was convinced that having incidents is an indicator for processes not under control, resulting in a higher chance of damages and a less profitable business.

Positive approach and collaboration

The dredging industry has significantly grown. Occupational health and safety has even been incorporated in Corporate Social Responsibility (CSR) policies. Health and safety does not only create a better working environment for own co-workers, but also for those people and stakeholders involved and affected by the activities. CSR is nothing else than a "duty of care", an expression which has been around since the 1800s.

In 2015, Jan De Nul Group launched its first campaign to improve the safety culture across the entire company. The campaign Image-Think-Act (ITA) promotes safety awareness focussing on: 1) leadership; 2) critical risks and life-saving rules; 3) ownership and accountability (Just culture); and 4) communication. The ITA programme focusses on operational control, i.e. the way to achieve less incidents instead of just achieving the target of less incidents. In 2021, the ITA programme was supplemented by the Code Zero programme that focusses on the goals "Zero Accidents", "Zero Waste", "Zero Emissions" and "Zero Breaches".

Companies used to be ashamed of incidents. There was no openness; lessons were certainly not shared with outsiders and sometimes even not with insiders. Since I joined IADC's safety committee in 2014, I have been actively involved in promoting a more open environment where dredging contractors can learn from each other's lessons. The purpose is still to grow as an industry. Safety is less considered as an area where the different contractors need to compete with each other but more as a possibility to improve as a whole. This open culture is a clear sign that the dredging industry as a whole has developed to a higher level of safety culture.

Instead of analysing incidents, where we focus on the negative impact, we shift our focus to successes. I once came across the comparison with the way a football coach manages their team: more games are won by addressing what the players do well instead of pointing out their weaknesses. That positive approach works is also translated to our industry in monitoring leading indicators (e.g. number of trainings, reporting of near misses, etc.) and adopting a positive safety culture, which is easier to build and maintain amongst employees.

Collaboration amongst various teams can create the right synergy to improve processes and work situations. Therefore, Jan De Nul Group has established an operational control committee, one for each of its business units, with members from various departments. On a monthly basis, improvement suggestions rising from good ideas as well as from incidents are analysed and concrete actions are defined to share knowledge and continuously improve the safety and operational control level.

> **This open culture is a clear sign that the dredging industry as a whole has developed to a higher level of safety culture.**

Summary

This article explores the progress of health and safety in the dredging industry and HSE professionals, share their experiences in building the safety culture within marine contractor organisations. Having built the safety management system and culture of Jan De Nul, Christophe Leroy shares his knowledge and lessons learned during his career within the dredging industry. And Ton van de Minkelis describes the systematic approach he has successfully applied to raise the safety culture at Van Oord to a higher level.

Ton van de Minkelis

Ton holds a bachelor's degree in Mechanical Engineering and a masters in Industrial Engineering and Organisation Development from Eindhoven University of Technology. From 1990-1993, he worked as a manufacturing engineer at Fokker Aircraft and in 1993 became Technical Manager at Det Norske Veritas responsible for all certification schemes in Benelux. In 2000, Ton joined Fokker Aerostructures as SHE-Q Director. Since 2013, he is QHSE Director of Van Oord, responsible for the deployment and improvement of the QHSE policy within the global organisation.

Christophe Leroy

In 1996, after completing two master degrees in Electro-mechanical Engineering and Civil Engineering, Christophe worked as a civil superintendent for Mansfelder Kupfer und Messing in Germany. In 1999, he joined Jan De Nul Group as Project Quality/HSE Manager and for 14 years worked on various international dredging and offshore projects around the world. Since 2015, Christophe is QHSSE Manager, responsible for the Quality Health Safety Security Environmental vision and strategy of the entire Jan De Nul Group, including daily development and implementation of QHSSE systems and monitoring the QHSSE performance.

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