



DREDGERS ARE MADE, NOT BORN: EDUCATION AND TRAINING FOR A CAREER IN TODAY'S MARITIME CONSTRUCTION INDUSTRY

ABSTRACT

The intricacies of today's maritime infrastructure construction and dredging industry require a highly skilled workforce. Given the variety of the types of skills needed, companies are on a constant look out to recruit top-notch people from all levels of the educational ladder. The process is twofold. Firstly, candidates must be found, not only from technical secondary schools and technical universities, but also from economic, legal and managerial backgrounds. Secondly, and equally important, an integral element in recruitment is retainment. More and more companies are offering the promise of "continuing education" for employees. For the member companies of the International Association of Dredging Companies this continuing education may take the form of on-the-job training, as well as specialised outside education and training provided by the employer to support employees in further developing their intrinsic talents and existing skills. The aim of these programmes is to provide opportunities to transform "a job" into a career. This offers an employee a chance for growth and at the same time guarantees the companies a successful transition into the future.

INTRODUCTION

One hundred years ago when dredging was a family business, workers in the dredging industry were born, not made. Expertise was handed down from grandfather to father to son. Not so in the 21st century. The modern international dredging company is a large corporation with thousands of employees, with affiliates worldwide, linked to many subsidiaries and joint ventures, where work is often far from the headquarters or home base. The complexities of economic and environmental issues, the enormity of the vessels in size and in variety of functions, and the technologies with which these ships are equipped, are beyond the expertise of a single individual, beyond transference of information simply by word of mouth.

In fact, be it capital or maintenance or remedial dredging, the construction of airports, harbours, land reclamation or offshore projects, maritime infrastructure

Above, Dredging and maritime construction projects take place all over the world. They require a highly skilled workforce, people who are able both to work as a team and to take individual responsibility for details and safety.

construction is a more accurate description of the activities of modern dredging companies. And these maritime construction projects require teamwork. A typical team may comprise financial planners, contract experts, project managers, site investigators, scientists, engineers, dredge masters, skippers and mechanics.

In that context it has become incumbent upon the companies themselves and the educational institutions to promote understanding of what dredging and maritime infrastructure construction mean to society. The industry must learn to enhance its own social status and prestige (NAS, 2005) in order to attract qualified people.

To reach the goal of finding and hiring the best and brightest young people, companies must actively recruit new personnel on all levels to fill a wide range of positions, from dredging crews to research engineers, men and women who are highly trained in their particular fields of expertise. Dredging and maritime construction companies nowadays depend on structured and structural education and training programmes. As a recent article in *The New York Times* described it: "One thing that executives at even the most successful corporations



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struggle with is how to lure talented candidates into their organizations or professions...how to 'incentivize' a job... so that an entry-level position has a chance to become a lasting career" (Gertner, 2006).

RECRUITMENT

To begin with, international dredging companies are in competition with other related maritime industries, and with each other, to attract well-qualified candidates. That means that Personnel & Organisation (P&O) departments must clearly define the needed skills and development opportunities, and offer a package that rewards ingenuity, dedication, and the long

hours intrinsic to the dredging industry. To attract quality candidates, a particular entry-level position should be seen as a stepping-stone to a broader-based, long-term career.

There are a wide variety of possible careers within a dredging company, ranging from jobs on-board immense dredging vessels, to civil and maritime engineers and project managers. Dredging companies often look for well-educated people in the obvious places – from technical universities, students in the fields of civil engineering, technical earth sciences, environmental science and industrial design. They also look at people in other higher education organisations in shipbuilding, hydrography and maritime officers, safety/quality control engineer, surveying and dredging technology. Other related but significant areas of study necessary to the modern dredging industry include lawyers, contract specialists, economists and accountants. But for personnel departments, defining the job title is only part of the "job". Dredging is a dynamic industry that demands certain personal as well as educational characteristics. Independent thinkers and problem solvers are sought, people who are able to adjust to



Figure 3

challenging circumstances. People with leadership qualities who are able to think long-term and imagine the next generation of technologies and projects. And common to most positions in the dredging industry is the interest in a diversity of cultures and the desire to experience these cultures firsthand (Figures 1 through 4).

Figure 1



Figure 2



The dredging industry needs personnel with a wide variety of skills and dredging and maritime construction often means working on-site, day and night, in distant countries. Figure 1. Crewmembers preparing to change the cutter head in Jamaica; Figure 2. Pipe and cable pull at night for an offshore project between Singapore and Indonesia; Figure 3. A surveyor taking measurements in the water; and Figure 4. Crewmember onboard operating the control panel.

Figure 4





Figure 5. Young people are the core of vitality in a dredging company. Here a group of younger personnel are attending an in-house course.

WORK-STUDY

Working and studying simultaneously has gained more and more favour over time. As the costs of studying increase, and the technical know-how grows more specialised, work-study programmes become more attractive. Attractive to students who often are able to earn some income as they continue their studies, and to the employers who are able to gain insight into the qualities of these potential full-time employees.

In this framework, the member companies of the International Association of Dredging Companies offer internships for qualified students to get hands-on experience working within the company for a period of time ranging from three months to a year. Often these interns are placed on projects abroad where they get a real understanding of the demands, challenges and excitement of major maritime infrastructure works. These on-site assignments abroad at dredging and construction sites are opportunities for the young engineer or crewmember, to gain a real feel for the industry, applying to a practical situation the theoretical lessons they have learnt in the classroom. As part of coordinating these internships, a mentoring programme is often in place as well. Mentors ensure that the interns know that, whilst in one sense they are being thrown into the deep, on the other hand they are provided a life jacket. A good mentor from within the company is essential to maximising the student's learning experience. At the same time the

mentor is introducing these young people to the culture of the company, and evaluating the ease with which they adapt to unusual situations that living and working abroad can present.

Cooperation with universities

IADC companies also work with universities and technical schools in their respective countries, by sponsoring or financially supporting research for thesis projects in areas that the company has targeted as potentially useful. Very often a good relationship with leading universities is also maintained through joint technical research between an in-house technical institute and the universities' technical and engineering faculties.

University research is an important platform for Research & Development and has resulted in important discoveries for the industry, such as more efficient turbidity modelling, improved cutter teeth, and environmentally more sensitive dredging methods.

At the same time, this cooperation provides a source of students who can become potential employees with insight into the industry. Indeed, the interaction of university research and practical implementation by the dredging industry "has been of major importance in showing the way forward in the development of dredging equipment," as the late Prof. de Koning (1993) remarked. Clearly there is a symbiotic relationship between the industry and educational institutions.

PRESENT STAFF, SENIOR MANAGEMENT AND INTRAPRENEURSHIP

Whilst attracting new employees is an ongoing activity, attention is also being spent to the present pool of employees working within the IADC companies. The aim is to help them evaluate and achieve their own personal goals and also to provide a clearer growth and career path. These programmes are not only in areas of technical expertise but also emphasise personal development and leadership qualities. They provide an incentive for employees to remain in the company, using their skills for long-term career development (Figure 5).

Most recently some IADC companies have instituted courses or training programmes that focus on in-depth technical expertise and senior management abilities. With regard to senior management abilities, the emphasis is on encouraging what has often been called "intrapreneurship". That is, encouraging amongst other things, daring and foresight, qualities that one finds in an entrepreneur, but then within the context of the company. Intrapreneurship is an excellent means of revitalising individual jobs, as well as a method for revitalising business processes more generally. The entrepreneurial spirit is also characterised by taking responsibility for managing yourself and others, improving the financial performance of projects, recognising and minimising risks including financial risks, and envisioning new commercial and marketing possibilities.

Simulators have been tested by experienced dredgemasters and the test results indicate true-to-life operating situations. Utilising a simulator allows efficient training of larger numbers of people annually, in different and difficult situations which would be too risky to do at sea. Figure 6. Control panel of a simulator for a trailing suction hopper dredger.

Figure 7. A simulator for a cutter suction dredger.

The importance of leadership and management skills in the modern maritime construction industry cannot be underestimated. The enormity and complexity of tendering, designing and constructing a project demands a multitude of organizational skills. Quite often the services of outside management training organisations and consultants are being utilised to develop extensive coursework, which has been customised to suit the particular needs of the dredging industry. Through training techniques, such as Competency Management, IADC member companies are fulfilling a double goal: helping employees develop their own potential and simultaneously preparing a new generation of managers.

PERSONNEL FOR THE FLEET

Of course the basics of dredging require highly skilled crews, skippers, ship engineers and dredge masters. With the increased technologies and size of current dredging vessels the need for "continuing education" on this front is more demanding than ever. To that end, the companies in cooperation with schools, such as Shipping and Transport College in Rotterdam (STC) as well as IHC's Training Institute for Dredging, have developed vocational courses to train new fleet personnel. Also in cooperation with shipbuilders and technology consultants, IADC companies have provided input for so-called simulators for training the "next generation" of crewmembers about the "next generation" of equipment (Figures 6 and 7).



Figure 6



Figure 7

Training simulators for trailing suction hopper dredgers

With the growing fleet of large trailing suction hopper dredgers (TSHDs) as well as shorter working times per crew, there is a need for more dredge operators. To increase capacity and reduce risk, TSHD training simulators (Figure 6) have been developed to supplement theoretical and onboard training.

The advantage of a simulator, with a dredge control desk replicating that installed on a modern-day TSHD, is the ability to train for difficult situations, whilst in practice such exercises are hard to create and are preferably avoided. When mistakes are made they can be corrected without harm. In addition, training costs are considerably lower on a simulator as several people can be trained simultaneously.

All related processes including sensors, actuators and the dynamic relationship between the processes can be simulated to obtain a realistic process. Actuators (pumps, valves, doors and so on) can be controlled manually as well as automatically using the installed automation equipment. The instructor can initiate dangerous process situations or faulty equipment to teach the trainee (operator) to find the fault by using the on-board diagnostics. Furthermore, all powers for jet-water, pump-process, trailing and auxiliaries are calculated to simulate the load of the diesel engines. The operator has to optimise the dredging process within the load limitations.

Software for the simulators is elaborate, and simulators can be adapted to the characteristics of different TSHDs by selecting a number of specific options at the start of the training session, for example as electrical or direct driven pumps, drive-mode of gearboxes, and suction tube configurations. The hardware of a simulator consists primarily of an integrated bridge, equipped with touch-screen monitors and the related controllers and indicators for the suction tubes, yield, potentiometers for adjusting the engine speed of the diesels, and various (emergency) controls for valves and pumps.

Cutter dredger training simulators

Simulators have also been developed that mimic the equipment and monitors of a self-propelled cutter dredgers (Figure 7), which similarly are implemented for crew training. Here too the same rules apply: training on-board complicated cutters can lead to unwanted damage and loss of productivity, so a cutter simulator affords the trainee the opportunity to learn without risks. The correct usage of pumps, including optimal speed, influence of pipe diameters, wear and tear, nature of the seabed, anchoring, automation, and other practical examples of regulation of a cutter are all given attention. The set up of the simulation system is based on automation techniques recently developed and applied to the automation of several dredgers, and can be best typified as "Flexible integrated monitoring and control automation". Evaluation methods for the training have

also been developed (see the IHC website). These simulators are essential to the updated training for dredge masters, captains, machinists and pipe-operators to work with the newest state-of-the-art vessels as they are developed. And once again, costs and risks are minimised.

In addition to the simulators, IADC companies organise in-house courses and participate in external programmes on a regular basis so that their crews are kept up-to-date for on-board safety, First Aid,

resuscitation courses, as well as global maritime distress and safety systems. Supplemental language courses are also made available.

OTHER "CONTINUING EDUCATION" POSSIBILITIES

The International Association of Dredging Companies as the largest umbrella organisation of the private dredging industry also plays a role in ensuring the



Figure 8. The IADC Seminar in Bahrain. This international group of participants, shown onboard a dredger, were underway to visit the site of a dredging project to get a firsthand impression of the enormity of maritime infrastructure projects.

highest standards of professional conduct and training for both the professionals within the member companies as well as for their potential clients and partners. Over last fifteen years one way in which the organisation has striven to support this goal is through educational seminars. There are now several such seminars being presented intermittently throughout the year, and throughout the world.

The newest addition to the IADC roster is "Conference and Workshop on Contract Management for Dredging and Maritime Construction" which took place for the first time in London, UK, October 12-13. Organised by the Institution of Civil Engineers (ICE) on behalf of the IADC and the Central Dredging Association (CEDA) with the support of FIDIC, the conference aims to develop amongst contracting partners a positive approach to planning, designing and executing maritime construction projects.

On the agenda as well is the annual UNESCO-IHE International Seminar on Dredging and Reclamation developed by IADC and held in Delft, the Netherlands. This year the seminar was also presented in Bahrain in November 11-15. This week-long seminar provides younger professionals with practical insights into the industry. Some of these young men and women work *within* the IADC companies, though often they are clients who work *with* the IADC companies (Figure 8). From IADC's perspective it is to everyone's advantage to have partners who better understand the nature and complexities of land reclamation and other dredging projects. The next seminar in this series will be presented in Tampico, Mexico from March 26-30, 2007.

Another landmark course, given under the auspices of IADC and CEDA, and organised by the Stichting PAO, is the Seminar on Environmental Aspects of Dredging. This two-day seminar was held from November 6-7 at Technical University Delft, the Netherlands, and was aimed at educating consultants and professionals from dredging and related industries as to the efforts of the dredging and maritime construction industry to work in environmentally beneficial ways.

Keeping in mind the enormous importance of "thinking green" in the modern world, the IADC member companies have supported this effort wholeheartedly.

CONCLUSIONS

The dredging of the past where knowledge was transferred from father to son through on-board practical experience is long gone. As Professor John Riddell (1996) wrote ten years ago, "...the level of technology now available in dredging has resulted in the realisation that a more formal approach to training.... has become desirable". That realisation has translated into new recruitment policies which reach out beyond national borders, into intensive vocational courses, and into the conscious development of in-house training programmes.

The 21st century dredging and maritime infrastructure industry is diverse, high tech and demands a highly educated and skilled workforce. In the last two decades, dredging has made a huge contribution to globalisation by improving worldwide infrastructure. Projects such as airports built on reclaimed land in the water in Hong Kong, Kansai and the New Doha International Airport as well as entirely new land masses for residences and recreation in Dubai, the many "Palm Islands", the World, and now in Qatar, the Pearl are characteristic of modern-day dredging projects. Add to this building new and expanding old harbours as at Le Havre, and offshore projects like LNG terminals in Raslafan and Sakhalin and you get a better insight into the diversity of maritime infrastructure construction.

These mega-projects are often the result of major joint ventures and are dependent on the dedication and creativity of a wide range of professionals, not only with dredging skills, but also with financial, contractual, legal, organisational and managerial knowledge. Discovering, recruiting and retaining good employees are therefore a necessity. Providing incentives for long-term career development is imperative.

For the IADC companies, the importance of investing in the education and training of personnel has never been more evident and IADC companies have made this one of their highest priorities.

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