



It's the real thing at Felixstowe

Port and terminals are rapidly replacing traditional training methods with computer simulation. World Port Development has invited Drilling Systems (UK) to explain how simulation training can save time and money. Ed Ramsay, Sales and Marketing Manager for the company explains ...

In December 2004, the Port of Felixstowe, UK chose to work in partnership with Drilling Systems (UK) to develop a state-of-the-art crane simulator to be used in training employees effectively and safely. To the casual observer, this may look an odd selection, as Drilling Systems had never developed a dockside terminal simulator, and there were competing products already in the marketplace, so why did the Port of Felixstowe select Drilling Systems? The Company has been developing real-time simulators for 17 years, predominantly in the oil and gas drilling industry, hence the company name. It has supplied over 100 drilling simulators in more than 40 countries which are used for safety training and certifying key employees on oilrigs. These mission critical simulators are used to prevent/reduce incidents, such as the North

Sea Piper Alpha platform disaster in 1988 that killed 167 people. In 2000, the company extended its activities into crane simulation, having been asked by the UK Government's Health & Safety Executive (HSE) to develop a simulator for cranes on offshore oil and gas rigs, handling a wide variety of lift objects (various sized containers, pipes, crates, skips etc). During this development process, the company developed a modularised solution that would enable other crane types to be modeled in a simulator in the future. In 2002, Austrian-based Liebherr-Werk Nenzing approached Drilling Systems to provide a simulator based on its LHM-500 Mobile Harbour Crane, so this was the company's first entry into dockside container handling, before the selection by the Port of Felixstowe. The partnership between



Drilling Systems and the Port of Felixstowe has brought together sophisticated real-time digital computing techniques, with 37 years of gantry crane expertise, and resulted in the most realistic simulation of gantry craneage available today.

The development process

Using engineering/general arrangement CAD drawings as a starting point, each crane is graphically reproduced in the 3D world by initially creating a wire frame version, then "facing" it, before finally applying photo-realistic textures. The mechanics of each crane, including the performance data of the engines, hydraulics and hoisting systems are incorporated to provide a real-life replication, with the facility to tune the operating performance of individual crane models. The Morris, ZPMC and MGM ship-to-shore (STS) cranes have separate modules, including "plug and play" operator panniers (discrete controls). The easily interchangeable panniers allow different crane types to be modeled on the same single simulator. Changing the panniers takes just a couple of minutes along with simply loading-up a new simulator exercise (snapshot), with the new crane type pre-configured. 'KraneSIM' can

either include generic port/dockside equipment, or can be focused to represent an individual or group of terminals for a multi-terminal operator. The Port of Felixstowe's simulator models the exact layout of its Trinity Terminal quay and surrounding yard areas. Phase II will also include the Port's North Rail Terminal and the Nelcon rail-mounted gantry cranes (RMG). The KraneSIM Dockside simulator features dynamic rope modelling originally developed for Drilling Systems' range of offshore pedestal crane simulators. This feature allows the operator to see a slack line at either boom height (depending on crane type), or at spreader level, providing the real-life visual cues when setting down/picking up the container. The over-exuberant setting down of a container on a terminal tractor will not only be felt at the operator's chair (through the motion base system), but will also be graphically displayed through a "wave" coming up the cable. This, together with the coiling of the control line through the dynamic rope model, adds to the realism of the training process. A wide range of weather conditions can be introduced into a simulation exercise, including rain, snow, fog and day/night lighting. Wind conditions, including directional, gusting and strength, are also catered for. A dynamic sea state, affecting vessel movement, can be linked to wind strength, thereby providing further realism to the training scenarios. By accurately reproducing the dockside environment, operators see a like-for-like view of their terminal, allowing forward planning, environmental exposure and understanding of dockside etiquette. The manufacturer-specific crane's characteristics include responses to ramp speeds, frame stiffness, load and spreader movement. This accuracy assists novice crane operators in making a



faster transition to competency, reducing on-the-job training hours (OJT) and therefore reducing overall training costs. The simulator can also be used for re-assessing experienced crane operators in their "working" environment. In handling malfunctions, KraneSIM can incorporate faults that are manufacturer specific and common to particular crane models, these faults may be due to improper operator sequencing or the result of a failure in an individual component. In addition to crane specific faults, a series of generic malfunctions can be simulated either by time delay or immediate instructor input. The simulator weighs 3.5 tonnes, in comparison to the 1,000 tonnes crane it has been modelled on, and has taken 1,400 hours to complete.

Improving TEUs handling

At the recent "2005 World Class Crane Management Seminar" in Las Vegas in September, which featured a keynote presentation from Mr Guan Tong Xian, President of ZPMC, China, it emerged that training - or the lack of it - was a common theme across the industry, both in terms of maintenance and crane operation. In terms of crane operator training, the KraneSIM-6000 simulator offers more than basic level training, but many are failing to see how advanced simulation technology can improve their terminal performance. When calculating TEUs per hour, the industry generally seems to accept that incidents will occur, causing downtime, resulting in a reduction of that key 'lifts per hour' figure. However, times are changing. As the new twin 40' and quad lift spreaders are developed for the field, advanced training solutions need to be developed in parallel. The advanced nature of the KraneSIM mathematical model has made it possible to use the simulator for R&D purposes, including work with RAM Spreaders to emulate new technology and lifting concepts, reducing their design time and providing a fast and effective means of prototyping. The advanced capability of the KraneSIM simulator also

supports this requirement for improved operator training. At last, the ports and terminals industry is beginning to accept and embrace this new technology and see it providing, in part, the solution to many problems. Having established the excellent relationship with Drilling Systems, the Port of Felixstowe is already working with the company to evaluate other possible simulation solutions that will interact with the STS/RTG (rubber-tired gantry)/RMG simulator.

A virtual and safe world

The system will allow operators to be tested in a virtual operating environment, safe in the knowledge that expensive equipment will not be damaged if mistakes are made. Potentially dangerous scenarios and crane operator competence under pressure can be evaluated in a safe manner, whilst it also ensures that there is always somewhere to train, and does not rely on taking a crane out of action when training is needed. The simulator is currently undergoing a rigorous three-month testing phase in Felixstowe, to establish where the system can best be utilised. General consensus of opinion to date by all operators (both experienced and novice) who have tried the simulator has been extremely favourable. Port of Felixstowe Training Manager David Piotrowski said: "It is an incredible machine, and once we put the Phase II software on it will be able to do so much more. Crane drivers are coming in and using the simulator now and evaluating it, and they are amazed at how good it is - just like the real thing." Phase II software will include, amongst other effects, the cab moving in response to the simulated wind conditions. Piotrowski continued: "We wanted the simulator to be as close to the real thing as we could make it; not just the way it handles, but also the way different parts of the machinery move and react in different conditions." It is hoped that the simulator will improve proficiency, productivity and safety, as well as providing the means to filter out unsuitable candidates, and to spot and solve individual problems. Once Phase II is introduced, the Training Department will be able to use the simulator to test and evaluate employees, and ensure that high standards are achieved. Paul Davey, Corporate Affairs Manager for Hutchison Ports (UK) Limited, which owns the Port of Felixstowe, said: "Through this joint venture with Drilling Systems, we will be able to ensure that trainees possess the requisite skills and professionalism to cope with the rigorous demands of today's busy port environment, before they even set foot in any of our equipment." ■