CM Labs Simulations - Port equipment simulation training

solutions based on authentic machine behaviours, accurate controls, and machine features

the challenge

Port operations can be hazardous, and particularly so for equipment operators. Operators are manipulating heavy loads using complex equipment, in dynamic operating environments. Operators also play a big part in the safety of others on the quay as they are the ones operating the equipment and their actions may impact other people – ITV drivers, people on the ship, people present on the quay.

According to a 2016 report from the International Labour Office, port work is regarded as an occupation with "very high accident rates" *despite* new and sophisticated innovations. Highlighting the risk to operators, a 2020 Port Skills and Safety report indicated that berth/quay were the top accident location in ports, accounting for 42.2% of all accidents.

Even under the best of conditions, operators have to be able to perform under a diverse set of operating conditions due to the 24/7 nature of port operations. However, even under the best of circumstances, the work is dangerous.

In the event of prolonged surges in vessel calls, for instance, pressure is exerted on maintenance and repair scheduling. This increases the likelihood of equipment malfunctions that expose operators to potential risk, including injuries or fatalities.

Other unexpected events or difficult weather conditions can provoke errors of judgment and destabilize the preparedness of even the most experienced operators.

Given these conditions, in most industries the solution is obvious: train, train, and then train some more.

But port terminals do not always have the luxury of dedicated instructional facilities or even regularly scheduled training, due to a lack of operational downtime, a lack of equipment dedicated to training, or both.

Ultimately, the challenge is to provide operators with a safe, effective means to train, so that they are prepared for the rigorous demands of port terminal operations.

the innovation

Simulation has long since earned its place as an operator training tool. However, when trainees get to the real equipment, they have traditionally needed to overcome “gaps” in simulation realism and undo the effects of any negative training.

As equipment has become more complex, this gap has become more pronounced. In complex, high-pressure environments, such as busy port terminals, this gap presents potent risks.

CM Labs Simulations' innovation has been to solve the realism gap by developing port equipment simulation training solutions based on authentic machine behaviours, as well as accurate controls and machine features. It is not just the machine and its physics – CM Labs works to model the operational conditions, so that operators become more familiar with how they should operate the equipment.

The key to this breakthrough is the true-to-life equipment behaviour embedded in CM Labs Simulations' training solutions. This realism emerges from the design work of CM Labs' experienced mechanical engineering group, together with input and validation from customers, seasoned operators, and other subject matter experts. In parallel, software engineers work in CM Labs' Vortex software engine to bring the realism to life in the shape of a holistic training tool that includes a wealth of learning and instructor tools.

Unlike other simulation developers, CM Labs' mechanical engineers have been collaborating with OEMs for decades, as well as with their expert operators—all with the goal of capturing the precise features and movement of the equipment in life-like operating conditions, so

there is no training gap for operators to overcome. The CM Labs team also has partnered with academic institutions in order to develop these innovative solutions.

The result: port terminals now have access to an innovative training tool that operators can use to develop focused skills while gaining familiarity and confidence, before setting foot inside the actual equipment.

how it was implemented

CM Labs simulation training solutions have been implemented at a range of port terminals, for a variety of use cases.

- Preparations for new equipment

Simulators give port terminals the opportunity to train to proficiency prior to delivery of remote-operated equipment. The world's first real-time remote operating station simulator was deployed by CM Labs at Ports of Auckland, in order to prepare trainees for delivery of remotely operated STS cranes.

- Updates to training programs

New Zealand's largest commercial port, Ports of Auckland Limited (POAL), uses CM Labs Simulations training to reach operational standards 33% faster, while providing a safer training environment. Likewise, by adding CM Labs' Straddle Carrier and STS Crane Training Simulation, DP World Melbourne, Australia has reduced training time by 50% and increased the rate of successful operator training by 150%.

- Evaluation benefits

Many port organizations use simulation to help instructors implement training and evaluation that is more consistent. It helps instructors to deep dive on students' progress and help focus training on where students require the most improvement. Simulation helps train for difficult moves, reducing the possibility of safety incidents.

- Terminal expansion

Port terminals that are undergoing expansion often need to train large numbers of operators in a short period of time. Without simulation, this can be prohibitively time-consuming and expensive. This has been one of the key drivers for adoption of CM Labs' simulation training at numerous ports internationally.

- New recruitment opportunities

CM Labs' solutions have had a powerful impact on the recruiting processes at the Port of Tilbury (UK). "The military are fascinated by what we were doing with simulation," said Simon Harper, Port of Tilbury's Learning & Development Manager and Director Tilbury on Thames Trust. "It attracts veterans to our programs, and it's a remarkably effective tool for recruitment."

result

Port terminal incidents tied to equipment operators are generally included in broader sets of safety metrics, so it can be difficult to quantify simulation-based training results. Still, terminals that rely on simulation agree that there are significantly fewer accidents associated with simulator-trained operators.

Other indicators are straightforward to quantify, including improved operator assessment and training effectiveness, and reduced learning curves.

- Improved operator assessment

With simulators, it's often possible to determine candidate potential within hours.

The traditional method of in-class and in-cab operator assessment and initial training is costly and tedious. Candidate qualification rates range from around 10% for complex cranes to 40%

for equipment such as straddle carriers. CM Labs' clients report that candidates having passed the initial simulator training have a nearly 99% success rate in becoming full-fledged crane operators.

Qualification rates skyrocket because the initial screening is far more effective, allowing organizations to focus on the right candidates, instead of those that don't have the aptitude to be operators.

- Improved training effectiveness

Using the traditional training method, given 100 candidates, 25-30 candidates will pass the live crane training, and of those, 10-12 candidates will become crane operators with acceptable productivity levels — 10%-12% of all candidates.

With the simulator method, 30 candidates will pass the short simulator training out of 100.

Of those, 25-30 candidates will become crane operators with acceptable productivity — 25%-30% of all candidates. The simulator approach is 2.5 to 3 times more effective.

- Reduced learning curve

Simulation makes it easier to implement concentrated seat time with targeted training objectives.

CM Labs' clients estimate that the learning curve is 6-12 months faster, which has a positive financial impact easily representing hundreds of thousands of dollars.

conclusion

In closing, just a few words from users of this innovative solution:

"It's straight out of the sim, and into productive work on the real crane."

Tony Couzner, Training Superintendent, Flinders Adelaide Container Terminal

"It improves our training success rate enormously, and it's revolutionized our approach to monitoring, measuring, and increasing productivity."

Simon Harper, Learning & Development Manager and Director Tilbury on Thames Trust, Port of Tilbury

"As a crane operator, you are responsible for the safety of the entire shipyard. And the CM Labs simulator helps train against unsafe manoeuvres."

Eric Battersby, Bulk Terminal Manager, Port of Corpus Christi Authority [PCCA]

LINK: https://www.cm-labs.com/en/simulation-solutions/vortex-training-simulators/hardware-features/