HOW TO ENSURE SUCCESSFUL CRANE SIMULATOR TRAINING

BY: DAVID CLARK, PRODUCT MARKETING MANAGER, CM LABS SIMULATIONS

The CM Labs booth at ConExpo 2017

Introduction: Why Simulators?

For years, simulators have been used in a variety of industries to reduce risk. That's because simulation saves lives when it is used to train operators who are using equipment in potentially hazardous or hostile environments.

Of course, some industries have been using simulation longer than others. The aerospace industry has been seriously using training simulators since before WWII – while in the offshore industry, regulatory bodies are now starting to mandate their use for operator qualification.

In the construction industry, simulators have been used for crane operator training since the mid-1990s. However, early simulators did not have very realistic graphics, and the simulation of the crane and load dynamics was poor. In addition, training content was really limited to basic control familiarisation and understanding basic operating procedures.

Today, there is a wide range of construction equipment simulator products available, from simplistic desktop "crane games" to extremely immersive high-fidelity simulators. Costs for crane simulator solutions varies from several thousand dollars to many hundreds of thousands.

Simulators are now being used as a key part of training in small and large operator training organizations – from construction equipment owners to large colleges. These organisations are finding that simulators are a much-needed "bridge" between classroom theory and the actual equipment on the worksite.

There are many things that simulation-based training can do that are impossible or difficult on real machines:

- One instructor can simultaneously instruct many students – not only one-to-one on the real machine.
- Students get more seat time, since simulators run 24/7, in rain, snow and hot weather – which means operators are more experienced by the time they get on the job.
- Trainees can experience "concentrated seat time" with operations that might take a lifetime to get on the job. This builds confidence and knowledge (for instance, tandem lifting, blind lifts, etc.).
- Trainees can experience failures and bad weather. This is critical, since learning when it is time to stop the lift is just as important as how to do the lift.
- You can do team based training in the classroom with multi-machine and multi-role simulation involving signallers and operators working together in a virtual environment.

In addition, for some organisations, simulator use maximises current resources, in the sense that time spent on the simulator means the real equipment is free for production, while wear and tear due to operator inexperience is minimised.

A ConExpo 2017 visitor tries out a Vortex simulator

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Any time you have operators operating complex equipment in sometimes unpredictable circumstances (for example, operating a tower crane on a busy worksite in inclement weather), safe responses to unexpected events must become second nature — and this is just not possible to do safely or economically on the real equipment.

This is especially true as the machines become more complex, the demands on the busy worksite grow, and the need for better equipped operators with advanced skills to do the job becomes more pronounced: It all boils down to simply being the best you can be in your trade.

The One Essential Quality of an Effective Training Simulator

In an ideal world, simulators improve the effectiveness of the training environment. They allow training

organisations to provide more total hours on the machine (with some of those hours being on the virtual machine), and the skills learned on the simulator are transferable to the worksite.

All this is provided, of course, that the simulators are teaching real skills, and not "fake," gamey skills.

Training operators is not a game. The problem with simulators based on game technology is that developers may have taken short-cuts in the simulation — so instructors end up with a "faked" simulation of the crane — one that is not validated against real crane behaviour. It is a real concern, since trainees who train on game technology risk negative learning — or worse, poor skills that could result in unsafe behaviour and bad outcomes.

This is in contrast to engineering-grade simulators, which improve instructional efficiency: They allow for higher trainee/trainer ratios, more seat time, improved trainee engagement, and faster time to competency. When simulation is well integrated into a training program it is the most effective learning environment possible.

This is especially key in an industry where new operators are not joining the profession at the same rate as experienced operators are leaving it. At the same time, newer operators are especially receptive to the use of simulation as a training tool to supplement classroom learning and seat time in the real thing. They have been conditioned to expect remarkable things from technology, and simulation is no different.

The base technology of simulation is not new — it involves replicating a crane cab, with motion base, using simulation and visualization software to provide a realistic and immersive experience.

What is new in the technology that engineering-grade simulators are bringing is carefully validated simulations that ensure the virtual crane behaves just like the real thing. Why should the construction industry expect any less? Playing games is not going to make you a skilled operator. We can use simulation to build real skills — and those skills are transferrable to the real machine and the real job.

It will take an experienced operator just a few moments in the simulator seat to tell whether or not it behaves like the real thing. In an engineering-grade simulator, we often find that they quickly forget that they're in a simulator, as they become immersed in the experience.

The military has been leveraging simulator-based training for decades, and have proven that it works – today, we are seeing the results that engineering-grade simulators are bringing to the construction industry, as organisations report more effective training, and safer operators.

The Three Styles of Crane Simulator Training

Like all tools, what simulators can help you accomplish depends on how you use them. Ultimately, there is no one "best" way to train with simulators, particularly since your approach may be highly dependent on your trainers or organisational resources.

Options range from reserving simulator use for inclement weather, all the way to incorporating simulator use into each training development milestone.

Simulators typically provide a "built-in" curriculum, which can reduce the time you spend developing your teaching materials and methodology. This is particularly useful for organisations launching a training program for the first time.

Some simulators also provide you with objective operator performance indicators and scores, which can help you determine when a trainee is ready to progress to the next stage of training.

Here are the three broad use cases we are seeing in the industry today:

1. Many organisations use simulators as part of a highly structured training program that alternates practical time equipment with simulator time, in addition to "bridging the gap" between the classroom and the real equipment. This typically results in less wear and tear on equipment, and speeds the learning process, as trainees can use the simulator to reinforce what they have learned out in the yard. Simulators also cut training time, as instructors are freed up to either go into more depth or focus attention on weaker trainees.

2. Other organisations use simulators as a way for seasoned operators to make sure they "stay sharp" between jobs, or to retrain following worksite incidents. In some cases, this kind of usage is blended with signaller training to ensure that everybody is communicating effectively as a team.

3. Still other organisations use simulators to ensure that they have a steady supply of skilled labour, by leveraging simulators as an objective operator assessment tool, either at the hiring stage, or as part of periodical performance reviews. They are also used as a recruitment tool at job fairs and high schools.

Ultimately, how you use simulators is going to depend on your requirements. But in order to assure the value of your simulator as a training, assessment, and productivity tool, you must define how you plan to use it, as well as defining your measures of success.

In the end, simulators will improve the skills, the experience and the confidence of operators entering the trade, as well as the skills of those who are "old pros" too – everyone can learn more. This will result in safer operations and fewer incidents. Our collective goal is building safe operations, and better training with simulation will help the industry get there. ▮

David Clark is Product Marketing Manager at CM Labs Simulations, the leading vendor for simulation-based training in the construction industry. See www.cm-labs.com for stories of simulator success.