

Simulated practices makes perfect

Ray Gillett, GTT Training, UK, outlines the increasingly important role of simulators in the training of personnel to ensure greater safety during operations involving LNG onboard vessels.

Simulators have been used in the training of seafarers for many years, with their use increasing as changes in technology have improved their capabilities and reduced their associated costs. Compared to other industries, however, their overall use is still relatively low. This is primarily due to shipping industry regulations not requiring their compulsory use, except for specific subjects, and a more traditional industry-wide training approach that aims to ensure that all trainees receive a similar level of basic training, no matter where the crews are being sourced from. This status quo is now beginning to change.

Increased training in the use of LNG

One area of shipping that is undergoing a step change in technology is in the type of fuels that are to be used, both now and in the future, along with the equipment and processes that are going to be required to handle them.

The fuel that is of prime interest at present is LNG, with the number of vessels being ordered to run on gas increasing significantly. While LNG is essentially the same as oil, in that it is a liquid hydrocarbon that burns, it has to be stored at very low temperatures to maintain it in a liquid state (approximately -160°C at atmospheric pressure) and handled carefully to minimise the subsequent risks of any release. Consequently, specialised storage and handling systems, along with appropriate operating procedures and crews with the knowledge and experience to be able to implement them correctly, are required.

As these systems are being fitted on vessels that are not engaged in the handling of dangerous liquids, other than traditional fuels, the owners of the vessels are having to think carefully about what additional training is required. As part of that process, they also have to carefully consider the training methods to be used to ensure they are effective, both in delivering the knowledge and competence required, and with respect to the time and subsequent costs that will be involved.

Currently, this process is further complicated by the fact that those personnel who already have the experience in the subject of handling LNG are already in short supply, due to the ongoing expansion of the LNG/LPG shipping sectors. The result is that many ship operators, both those who will be using LNG as a fuel and those carrying it as a cargo, are needing to increase the amount of training that they provide, in order to ensure they have sufficient numbers of personnel available, both for manning the vessels and having the correct expertise within their offices.

IMO requirements

When considering the training that crews require for both LNG carriers and LNG-fuelled vessels, the basic requirements are defined by the IMO within the 'Standards for the Training & Certification of Watchkeepers' (STCW). Under these requirements, all crew who will be serving onboard a vessel that either carries LNG or uses it as a fuel are required to



Figure 1. G-Sim desktop session.

attend a basic course, and those who will be directly engaged in handling the LNG are required to attend an advanced course. The duration of the courses can be a few hours for the basic course, and up to 10 days for an advanced course, depending upon the requirements of the flag state that is issuing the certificates. Most of the subjects within these courses can be delivered within a classroom or self-learning environment, but using simulators is optional. The objective of the STCW courses is to ensure everybody is aware of the safety implications of handling liquid gases on any type of vessel being considered. They are not designed to teach the details of using specific systems efficiently or what is required for maximum operational effectiveness. Consequently, at this level, even for the advanced course, a simulator may only be used to introduce the basic concepts.

At present, most of the vessels that are intending to use LNG as fuel are those that do not usually handle bulk liquids, such as passenger vessels, container vessels and bulk carriers. Consequently, the IMO decided further practical training is required as part of the STCW course focusing on the transfer during the bunkering process, with operators being required to attend at least three bunker operations in a supernumerary capacity before they are able to be directly involved. Recognising that this may be difficult to arrange, they have allowed that two of the three required bunker operations may be undertaken using a suitable simulator.

With regards to training in handling liquids, this is the first time that the IMO has recognised that simulators can be used effectively to deliver appropriate 'practical' training, and can be used instead of actually having to undertake the real task to gain an official certificate. This decision is based on the experience that has been gained using simulators in other areas of STCW training, such as for the bridge and engine room, and the recognition of the continuing improvements in realism that modern day simulators can provide.

Additional training

STCW provides the basics, but then it is up to operators to decide what additional training is required and how it should be delivered. Often this focus is on ensuring the crew are fully familiar with every aspect of operating the system, whether it be cargo or fuel gas handling. Guidance in these areas is provided by the two industry bodies: the Society for Gas as a Marine Fuel (SGMF), and the Society of International Gas Tanker and Terminal Operators (SIGTTO). Most of this type of training involves having a detailed understanding of the principles and procedures that are involved in handling liquid gases, in addition to showing competence in being able to put this accumulated knowledge into practice. Demonstrating the latter on real systems can only be achieved under close supervision and with a lot of restrictions in place because of the levels of risk, both from a safety and a commercial perspective. This is where simulators can be used most effectively to allow the personnel to demonstrate their skills across all aspects of the role to be undertaken, in a completely safe environment.

LNG handling activities

The handling of LNG involves storage tanks and equipment such as pumps, heat exchangers and compressors, linked via a network of pipelines and supplementary systems, including nitrogen and inert gas generators. All of these



Figure 2. G-Sim training session.

items fall into the general classification of process flow simulation, though in the marine sector, traditionally those used for cargo activities are generally known as liquid cargo handling simulators (LCHS). Simulators for providing training on LNG fuel systems are relatively new to the market and may be similar to those used for liquid cargo, or they may be combined with the engine room simulators, depending upon the manufacturer.

The scope and functionality of simulators for training in this area can vary significantly, depending upon the primary purpose for which they have been designed. They can range from desktop systems that replicate the control systems used onboard vessels, to large scale systems that are designed to recreate the actual working environment onboard the vessels concerned, using hardware in the form of real or virtual consoles. Virtual reality systems are also beginning to become more widely available, allowing complete environments to be recreated within a headset. In an ideal world, you would choose the type of simulator to match the training objectives to be taught. However, marine training schools are usually constrained by budgets and hence the training often needs to be adjusted to suit the type of simulator that is actually available.

Full environmental simulators are excellent for placing students in a situation where the real environment can have a significant impact on the decisions and actions they will take, or for the training of groups where the tasks to be undertaken are split between a team, hence their extensive use in bridge and engine room training. However, they are not so good for training multiple students in individual skills, as only one person can perform the tasks at a time, with the others watching or doing something else. In contrast, desktop simulators are excellent for training and allowing multiple students to demonstrate their skills by undertaking the same task at the same time, but they are not so effective at simulating scenarios in which the surrounding environment plays a key role in influencing the decision making process. For process operations, the latter is usually not as important as having an understanding of the equipment involved and how it should be setup, hence desktop simulation tends to be more widely used, as it allows the training required to be delivered more cost effectively.

G-Sim simulator

The G-Sim simulator, produced by GTT Training, is a 'desktop' simulator designed specifically for training personnel in the handling of liquid gases, and is used by GTT Training instructors in the delivery of their own course portfolio. The student interface replicates a modern shipboard control system, but with the operation simplified to ensure that minimal time is required for teaching the students how to use the system. This allows the focus to be on the undertaking of the various gas-related operations. G-Sim allows students to undertake every operation that is required in the handling of liquid gases onboard LNG carriers, and vessels using LNG as fuel, with specific models available for multiple configurations of LNG carrier, LNG fuel gas handling systems (FGHS) and LNG bunkering. Fully approved by DNV GL, and capable of being used on any Microsoft Windows based PC or tablet, the software supports multiple stations which can be quickly configured for individual, group or control room training requirements.

Do not forget the instructor

Simulators are a very powerful tool in the training tool kit as they allow students to learn using the basic training methodology of 'learning by doing'. An often-quoted statistic is that, if a student attends a lecture, they will walk away retaining 10 – 15% of the knowledge imparted during the time. When simulators are used, the retention level is well above 75%. Obviously, this is dependent upon the subject and how the simulator is being used, but the one aspect they do allow is for students to directly put into practice the knowledge they have acquired. If the task is completed successfully, then this experience reinforces both their understanding and confidence. Alternatively, if they make an error, not only do they appreciate the resulting outcomes much more quickly, but they can do so with no risk.

However, simulators are just a tool. In fact, unlike other forms of training, they do not themselves provide assistance to the student in the learning process. All they do is provide a realistic environment, and as in real life, they do not tell a student when they are making an incorrect decision, they just show them the consequences. Therefore, a very important part of any simulator is the instructor, as it is they that set up the appropriate scenarios, monitor the students' performance and provide the required feedback to ensure that the training is effective.

Conclusion

As previously mentioned, personnel with experience working with LNG, and especially using LNG as a fuel, are in very short supply. Consequently, one of the challenges that is being faced by the marine education sector is finding personnel with the necessary experience (both practical and with regards to teaching) that can run the training programs using simulators effectively. For the ship owners/operators, this also means that when evaluating the training centres they wish to use, they also need to look carefully at the quality of the training being provided. It is critical that owners/operators ensure that their ships' crews and operators are not just trained, but are also confident and competent in handling liquefied gases – as cargo, fuel or both simultaneously – and thus protect the multi-million dollar assets they are responsible for. **LNG**