Dynamic Logistics Simulation: A Powerful Planning Tool

164

Stefan Brown

Ausenco, Canada

Liquefied Natural Gas (LNG) is a commodity widely used in the power generation sector. Recently, global trade has reached volumes never seen before and this trend is expected to continue. Major suppliers located in Asia Pacific, Africa, and the Middle East are increasing their production and new projects are arising to meet the surge demand coming from Japan, South Korea, and China.

LNG projects are notorious as intensive capital investments, typically located in demanding environments and required to work within tight operational limits. As demand increases, the industry faces the need to rapidly develop projects, ensuring adequate return on investment. Therefore, understanding enough detail about an entire system from the beginning is crucial for the success of the project.

Dynamic logistics simulation software is a powerful tool available to provide a holistic analysis of different project alternatives and conditions in a short period of time. A team of engineers can develop a sophisticated model of an LNG supply chain system and use this model to investigate how the operation will perform – both as planned and in various “what if” scenarios. These models, which process discrete events through time, can accurately capture how random and systematic delays to any part of the supply chain cascade through the system in complex ways. Understanding these effects can help develop plans to manage risks and design a capital efficient system to maximize returns of projects. Once the model is built, a multitude of possible scenarios can rapidly be tested to allow unbiased trade-offs between various assets such as onshore infrastructure and the LNG fleet. These models can be used through design and into operational planning, HAZID and permitting applications.

The power of dynamic simulation modelling in the planning of a complex LNG supply chain is demonstrated in the LNG Hawaii Express Project. This project looked at a complex and unusual supply chain network to deliver LNG from Vancouver, Canada to the Hawaiian Islands involving a variety of transport modes and several transfer points. Since the Hawaiian Islands do not have bulk LNG import or delivery infrastructure, cargoes were to be transferred into containers on infield support vessels via a ship-to-ship transfer off the coast of Oahu. Containers were to be unloaded onto shore and distributed throughout the islands via trucks and inter-island barges. Due to the complex nature of the supply chain, static analysis was limited in its ability to capture the interaction of system-wide effects.

The project tested the efficiency and robustness of the proposed delivery infrastructure in different scenarios. The simulation model included the infrastructure at all transportation service locations, weather thresholds and conditions, planned and

unplanned maintenance delays, and seasonal LNG demand. Along with studying the adequacy of the infrastructure and the system's response to maintenance events, a number of sensitivity analyses were run to examine the effect of daylight restrictions, third party traffic, number of infield support vessels, number of containers, and number of trucks, among other parameters.

Presented by: Brown, Stefan

Topics: 3.3 - Integrated management of global supply chains