Using a digital twin to model the transfer of LNG from ships to shore

Industry: Shipping

Location: UK-based

Challenges:
- Compensating for effect of tides and winds on flow of LNG
- Training operators on site from OEM site in UK

Solutions:
- Translated original process software into model
- Refined using client input and testing

> *"This project highlights the fact that you can benefit from the creation a digital twin any stage of a process's life cycle. It's not too late if you didn't have one created when the process was first implemented."*

- Steve McDermott
Sales Manager,
Actemium Automation Teesside

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Background

Our client, part of an international group, delivers safety-critical solutions for flow control for the oil, gas and petrochemicals industries. They were looking for a way to model their system for the transfer of liquified natural gas (LNG) from ship to shore in order to assess potential design changes and performance limits. Our Actemium Automation Teesside team came on board to create a digital twin.

Challenges

When creating a digital twin, we had to incorporate the flow of the liquid while compensating for tide and wind variations on the pipes between the source and destination. We also needed to set up a training hub in the UK OEM and remote stations at customer ports, which require including trainer-to-trainee communication while running digital twin models.

Solution

To create the digital twin of the LNG transfer process, we started by translating into our model the original designed software being used for the transfer. We then refined the model, which included using input from the client and the results from their real-world testing to determine if the model was fully representing the actual process.

Results

The creation of a digital twin model is allowing the client to effectively simulate both design changes and performance on the limits to flow. Both outcomes can run in slow motion, in real time and be accelerated through long sections of the process.

In addition, they are using the model as a training tool for their customers, as the mimics the transfer system exactly and allows for the training to occur in a safe environment, protecting the live system from spills. Using a central server based in the design office, they can manage training remotely. A trainer, based anywhere in the world, can control a simulation and introduce random events, while the trainee operator is in a training room in their own plant located anywhere. And all is done through secure links using the latest internet security.

Both the testing simulations and the training sessions can be saved exactly at the point they ended to allow engineers and operators to return to point where they left off.

Future plans

We continue to work with the client on ways to improve the precision of the LNG flow modelling by including more calculations.