

Pipe and Cable Lay



photo: courtesy of Huisman

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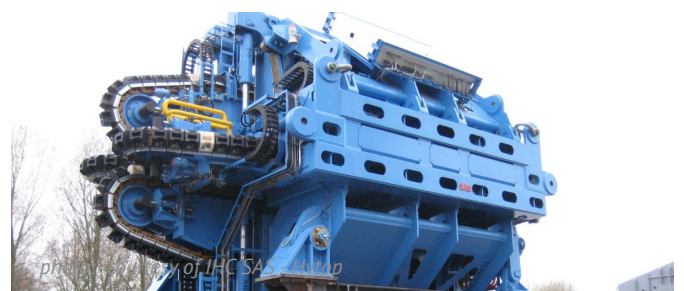
The complexity of the machinery for pipe and cable lay not only stems from the individual machines but also from the coordinated operation to lower a cable or pipe safely from the ship. Tensioners, straighteners, reels, carousels and other machines all have to operate at the same speed, while preventing the build up of force or oscillations.

Dynamics

Dynamics simulation is the best way to investigate these machines and that is exactly what Controllab provides. Controllab has over 15 years of experience in modelling and simulation of tensioners, carousels, reels and other equipment for pipe and cable lay. We have equipment models which are verified with measurements on the real machine. By combining these equipment model with the control systems we can do system simulations. With these simulations we can run hundreds of scenarios, identify problems and finding root causes.

Tensioners

Tensioners are used to keep tension in the line while it is being installed on the seabed. IHC-SAS is specialized in tensioners and asked Controllab to help converting its control system from hydraulic driven to electric driven tensioners.



With a dynamic model of system, simulations were carried out. The simulations showed that the performance could significantly be improved with a redesign of the control system. A new control system was developed and tested with simulations. Scale model test verified the outcomes. The improved controller is now implemented in a whole range of electric driven tensioners.



Carousel Control

Carousels are used for storage of flexible pipes. They are driven by electrical motors that have to provide sufficient torque and maintain a speed synchronized with other system components such as tensioners. The massive inertia of loaded carousel, means that they cannot be stopped suddenly, but have to be reduced in speed gracefully.

For one of the leading companies in the offshore wind industry we have simulated a vessel with two carousels with a direct feed through of the cable. The simulations showed that under certain loading conditions, an emergency stop would bring one of the carousel to an earlier halt than the other one, with the potential danger of a cable break. Another concern, having not enough buffer capacity to compensate for the ship motions in waves, proved to be less of a problem.

A change in the controller architecture was not enough, also the speed of communication between individual controllers had to be increased to solve the problem. The viability of the solution was demonstrated with simulations.

Pipe Rupture

Allseas is a global leader in offshore pipeline installation. For a project in the Gulf of Mexico a risk assessment was required to investigate the safety of the crew during a segment break. The risk assessment was carried out using a dynamic model, that couples multiple pipe segments with the stinger geometry. Controllab helped with the development of this model.

Depending on the desired accuracy, a simulation run would take between 1 and 10 minutes. With this result, Allseas could run a number of scenarios within a short time period, and visualize the results with animations. This was used to effectively demonstrate that the crew on deck was safe during a pipe brake in any segment.

Track Record

Controllab is active in the Marine and Offshore market for more than 20 years. Our engineers have gained a thorough understanding of servo hydraulics, electric drives and machine design. This helps us to understand the dynamics of pipe and cable laying equipment and develop novel control strategies.

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