

LIVO

LEANWIND Installation Vessel Optimizer

LIVO is a software program that offers decision support for maritime logistics optimization for installation of offshore wind farms. Advanced analytical techniques from operations research is implemented to help decision makers selecting the best configuration of logistical resources and activity schedule for installation of offshore wind farms.

The installation process has shown to be challenging and in many cases more cost-intensive than what believed necessary. Hence it is necessary with better planning of the processes.

LIVO is a decision support tool, developed by MARINTEK in the LEANWIND project. It is an automated optimization model that can be used to find the optimal combination of vessels, infrastructure and activity schedule for the installation phase.

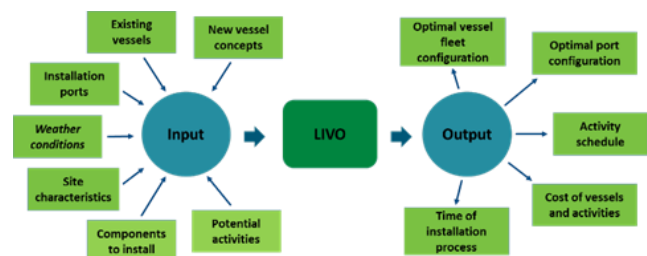
The use of LIVO by stakeholders in the offshore wind industry can significantly reduce the cost of energy by a reduction of installation costs. This is achieved through better planning of the installation process, providing decision support with respect to selecting and developing cost-efficient logistics solutions and installation schedules.

APPLICATION AREAS

LIVO can provide valuable decision support to several stakeholders in the offshore wind industry:

- Offshore wind farm developers
 - Which are the optimal installation vessel resources?
 - Which are the optimal installation strategy configurations?

- Which installation ports and what type of port characteristics?
- What is the optimal installation activity schedule?
- Installation vessel providers and innovators
 - Cost/benefit analysis for evaluating existing vessels
 - Early phase feedback for design of new vessel concepts
- Installation concept developers/innovators
 - Cost/benefit analysis of new concept



SOFTWARE OVERVIEW

LIVO is built with an Excel based input/output user interface. The model itself is implemented in Java as an executable file. Weather input is read as time series from text-files.

KEY FEATURES

- Advanced analysis of logistics operations for the installation of offshore wind farms
- Propose cost-optimal solutions to the planning problems
 - Optimal vessel fleet configuration
 - Optimal port configuration
 - Optimal activity schedule
- Weather conditions (wind/wave) and their effect on the solution is accounted for in a deterministic manner
- Optimizes both on costs and time of installation process

MODELLING OVERVIEW

In the discipline of operations research (OR), the aim is to develop and apply advanced analytical methods for decision-making process. The modelling of LIVO is from a research area within OR where mathematical models are used to describe the planning problems and solution methods for these are used to find optimal or near-optimal solutions to the problems.

The mathematical model that forms the basis of LIVO is a pattern-based formulation where a given pattern describes what a vessel can execute of a given combination of installation activities during a planning period. All such potential patterns are generated for all installation vessels and activity combinations.



The patterns are input to a mathematical optimization model. With the following variables:

- Which installation vessels to use
- When to use the installation vessels
- Which installation patterns the vessels should execute
- Which installation ports/bases to use

The objectives of the optimization model are:

- Minimize total time of installation process.

REFERENCES

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