Japan Marine United Corporation

Aiming for Overall Optimization of EPCI/O&M for Low Cost and Serial Production

Akita Floating Offshore Wind Demonstration Project

JMU Japan Marine United Corporation

Summary of Research & Development [E-xx]:EPCI [O-xx]:O&M

[E-6]: Development & Standardization of High-precision Structural Analysis Methods for Large FOWT

Develop a high-precision structural analysis method that considers the flexibility of the floater and WTG, as well as the effects of wind loads, aiming to optimize the reliability and cost of the floater.

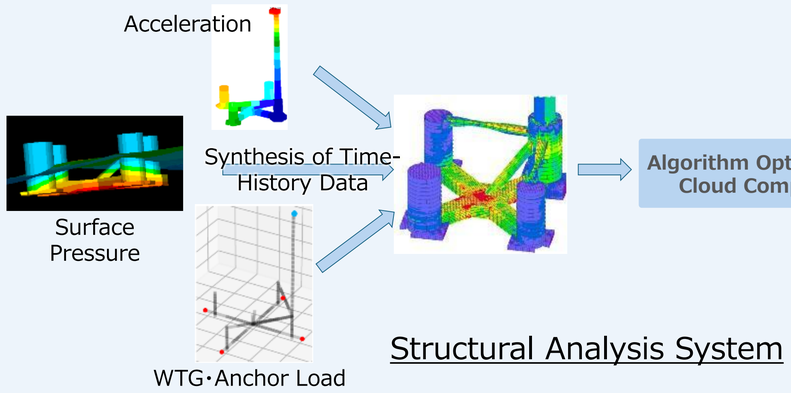
- **Development of the Integrated Load Analysis(ILA) Modeling Method**

Develop a modeling method that appropriately considers elastic response in the ILA.

- **Development and Advancement of Structural Analysis Methods Based on ILA**

Develop a structural analysis system capable of structural strength evaluation that appropriately incorporates ILA results.

Tank test



Structural Analysis System

[E-4]: Improvement of Operational Limits of Installation Vessels and CTVs

Develop highly efficient mooring installation methods and highly precise accessibility assessment technologies to improve the operational limits of installation vessels and CTVs.

- **Development of Efficient Mooring Installation Methods for Commercial-Scale Floating WF** (Subcontractor:K-Line Wind Service)

Develop more feasible installation methods and installation vessels by verifying the required cycle time for mooring installation, as well as utilizing feedback from the demonstration project.

- **Improvement of accessibility to Floater**

Develop technology to judge real-time accessibility based on floater motion data etc.

[E-3]: Optimization of Floater Logistics for Minimizing Temporary Wet Storages

Optimize the cycle of floater logistics and preparation for WTG integration to minimize costs arising from downtime.

- **Efficient Floater Logistics**

Optimize floater logistics from multiple construction yards to base ports to meet mass production against weather windows for offshore work.

- **Efficiency Improvement of WTG Installation Preparation Work on Floater**

Develop safe and efficient grounding/refloating means of floater.
Develop means to omit post-refloating inspections.

[E-1]: Establishment of Afloat Joining Technology

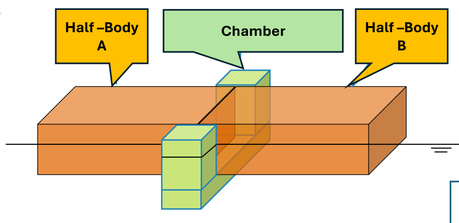
Demonstrate an “Afloat Joining Technology” that can integrate two hull blocks built in dock into one in floating condition to utilize many existing medium sized shipyards.

- **Improvement of Afloat Joining Technology for commercialization**

Brush up and verify the construction procedure for the mock-up test conducted in Phase 1.

- **Standardization of Afloat Joining Technology**

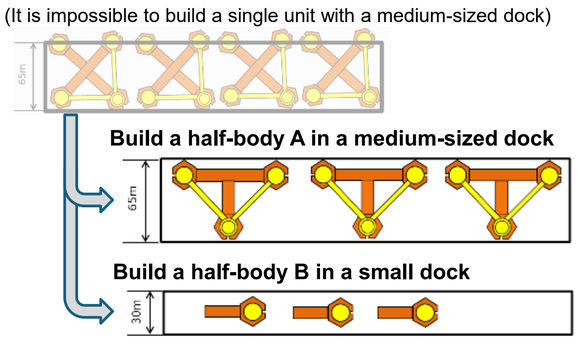
Create standard procedures to enable afloat joining operations at any fabrication site.



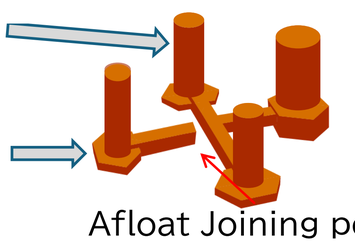
Afloat Joining Technology

Utilization of small and medium-sized docks

(It is impossible to build a single unit with a medium-sized dock)



Afloat Joining on the sea



Afloat Joining point

[E-7]: Overall Cost Optimization of Hybrid Mooring in Deepwater Regions

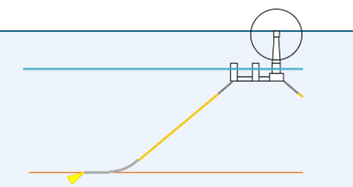
Develop design system of Taut/Semi-Taut Hybrid Mooring to optimize total cost including procurement and installation in deepwater regions.

- **Development of an Optimal Mooring Design System Considering Installation Methods**

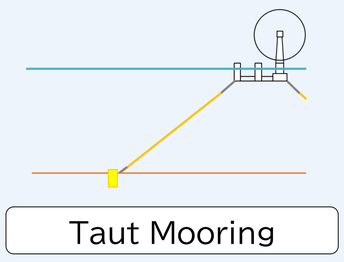
Develop an Optimal Mooring Design System to determine number and size of anchors and mooring lines considering water depths and wind turbine size, as well as total costs.

- **Development of Semi-Taut and Taut Mooring Technology**

Develop optimal Taut/Semi-Taut Mooring Design with Potential Cost Reduction.



Semi-Taut Mooring



Taut Mooring

[O-2]: Improvement of the project asset value

i.e., power production and lifetime, by utilizing Digital Twin system

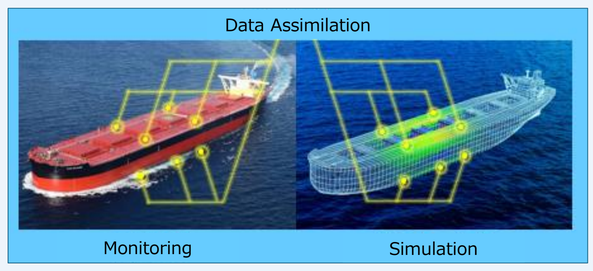
Establish O&M method of FOWTs which can monitor structural integrity from the onshore bases by utilizing Digital Twin system to improve the project asset value such as power production and lifetime.

- **Verification of Inspection Optimization Scenarios**

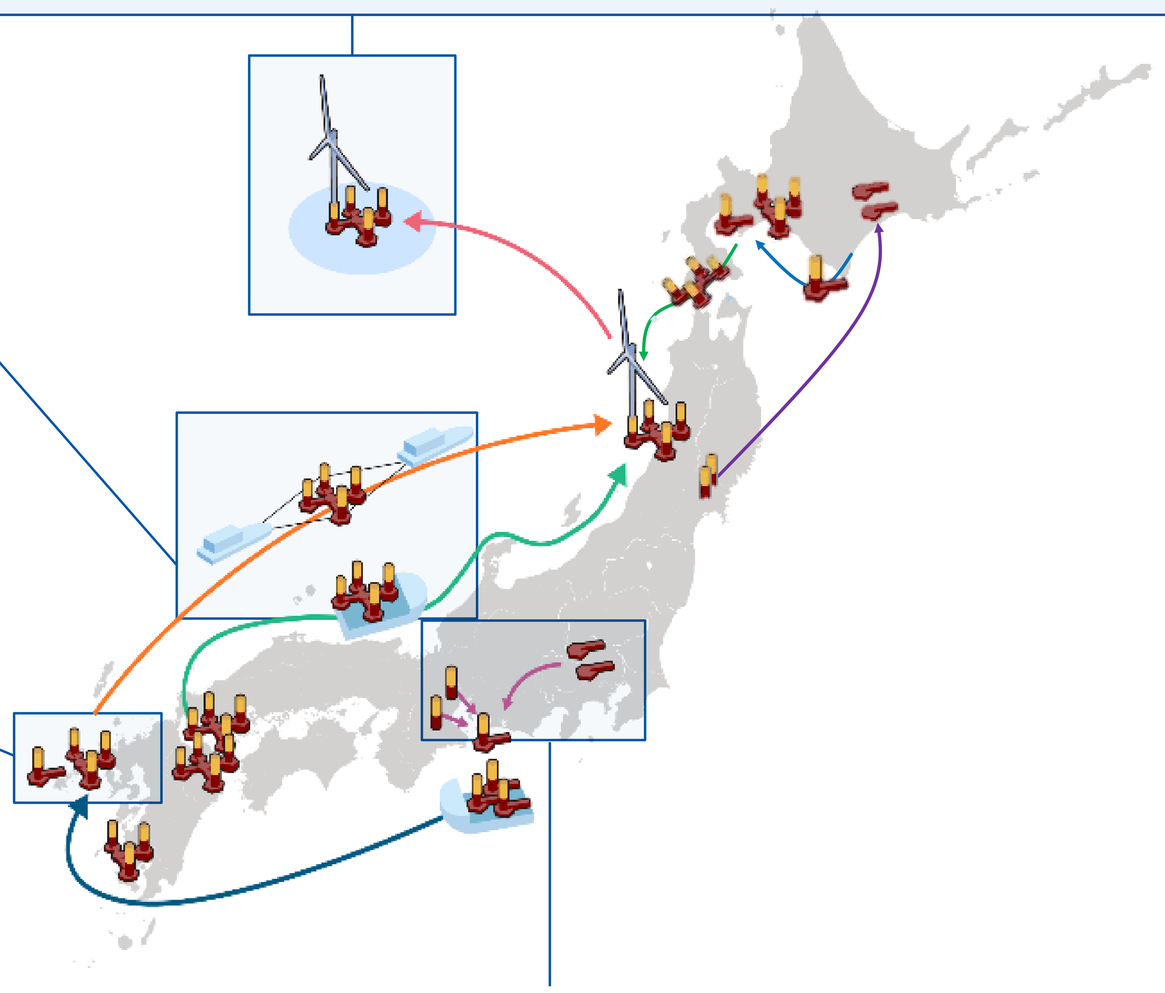
Structural Damage Risk Map Using Digital Twins
⇒Identify high-risk areas and optimize preventive maintenance

- **Verification of Mooring Integrity Assessment Methodology**

Estimating Mooring Tension Using Digital Twins
⇒ Managing remaining service life and detecting anomalies in mooring systems



Ship Structure Digital Twin System



[E-2]: Establishment of Optimal Construction Methods by Building the Alliance

Establish an alliance with existing yards for steel structures such as ships, bridges, jackets, etc. to build hull to contribute serial production of floaters.

- **Reducing construction costs through design optimization, considering alliance partners**

Share the floater design with the alliance candidate’s yard, obtain feedback from the perspective of floating structure construction, and incorporate it into the floater design.

- **Optimize the supply chain with systems engineering**

Exploring the optimal supply chain combinations using systems engineering based on network models