## 附件 2-1 E-NNOVATE 2025 波兰国际创新展览会线上展

# 发明项目展板英文图片内容(一)

CAI No.05-1

## Invention: Advanced Offshore Platform Gangway with Wave

 Compensation Function
 一种具有波浪补偿功能的海上平台登临栈桥

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## Introduction:

#### (1) Advantages of the invention

A six-DOF wave compensation system, combined with micro-inertial sensors and real-time hydraulic control, keeps the gangway dynamically stable and overcomes the limitations of fixed gangways. It enhances boarding safety in rough seas, reduces structural damage, and suits offshore maintenance and rescue operations.

Using hydraulic actuation, multi-DOF compensation, and intelligent alerts, the gangway adapts in real time, lowers maintenance risks, extends lifespan, and supports efficient offshore oil and gas development. It ensures personnel safety and promotes sustainable unmanned platform operations. With the growth of deep-sea energy and unmanned platforms, integrating AI and IoT will enable fully automated smart gangways, expanding their role in offshore engineering.

#### (2) Applications

The six-DOF wave compensation system, equipped with micro-inertial sensors and real-time hydraulic actuation, will find extensive application in future intelligent offshore operations. As the development of deep-sea energy and unmanned offshore platforms accelerates, this system can be integrated with digital twin technology, edge computing, and AI-driven decision-making to enable fully automated gangway operations. In scenarios such as unmanned oil and gas platforms, offshore wind farm maintenance, or deep-sea scientific research missions, the system will autonomously adjust to dynamic sea conditions, ensuring safe and continuous personnel and equipment transfer even in severe weather. Combined with IoT-based real-time monitoring and predictive maintenance algorithms, it will reduce operational risks and downtime, enhancing the safety, efficiency, and sustainability of offshore engineering. In the future, with the advancement of 5G/6G communication, autonomous vessel navigation, and AI at the edge, smart gangways will become a core component of intelligent maritime infrastructure, supporting the transition to automated, intelligent, and eco-friendly offshore operations.

#### (3) Research achievements

The achievements include one published academic monograph, over 40 research papers, 10 authorized invention patents, and 9 registered software copyrights.



Fig. 1 Picture of the gangway



Fig. 2 3D model of the gangway



Fig. 4 Flowchart of horizontal rotational motion of the gangway



Fig. 5 Research achievements and application scene



(a) Safe personnel and equipment transfer between ships and platforms: the system is primarily designed to connect offshore floaters and vessels in challenging sea conditions. It ensures dynamic stability of the gangway, allowing safe and efficient boarding of personnel and equipment.



(b) Marine research and exploration: it can be used in scientific research vessels to connect with buoys, observation platforms, or underwater drones, ensuring safe and stable access for researchers and equipment.



(c) Support for offshore oil and gas development: the system is well-suited for offshore oil and gas platforms, where it reduces the risk of operational interruption and increases safety for workers. It also minimizes structural damage caused by repeated exposure to harsh marine environments.

Fig. 6 Application scene

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# 附件 2-2 E-NNOVATE 2025 波兰国际创新展览会线上展 单位/公司介绍展板英文、图片内容(二)

CAI No.05-2

# **Tianjin University**

## Introduction:

Tianjin University (TJU), founded on October 2, 1895, as Peiyang University, is China's first modern university and a pioneer of modern Chinese higher education (Fig. 1).

TJU achieved the following rankings (Fig. 2):

- QS World University Rankings 2024: 269<sup>th</sup> (11<sup>th</sup> in China);
- Times Higher Education (THE) World University Rankings 2025: 201- 250<sup>th</sup> (16<sup>th</sup> in China);
- Best Chinese Universities Ranking 2024: 20<sup>th</sup>;
- Chinese University Engineering Strength Rating 2024: 10<sup>th</sup>.

TJU has 15 disciplines ranked in the top 1% of the Essential Science Indicators (ESI) database, including 5 in the top 1‰ and 2 (Engineering and Chemistry) in the top 0.1‰.

This invention is developed based on national research platforms at Tianjin University, including the National Facility for Earthquake Engineering Simulation and the State Key Laboratory of Hydraulic Engineering Intelligent Construction and Operation (Fig. 3).

The school adheres to the principle of opening up to the world and deepening international exchanges and cooperation in an all-round way. TJU has cooperated with 260 universities, research institutes, and companies in 50 countries and regions (Fig. 4).

For a long time, through the unremitting efforts of all teachers and students, Tianjin University has become a high-level research university with strong faculty, distinctive discipline characteristics, first-class education quality, and scientific research level in China, and a significant influence in the world.



Fig. 1 Campus scenery



Fig. 2 Statistical data



National Facility for Earthquake Engineering Simulation



State key laboratories

Fig. 3 Scientific research platforms



Fig. 4 International certification



Fig. 5 Team photo of Naval Architecture and Ocean Engineering Speciality

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