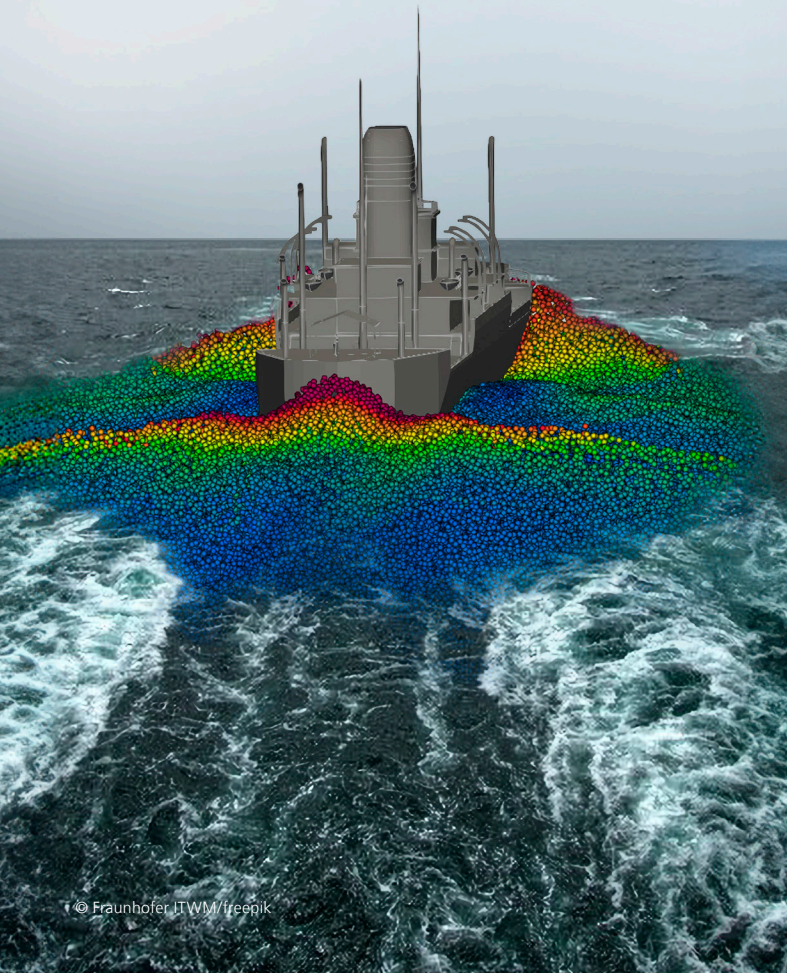


The MESHFREE software simulates many processes in the shipping industry.



## Fraunhofer Transport Alliance

The Fraunhofer Transport Alliance combines the transport-related expertise of its member institutes and works in various working groups in the individual transport sectors.

The Waterborne working group offers comprehensive expertise in the areas of maritime logistics, ship operation, maritime technologies, shipbuilding, alternative propulsion technology, maritime policy and environment.

The aim is to support shipowners, shipyards, ports, logistics service providers and the maritime supply industry in fulfilling their tasks and to develop innovative, customized solutions.

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SMM

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*Ship simulators are used at the Fraunhofer CML to test autonomous technologies*

### **Fraunhofer CML** **Innovating the Maritime Sector**

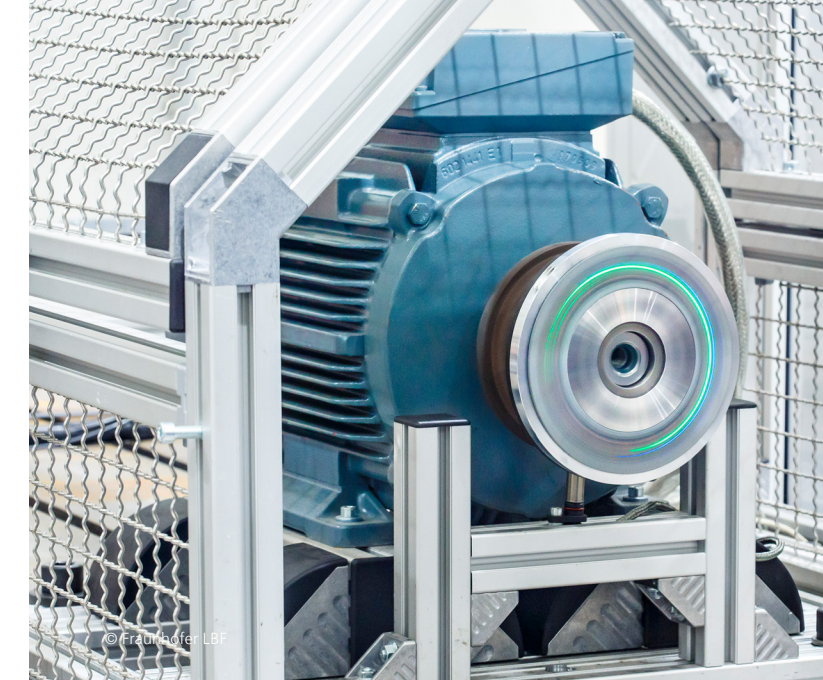
The Fraunhofer Center for Maritime Logistics and Services CML develops new solutions for the maritime sector and the maritime supply chain. At SMM 2024, the CML will be showcasing new maritime technologies, the use of artificial intelligence in innovative solutions and software solutions for ship operations. Our highlights this year: Together with our ARVR developments, our mobile ship simulator provides a testing ground for shore-based remote support for maritime units, among other things. Visitors can try this out for themselves on site. We will also be demonstrating live how image recognition can be used profitably at the terminal. By detecting damage, for example, visual container inspection processes can be carried out much more efficiently. With our speech recognition system, we are demonstrating the possibilities of using AI in a maritime environment. Characterized by background noises and dialects, AI helps to transcribe radio messages, making communication accessible after a situation has developed.

### **Fraunhofer IFAM** **Manufacturing Technology and Applied Materials Research**

The Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM offers research services in the field of maritime technologies for the shipbuilding and offshore industry. Development focuses on corrosion protection, functional coatings and adhesive bonding processes as well as the development of reinforced polymer materials with specific properties and adapted joining techniques. In addition to metallic materials, lightweight fiber-reinforced plastics are increasingly being used in lightweight construction for ships. Challenges arise here on the one hand regarding safe behavior in the event of fire and on the other hand with regard to joining techniques suitable for the material. Solutions are shown using a ship's staircase and deck adhesive bonding demonstrator.

### **Fraunhofer IGP** **More Flexibility in Production at Shipyards and Innovative Bonding in Ships**

Maritime production is the DNA of the Fraunhofer Institute for Large Structures in Production Engineering IGP. For more than 25 years, our research has focused on making maritime production more flexible, efficient, economical, and even more ecological. Therefore, two innovative solutions for the present challenges in the maritime industry will be presented at SMM. To meet the increasing flexibility requirements of shipyards in the newbuilding, repair or recycling sectors, a holistic and intelligent shipyard planning approach will be presented that identifies and validates the required restructuring actions to increase the flexibility. Furthermore, a post-processing-free, bonded holder system will be presented, which has already received shipbuilding approval. This can be used instead of welded holders and thus enables shipyards to achieve a more efficient production process.



*The rotary energy harvester is used in the drive train of ships.*

### **Fraunhofer ITWM** **Digital Twin**

Simulations and Digital Twins are indispensable for many companies. Because conventional software often fails to model highly dynamic processes satisfactorily, researchers at the Fraunhofer Institute for Industrial Mathematics ITWM have developed the MESHFREE tool, a solution that works without a rigid computational grid. MESHFREE simulations cover a wide range of processes and save time and money – from water management to avalanches and foam formation. With a focus on maritime applications, MESHFREE is particularly suitable for the simulation of moving ships and their interaction with waves, tank sloshing, spray cleaning, flooding or floating bridges for disaster control. ITWM is the world's largest research institute for industrial mathematics. The aim is to further develop mathematics as a key technology, provide innovative impetus and put it into practice with industrial companies.

### **Fraunhofer LBF** **Reliable Operation of Maritime Components**

The Fraunhofer Institute for Structural Durability and System Reliability LBF develops solutions along the entire value chain, from the material and its processing to the realization of the finished component and the complex system through to qualification with regard to the safety and reliability of systems. The field of expertise includes component design concepts for the reliable and failure-free operation of maritime components, vibration reduction with the aid of vibroacoustic metamaterials, as well as system and process monitoring using smart energy-independent sensors. In addition, the analysis and evaluation of weld seam geometry with regard to fatigue strength, customized analysis and testing concepts for the development of components exposed to hydrogen, ammonia and corrosive media and the design of component reliability and safety. Furthermore, the fatigue strength assessment of cast, welded or printed components and the development of application-related test and design methods for metallic materials and structures in fatigue strength.