



Terminal Operating Systems improve the productivity of a wide range of handling processes.

ARTIFICIAL INTELLIGENCE FOR PORT TERMINALS CURRENT MARKET OVERVIEW PUBLISHED

High handling capacities, new technologies and rising customer demands are creating an increasingly competitive situation among terminal operators. The COVID 19 pandemic has turned the planning of many terminals upside down with new insecurities and unsure expectations. The changing environment places high demands on Terminal Operating System (TOS) providers. TOS are complex IT solutions that control and document terminal operations to optimize handling efficiency within a terminal. In order to adapt to the new needs and requirements of their customers, TOS providers must continuously develop their products. With the goals of highlighting trends, creating transparency, and

helping terminal operators make decisions about the best TOS for them, Fraunhofer CML is now publishing „Terminal Operating Systems 2021,“ the fourth edition of a market overview.

A number of innovations over the past decade have made TOS more productive worldwide. Extensive data collection by technical and IT systems on terminals lays the foundation for the use of artificial intelligence. The goal-oriented data analysis enables immense possibilities for gaining specific information and optimizing processes. More and more providers and users of TOS are beginning to take advantage of this enormous potential. They expect AI to open up opportunities for better coordinated and more efficient

operations, lower energy consumption and seamless communication. For this reason, the use of AI in TOS is a key focus in this year's study. In addition, the study provides detailed information about the systems on the market today and presents their respective performance characteristics and modules in a clear and comparable manner. The study thus also provides a basis for selection and decision-making processes.

The study „Terminal Operating Systems 2021“ is available in English. You will find all the information you need to obtain the study on our [homepage](#).

FLEXIBLE WORKFORCE PLANNING MASTERING NEW REQUIREMENTS EFFICIENTLY

The COVID 19 pandemic has led to completely new framework conditions due to stalled international transports, border closures, changed opening hours and much more, and has upset the established supply chains. Companies in the production, transport and trade sectors must adapt to the new, and still changing, situation by adjusting their personnel planning.

In areas where similar activities are carried out repeatedly, employee scheduling can be optimized through intelligent information gathering and data evaluation. In this context, the possibilities now go far beyond the simple assignment of tasks to employees. Fraunhofer CML has developed the „Timekeeper“ module for working time recording as part of its SCEDAS® software solution: A basic prerequisite for the flexible

planning of work tasks and the sustainable increase in the efficiency of processes is the knowledge of the duration of processing. This is recorded in Timekeeper by the employees performing the work. Individual activities that occur repeatedly in a company or a process are documented with the help of Timekeeper and stored with further information, such as the qualification required for the execution.

SCEDAS® Timekeeper can be made available to employees as an app that lists the tasks in a selection menu and automatically forwards the time recorded. Personal data remains untouched; only the qualification is stored for documentation.

The current information is visualized in a company-specific dashboard. The software on which Timekeeper is based takes into ac-

count not only the required qualifications and assigned task areas, but also other parameters. Taking into account new conditions, such as pandemic-related changes in working hours, increases employee motivation and promotes trouble-free workflows within the company.

The time recording system can be implemented as a stand-alone solution or, thanks to open interfaces, can be integrated into the company's IT landscape.

Timekeeper provides the data basis for relevant tasks and execution times for automated personnel planning with SCEDAS®. If, for example, the workload of an employee changes unexpectedly, the Timekeeper can be used to quickly and flexibly convert the changed personnel resources into new schedules.

FOREWORD



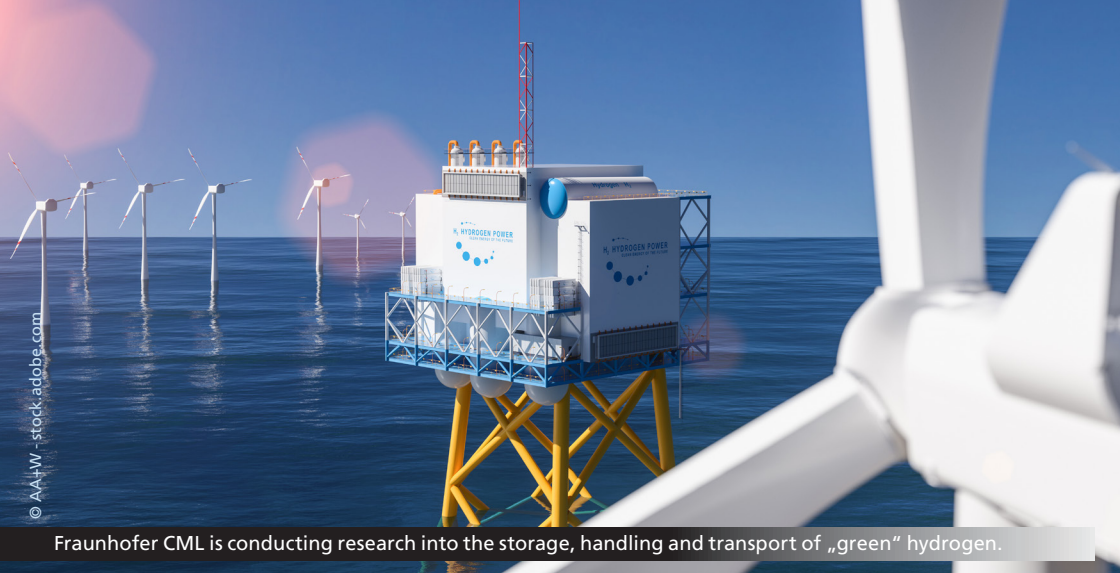
Dear Readers,

this month marks a special anniversary: for one year now, the CML has been in the home office, just like large parts of the global office staff. The benefits of digitization and flexibility in this abrupt change were felt early on. Those who have mobile work devices and secure access to data servers and communication tools can continue work processes largely without disruption, even in the face of such dramatic changes.

These requirements for powerful hardware, software and integration into flexible systems apply all the more to the complex, essential planning tools that ensure efficiency, transparency and productivity in the maritime transport chain. As examples of this, in this newsletter we present our current market study on Terminal Operating Systems and the extension of our personnel planning software SCEDAS®, which can also be used for logistics companies. You are also invited to read about our research activities on the use of hydrogen in the maritime industry.

I hope you enjoy reading this issue!

*Yours, Prof. Carlos Jahn
Head of Fraunhofer CML*



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Fraunhofer CML is conducting research into the storage, handling and transport of „green“ hydrogen.

HYDROGEN - ADDED VALUE FOR THE MARITIME INDUSTRY AND LOGISTICS

According to experts, hydrogen will play a central role in Europe's energy supply before the end of this decade. The young hydrogen industry aims to synthesize a versatile energy carrier from a free raw material using surplus energy. The drivers of this energy and transport revolution are placing great hopes in particular in green hydrogen, i.e. hydrogen produced with renewable energies. The focus is mostly on production and utilization potentials, rarely on transport, handling and (intermediate) storage - and this is exactly where the Fraunhofer CML comes in with new projects.

A look at the end of the decade: The maritime supply chain begins far offshore. According to the power-to-X principle, hydrogen is produced partly directly at sea (offshore) using northern German wind power and electrolyzers. From there, it is transported by bunker ships to ports, where it is fed into a hydrogen network and supplied to industry and heavy goods traffic.

The location of northern Germany also offers good conditions for this scenario because of its high-performance maritime industry, the know-how for setting up the offshore production sites, the transport and transshipment on land, and the potential large-scale consumers in the form of industry and maritime shipping. In a certain sense, the maritime industry has a dual role to play in the transformation: It must not only become part of global hydrogen logistics and build up cor-

responding infrastructures (also for imports) in ports and fleets, i.e., in addition to maritime transport, it must also develop solutions for transshipment in ports and for transport inland.

Shipping itself, as an emitter of CO₂ (responsible for nearly 3 percent of global emissions) and pollutants, must also become more sustainable. The CML is collaborating on various solutions in both areas.

Among other things, Fraunhofer CML supports companies in the identification as well as the practical implementation of possible applications of hydrogen, both in maritime transport and in hinterland logistics. To this end, it has conducted a current study together with other Fraunhofer institutes. This study examines the prerequisites for the supply chain of a hydrogen economy that is to be established - as well as its transport requirements in terms of production, transport and use. It also serves as a preliminary stage for developing the necessary technologies or services for companies in their individual demand scenarios. This should enable them to actively shape the future market.

The manufacturing industry itself is also increasingly exploring the possibilities of decarbonizing its production. In a project on hydrogen logistics, CML employees are modeling and evaluating logistics chains for hydrogen transport to an industrial company inland, taking particular account of transport-related energy losses. Transport and logistics costs are

considered a decisive factor for the competitiveness of hydrogen - transport losses and the connection to the industry are still considered weak points.

Another starting point for using hydrogen in maritime logistics is synthetic marine fuels. To this end, the Fraunhofer Alliance for Transport, with the participation of the CML, is organizing a Digital Session on March 25, 2021. On the topic of „Hydrogen-based Fuels in the Maritime Industry,“ a panel of experts will explain the status and promising developments of hydrogen technologies in shipping (see „Dates“). Keynote presentations will address hydrogen engines, the development of hydrogen systems and the expected market development. A discussion with the participants on the most promising developments is explicitly encouraged.

Over the course of the still young decade, a hydrogen economy will become established, in which several sub-sectors of the maritime supply chain will play a decisive role, that much is certain. Maritime companies should now address the question of how they can align their business fields to this and help shape the transformation. This will give them the opportunity to position themselves in the market at an early stage, to help shape what is on offer, and to benefit from the value chain.

IN BRIEF

From 2021, the Fraunhofer CML will further expand its competencies and strengthen its commitment to port technology. Our new research area **Port Technologies** deals with the safe, economical and low-emission design of processes and structures related to cargo handling in ports. The team, which is currently being established, is developing competencies and initiating research projects in the focus areas of automation, digitalization and robotics. In the future, innovative and practical solutions will be developed and implemented for port stakeholders, manufacturers of port equipment and other relevant market players.

Maritime Innovation Update - our weekly MIU, every Friday at 12 noon since the beginning of November, has gained an amazing audience after only four months of „air time“. The quarter-hour presentations, in which our researchers report on current projects and solutions, have already attracted more than 550 viewers. In the future, the broad spectrum of presentations will also be presented in English at irregular intervals, and we will make past presentations available for listening on our homepage. We are pleased about the great interest and the opportunity to present our topics and researchers in this new format. All information about the MIU can be found on our homepage under „Events“.

+++DATES+++

- **LEC Sustainable Shipping Technologies Forum**, April 27 to 28, 2021, hybrid event (English)
- **Maritime Innovation Insights**, our lecture series digital, daily from May 3 to 6, 2021 at 12 p.m. (German)

IMPRINT

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