Optimisation of Shipyard Processes Boosts Productivity and Eco-efficiency

The smoother the process, the better the eco-efficiency

Eco-efficiency in shipping is often focused on ship operations, but it is important to widen the perspective to cover shipbuilding and ship repair. Reducing waste material and improving recycling have direct positive effects on eco-efficiency. Increased productivity and efficiency of production processes have positive impacts as well, as there will be fewer useless transfers of items, damages and need for adjusting or fixing work phases.

Key findings

The need to optimise processes is relevant for shipyards where vessels are built and repaired, as doing so can increase productivity and eco-efficiency.

At shipyards, **inefficiencies** are often most prominent in **process management and supply chain management.**

One challenge is that the shipbuilding process includes a large network of different-sized companies, and the **new solutions and procedures should be applied across the whole supply chain**.

Optimisation of processes, restructuring of work, and capitalisation of new digital technologies can **improve productivity and efficiency** in shipyards.

Digital technologies, such as 3D scanning, virtual reality (VR) and augmented reality (AR) solutions, can be utilised to improve, for example, block manufacturing, dry docking and repair operations. **Workhours can be saved, the quality of work and product can be improved and waste and emissions can be reduced**.

Technology needs further development and innovation, but the biggest challenge may lie on the human side: **how to get personnel to adopt new digital solutions**, to share more information within and between companies in the supply network and to fully utilise the opportunities that digitalisation provides.

Training and education are key factors in making the shipyard processes more productive and eco-efficient with the help of digitalisation.

More productivity and eco-efficiency through digitalisation

There are many phases in the shipbuilding process where productivity and (eco-)efficiency can be improved. Optimised and digitalised operations and processes, restructuring of work and capitalisation of new technologies like AR and VR applications, 3D and digital twins and other digital solutions can be used to reach this goal.

In shipbuilding, process management and supply-chain management play crucial roles in making the whole process more effective. Information sharing and transparency across and between the different companies working in the same supply chain have to be improved to make the process smoother and increase the quality.

Even if the main focus is on better productivity and efficiency, the adaption of new digital solutions has positive effects on the environment as well. For example, the utilisation of 3D technology in the block manufacturing process reduces the use of material and lead time. Many man-hours are also saved because 3D scanning and measuring enable better process planning and proactive actions.

The benefits of digital solutions are not restricted to newbuilding processes as they also apply to ship repair activities. With 3D scanning, it is possible to get more detailed verification than with human eyes. It is also possible to collect 3D imaging data from many dry dockings and thus create a portfolio of geometrical data that considers all changes made since the first 3D model was created.

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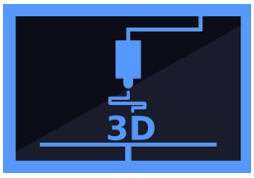
Implications and recommendations

It is very important that shipbuilding is included in eco-efficiency studies. The **whole life cycle of a ship**, from designing and building through operating and repairing until the final recycling process, should be considered and made more eco-efficient and sustainable.

Digital solutions can and should be used in many phases of the shipbuilding process. They can be utilised in basic works, such as monitoring welding quality in real time or using welding robots. Digital solutions have much potential in **real-time planning and reporting** problems, improving **task training and handover** and **controlling and managing warehouse inventory**.

3D technology has a lot of potential to be applied in shipyards. With 3D printing, it will be possible to manufacture spare and missing parts. Digital twins based on 3D scanning will be used for virtual delivery inspections and in planning repairs. More emphasis on developing 3D technology is needed.



Shipyards are vast facilities with many supplier companies working both inside and outside of the yard area. **New operating methods and policies** should be applied across the supply chain. For example, if the aim is to reduce waste, all subcontractors will need to follow the same instructions. This challenges the **management of the supply chain and network**. More information exchange and visibility are needed.

Another challenge is that the readiness to adopt digital changes varies from one company to another. Special emphasis should be placed on enhancing **digital capabilities and knowledge** of small and medium-sized companies. This could be partly financed by EU and national programmes, and it would also benefit many sectors other than shipbuilding.

Knowledge management is one key issue in the transition to a digitalised working environment. It can be challenging to get personnel to share their knowledge and incorporate it into the system. However, improved knowledge sharing within organisations would speed up the enhancing of eco-efficiency through digitalisation.

In addition to personnel skills, the **technological capabilities** for processing large amount of data to share and view data online need investments. Research and development work on sophisticated software needs promoting as well.

It is a question not only of whether the technology is capable enough but also of whether people are ready to use it. Barriers may be higher in the implementation of digital technologies than in their availability. **Education** rises to a top priority in promoting the digitalisation of shipyard processes. This needs to be noticed on both EU and national levels.

Different approaches to using digitalisation in shipyard processes studied in the ECOPRODIGI project

In the case of optimisation of shipbuilding processes at shipyards, collaboration was carried out by Meyer Turku, JSC Western Baltic Engineering, OSK-ShipTech, Carinafour, Sininen Polku, Chalmers University of Technology and Klaipeda Science and Technology Park.

The work included three stages. The first included interviews, study visits to a shipyard and a survey to external experts to identify core capabilities for sustainable shipyard processes. New concepts and solutions in the shipyard processes and supply-chain management were investigated.

The second stage included an industrial phase which evaluated the manufacturing process of two specific blocks. Eco-inefficiencies in the collaborative processes and potential of 3D technology for improving them were investigated.

The third stage covered dry docking and repair operations and included 3D scanning, measuring and post-processing of data.

Further reading

Maritime industry processes in the Baltic Sea Region. Synthesis of eco-inefficiencies and the potential of digital technologies for solving them. ECOPRODIGI RESEARCH REPORT 2020.
Elisa Aro, Niels Gorm Malý Rytter, Teemu Itälinna.
https://ecoprodigi.eu/wp-content/uploads/2020/02/ECOPRODIGI-Research-Report-1-2020-final.pdf

A more specific policy agenda and the results on the pilotings conducted in the project will be released in December 2020.

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