

DIGITALNI MODEL KAO PODLOGA ZA PROJEKTIRANJE TEHNOLOGIJE GRADNJE BRODA

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Brodogradnja je specifična i vrlo kompleksna grana industrije, a svaki segment brodograđevnog procesa treba biti podržan detaljno razrađenom dokumentacijom usklađenom sa međunarodnim standardima i propisima. Pri tome, u naprednom brodograđevnom procesu cijeli proces mora biti podržan implementacijom suvremenih digitalnih tehnologija. Primjena 3D modela broda u današnjoj brodogradnji uglavnom je bazirano na u potpunosti izrađenom modelu kasnije u fazi projektiranja i gradnje broda. Naime, projekt tehnologije može biti već u odmakloj fazi, a digitalni model još u početnoj fazi izrade. Suvremena brodogradnja treba težiti većoj i bržoj implementaciji 3D modela u proces projektiranja u što ranijoj fazi procesa gradnje broda. Pravovremeno izrađen model omogućuje bolji i kvalitetniji projekt tehnologije, te optimalno tehnološki prihvatljiv način izrade i montaže brodskog trupa. U tom kontekstu, u ovom radu se analizira projektno tehnološka dokumentacija gradnje broda s naglaskom na implementaciju softvera 3D Experience za izradu modela broda u što ranijoj fazi projektiranja. Ovakvim načinom rada omogućeno je bolje i kvalitetnije projektiranje tehnologije, koje za rezultat ima efikasniju računalno podržanu integraciju projektiranja, gradnje i opremanje broda. Prednosti ovakvog pristupa projektiranju tehnologije očituju se kroz povećanje kvalitete konačnog proizvoda, manji utrošak radnih sati, bolju preraspodjelu rada te u konačnici smanjenje ukupnih troškova. Temelj za projektiranje tehnologije opisan u ovom radu jest podjela broda na tehnološke jedinice definirane na način da odgovaraju tehnologiji određenog brodogradilišta. Dodatno, izrada 3D modela prikazana u ovom radu omogućuje uvid u strukturu broda i njegove tehnološke karakteristike relevantne za gradnju i opremanje broda značajno prije faze izgradnje broda u brodogradilištu. Takvom tehnološkom raščlanom modela broda u ranoj se fazi procesa definira preliminarni proračun težina i težišta pojedinih sekcija broda. Isto smanjuje pojavljivanje grešaka i ponavljajućih radova u skupoj fazi gradnje i opremanja broda. U konačnici u ovom radu se naglašava da je izrada i primjena detaljnog digitalnog modela broda u što ranijoj fazi projektiranja i gradnje broda, osim navedenih prednosti, temeljni korak u procesu implementacije koncepta digitalnog blizanca u procesu gradnje i eksploatacije broda što se navodi i kao osnovni nastavak ovog istraživanja.

Ključne riječi: brodogradnja, projektiranje, tehnologija, 3D Experience, digitalni blizanac

DEVELOPMENT OF A DIGITAL SHIP MODEL AS A FOUNDATIONAL FRAMEWORK FOR SHIP CONSTRUCTION TECHNOLOGY DESIGN

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Shipbuilding is a specific and very complex branch of industry, and each segment of the shipbuilding process needs to be supported by detailed documentation in line with international standards and regulations. In addition, in an advanced shipbuilding process, the entire process must be supported by the implementation of modern digital technologies. The application of 3D ship models in today's shipbuilding is mainly based on a model created later in the design and construction phase of the ship. Namely, the technology project may already be in an advanced stage, while the digital model is still in the development phase. Modern shipbuilding should strive for greater and faster implementation of 3D models in the design process at the earliest possible stage of the shipbuilding process. A timely model enables a better and higher quality technology project, and an optimally technologically acceptable method of manufacturing and assembling the ship's hull. In this context, this paper analyzes the project-technological documentation of ship construction with an emphasis on the implementation of the 3D Experience software for the creation of ship models in the earliest possible design phase. This way of working enables better and better technology design, which results in a more efficient computer-supported integration of designing, building and ship outfitting. The advantages of this approach to technology design are manifested through an increase in the quality of the final product, a lower consumption of working hours, a better redistribution of work and, ultimately, a reduction in total costs. The basis for the design of the technology described in this paper is the division of the ship into technological units that are adapted to the technology of a particular shipyard. In addition, the creation of the 3D model presented in this paper enables an insight into the structure of the ship and its technological characteristics relevant to the construction and equipment of the ship significantly before the construction phase of the ship in the shipyard. Such a technological analysis of the ship model defines a preliminary calculation of the weight and center of gravity of individual sections of the ship at an early stage of the process. It also reduces the occurrence of errors and repetitive work in the expensive phase of building and ship outfitting. Ultimately, this paper emphasizes that the creation and application of a detailed digital model of the ship at the earliest possible stage of the design and construction of the ship, apart from the mentioned advantages, is a fundamental step in the process of implementing the concept of a digital twin in the process of construction and exploitation of the ship, which is stated as the basic continuation of this research.

Keywords: shipbuilding, design, technology, 3D Experience, digital twin