

Local Communities



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IMarEST BeNeLux Branch - Technical Meeting 3D printing of Propellers

Speakers: Don Hoogendoorn and Constantinos Goulas
Position: Principal Research Engineer at Damen, Postdoctoral Researcher from TU Delft at RAMLAB
Companies: Damen Shipyards and RAMLAB
Websites: <https://www.damen.com> and <http://www.ramlab.com/>
Date: Thursday 20th of September 2018
Time: 18:30 – 22:00
Venue: Delft University of Technology – 3ME Faculty – Lecture room B (Isaac Newton)
 Mekelweg 2
 2628 CD Delft
Contact: IMarESTBeNeLux@gmail.com
Parking: P-Aula or P-3ME; see campus map on <http://www.tudelft.nl/en/contact/>.

Dear member or friend,

You are hereby cordially invited to the coming Technical Meeting of the IMarEST BeNeLux Branch. Details of the programme and additional information can be found below. Your attendance to this Technical Meeting will be much appreciated. I look forward to seeing you on the 20th of September.

Would you kindly let me know if you plan to attend this event by registering [online](#). Please register before Monday 17nd of September, so that we can order sufficient refreshments. Please note we have changed our policy concerning refreshments for non-members of IMarEST. We now kindly ask a contribution to refreshment costs of 5 euro's from non-members. The bank account number of IMarEST BeNeLux branch is: [NL67 RABO 0364 6179 69](#) (no refunds).

Thank you in advance.

Yours sincerely,
 Erik-Jan Boonen – Honorary Secretary IMarEST Benelux Branch.

Detailed Programme

18:30 Welcome incl. coffee; meet other attendees
 19:00 Technical Presentation
 19:45 (Coffee) Break
 20:00 Technical Presentation
 20:45 Discussion / remaining questions
 21:00 Drinks / Networking event
 21:45 Closure

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Abstract

Presentation 1:

Marking a major step forward in the application of 3D printing techniques in the maritime sector, Damen Shipyards Group has entered a cooperative consortium with RAMLAB, Promarin, Autodesk and Bureau Veritas. The goal of this group of forward-looking companies is to develop the world's first class approved 3D printed ship's propeller, named 'The WAAMPeller'. The WAAMPeller was based on an existing Promarin design that is typically found on a Damen Stan Tug 1606. This 1.3 m diameter propeller weighs approximately 180kg. Using Autodesk software in the construction process, Port of Rotterdam's RAMLAB fabricated the WAAMPeller using a Ni-Al Bronze alloy and the Wire Arc Additive Manufacturing (WAAM) process. Bureau Veritas was involved in the certification of the completed product, making the WAAMPeller the first metal 3D printed maritime component approved by Class. What is quite unique about this project's consortium of companies is that, while they have joint interests, they also have individual aims. This leads to a very productive and cooperative atmosphere in what was a very exciting and successful project. During this lecture Don Hoogendoorn will give an overview of the project and which challenges had to be overcome during the development of the propeller.

Presentation 2:

The second part of the lecture addresses the technical aspects of the WAAMPeller project in depth. At first, a general introduction to Additive Manufacturing for metals will be given. RAMLAB produces large scale metal components, therefore specialises in a high productivity technique called Wire and Arc Additive Manufacturing (WAAM). Producing large objects layer by layer and meeting stringent quality requirements involves complicated automation and control. After presenting the challenges faced when depositing the WAAMPeller, the WAAM setup as developed at RAMLAB will be explained.

The success of the WAAMPeller lies to a great extent in the material-centric approach adopted. Every component's mechanical properties are defined by the heat treatment cycle followed during its production. To design the heat treatment cycle and to guarantee the resulting mechanical properties, extensive metallurgical investigations were performed. These included material selection, metallography, tensile tests, corrosion tests, Charpie impact tests and non-destructive tests. The results of these tests were analysed and were used for developing the certification plan of the WAAMPeller.



About the Speakers

Don Hoogendoorn is Principal Research Engineer (Structures & Production) at Damen Shipyards Gorinchem. In this role he is amongst others responsible to explore alternative manufacturing techniques. Damen R&D started its research into additive manufacturing several years ago. To validate the initial analysis Damen teamed up with RAMLAB to develop the first 3D printed propeller.

Constantinos Goulas is a materials scientist and welding expert. He is working as a Post-doctoral researcher for TU Delft and RAMLAB, which is a startup company making parts on-demand with 3D-metal printing. His research focuses on materials science aspects of large scale 3D printing of metals. He holds a doctorate from TU Delft in physical metallurgy of steel and a Master's degree in mining and metallurgy from National Technical University of Athens.