

Press release

Naval Group and Centrale Nantes print the world's first hollow propeller blade

Naval Group and Centrale Nantes have printed the first demonstrator of hollow propeller blades by metal additive manufacturing as part of the European H2020 project, RAMSSES¹. Funded by the European Commission, this collaborative program aims to reduce the environmental impact of ships. Centrale Nantes and Naval Group are taking the lead within this project on the production of innovative propeller demonstrators to improve the operational capabilities of ships.

In order to improve vessel propulsion, Centrale Nantes and Naval Group are using additive manufacturing to design large parts (propellers of 6 metres in diameter), which could not be produced thus far using traditional manufacturing technologies. Implementing the Wire Arc for Additive Manufacturing (WAAM) process allows for the printing of large parts and paves the way for the production of propellers with more complex geometry.

Substantial industrial gains

The one-third scale hollow blade demonstrator, representative of a container ship propeller, was printed in stainless steel in less than one hundred hours, weighing in at about 300 kg. The teams' sheer technical prowess means that weight gains of over 40% will be achievable compared to conventional processes.

Significant operational gains

Sirehna, a Centrale Nantes spin-off and subsidiary of Naval Group, is piloting the blade design in order to improve propeller energy efficiency and reduce their environmental impact. Sirehna's work has led to an overall optimization of blades in terms of efficiency and endurance, but also a significant reduction in radiated noise and vibrations. Reducing the environmental footprint linked to propulsion, as demonstrated in the H2020 RAMSSES project case study, is a challenge for all types of vessels, and particularly for large container ships.

Naval Group and Sirehna have been able to count on the exceptional technical resources and extensive knowledge offered by Centrale Nantes. The school's expertise in trajectory generation and additive manufacturing is needed to produce the blade. This long-standing co-operation, which took on a formal footing in 2016 with the creation of a joint laboratory (JMLT²), feeds through to control over the entire digital chain from design to mechanical dimensioning and hydrodynamics to manufacturing, and will lead to the production of a complete propeller.

Naval Group's Patrice Vinot, Propeller Package Manager for the RAMSSES project, underlines the challenge of such a manufacturing process: *"Although additive manufacturing is increasingly present in industry, the programming and design of complex parts, such as propeller blades for ships, represents a considerable challenge for our teams and our partners. The potential of the process revealed by this new case study means that we now anticipate unparalleled performance for the propellers of tomorrow. Taking part in projects such as RAMSSES and coordinating our network of academic and industrial partners will allow us to bring 3D printing into shipyards for the long term."*

Professor Jean-Yves Hascoët, head of the Rapid Manufacturing Platform at Centrale Nantes and international expert in additive manufacturing: *"Additive manufacturing has been developed over the last 35 years on the Rapid Manufacturing Platform. All these years of research come to fruition through a project like RAMSSES, which represents a real transfer of our technologies into an industrial environment."*

¹ RAMSSES: Realization and Demonstration of Advanced Material Solutions for Sustainable and Efficient Ships. 48 months of collaborative program, 21 work packages, 37 partners of 12 countries, marked by the presence of the main shipyards (Damen, Meyer Werft, Chantiers de l'Atlantique, Naval Group...) and European maritime research laboratories (including TNO in Netherland and the Research Institute of Sweden), RAMSSES is indeed a megaproject. Its ambition is to implement and demonstrate via experimentation campaigns that new advanced material solutions in shipbuilding can lower the environmental footprint.

² JLMT: Joint Laboratory of Marine Technology. Created in 2016 the JLMT is a joint laboratory in industry and research which the general objective is to mobilize academic and industrial skills of Centrale Nantes, Nantes University and Naval Group in order to result in qualified innovation for Naval Group's industrial applications in the field of naval construction.

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About Naval Group

Naval Group is a European leader in naval defence. As an international high-tech company, Naval Group uses its extraordinary know-how, unique industrial resources and capacity to arrange innovative strategic partnerships to meet its customers requirements. The group offers a wide range of marine renewable energy solutions. Attentive to corporate social responsibility, Naval Group is a member of the United Nations Global Compact. The group reports revenues of €3.7 billion and has a workforce of 13,429 (data for 2017).

About Centrale Nantes

Founded in 1919, Centrale Nantes is a French engineering school and member of the Écoles Centrales Group. Its undergraduate, Master and PhD programs are based on the latest scientific and technological developments and the best management practices. At Centrale Nantes, research and training are organised into three key areas for growth and innovation: manufacturing, energy transition and healthcare. With research platforms ranging from digital simulation to prototyping using full scale models and an incubator with 20 years of experience in supporting start-up projects, the school has two major tools for innovation and creation, working hand in hand with industry. Centrale Nantes promotes its teaching and research capabilities at international level through around 100 partnerships with prestigious universities and schools worldwide.

Centrale Nantes welcomes 2,410 students, including 1,440 undergraduate students, 170 Executive Education and ITII degree apprenticeship students, 270 PhD students, 430 Masters students, and 100 Bachelor/Foundation Master students on its 40-acre campus.