About *GATERS Newsletter*

GATERS Newsletter is published six-monthly to report some activity highlights from the collaborative H2020 European project "GATERS", including the three of the 18 project partners' profiles at the end of each issue.

The last issue of the GATERS Newsletter (#1) reported on the introduction to the GATERS project, including its background aims/objectives, partners, work programme and management. It also included some activity highlights of the project for the first six months (Feb '21 to Aug' 21). This issue (#2) focuses on the second six months' activity highlights (Aug '21 to Feb'22)

Activities Highlights (From August 2021 to February 2022)

European Commission's H2020 Framework sponsors the three years of Innovation Action project GATERS with 18 partners and a 5.9M EUR total budget. The project was kicked-off on 24 Feb 2021 to achieve its aims and objectives within the nine work packages (WP) shown in Fig. 1.

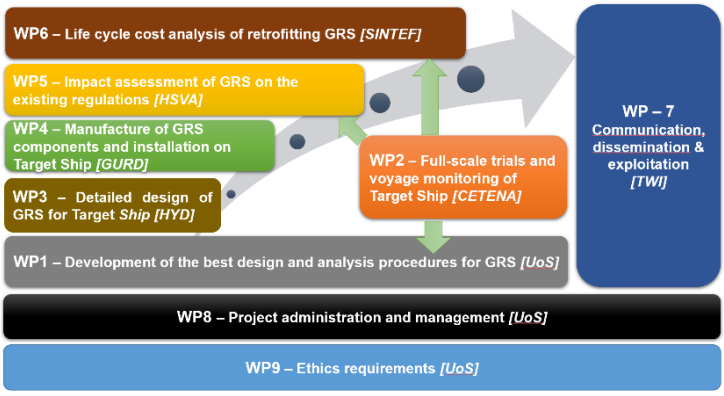


Fig 1. GATERS Project work packages

The following are some activity highlights during the second six months of the project in the active WPs:

- WP1 is the main engine of GATERS which is led by the partner Strathclyde University (UoS) to develop the best methodology for designing and retrofitting the project target ship (MV ERGE) with a gate rudder system (GRS) using the numerical, experimental and full scale-empirical procedures. In the second six months of the project, the most pressing activity was completing the detailed design of the retrofit GRS to secure class approval from BV. For this purpose, the CFD predictions were conducted to estimate the critical loadings (Fig. 2) on the GRS. This was supported by the additional and accelerated model tests conducted by the partner ITU in their towing tank with a 3.6m model under varying GR angles and ship speeds. The estimated loads were input to the FEA analysis code (Fig. 4) by the partner TWI and UoS to check on the stresses (Fig. 3) at the critical location of the GRS and the deformations (Fig. 5) of the blades under the extreme loading based on the detailed CAD drawings produced by the partner GURD in WP3.

  The initial design of the GRS propeller was fine-tuned with the model test data produced by the partner CNR in their towing tank with a 6.0m model of MV ERGE (Fig. 6). The model test campaign in CNR was kicked off relatively later than initially scheduled in Dec '21 for the comparative resistance and propulsion tests of the target vessel to confirm the expected power saving with the retrofit of the GRS in comparison to the vessel's existing conventional flap rudder. The test results presented preliminary power savings of up to 10% for trials and full-load conditions (Fig.7). The model tests in CNR continue with the cavitation tunnel tests as this *Newsletter* is prepared. This will follow by the free-running manoeuvring tests in a lake with the same model. In the meantime, other model test campaigns with the 1st GRS equipped Japanese container vessel (Shigenobu) and her sister ship (Sakura) were underway by the partner HSVA, with an 11m model of these vessels tested in their towing tank for R&P tests in Oct 2021 (Fig.9) and later in Feb 2022. A 5.5m model of the same vessels was also tested at the ITU towing tank (Fig. 8) to provide essential model tests data together with the HSVA tests for the CFD prediction campaign of WP1 to shed light on the scale effect. The CFD campaign of WP1 has been well underway for modelling the two target ships (i.e. MV ERGE and Shigenobu) with the gate rudder and conventional rudder systems (CRS) to develop an accurate CFD based prediction methods for powering, manoeuvring and seakeeping in the model and full-scale.

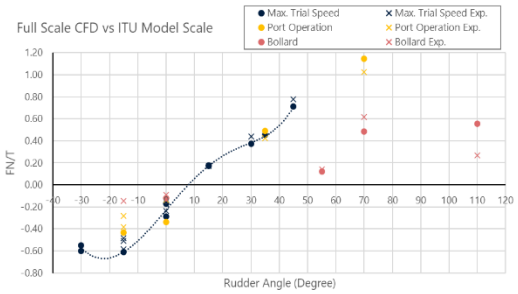


Fig 2. Comparison of experimental rudder normal force with the full-scale CFD predicted force.

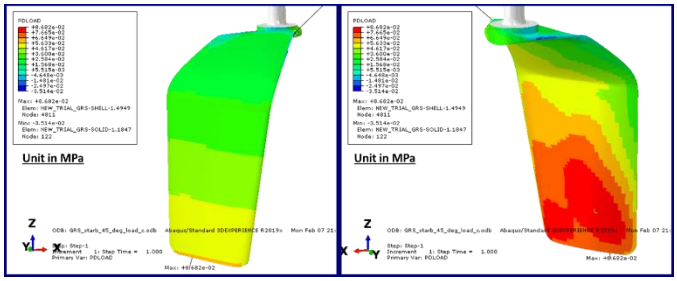


Fig 3. Predicted stresses - Load case of starboard side rudder at 45° - applied pressure load (5.1% magnified load)

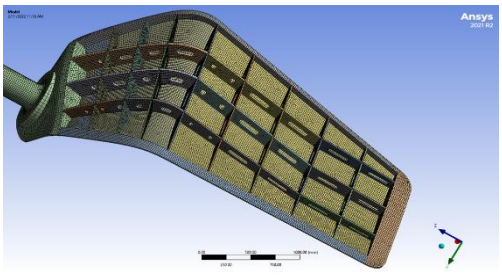


Fig 4. Modeling and mesh of GRS blade in ANSYS for 45° load case of starboard rudder blade

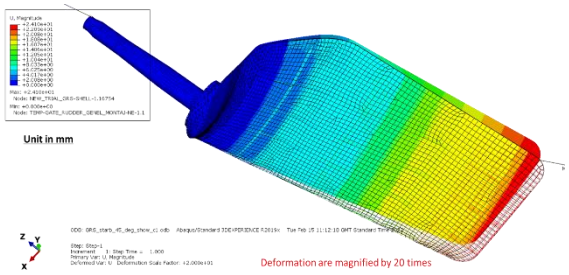


Fig 5. Predicted blade deformantions - Load case of starboard side rudder at 45°(5.1% magnified load)

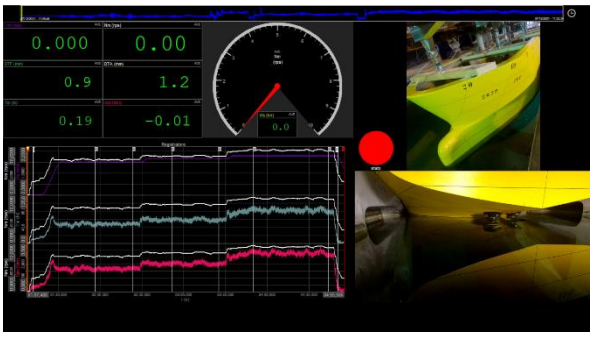


Fig 6. 6m ERGE model and data collection set up at the CNR tank test facility

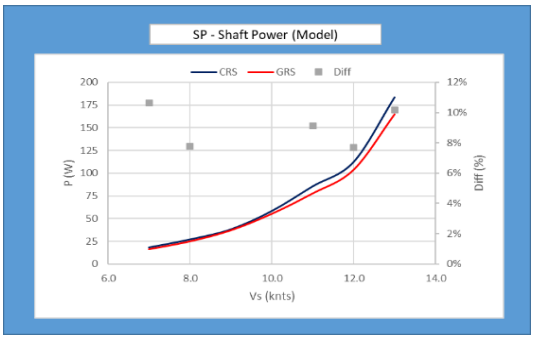


Fig 7. Measured shaft power on 6m model with GRS and CRS arrangement

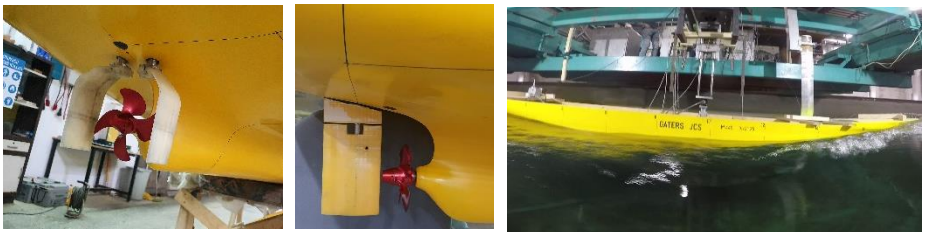


Fig 8. Japanese container vessels (Shigenobu and Sakura) 5m model rudder set up (left) and self-propulsion tests underway (right) at ITU towing tank.

Fig 9. 11m ERGE model GRS set up (left) and self-propulsion tests underway (right) at HSVA towing tank.

- WP2 is led by partner CETENA and involves the full-scale trials and voyage performance monitoring of MV ERGE before and after the GRS retrofitting to assess the benefits of the GRS in terms of powering, manoeuvring, emissions, hull pressure, vibration, and underwater radiated noise. In the second six months period of the project, MV ERGE was fully equipped with a torque meter, shaft speed and rudder angle sensors and a fuel meter by the partners CETENA, BV, CAPA and HYD (Fig. 10 and 11). The performance monitoring campaign was kicked off on Oct 21 using CETENA's data acquisition system. In the meantime, an agreement was reached with the Lamma Consortium to purchase the met-ocean data on the vessel routes to facilitate the performance data analyses. This WP is also making necessary preparations for the sea trials before and after the retrofitting, which is expected to take place in October/November 2022.

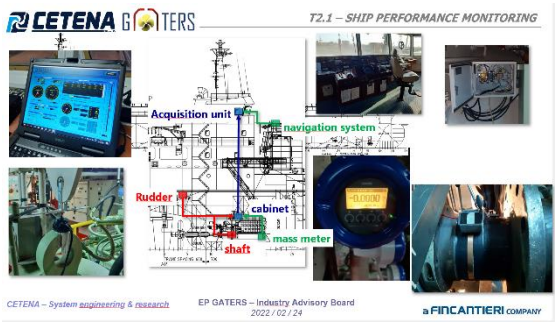


Fig. 10. A general view of MV ERGE's performance monitoring system components

Fig. 11. A professional visit to MV ERGE (CAPA) in Italy by the project partners CETENA and BV for a trouble shooting solution

- WP3 is led by the partner Hidroteknik (HYD) and involves the detailed engineering design of the GRS components on the target vessel. In the last six months of the project, following the initial hydrodynamic design of the GRS by the partner UoS, the detailed designs of the GRS blades, propeller and shaft were completed by the joint efforts of the partners UoS, GURD, SMP and TWI and all necessary CAD drawings were prepared for these main components and submitted to the BV for the class approval including the supporting calculations (Figs. 12, 13 and 14). During this reporting, the class approval process is still underway. The timing of the approval will determine the exact time for drydocking for the retrofitting. This WP also specifies the selection of the Steering gear machinery and associated control (Autopilot) system. Although each GR blade's required steering gear capacity is less than the current steering gear, the owner CAPA preferred to twin the existing steering gear with the same torque capacity (125 kNm) from DATA (Hydraulic) of Turkey. The Autopilot system for the GRS was selected from Tokyo Kekki's AUTOPILOT PR-900 series with the two independent ruder blades with an angle range of -20 to +110 deg (toe-in to toe-out positions, resp.)

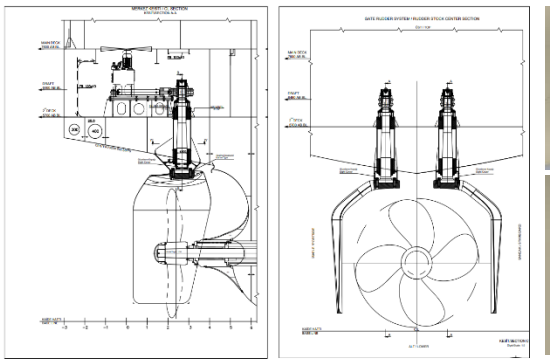


Fig. 12. Design details of the GRS (left) and its arrangement in 3D (right) for MV ERGE

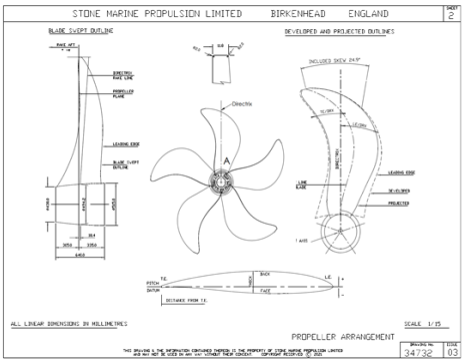


Fig. 13. Design details of the new propeller designed for the GRS system of MV ERGE

- WP4 is led by the partner Gurdesan (GURD) and involves manufacturing the GRS components and installation on the MV ERGE. The strategic planning for removing the existing CRS and installation of the GRS has already been done. Manufacturing of the components is due to start following securing the class approval that will continue with the sea trials and retrofitting task in October/November 2022.

- WP7 facilitates the project communications, dissemination and exploitation (CDE) activities led by the partner TWI. Following the busy first six months CDE activities to raise the project profile in Europe and globally, the CDE activities continued in the second six months. These included the official integration of the association of the Turkish Coaster Shipowner (KOSDER) into the GATERS Industry Advisory Board. Furthermore, the project was presented at three consecutive international conferences via three keynote presentations. These events were the 2nd Int'l Congress GMO-SHIPMAR 2021 (16-17 Sept), 4th Greentech Shipping Virtual Forum 2021 (Oct 19), and 7th Int'l Conference ISCOT 2021 (19-20 Nov). Also, GATERS had an invitation from the International Chamber of Shipping to display the project activities in the "Shaping the Future of Shipping" conference/exhibition event on 5-6 Nov 2021 in conjunction with the global climate meeting, COP'26 event in Glasgow. In this event, GATERS was presented to the global VIP audience, including the UK and other foreign ministers and the IMO secretary, through the effective dissemination of materials prepared and displayed (Fig. 14)

Fig. 14. GATERS project was presented to the global VIPs (including the IMO secretary on the left) in the "Shaping the Future of Shipping" conference/exhibition event in conjunction with the global climate meeting, COP'26 event in Glasgow .

- WP8 is led by the project coordinator, UoS and involves GATERS' technical and financial management. During the last six month period, WP8 arranged the regular WP and task meetings for the active WPs. In addition, the 3rd and 4th Steering Committee (21st Oct 2021 & 17th Feb 2022, resp.) and the 2nd General Assembly (23rd Feb 2022) meetings, the 1st Industry Advisory Board (24th Feb 2022) meeting was held successfully.

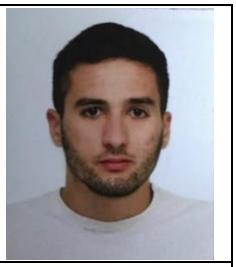
Project Partners Profiles

In each Newsletter issue, we introduce the three project partners of the GATERS project in turn, including their key staff and roles contributing to GATERS. In this issue, the partners: (4) Glafcos Marine Ltd (GME), (5) The Institute of Marine Engineering (CNR), (6) Hidroteknik Nautical Design Technologies Ltd (HYD) are introduced in the following pages.

➢ 4. Glafcos Marine Ltd (GME):

Glafcos Marine is a technical group composed of Naval Architects, Marine, Mechanical, Electrical Engineers and Programmers which provides multi-disciplinary advisory services, software products and systems in the maritime industry. The main areas of maritime services provided by Glafcos Marine are consultancy services for strategic planning and problem-solving of technical issues faced by shipping companies during vessel's life cycle, starting from new building design, vessel retrofitting, construction supervision, sea trials attendance, ship inspection, maintenance and major repairs. Inspection services ranging from condition identification surveys to sale purchase and damage surveys are supplied. Glafcos has an international network of collaborators in the broader area of supporting ship operations, including shipyards, ship-owners and ship-operators. Glafcos is also an accredited service supplier member of Classification Societies under the International Association of Classification Societies (IACS) in the field of non-destructive testing.

Glafcos Marine has a long record of successfully completed and on-going projects funded by EU in the last decades and other international and national agencies. Our research interests vary from robotics and vessel retrofitting to renewable energy sources. The connecting link of our project is our expertise in the marine environment and in the development of novel technologies for marine and maritime applications. Through our experience of almost two decades of continuous research activity, our R&D department is now capable of designing and manufacturing in-house prototypes of complex systems, such as robots and energy absorbing devices.

				
Leonidas Drikos Managing Director Naval Architect & Mechanical Engineer, MSc. Applied Economics & Finance, MSc.	Athanasios-Rafail Lagos Project Manager Electrical & Computer Engineer, PhD	Vassilios Kyrkos Naval Architect & Mechanical Engineer, MSc.	Georgios Kakaliouras Naval Architect & Mechanical Engineer, MSc.	Panagiotis Raftis Naval Architect & Mechanical Engineer, MSc.

➢ 5. The Institute of Marine Engineering (CNR-INM):

The Institute of Marine Engineering (CNR-INM) is a public research institute within the Department of Engineering, ICT and Technologies for Energy and Transport of the National Research Council of Italy. CNR-INM mission is to conduct fundamental and applied research in the field of marine engineering, foster innovation and competitiveness of the national industrial system, promote the internationalization of the national research system, provide technological solutions to emerging public and private sector needs and challenges, and foster the personal and professional growth of human resources. CNR-INM mission is pursued within several areas of marine engineering including low-environmental impact vehicles for a sustainable transport, marine technologies, low-emission energy technologies, marine robotics, logistics and transport in maritime environment, marine vehicles, energy management on-board and in port/coastal areas.

Research and technology support activities take advantage of a world-class multi-purpose platform of infrastructures for hydrodynamic testing that include wave and calm water tanks, a depressurized circulating water channel, a hydrodynamic tunnel and an outdoor manoeuvring basin. Some of these infrastructures are ranked among the largest hydrodynamics facilities in the world for testing ship models and marine energy systems. Since 80s, CNR-INM has pioneered the development of state of the art theoretical/computational and optimization tools to address a wide range of problems in the field of marine engineering.

CNR-INM has a long record of successfully completed and on-going projects funded by EU and other international and national agencies.

INM-CNR leads WP1.3 and contribute to WP2, WP7 and WP8 with the following member of staff and their roles.

Dr Mario FELLI,

Project manager and PI for CNR, Manager of C&N, velocimetry and DIC tests

Dr Salvatore Mauro,

Manager of manoeuvring tests

Dr Ivan Santic,

Manager of R&P and seakeeping tests

Serena Premici, BCL.

Administrative manager

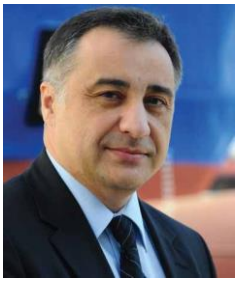
➢ 6. Hidroteknik Nautical Design Technologies Ltd (HYD):

Hidroteknik was founded in 2011 to transfer academic knowledge and experience to industrial problems through advanced engineering methods. Hidroteknik provides design and engineering consultancy services to the merchant and naval shipbuilding and ship operations using the experience gained by Hidroteknik personel over 40 years, by making use of extensive problem and solution database, measurement experience and academic knowledge. Areas of Practice Hidroteknik provides services mainly in three areas:

- Computational Fluid Dynamics: Hydrodynamics and aerodynamic problems related to ship design and operation are tackled by Hidroteknik using advanced techniques and in house computational infrastructure.
- Trials & Measurements: Both model scale and full-scale shipbuilding data is collected using techniques to reduce uncertainty. Hidroteknik has its own equipment for speed, EEDI, shaft power, manoeuvrability trials, noise and vibration measurements
- Tool development: Specialized methodology and software development, industry studies. Currently has software for seakeeping and manoeuvrability, onboard noise prediction, simulation for helicopter landing on ships

Hidroteknik is providing advisory services to the Turkish Chamber of Shipping, Turkish Ship and Yacht Exporters Association, Turkish Shipbuilders Association, and Turkish Port Operators Association on climate change and energy efficiency of ships. The research team of Hidroteknik have been involved in many research projects, both national (Ship energy efficiency, decision support systems, onboard noise, wind-assisted ship propulsion, ship-helicopter interface) and international (European Commission co-funded projects: TARGETS, TEFLES, SMOOTH, ARIADNA, POP&C).

Hidroteknik leads WP3 and contributes in WP2, WP5, WP6, WP7 and WP8 with the following member of staff.



Mustafa INSEL
Business Development

A. Ziya SAYDAM
General Manager

Serhan GOKCAY
Technical Manager

- Project ID: 860337
- Project partners' website: www.gatersproject.com
- EC (CORDIS) website: https://cordis.europa.eu/project/id/860337
- Social media platforms:
  https://twitter.com/gatersproject;
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  https://www.youtube.com/channel/UCh0n9ruJt75bS64Js4vQEFw
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- Project Coordinator: The University of Strathclyde, UK
  FAO: Prof Mehmet Atlar; (mehmet.atlar@strath.ac.uk), The Principal Project Investigator and Coordinator
  Tel: +447900890228 (mob); +441415484947(w)

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