KTH Marina system

KTH MARINA SYSTEM & SKEPPSÄLLSKAPET ARRANGERAR:

MARINE TECHNOLOGY DAYS

2-3 JUNE 2026

THE 18TH NAVAL ARCHITECTURE STUDENT CONFERENCE, NASC-2026

&

MARITIME EXPO

Program & Abstracts!

MARINE TECHNOLOGY DAYS -The 18th Naval Architecture Student Conference, KTH-NASC-2026 | KTH

PROGRAM TISDAG 2/6 MARINTEKNIKDAGAR PÅ KTH 2026

DAG 1 SESSION 1-4

OSQUARS BACKE 18 SAL E3, KTH | E3

8.15	**Studentkonferens – Vad och varför!** *Karl Garme, KTH Marina system*				
8.20-10.00	SESSION 1: BALANCING THE SURFACE *Ordförande: Elin Lindbergh, Saltech*				
	KEx åk3	**Rescue system for AUV** *Hicham Benkhalfa*			
	MEx åk5	**GPU-accelerated simulation in studies of parametric roll incidents** *Angelica Boin*			
	KEx åk3	**Underwater robot design for AUV recovery** *David Gustavsson*			
	MEx åk5	**Accelerations in PCTC:s - A Data Analysis** *Kajsa Engelfeldt*			
	MEx åk5	**Trimaran vs monohull** *Jonas Andersson*			
10.00-10.30	KAFFEPAUS				
10.30-12.15	SESSION 2: AERO & HYDROMECHANICS *Ordförande: Lukas Blau, Wallenius Marine*				
	MEx åk5	**CFD Strategies for Wing Sails** *Akash Konar*			
	KEx åk3	**Parametriskt exciterad rullning** *Leo Stenberg Wahlström*			
	MEx åk5	**Wing-sail and Bow-foil System** *Julian Berrio Quintero*			
	KEx åk3	***SU-MOTH*** *Viktor Eriksson*			
	MEx åk5	**Hydrofoils vs the operational envelop** *Hugo Olsson*			
ca 12.15-13.00	LUNCH				
13.00-14.45	SESSION 3: EXPLORE AND MODEL *Ordförande: Sonja Wadelius FMV*				
	KEx åk3	**Why is there a nozzle around marine propellers** *Johan Thulin*			
	MEx åk5	**Hybrid Carbon-Flax Sandwich for Marine Structures** *Felipe Perez-Andujar*			
	KEx åk3	**System for AUV Deplacement Control** *Axel Skagermark*			
	MEx åk5	**Residual stress impact on instability and collapse in submarine pressure hulls** *Greta Garme och Jesper Olanders*			
	KEx åk3	**Modellering av parametriskt exciterad rullning** *Oscar Berg*			
14.45-15.15	KAFFEPAUS				
15.15-17.00	SESSION 4: MARITIME TECHNOLOGY AND PRACTICE *Ordförande: Anton Dunström, Saltech*				
	KEx åk3	**Underwater capture systems for an AUV** *Jacob Henriksson*			
	MEx åk5	**Digital twin for ship design and production** *Xuhui Li*			
	MEx åk5	**Local Surface Deformation in Large-Scale Yacht Construction** *Robin Heise*			
	MEx åk 5	**A Diamond Shaped Pipe Trunk - A Way to Improve Intact Stability?** *Arvid Eriksson*			
	KEx åk3	**Samtalen under ytan** *Boel Wessman*			
Från ca 17.00	MÄSSA I KRÖKEN, NYMBLE				

MARINE TECHNOLOGY DAYS -The 18th Naval Architecture Student Conference, KTH-NASC-2026 | KTH

PROGRAM ONSDAG 3/6 MARINTEKNIKDAGAR PÅ KTH 2026

DAG 2 SESSION 5-8

OSQUARS BACKE 18 SAL E3, KTH | E3

	SESSION 5: ASPECTS ON PROPULSION *Ordförande: Petter Holmberg, RISE Maritime*			**SESSION 7: COMPOSITES AND DESIGN** *Ordförande: Ioli Gypa, Oversea*	
8.15-10.00	*KEx åk3*	**Skärgårdens osynliga ljudmiljö - hur får människan plats?** *Benjamin Alberts*	*13.00-14.45*	*KEx åk3*	**Hållbar design** *Ted Wänerstrand*
	MEx åk5	**Structural Optimization of Submarine Pressure Hulls** *Martin Johansson*		*MEx åk5*	**Lessons Learned from Damage History of a Corvette** *Edvin Svenske*
	KEx åk5	**Modelling and Optimization of a Contra-Rotating Propeller System** *Gusten Kiltorp*		*KEx åk3*	**Balanssystem för AUV** *Phoebe Jaresand*
	MEx åk5	**Pushing Device for a passenger ship** *Jakob Wallinder*		*MEx åk5*	**Sandwich vs Single-skin in large, high-speed craft** *Per Thorén*
				KEx åk3	**Thrust vector system** *Niklas Allo*
10.00-10.30	KAFFEPAUS		*14.45-15.15*	AVSLUTNING	
	SESSION 6: STUDIES FROM THE PRACTICE *Ordförande: Erik Ovegård, FOI*			**SESSION 8: NOVEL DESIGN** *Ordförande: Caroline Ferning, Lighthouse*	
10.30-12.15	*KEx åk3*	**Recovery system för AUV** *Georges Hili*	*15.15-17.00*	*KEx åk3*	**Reglersystem för vektorpropulstionssystem** *Vincent Eriksson Revmatas*
	MEx åk5	**Explosionsbelastning av marina kompositstrukturer** *Gösta Lindqvist*		*MEx åk5*	**Integrated batteries-concept and challenges** *Marco Gaspari*
	KEx åk5	**Construction of VBS for AUV SAM** *Albin Hurve*		*MEx åk5*	**Structural aspects of batteries integrated in marine craft** *Madya Kusuma Dewa*
	MEx åk5 (ZOOM)	**Migrant boat detection in SAR operations** *Timothée Maignen*		*KEx åk3*	**Design för sensorintegrering i AUV** *Erik Ahnfalk*
	MSc-course	**Manouvering and rolling the m/s Rex!** *Louise Fritz*		*MSc-course*	**Sailing and Sustainability, Is it possible?** *Baptiste Callieu*
12.15-13.00	LUNCH		***Exakt 18.30***	MIDDAG PÅ M/S APHRODITE AVGÅR FRÅN STRANDVÄGEN 13	

ABSTRAKT TILL PRESENTATIONERNA VID STUDENTKONFERENSEN 2026

SESSION 1: BALANCING THE SURFACE

Ordförande: Elin Lindbergh, Saltech

Rescue system for AUV

Hicham Benkhalfa

This presentation focuses on the physical modeling and simulation of an emergency ascent for the autonomous underwater vehicle SAM. A mathematical model was developed in MATLAB to numerically simulate the vehicle's emergency ascent from depths down to 150 meters. Crucially, the simulations incorporate real-world hydrographic data, analyzing how spatial density variations in the Baltic Sea and the Swedish west coast impact buoyancy and drag. The results quantify the vehicle's ascent velocity and acceleration profiles over time.

GPU-accelerated simulation in studies of parametric roll incidents

Angelica Boin

Parametric rolling represents a critical dynamic instability affecting modern container ships, capable of generating large roll amplitudes that exceed cargo securing design limits and result in significant container loss. This thesis assesses the capability of a GPU-accelerated, hybrid linear-nonlinear time-domain simulation model to reproduce parametric roll behaviour observed in two real-world incidents: the APL England (2020) and ONE Apus (2020) cases, involving head and following sea conditions respectively. Since exact hull geometries and loading data for the vessels involved are not publicly available, representative hull forms are constructed by scaling and stretching established public-domain geometries. Wave conditions were first replicated using Jonswap spectrum and later using Era5 reanalysis data. Sensitivity studies are conducted to evaluate the influence of uncertain parameters, including roll damping, radius of gyration, and loading condition. Simulation results are compared against incident reports and formal investigations to assess model accuracy and its potential applicability for operational parametric roll guidance.

Underwater robot design for AUV recovery

David Gustavsson

Autonomous recovery of Autonomous Underwater Vehicles (AUVs) is a critical research area due to its potential to eliminate the need for large, crewed surface vessels. One idea is to use an airborne drone, mechanically coupled to an underwater Remotely Operated vehicle (ROV) that can be lowered below the water surface to catch the AUV. The use of a flying drone imposes strict limits on the total system weight, a total of 30kg is allowed including the drone, ROV and AUV, favouring a lightweight solution. This presentation explores this possibility and focuses on the ROV itself. Comparisons of available underwater platforms led to the decision to design a new ROV, one focused on lightweight solutions and manoeuvrability that allows for a successful docking with the AUV. This resulted in a prototype-ready design featuring off the shelf control electronics and propulsion systems, validated in Computer Aided Design (CAD) software.

Accelerations in PCTC:s - A Data Analysis

Kajsa Engelfeldt

A data analysis has been performed on real life motion data collected from 5 PCTC:s from approximately the past 5 years to further understand the ships' dynamics at sea. This presentation will demonstrate what can be achieved with a data analysis of acceleration data, and present insight into how ship motions and accelerations have varied during this period. Particular focus will be on how the accelerations vary with ship stability.

Trimaran vs monohull for performance

Jonas Andersson

Naval vessels face increasing demands for improved seakeeping, efficiency, and endurance. These demands are all influenced by hull form and this study investigates the potential of trimaran configurations composed of slender hulls as an alternative to conventional monohull designs. A summary and review of common definitions of hull slenderness is included. Using the Swedish Visby-class corvette as a reference, a series of trimaran designs with comparable displacement and principal characteristics is developed. The hydrodynamic resistance and seakeeping performance of the configurations are evaluated and compared. Focus is placed on performance at the relevant speeds and vessel responses. The results aim to determine whether a trimaran configuration can provide measurable advantages over a monohull, while highlighting the influence of hull slenderness on naval vessel performance within defined operational constraints.

SESSION 2: AERO & HYDRODYNAMICS

Ordförande: Lukas Blau, Wallenius Marine

CFD Strategies for Wing Sails

Akash Konar

In this work, I am studying CFD modelling strategies for wing sail aerodynamics, with a focus on comparing different inflow and turbulence modelling approaches to identify a reliable and computationally efficient setup for predicting performance.

Parametriskt exciterad rullning

Leo Stenberg Wahlström

Den 16:e januari 2021 var det danska containerfartyget Maersk Essen på väg från Xiamen i Kina, till Los Angeles i USA, när det plötsligt utsattes för extrem rullning. Väderförhållandena var inte utöver det normala, trots detta uppnåddes en maximal rullvinkel på 30 grader, vilket resulterade i 689 containrar förlorade överbord och ytterligare 258 containrar skadade. Danska haverikommissionen DMAIB konstaterar att Parametriskt exciterad rullning är den mest sannolika orsaken bakom olyckan; ett stabilitetsfenomen där frekvensen hos inkommande vågor och fartygets naturliga oscillation hamnar i resonans. Men hur uppstår fenomenet egentligen? Vad i Maersk Essens utformning möjliggjorde dessa extrema rullvinklar och vad kunde besättningen gjort annorlunda för att undvika olyckan?

Wing-sail and Bow-foil System

Julian Berrio Quintero

This thesis develops a performance prediction framework to evaluate the net benefit of wing-sail propulsion under realistic operating conditions, accounting for wave-induced added resistance. While most studies focus on calm-water performance, this work includes sea-state effects to assess their impact on the overall performance of wind-assisted propulsion systems. The case study is based on the wind-powered Pure Car Carrier (wPCC) concept developed by Wallenius Marine, using previously obtained numerical results, wind-tunnel measurements, and free-running tests of a 7 m model with four wings to inform the aerodynamic model. The proposed framework couples aerodynamic force predictions, hydrodynamic resistance modelling, and a force-equilibrium solver to estimate propulsion power under different apparent wind conditions and operational scenarios. In addition, the study examines the interaction between wind-assisted propulsion and motion-control and wave-energy-harvesting technologies by exploring a bow-mounted hydrofoil to reduce wave-induced added resistance and improve system performance.

SU-MOTH

Viktor Eriksson

Kan ett ortotropt material, såsom trä, modelleras som ett isotropt material i ett FEM-program för att förenkla hållfasthetsberäkningar? Under ett examensarbete på KTH undersöktes exakt denna fråga, och resultatet visar att denna modellering går att göra under rätt omständigheter. Viktigast är att belastningen primärt är riktad i en av huvudriktningarna, och att infästningarna modelleras korrekt. Presentationen redogör för hur resultatet bevisades, men också för vilka begränsningar som behöver göras för att tillförlitliga svar ska kunna ges av modelleringen. Vidare presenteras vanliga fallgropar vid denna typ av modellering, och hur stor inverkan dessa kan ha på resulterande simuleringen.

Hydrofoils vs the operational envelop

Hugo Olsson

Naval vessels are expected to undergo a transition as future energy systems move away from conventional marine diesel. The alternatives introduce new design constraints due to their lower energy density, affecting the operational performance. To maintain performance, concepts that reduce hydrodynamic resistance have gained renewed interest. Hydrofoils are one such concept: by lifting the hull out of the water, they can significantly reduce drag at higher speeds. While hydrofoils are well-established for small craft, their applicability to larger naval vessels remains uncertain. This study evaluates the feasibility of hydrofoil-borne operation for a 430-ton patrol-type vessel by analyzing foilborne and hullborne resistance, lift requirements and cavitation limits. Results show that hydrofoils provide a performance advantage only above approximately 30 knots.

SESSION 3: EXPLORE AND MODEL

Ordförande: Sonja Wadelius, FMV

Why is there a nozzle around marine propellers

Johan Thulin

Varför sitter det en dysa runt vissa marina propellrar? I denna presentation behandlas vad en dysa är, hur vattenflödet påverkas och hur den kan förbättra propellerns prestanda. Dysans fördelar och nackdelar diskuteras samt dess påverkan på framdrivningen. Slutligen besvaras frågan: om dysor erbjuder så många fördelar, varför används de bara ibland?

Hybrid Carbon-Flax Sandwich for Marine Structures

Felipe Perez-Andujar

The idea of the presentation is to first introduce flax fibres as a construction material, describing the properties, manufacturing and interesting facts. Then, I will continue to the applications for marine structures, where I will briefly comment on ship design and scantling, and present the different material concepts I am using to design the hull of a motor yacht. For these different materials I have studied so far analytically the mechanical and dynamic properties, pending to do a lab test to properly determine the dynamics and the inherent damping properties of a flax composite. I will show the results I have so far and what is pending to do to complete my master thesis.

System for AUV Deplacement Control

Axel Skagermark

In the Bachelor's thesis that I conducted together with Albin Hurve this spring, we investigated how to further develop the variable buoyancy system for the small underwater vehicle SAM. The project consisted of first examining which design should form the basis for further development, and subsequently building a prototype of the system. This presentation provides an insight into how we evaluated different design alternatives. A VB system alters the vehicle's density in order to submerge and surface in the water. The system typically consists of a pump that pumps water into an internal tank within the vehicle. Different pumps were compared and analyzed regarding the water flow that could be achieved under various pressures. The scope of the work was limited to investigating a piston pump design, a gear pump design, and a peristaltic pump design. Based on datasheets, experiments, and simplified pump models, their performance could be estimated, which then formed the basis for selecting the pump design to be investigated further.

Residual stress impact on instability and collapse in submarine pressure hulls

Greta Garme och Jesper Olanders

Our master's thesis investigates the influence of residual stresses and geometric imperfections on collapse behavior in submarine pressure hulls. We study Mechanical Engineering at Lund University and have conducted this work in collaboration with Saab Naval in Lund. The pressure hull is the component responsible for resisting external pressure, making its structural integrity essential for key submarine properties such as diving depth. During manufacturing, residual stresses and geometric imperfections are introduced into the hull. This thesis examines how these factors affect collapse behavior, with particular focus on the interaction between residual stresses and geometric imperfections. Finite element modeling is used to analyze a smaller pressure hull segment, where the stress distributions from cold rolling and welding are applied as initial stress conditions. The pressure hull models are then evaluated under external pressure and axial compressive loading until plastic collapse.

Modellering av parametriskt exciterad rullning

Oscar Berg

Parametriskt exciterad rullning är ett av IMO:s fem identifierade fenomen som kan ge upphov till kritisk stabilitetsförlust hos moderna lastfartyg. Fenomenet uppstår genom tidsvariationer i fartygets förmåga till att skapa ett återställande moment, och är därför starkt kopplat till vattenlinjens dynamik när inkommande vågor propagerar längs skrovet. Denna studie har bland annat undersökt hur upplösningen på ett numeriskt modellerat skrov påverkar hydrostatiska storheter såsom GM och GZ, som slutligen avgör hur tidsdomänresponsen ser ut för detta fenomen. Kärnan och nyckelinsikten ligger i att avbilda vattenlinjens dynamik fysikaliskt konsistent. En för grov skrovupplösning gör att vattenlinjen inte kan representeras tillräckligt väl, vilket då resulterar i diskontinuerliga hydrostatiska variationer. Detta leder till att den parametriska variation som utlöser fenomenet då inte kan fångas numeriskt. Hur påverkar egentligen skrovets upplösning tidsdomänresponsen och systemets resulterande dynamik? Vilken nivå av upplösning krävs för att ge fysikaliska och konsekventa resultat?

SESSION 4: MARITIME TECHNOLOGY AND PRACTICE

Ordförande: Anton Dunström, Saltech

Underwater capture systems for an AUV

Jacob Henriksson

Docking and securing a moving Autonomous Underwater Vehicle (AUV) below the surface is a critical operational phase where mechanical reliability must cope with strict energy and payload constraints. This presentation explores the development of an integrated sub-surface capture system for the AUV SAM, designed to be deployed from the ROV platform detailed in David Gustafsson's presentation. The talk provides an evaluation of various mechanical concepts—including scissor-latch principles, rope snares, and active grippers, assessed against mass, structural stability, and manufacturability. Special emphasis is placed on the system requirement for the mechanism to remain completely energy-neutral in its resting positions to maximize the mission range. We present the prototype-ready four-armed gripping mechanism, which securely holds the AUV without structural modifications that has been developed using Computer Aided Design(CAD) software.

Digital twin for ship design and production

Xuhui Li

Next-generation ships require the integration of various emerging green technologies on board to achieve maritime decarbonization, while the lack of reference cases creates challenges for developing these green ships with sufficient credibility. In this context, this study aims to develop a Digital Twin (DT)-based methodological framework for next-generation ship design, specifically focusing on Wind-Assisted Propulsion Ships (WAPS). The DT system in this framework can dynamically feedback manufacturing deviation data from the production end to ship designers, and it can simultaneously evaluate the mechanical performance of the deformed sails and the resulting stress on the ship deck through CFD and FEM analyses. The safety performances of produced ships can then be assessed by ship designers based on these results. Furthermore, optimization methods are applied to improve the arrangement of sails on the deck, thereby enabling the DT system to provide guidance for the adaptive design of next-generation ships.

Local Surface Deformation in Large-Scale Yacht Construction

Robin Heise

Modern mega yachts continue to represent a significant symbol of prestige within the luxury maritime industry. To satisfy the increasing demands of future owners, exceptional precision is required throughout all stages of design and construction, from the initial concept phase to final delivery. In parallel, the growing complexity of customer-specific requirements necessitates continuous adaptations within established manufacturing processes. In recent years, however, several new-build yacht projects have exhibited undesired local deformations of the exterior hull plating. Such surface irregularities negatively affect the visual appearance of the vessel and may compromise the high aesthetic standards expected within the superyacht sector. This presentation provides an overview of hull areas particularly susceptible to such deformations and discusses several key factors contributing to these visual imperfections. Finally, an outlook will be provided regarding potential strategies and measures aimed at reducing or preventing the occurrence of such deformations in future projects.

A Diamond Shaped Pipe Trunk - A Way to Improve Intact Stability?

Arvid Eriksson

When designing a vessel, it is important to consider intact stability to ensure safe operation. For vessels of tanker type, it is particularly important since these have large free surfaces in the cargo tanks, making the ship less stable, and carry cargo that can pose severe environmental risks if released. To reduce these free surface effects in the cargo tanks, this thesis introduces the Diamond Shaped Pipe Trunk concept. Two alternative designs are evaluated and compared with the traditional approach of increasing tank subdivision through additional longitudinal bulkheads. In this presentation, the performance of these new designs will be discussed and assessed against the intact stability requirements defined in MARPOL Annex 1 Chapter 4 Regulation 27. In short, the Diamond Shaped Pipe Trunk concepts show promising results at low angle stability, but this does not translate to high angle stability making it a solution with limitations.

Samtalen under ytan

Boel Wessman

Under ytan i Östersjön pågår en ljudvärld som sällan uppmärksammas. För arter som torsk är ljud en viktig del av livet och används bland annat vid kommunikation och reproduktion. Under parningssäsongen producerar torskar lågfrekventa "grymtanden" för att kommunicera med varandra, men dessa signaler riskerar att maskeras av ett ökande mänskligt skapat undervattensbuller. Samtidigt ökar antalet fritidsbåtar i kustnära miljöer där många marina arter lever och reproducerar sig. Denna presentation utgår från djurens perspektiv och undersöker hur buller från fritidsbåtar påverkar havets ljudmiljö. Analysen bygger på mätningar från Trosa skärgård där hydrofoner, radar och laseravståndsmätare registrerade passerande fritidsbåtar och deras undervattensbuller. Resultaten visar att bullret från fritidsbåtar överlappar djurens kommunikation. Studien belyser därmed hur mänsklig aktivitet kan förändra havets ljudlandskap och påverka marina ekosystem.

SESSION 5: ASPECTS ON PROPULSION

Ordförande: Petter Holmberg, RISE Maritime

Skärgårdens osynliga ljudmiljö - hur får människan plats?

Benjamin Alberts

Fritidsbåtar är en självklar del av svenska skärgårdsvikar – men under ytan skapas ett osynligt buller som kan störa det marina livet. Vår studie undersöker och validerar metoder för att uppskatta bullernivån i skärgårdens vikar för att skydda fiskar och marina däggdjur som är beroende av ljud för kommunikation, navigation och jakt. Genom en fältstudie i Trosa skärgård samlades ljuddata in med hydrofoner, radar och laseravståndsmätare för att koppla specifika båtar till uppmätta ljudnivåer. Resultaten visar att fritidsbåtar kan generera mycket höga ljudnivåer, upp till 158,7 dB, inom samma frekvensområden som används av bland annat torsk och tumlare. Studien visar även att en teoretisk källmodell kan uppskatta bullernivåerna med relativt god precision. Detta är de första stegen i den omdiskuterade forskningen som främjar livskvaliteten hos Sveriges undervattensdjur.

Structural Optimization of Submarine Pressure Hulls

Martin Johansson

The thesis covers the development of an optimization method for submarine pressure hull structures using parameterized finite element models. The method combines fatigue and buckling constraints with mass and cost minimization to identify optimized designs. The study shows how operational requirements, such as different diving profiles, influence the dimensions of the obtained optimal geometry and the governing failure mechanism. In many cases, buckling governs the design, while fatigue becomes more critical for higher strength steels and certain diving profiles. The response surface-based optimization method sufficiently captures the design space and enables a fast evaluation of multiple design alternatives. Furthermore, the developed program is modular, allowing variation of base geometry and refinement of individual sub-methods, such as the fatigue or buckling evaluation without changing the overall optimization routine.

Modelling and Optimization of a Contra-Rotating Propeller System

Gusten Kiltorp

Contra-rotating propellers offer improved efficiency over conventional single propellers by recovering energy from the swirl in the slipstream, making them attractive for a range of applications. This presentation focuses on the modelling and optimization of such a system using the combined Blade Element Momentum Theory (BEMT). Momentum theory, derived from conservation of axial and angular momentum, relates the induced velocities to thrust and torque. Blade element theory, in contrast, treats the propeller as a collection of two-dimensional airfoil sections, linking local hydrodynamic forces to blade geometry. Equating the thrust and torque from both theories yields a non-linear system, solved via fixed-point iteration. For the rear propeller, the equations are modified to account for the axial and swirl velocities induced by the front. A grid search over chord and twist distributions then identifies geometries that maximize efficiency across a given range of operating points, yielding a system with over 70% efficiency.

Transom Pushing Device for a passenger ship

Jakob Wallinder

Projektet som presenteras inbegriper i huvudsak framtagnings- och konstruktionsarbetet av en fartygsanpassad prototyp av en så kallad Transom Pushing Device (TPD). TPD är en skedformad platta som monteras bakom ett fartyg och som i deplacerande- och halvplanandelägen genererar en tryckande kraft, i färdriktningen, genom utnyttjandet av den återcirkulerandezonen. Arbetet har genomförts hos RISE, i samarbete med Blidösundsbolaget och Kongsberg, och har haft M/S Mysing som utgångsobjekt i samband med framtagningen och konstruktionen av prototypen.

The thesis presented primarily focuses on the design and construction of a vessel-adapted prototype of a so-called Transom Pushing Device (TPD). A TPD is a spoon-shaped plate installed aft of a vessel that, in displacement and semi-planing modes, generates a pushing force by utilizing the recirculating zone behind the transom. The thesis has been carried out at RISE, in collaboration with Blidösundsbolaget and Kongsberg, and M/S Mysing was used as the reference vessel for the prototype design and development.

SESSION 6: STUDIES FROM THE PRACTICE

Ordförande: Erik Ovegård, FOI

Recovery system för AUV

Georges Hili

This project presents the optimization and validation of an Emergency Drop-weight System (EDWS) for the autonomous underwater vehicle SAM 3. The focus was on reducing the physical size of the electronics and simulating the vehicle's ascent performance. By redesigning the PCB and introducing microcontroller-driven logic, the board's area was reduced by 56%. Furthermore, a physical model was developed in MATLAB to numerically simulate an emergency ascent from a depth of 150 meters.

Explosionsbelastning av marina kompositstrukturer

Gösta Lindqvist

Internal explosions is a severe happening that can occur anywhere including in ship structures where it can have devastating effects. This thesis has aimed to develop a modell that can simulate an internal explosion in a ship structure with the purpose of extracting structural response from the structures. The main challenges with this thesis has been to figure out a way of modelling the composite structure and also how to simulate the internal explosion. Two different ways of simulating the explosion was investigated, a semi - empirical/empirical method and the Arbitrary Lagrangian Eulerian (ALE) method. The aim was to replicate the structural responses from the ALE method with the semi - empirical/empirical method in order to shorten the simulation time for bigger structures in the future.

Construction of VBS for AUV SAM

Albin Hurve

A Variable Buoyancy System (VBS) is used to change the displacement of an AUV in order to sink or ascend vertically. The VBS generally limits the depth that the AUV can reach, and therefore its performance limits what kind of missions the vehicle can perform. This presentation is about the implementation of a peristaltic pump into a VBS to be used in the KTH-developed AUV SAM. Peristaltic pumps are generally used for medical and chemical applications, but they have some properties that could make them suitable for use in a VBS. Since peristaltic pumps for maritime applications are not generally available on the market, a custom prototype was built to see if it would be a feasible solution to be used in the next generation VBS in SAM. Some design choices and lessons learned from the development process will be discussed in this presentation.

Migrant boat detection in SAR operations

Timothée Maignen

Search and Rescue organizations attempt to save the most lives possible on Mediterranean migration routes. Their success depends both on the indications quality and on the time taken to intercept the vessel. This Master Thesis develops a detection and drift trajectory prediction tool for small vessels, and assesses its performance. The vessel detection is performed on satellite imagery using a pixel-intensity-based algorithm. Detected ships are cross-checked with AIS information, enabling the qualification of algorithm parameters. The analysis shows unsatisfactory results for vessels shorter than 20 meters; however, a detection-rate-based threshold is proposed for use in future studies. The developed drift prediction engine uses the Leeway method to perform stochastic simulations. Applied to operational cases, it allows for an approximation of Leeway coefficients for a migrant vessel. CFD computations complement this. While the results indicate good drift modeling performance, discrepancies with the CFD approach suggest an oversimplified representation of the vessel.

Manouvering and rolling the m/s Rex!

The chosen one I!

SESSION 7: COMPOSITES AND BATTERIES

Ordförande: Ioli Gypa, Wallenius Marine

Hållbar design

Ted Wänerstrand

Jag och Viktor gjorde vårt KEX inom det på KTH nystartade SuMoth-laget. SuMoth är en studenttävling där studenter designar, bygger och kappseglar en foilande Moth-jolle med fokus på låg miljöpåverkan. Tävlingen premierar förnybara, återbrukade och återvunna material genom att begränsa och straffa övriga material. Trots en mycket begränsad budget fick vi, genom kontakter och några mejl, få tag på återbrukade hockeyklubbor och trä till inköpspris från ett snickeri. Trä är lätt att bearbeta men har varierande materialegenskaper, medan hockeyklubborna är lätta och styva kompositer men med begränsade möjligheter till formändring utan försämrade egenskaper. För att bestämma olika träslags E-modul och brottgräns genomfördes en serie materialtest. Vi testade också att limma upp trä-sandwich-balkar. Även hockeyklubborna testades för att bestämma deras böjstyvhet. Efter lite grundläggande beräkningar och modellerade vi balkarna i ett FEM-program med hjälp av materialdata från våra mätningar och bestämde deras slutgiltiga tvärsnitt.

Lessons Learned from Damage History of a Corvette

Edvin Svenske

The damage history of a corvette class provides an insight into the life cycle of a sandwich-hulled ship, with unique advantages and challenges when compared to more conventional ships. An in-depth study was done on available error reports related to a class of corvette. The results show that delamination and debonding are common for the earlier ships, but have been eliminated for the later ships in the class. Cracks, scratches and accidents are the most common damage types when the ships are in use. More than a fourth of all damages are below the water level. Recommendations for the planning of future sandwich vessels include studying the literature that has since developed about the use of sandwich structures in naval architecture, testing to ensure future materials are compatible, a rigid examination of docking procedures in order to minimize the risk for accidents and a proper systematization of error reporting.

Balanssystem för AUV

Phoebe Jaresand

What do a cyclist, a skier, and an autonomous underwater vehicle have in common? All of them control their motion by shifting their center of gravity. Most people perform this action instinctively every day, yet the same principle is also used in advanced engineering systems operating in some of the world's most challenging environments. This presentation explores how active center-of-gravity displacement influences balance, stability, and maneuverability, from everyday human movement to modern underwater robotics. By connecting familiar examples with real engineering applications, the presentation offers a new perspective on a physical principle that is both simple and powerful. The presentation concludes with examples from the development of an active center-of-gravity control system for an autonomous underwater vehicle, demonstrating how moving a mass by only a few centimeters can significantly affect vehicle behavior.

Sandwich vs Single-skin in large, high-speed craft

Per Thorén

What happens when the design problems of fast craft are combined with the design problems of large craft? In this presentation I will cover my approach to the problem of selecting a material for the hull bottom of a large, high-speed vessel, specifically the Visby-class corvette. Calculation methods include the DNV Rules, FEA, and various optimisation methods.

Thrust vector system

Niklas Allo

This presentation provides insight into the new thrust vectoring system developed for the autonomous underwater robot SAM. The new system utilizes two gimbal motors to actuate the vehicles thruster to commanded thrust vector angles, replacing the legacy vectoring mechanism with a more capable solution. It demonstrates substantial improvements in maneuverability, steering accuracy, operational reliability, and acoustic performance compared to previous SAM generations. The presentation discusses the mechanical design, actuation concept, and performance evaluation. The enhanced thrust vectoring capabilities enable SAM to operate more effectively in demanding marine environments and will provide a strong foundation for future research.

SESSION 8: NOVEL DESIGN

Ordförande: Caroline Ferning, Lighthouse

Reglersystem för vektorpropulstionssystem

Vincent Eriksson Revmatas

Moderna undervattensrobotar behöver många små system som kan arbeta tillsammans på ett smidigt sätt. ROS 2 är ett vanligt verktyg inom robotik, men att koppla samman små mikrokontroller i sådana system är inte alltid enkelt. Det här projektet undersöker hur micro-ROS kan användas för att ansluta mikrokontrollers till undervattensrobotplattformen SAM 3 (Small and Affordable Maritime Robot) vid Swedish Maritime Robotics Centre. En prototyp byggdes med en ESP32, där kommunikationen mellan mikrokontrollern och det centrala ROS 2-systemet testades framgångsrikt. Projektet undersökte också hur SAM 3:s anpassade meddelandetyper kan användas, vilket visade sig vara en av de största tekniska utmaningarna. Resultaten visar att micro-ROS har stor potential för framtida utveckling av SAM 3.

Integrated batteries-concept and challenges

Marco Gaspari

This thesis presents the development of a modular lithium-ion battery pack for marine applications, focusing on thermal management under varying electrical demand scenarios. The design integrates a liquid-cooling system optimized to maintain a uniform cell temperature distribution under demanding operating conditions while ensuring reliable electrical performance through a scalable modular architecture. The battery enclosure is conceived as a multifunctional structural element that maximizes the use of available onboard volume while reducing installation constraints. Due to their low weight, individual modules can be easily installed and maintained and may be directly integrated into the vessel structure as walkable surfaces. Internal bulkheads increase structural stiffness and, together with aerogel-based insulation, provide passive thermal barriers that mitigate heat propagation during cell failure or thermal runaway events. The system is specifically conceived for hybrid marine propulsion, supporting low-speed and zero-emission manoeuvring during docking operations, assisting vessel acceleration to reach planing conditions, and providing supplemental power to maintain planing speed in rough sea states. The proposed architecture combines compactness, cooling efficiency, electrical reliability, and enhanced safety for future electric and hybrid marine propulsion systems.

Structural aspects of batteries integrated in marine craft

Madya Kusuma Dewa

This thesis adopts an exploratory design approach to develop a battery pack that can function as a structural component within a vessel. Using commercially available components, the study focuses on designing a system that is sufficiently strong to withstand applied structural loads without compromising its integrity, while also fulfilling its primary function of energy storage for electric and hybrid vessels. By integrating the battery directly into the vessel's structure, the concept aims to improve packaging efficiency and reduce redundant structural mass, addressing key limitations of conventional battery installations that add weight and occupy valuable space in constrained engine rooms. Beyond static strength, the study also investigates the effects of dynamic loading, as the integrated battery system is subjected to vibrations and wave-induced forces during operation. Particular attention is given to maintaining structural integrity, protecting internal components, and ensuring reliable electrical connections under realistic marine loading conditions.

Design för sensorintegrering i AUV

Erik Ahnfalk

Denna presentation redovisar och beskriver processer angående användning av kommersiellt tillgängliga (off the shelf) produkter för konstruktion av marina robotar. Först i det underliggande KEx arbetet och därefter ett bredare perspektiv. I presentationen dras liknelser till pågående drönarupprustningen, inom försvaret samt analyser dras kring kriget i Ukraina, och Ukrainas nyttjande av marina drönare. Syftet med presentationen är att redogöra möjligheterna som finns inom assemblering av marina robotar utan att behöva bygga upp en industriell bas, samt ge exempel på hur detta tillämpats i Ukraina och kan tillämpas i Sverige.

Sailing and Sustainability, Is it possible?

Baptiste Callieu