Department of Marine Technology

ANNUAL REPORT 2013

NTNU – Trondheim
Norwegian University of
Science and Technology

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Photo front page: NTNU, Marine Technology

INTRODUCTION

Organisation

The Department of Marine Technology consists of two disciplinary groups:

Marine Systems Research Group: teaches and does research on all major aspects of marine systems, such as machinery, maritime transport systems, offshore oil and gas installations, and offshore energy production systems. It focuses on system design and operation, as well as interaction and adaptation to the surroundings in a total life cycle perspective. The prioritized research areas are:

- Risk and safety management of marine systems
- Multi-Level Design of complex marine systems
- Design and verification of complex energy systems
- Sustainable Arctic Shipping

Marine Structures Research Group: educates and conducts research in the fields of marine constructions, marine hydrodynamics and marine control engineering. Key research areas are:

- Oceanography
- Wave induced motions and strongly nonlinear loads
- Structural load effects
- Abnormal loads and accidental load effects
- Slender marine structures
- Ship operations
- Marine operations
- Aquaculture facilities
- Very large floating structures
- Deep-sea mineral mining
- Wind-, current-, and wave-energy production
- Structural design
- Ocean science

Management

Head of Department:
Prof. Harald Ellingsen
harald.ellingsen@ntnu.no

Assistant Head of Department
(until July 2013):
Associate Prof. Eilif Pedersen
eilif.pedersen@ntnu.no

Assistant Head of Department
(from August 2013):
Prof. Svein Sævik
svein.savik@ntnu.no

Head of Office:
Astrid E. Hansen
astrid.e.hansen@ntnu.no

Head of Marine Structures
(until July 2013):
Prof. Jørgen Amdahl
jorgen.amdahl@ntnu.no

Head of Marine Structures
(from August 2013):
Professor Roger Skjetne
roger.skjetne@ntnu.no

Head of Marine Systems
(until July 2013):
Prof. Ingrid Utne
ingrid.b.utne@ntnu.no

Head of Marine Systems
(from August 2013):
Prof. Stein Ove Erikstad
stein.ove.erikstad@ntnu.no

Address, location

Postal address: NTNU, Dept. of Marine Technology, 7491 Trondheim, Norway
Visiting address: Marine Technology Centre, Otto Nielsens v 10, 7052 Trondheim, Norway
Telephone: (+47) 73 59 55 01. Fax: (+47) 73 59 56 97
Email: **imt-info@ivt.ntnu.no**
URL: www.ntnu.edu/imt

Photo: Garberg Foto

FOREWORD

2013 was another prosperous year for the Department of Marine Technology. The master student production was higher than ever, as was the case regarding the admission of new students and the proportion of female applicants. Women have for real invaded the male bastion marine technology. Further, the publication rate is very strong and 19 PhD's graduated which equals the highest figure ever in Department history. The EU-projects turnover increased compared with previous years. Administrative support with routines for project initiation and follow up was further improved contributing to a positive impact on the general work environment and efficiency.

CoE AMOS has progressed well with establishment of planned activities as project initiation, international co-operation and high PhD engagement. Further, we have achieved the financing of another 5 years gift professorate sponsored by DNV GL via the AMOS and DNV GL agreement.

Available space for new employees and many new students at the Marine Technology Centre is, however, limited and close to limit. At the same time, the laboratories and much of the infrastructure needs upgrading and refurbishment, increasing the need for the Ocean Space Centre (OSC). It is therefore positive that the Ministry of Trade, Industry and Fisheries have concluded to pursue the project into the next phase, which comprises a more detailed evaluation of the chosen concept.

It is, however, important to maintain the running business while waiting the realization of the large OSC-process. Hence, it was important and positive that we and MARINTEK in 2013 were awarded NOK 50 million from the Research Council for upgrading of the present laboratories. The in house co-operation with MARINTEK is of course mandatory and desirable here as in many other aspects.

The coming year is both prosperous and challenging. One important challenge will be to increase the staff with several new employees, especially with respect to scientific personnel, but also in the laboratories and in the administration. Further, we are in the middle of a new SFI application process. Compilations of such applications are very challenging, but there will be much to gain if we succeed. Feedback from the Research Council with respect to success or not is expected by the end of 2014.

Another upcoming challenge next year is that the Research Council plans to conduct an "Evaluation of basic and long term research within Engineering Science". In this process our research groups will be evaluated within the areas of "Scientific quality and productivity", "Relevance and impact" and "Strategy, organization and research cooperation". The Department looks forward to take part in this process.

The NTNU board decided late 2013 to establish a new key research area; NTNU Ocean Science and Technology, together with three other research areas. In 2014 the aim is to operationalize this area with a management in place together with research plans and activities.

The in-house co-operation with MARINTEK has been successful contributing to making the Centre of Marine Technology unique in the marine and maritime world. Co-operation with other parts of the SINTEF organization has been important, especially with SINTEF Fisheries and Aquaculture. Our laboratories are in constant development, as for instance is the case for the AUR-lab initiative.

As in previous years, the co-operation and day to day contact with our students is inspiring and constructive. Among other things, last winter the students arranged the traditional "Shipping Conference" (Skipsfartskonferansen) with an impressive representation of leading speakers from the marine and maritime industry. Further, the in-house co-operation with both MARINTEK and our students was fruitful in connection with our "Marine Technology Days" (Marintekniske Dager), an arrangement which took place at the same time as the students arranged "Industry days" (Bedriftsdagene) at the Center.

We strive to steadily improve the work environment and a social event working group was established in 2013. This initiative has already been fruitful and there are of course expectations with respect to the activities in 2014.

Recruitment activities are highly prioritized at the Department and several events have been arranged, such as the "Women day" (Jentedagen) in order to recruit more female students, and the Ocean Space Race, the Talent Camp, participation at the Boat festival in Ålesund and the Research days and Researchers night, all in order to increase young people's interest in physics, mathematics and technology. These activities have proved to be both necessary and highly successful, and will be prioritized even stronger in 2014.

STAFF

In summary, the Department staff consists of 186 persons, belonging to the following categories:

Type staff	Numbers
Scientific staff	**53**
of which:	
– professors	19
– associate professors	2
– assistant professors	3
– adjunct (associate) professors	17
– researchers	4
– postdoctoral fellows	8
PhD students	**108**
Administrative personnel	**13**
Technical personnel	**17**

Scientific staff

Amdahl, Jørgen	Professor
Asbjørnslett, Bjørn Egil	Professor
Ehlers, Sören	Professor
Ellingsen, Harald	Professor
Erikstad, Stein Ove	Professor
Faltinsen, Odd Magnus	Professor
Greco, Marilena	Professor
Holm, Håvard	Associate Professor
Holmedal, Lars Erik	Researcher
Hultgreen, Liv Randi	Assistant Professor
Karlsen, Ludvig	Professor
Larsen, Carl Martin	Professor
Lauritzsen, Kristin	Assistant Professor
Leira, Bernt Johan	Professor
Moan, Torgeir	Professor
Myrhaug, Dag	Professor
Pedersen, Eilif	Associate Professor
Pettersen, Bjørnar	Professor
Skjetne, Roger	Professor
Steen, Sverre	Professor
Sævik, Svein	Professor
Sørensen, Asgeir Johan	Professor
Utne, Ingrid Bouwer	Professor
White, Maurice Furneaux	Professor
Aanondsen, Svein Aanond	Assistant Professor

Administrative Staff

Bremvåg, Annika	Higher Executive officer
Dahl, Ingelin	Higher Executive Officer
Gripp, Jannike	Executive Offiser
Hansen, Astrid Elisabeth	Head of Office
Karoliussen, Renate	Higher Executive Officer
Mørkve, Kristin Johansen	Senior Executive Officer
Neyts, Alexandra	Project Manager
Nordtiller, Marit	Higher Executive Officer
Schjølberg, Ingrid	Assistant director general
Solheim, Marit	Higher Executive Officer
Wold, Sigrid Bakken	Senior Executive Officer
Østbye, Reidun Kristin	Executive Officer
Østhus, Oddny Kristine	Senior Executive Officer

Technical Staff

Bach, Bjørn Tore	Head Engineer
Fleischer, Eirik	Head Engineer
Gran, Frode	Staff Engineer
Innset, Trond	Staff Engineer
Jalali, Mostafa	Staff Engineer
Kristiansen, Øystein	Staff Engineer
Lines, Johan Terje	Engineer
Minde, Kristian	Engineer
Paulsen, Oddvar	Staff Engineer
Rosten, Terje	Head Engineer
Schjetne, Roar	Head Engineer
Selven, Mats Johan Strand	Apprentice
Staven, Robert	Head Engineer
Vinje, Ole Erik	Engineer
Volden, Frode	Engineer
Wahl, Torgeir	Head Engineer
Aasen, Einar Magnus	Head Engineer

Scientific Staff, temporary

Andersen, Trond Michael	Adjunct Associate Professor
Berg, Tor Einar	Adjunct Professor
Fagerholt, Kjetil	Adjunct Professor
Furnes, Gunnar	Adjunct Professor
Gao, Zhen	Adjunct Associate Professor

Hagen, Arnulf	Adjunct Professor
Hansen, Martin	Adjunct Associate Professor
Haver, Sverre	Adjunct Professor
Hutchison, Suzanne Ruth	Postdoctoral Fellow
Kang, Ju Young	Postdoctoral Fellow
Krokstad, Jørgen	Adjunct Professor
Ludvigsen, Martin	Postdoctoral Fellow
Michailidis, Konstantinos	Researcher
Nematbakhsh, Ali	Postdoctoral Fellow
Pedersen, Egil	Adjunct Professor
Rakke, Jørgen Glomvik	Researcher
Ren, Nianxin	Postdoctoral Fellow
Riska, Kaj	Adjunct Professor
Rustad, Anne Marthine	Adjunct Associate Professor
Su, Biao	Postdoctoral Fellow
Søreide, Fredrik	Adjunct Professor
Thorstensen, Tom Anders	Adjunct Associate Professor
Tymokha, Oleksandr	Researcher
Vinnem, Jan Erik	Adjunct Professor
Wallace, Stein William	Adjunct Professor
Wang, Hong	Postdoctoral Fellow
Aarsnes, Jan Vidar	Adjunct Professor
Yang, Limin	Postdoctoral Fellow
Ye, Xiaorong	Researcher

PhD students

Abrahamsen, Mia Prsic	Gallardo Canabes, Jose Patricio
Afzal, Mohammad Saud	Gansel, Lars
Alwan, Sabah Nouri Jasem	Gavrilin, Sergey
Arslan, Tufan	Ghamari, Isar
Bachynski, Erin	Ghane, Mahdi
Bakkehaug, Rikard	Gunnu, Giriraja Sekhar
Balland, Oceane	Hanssen, Finn-Christian W.
Bambulyak, Alexei	Hatefi, Seyed Behzad
Bardestani, Mohsen	He, Zhao
Bhattacharyya, Anirban	Henry, Pierre-Yves
Brandtsegg, Andreas Saur	Holen, Siri Marianne
Brate, Tom Ivar	Hoseini Dadmarzi, Fatemeh
Bergström, Martin	Husjord, Dagfinn
Borri, Daniele	Jafarzadeh, Sepideh
Breu, Dominik	Jiang, Zhiyu
Bruserud, Kjersti	Johari, Jona
Bøckmann, Eirik	Jørgensen, Ulrik
Candeloro, Mauro	Karpa, Oleh
Chabaud, Valentin Bruno	Kim, Ekaterina
Cheng, Zhengshun	Kjerstad, Øivind Kåre
Chuang, Zhenju	Kramer, Jarle Andre
Dahl, Andreas R.	Kurniawan, Adi
Dai, Lijuan	Kvittem, Marit
Das, Jitapriya	Das, Jitapriya
De Almeida Fernandes, Daniel	De Almeida Fernandes, Daniel
De Vaal, Jacobus Bernardus	De Vaal, Jacobus Bernardus
Dukan, Fredrik	Dukan, Fredrik
Erceg, Sandro	Erceg, Sandro
Etemaddar, Mahmoud	Etemaddar, Mahmoud
Erceg, Boris	Erceg, Boris
Fernandes, Daniel De Almeida	Fernandes, Daniel De Almeida

Lekkas, Anastasios
Li, Lin
Li, Peng
Li, Quinyuan
Lindstad, Haakon
Longva, Vegard
Luan, Chenyu
Lubis, Enni Lisda
Malin, Maximilian
Mc Guinness, Edgar John
Milakovic, Aleksandar-Sasa
Miyazaki, Michel Rejani
Muliawan, Made Jaya
Myland, Daniela
Nasution, Fachri Panusunan
Norgren, Petter
Nornes, Stein M.
Patricksson, Øyvind
Pedersen, Dinhoff Morten
Perez Ramirez, Pedro Agustin
Peymani Foroushani, Ehsa
Polić, Dražen
Rasekhi Nejad, Amir
Rejani Miyazaki, Michel
Rogne, Øyvind Ygre
Rumawas, Vincentius
Ruud, Stian Knud
Shainee, Mohamed
Shen Yugao
Singh, Dig Vijay
Solem, Siri
Storheim, Martin
Strand, Ida
Suyuthi, Abdillah
Taskar, Bhushan
Thorat, Laxminarayan
Thorsen, Mats Jørgen
Thorvaldsen, Christoffer Fredrik
Thys, Maxime
Tõns, Tõnis
Tutturen, Svenn Are
Ushakov, Sergey
von Bock und Polach, Rüdiger
Wan, Ling
Wang, Kai
Wu, Xiaopeng
Xing, Yihan
Yang, Dan
Yum, Kevin Kosup
Zhang, Bin
Zhang, Qin
Zhao, Bo
Zhu, Wenting
Ødegård, Øyvind

Professor Emeritus

Berge, Stig
Endal, Anders
Erichsen, Stian (passed away in August 2013)
Svein Kristiansen
Minsaas, Knut Johan
Rasmussen, Magnus
Sillerud, Bjørn Oskar
Westby, Ola

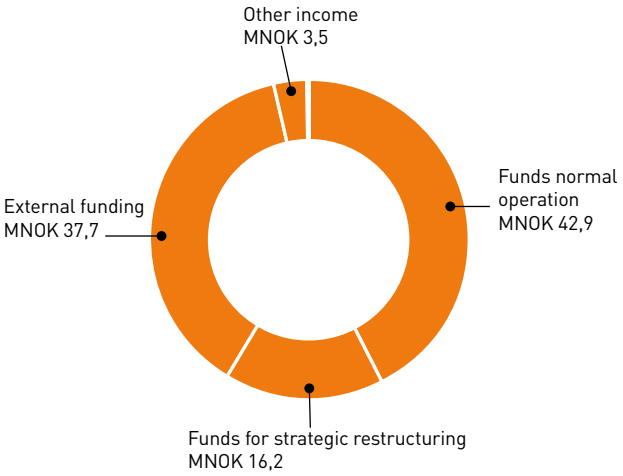
ECONOMY

Distribution of financial contribution

Income is generated from two primary sources:
- funding from the government for normal operations and strategic restructuring, and
- external funding from private and public contributors for both commissioned and sponsored projects.

Governmental funding is relatively stable. However, as it depends on both the quality and the quantity of research results, there are some variations in time. Income from commissioned and sponsored projects varies with the economic situation in the industry.

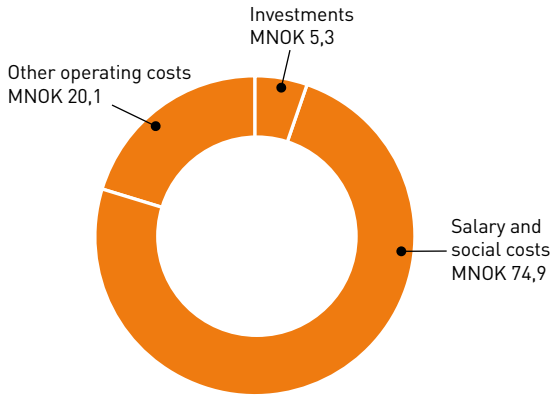
INCOME 2013



Distribution of cost categories

A zero-based budgeting is used, having the costs adjusted to the income level. Salary and social costs make up over 75% of the total costs.

COST ALLOCATION 2013



PROJECTS

Research projects

This section describes a sample of projects that are run by the Dept. of Marine Technology. A full list of national and European projects is given at the end of this chapter.

Air-Sea interaction and Transport Mechanisms in the Ocean

This is a FRINATTEK project supported by the Norwegian Research Council. There is one Phd candidate, one post.doc and one researcher working on this project.

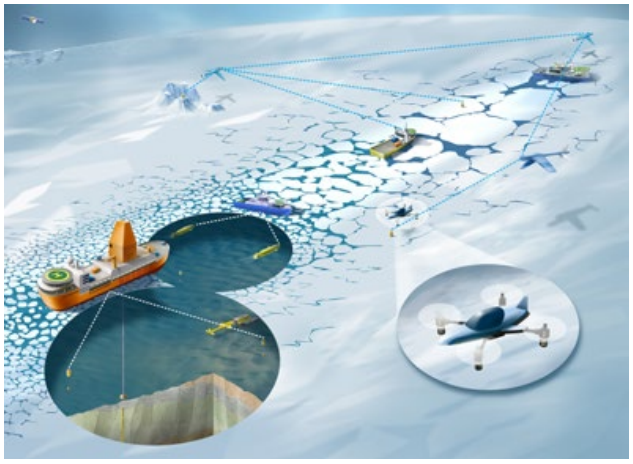
Our aim is to apply and further develop our two existing Large Eddy Scale (LES) ocean models to predict the air-sea interaction and the resulting wave-current flow from the free surface to the bot- tom. This includes the entire dynamics of the wind above the waves, the free surface, as well as in the entire water column from the free surface to the bottom; these flows are mutual dependent. We propose to study the resulting shear stress and turbulence exchange mechanisms between the ocean and the atmosphere (relevant to climate research) as well as transport mechanisms both in the near ocean surface wind boundary layer above the waves, and in the ocean flow from the free surface to the bottom.

Contacts: Prof. Lars Erik Holmedal (lars.erik.holmedal@ntnu.no) and Prof. Dag Myrhaug (dag.myrhaug@ntnu.no)

Arctic DP

The project "Safe and green dynamic positioning (DP) operations of offshore vessels in an arctic environment" was awarded by the Research Council of Norway to NTNU and industry partners Kongsberg Maritime, Statoil, and DNV-GL for a project period 2010-2014. Its vision is for Norwegian industry to attain world leading competence and knowledge of DP system technology and operations developed for safe and environmentally robust offshore operations in the Arctic. The main focus is on understanding the physics of DP vessel motions in arctic sea-ice in order to develop mathematical models and numerical simulators for use in automatic control theory, estimation, and development of decision support tools for improved design and situational

awareness. Five PhD students and a Post-doc have been working on the project in 2013. A numerical ice tank simulator for numerical testing of structure responses in broken ice has been implemented and taken into use. Experiments have been conducted with use of an unmanned aerial system to autonomously track and predict motions of icebergs with support from Maritime Robotics. Currently, the use of an AUV as an underwater mobile sensor platform for monitoring the underwater sea-ice topography is being tested together with AUR-Lab and CRI SAMCoT.



Bjarne Stenberg, © NTNU

Contact: Prof. Roger Skjetne (roger.skjetne@ntnu.no)
www.marin.ntnu.no/arctic-dp

Marine mineral resources in Norwegian waters
Department of Marine Technology and the Department of Geology and Minerals Resources Engineering have in cooperation with Statoil and Nordic Ocean Resources executed a project to establish the potential of seabed mineral resources in Norway. A special focus area in the project is to increase the knowledge of possible massive sulfide mineralization along the Mid-Atlantic Ridge. Preliminary estimates indicate substantial volumes of copper, zinc, silver and gold similar to a total value of NOK 430 billion. The project will continue in 2014, and the Department is also partner in a new EU project on the same topic entitled Blue Mining.

Contact: Fredrik Søreide (fredrik.soreide@ntnu.no)

Sustainable Arctic Sea Transport (SAST)
Offshore activities and shipping in Arctic regions are increasing significantly due to the vast amount of natural resources found in the high north. This is actively contributing to the identification of the required safety level for arctic ship-based transport and further identifies risk-mitigation measures and arctic sea specific risk-based design methodologies. A number of projects were initiated in 2013, such as:

- RISKAT – Holistic risk-based design for sustainable arctic sea transport
- BARENTS 2020 - Arctic field logistics and Trans-Arctic shipping; Development of new business and commercial models for Arctic transportation

The SAST research group is partner in the Joint Centre of Excellence for Arctic Shipping and Operations.

Contact: Prof. Sören Ehlers (soren.ehlers@ntnu.no)
http://www.ntnu.edu/sast/projects

Joint Centre of Excellence for Arctic Shipping and Operations
There is an increasing interest in Arctic Oil and Gas exploration and mineral resources. Risk-based design methodologies using first principal methods are required for safe operations and transport of natural resources within and out of the Arctic. This Joint Centre of Excellence aims at advancing safe arctic operations and transport through a holistic risk-based approach. It focuses on design relevant actions occurring during the entire life-cycle of the ship or installation at sea. The centre is funded by Lloyd Register Foundation. It is a collaboration between NTNU, Aalto University (Finland), Memorial University of Newfoundland (Canada) and the University of Helsinki (Finland).

Illustration: Bjarne Stenberg, © NTNU

Contact: Sören Ehlers
www.ntnu.edu/sast/joint-center-of-excellence
http://cearctic.com

European projects

HYDRALAB IV	A network dealing with the complex interaction of water with environmental elements, sediment, structures and ice	FP7
HyDynPro	Dynamic analysis of the drive train of azimuthing thrusters, including hydroelastic effects and fluid-structure interaction	MARTEC ERA-NET
MARINA	A platform project to establish a set of equitable and transparent criteria for the evaluation of multi-purpose platforms for marine renewable energy (MRE)	FP7
MARE-WINT	New Materials and Reliability in offshore WINd Turbines technology	FP7

National projects

Air-Sea Interaction and Transport Mechanisms in the Ocean	NRC (FRINATEK)
Arctic field logistic and transarctic shipping (MFA B2020)	Ministry of Foreign Affairs
Design and verification of control systems for safe and energy-efficient vessels with hybrid power plants (D2V)	NRC (KMB)
Energy Management In Practice phase 2 (EMIP 2)	NRC (BIP)
Et fullskalalaboratorium eller testing av fremtidens marine teknologi i tett samarbeid mellom næring og akademia (F/F Gunnerus)	NFR (BIP)
Forbedret Analyse av Risiko presentert Grafisk for Effektiv miljøberedskap (FARGE)	NRC (BIP)
Full Scale Performance Prediction for Energy Efficient Ship design (PropScale)	NRC (KPN)
Holistic risk-based design for sustainable artic sea transport (RISKAT)	NRC (KPN)
Integrated decision support approach for ship, fleet and maritime supply chain design (IDEAS)	NRC (BIA)
Joint Centre of Excellence for artic shipping and operations	Lloyd Register Foundation
Low Energy and emission design for Ships (LEEDS)	NRC (KMB)
Maritime Logistics Fleet Size and Mix (MARFLIX)	NRC (KMB)
Safe and Green Dynamic Positioning Operations of Offshore Vessels in an Arctic Environment (Arctic DP)	NRC (KMB)
Safe, environmental friendly, and cost effective operation of vessels and installations in the Arctic	NRC (BIA)
Sea Trials and Model Test for Validation of Shiphandling Simulation Models (SimVal)	NRC (KPN)
Ship concepts for harvesting Recovery and storage of Energy (HRS-Ship)	NRC (BIP)
Sustainable design of ships for the future (SHIP-4C)	NRC (KMB)
Towards sustainable fish farming at exposed marine sites (SUSTAINFARMEX)	NRC (KMB)
Virtual Prototyping of Maritime Systems and Operations (ViProMa)	NRC (KPN)

NRC: Norwegian Research Council
KPN/KMB: Knowledge building project for the industry (Kompetanseprosjekter for næringslivet)
BIP: User-driven innovation project (Brukerstyrt innovasjonsprosjekt)
BIA: User-driven innovation platform (Brukerstyrt innovasjonsarena)
FRINATEK: Independent projects in mathematics, natural sciences and technology under the FRIPRO funding scheme

CENTRES OF EXCELLENCE

AMOS

The NTNU Departments of Marine Technology and Engineering Cybernetics together with leading international research partners and Norwegian companies were awarded a Centre of Excellence (CoE) by the Research Council of Norway in 2013. AMOS will contribute with fundamental and interdisciplinary knowledge in marine hydrodynamics, ocean constructions and control theory. The research results will be used to develop intelligent ships and ocean structures, autonomous unmanned vehicles (under water, on the surface and in air) and robots for high-precision and safety-critical operations in extreme environments. This is necessary in order to meet challenges related to environmental and climate, safe maritime transport, mapping and surveillance of large ocean and coastal regions, offshore renewable energy, fisheries and aquaculture as well as deep-sea and Arctic oil and gas exploration.

In 2013, the following activities took place:

- Official opening of the NTNU centres of excellence
- Development of unmanned aerial vehicles (UAVs) in collaboration with Maritime Robotics.
- Signature of a collaboration agreement between the University of Porto and AMOS
- Workshop on applications of autonomy in the marine industry (30/08).
- UAV and AUV field experiments with the University of Porto and MBARI

www.ntnu.edu/amos

CeSOS

The Centre for Ships and Ocean Structures (CeSOS) was established as a Centre of Excellence by the Research Council of Norway and NTNU in 2002. It was founded by a number of well-known and well-respected NTNU scientists in collaboration with leading staff from Massachusetts Institute of Technology (MIT). CeSOS focuses on the development of fundamental knowledge concerning the design and operation of future ships and ocean structures by integrating theoretical and experimental research in marine hydrodynamics, structural mechanics and automatic control. The centre formally ended in 2013. An overview over key personnel, scientific publications and PhD theses are available on the CeSOS web site.

www.cesos.ntnu.no

Other national expertise centres with involvement of Dept. of Marine Technology

CREATE: A Centre for Research-based Innovation with a common focus to innovate technology, products and solutions specifically to improve the grow-out phase of marine fish culture. Lead partner: SINTEF Fisheries and Aquaculture.

www.ntnu.edu/research/research_excellence/create

Sustainable Arctic Marine and Coastal Technology (SAMCoT): A Centre for Research-based Innovation for the development of robust technology necessary for sustainable exploration and exploitation of the valuable and vulnerable Arctic region. Lead partner: NTNU Department of Civil and Transport Engineering.

www.ntnu.edu/samcot

Norwegian Research Centre for Offshore Wind Technology (NOWITECH): A Centre for Environment-friendly Energy Research established to conduct concentrated, focused and long-term research in order to solve specific challenges in the field of energy and the environment. Lead partner: SINTEF Energy Research.

www.sintef.no/Projectweb/Nowitech/

Center for Integrated Operations in the Petroleum Industry (IO Center): A research-based innovation center, aiming to develop new methods and tools for integrated operations, which can be embedded in improved work processes in the oil companies and enhanced products and services from the suppliers. The solutions that are developed at the centre are verified through pilot projects in the industry. Lead partner: NTNU Department of Petroleum Technology and Applied Geophysics.

www.iocenter.no

Rolls-Royce University Technology Centre (UTC): "Performance in a Seaway". Research collaboration with Rolls-Royce, focusing research on propellers and propulsion in waves and off-design conditions.

www.ntnu.no/imt/forskning/rolls_royce

EDUCATION

Photo: NTNU AUR-lab, Geir Johnsen

Educational programs

The Department is responsible for the organization and implementation of the Marine Technology educational program at the faculty. It is offered to students as three options mainly (with number of students graduating in 2013 in brackets):

- as a 5 year integrated master program (91)
- as a 2 year master program for students with a Norwegian Bachelor degree (16)
- as a 2 year international master program (19)
- other master programs with a specialization in Marine Technology (4)

The first 3 years of the integrated master program contains introductory courses in mathematics, statistics, physics, chemistry, mechanics, thermodynamics, but also courses introducing the marine diciplines and the marine aspects and design and operational problems to be challenged throughout the program.

From the 6th semester, the students can choose between eight specialisations:

- Marine Structures
- Marine Cybernetics
- Marine Hydrodynamics
- Marine Operations
- Marine Engineering
- Marine Design and Logistics
- Marine Resources and Aquaculture
- Subsea Technique

The study specialisations combine the disciplines of hydrodynamics, structural engineering and marine systems. An emphasis is placed on the students' ability to combine practical understanding with the use of mathematical models and computer-based methods of analysis. One focuses also on the development of the students' ability to see the big picture in technical problems related to design, analysis and operations of marine systems.

The 2-year Master of Science programs in Marine Technology is offered to students having a bachelor degree in Naval Architecture, Ocean Engineering or similar at admission. The structure of the programs is built on the courses offered in the last two years of the 5-year program.

In addition to Marine Technology, the Department is involved in the following programs:

- Engineering and ICT – 5 year integrated master program
- Maritime Engineering – 2 year international master program (Nordic Five Tech program, in cooperation with the Danish Technical University in Denmark, the Royal Institute of Technology and Chalmers University of Technology in Sweden, and the Aalto University in Finland)
- Marin Coastal Development – 2 year international master program
- Subsea Technology – 2 year master program in cooperation with Bergen University College
- European Wind Energy Master – 2 year international master program in cooperation with Delft University of Technology, Technical University of Denmark, and Carl von Ossietzky Universität Oldenburg

Exchange students – NTNU students abroad

Spring semester 2013

Number of students	University	Country
12	Universidade Technica de Lisboa	Portugal
11	University of California, San Diego	USA
7	Delft University of Technology	Nederland
7	Pontificia Universidade Catolica do Rio de Janeiro (PUC)	Brasil
6	National University of Singapore	Singapore
4	University of Strathclyde, Glasgow	Storbritannia
4	University of California, Berkeley, San Francisco	USA
3	University of British Columbia, Vancouver	Canada
3	Universidade Federal do Rio de Janeiro (UFRJ)	Brasil
3	Nanyang Technological University	Singapore
3	University of New South Wales, Sydney	Australia
3	University of Western Australia, Perth	Australia
2	Texas A&M University	USA
2	University of New Orleans	USA
2	University of Auckland	New Zealand
2	Pusan National University	Sør-Korea
1	Instituto Superior Technico, Lisboa	Portugal
1	University of Newcastle upon Tyne	Storbritannia
1	Technische Universität Hamburg	Tyskland
1	University of California, Santa Barbara	USA
1	University of Michigan, Detroit	USA
1	UBA, Buenos Aires	Argentina
1	Seoul National University	Sør-Korea

Autumn semester 2013

Number of students	University	Country
5	University of California, Santa Barbara	USA
4	Universidade Technica de Lisboa	Portugal
4	University of California, Berkeley, San Francisco	USA
4	Universidade Federal do Rio de Janeiro (UFRJ)	Brasil
4	National University of Singapore	Singapore
3	University of Strathclyde, Glasgow	Storbritannia
3	Pontificia Universidade Catolica do Rio de Janeiro (PUC)	Brasil
2	Technische Universität Berlin	Tyskland
2	Massachusetts Institute of Technology (MIT)	USA
2	Texas A&M University	USA
2	University of Auckland	New Zealand
1	École Centrale de Nantes	Frankrike
1	Instituto Superior Technico, Lisboa	Portugal
1	Chalmers University of Technology, Gøteborg	Sverige
1	University of California, San Diego	USA

1	UBA, Buenos Aires	Argentina
1	University of New South Wales, Sydney	Australia
1	The University of Western Australia, Perth	Australia
1	Seoul National University	Sør-Korea
1	Nanyang Tecnological University	Singapore

Master theses (completed in 2013)

Candidate	Supervisor	Title
Aagaard, Olav	Leira, Bernt Johan	Hydroelastic Analysis of Flexible Wedges
Afzal, Mohammad Saud	Holmedal, Lars Erik	3D Numerical Modelling of Sediment Transport under Current and Waves
Aga, Halvor Larsson	Leira, Bernt Johan	Assessment of structural requirements related to LNG fuel tanks
Amundsen, Brage Carstens	Pedersen, Eilif	Evaluation of Environmental Effects of Propulsionsystems for a PSV
Andresen, Even Sunde	Asbjørnslett, Bjørn Egil	Design of an Offshore Standby Base for Remote Regions
Aspelund, Leiv	Pettersen, Bjørnar	Experimental Study on the Hydrodynamic Forces acting on Objects in a Moonpool
Bekkeheien, Mari Aarrestad	Larsen, Carl Martin	Higher Order Loads from Steep Waves on Floating Wind Turbines
Bergsrønning, Erlend	Andersen, Trond Michael	Maintenance Concepts and database solution.
Bjerkelund, Tim	Asbjørnslett, Bjørn Egil	Weight Margins and Flexibility in Offshore Rigs
Bjerknes, Tobias Røtvold	Utne, Ingrid Bouwer	System integrity and holistic risk understanding
Bjønness, Christopher	Leira, Bernt Johan	Estimation of Extreme Response for Flexible Risers
Bjørge, Daniel	Ellingsen, Harald	Uttak av slakteklar fisk fra sfæriske merder
Bollmann, Magnus Røsseland	Faltinsen, Odd Magnus	Flytebro med nytt forankringssystem
Brandeggen , Jon Kjos	White, Maurice F.	Design of Pipeline End Termination
Bratfos, Terje	White, Maurice F.	Design of Pipeline End Termination
Browne, Vibeke Christine	Faltinsen, Odd Magnus	Assessment of Low-Frequency Roll Motions on the Semisubmersible Drilling Rig COSL Pioneer
Brunborg, Maren	Larsen, Carl Martin	Vortex Induced Vibrations of Slender Marine Structures
Bøhlerengen, Simen	Amdahl, Jørgen	Probabilistic material modeling of iceberg for analysis of accidental impacts with ships and offshore structures
Casanova, Claudia	Ellingsen, Harald	Modeling of Aquaculture PET Net with the Use of Finite Element Method
Chrolenko, Michael Olivier	Larsen, Carl Martin	Dynamic Analysis and Design of Mooring Lines
Dai, Tianjiao	Sævik, Svein	Anchor Hooking of Pipelines
Dwikartika, Widyasatka	Ellingsen, Harald	Modeling of Aquaculture PET Net with the Use of Finite Element Method
Dypvik, Tora Gjermstad	Utne, Ingrid Bouwer	Planlegging av Arktiske operasjoner
Ebbesen, Cathrine	Larsen, Carl Martin	Analysis of Motions and Anchor Line Forces for Floating Production Units
Egeberg, Tale Fjell	Pettersen, Bjørnar	Onset and Progression of Vortical Structures for a Surface Combatant at Drift Angles 0, 10 and 20 Degrees
El Jaaba, Mustapha	Amdahl, Jørgen	Structural resistance of polar ships to ice loading
Fan, Shengsheng	Sævik, Svein	Upheaval Buckling of Offshore Pipelines

Candidate	Supervisor	Title
Feng, Lingshi	Sævik, Svein	WORKOVER RISERS - Interaction between Riser and Drillfloor
Finserås, Live Reiten	Pettersen, Bjørnar	Simulation of Viscous Flow Around a Circular Cylinder with OpenFOAM
Flem, Bjørnar Levi	Skjetne, Roger	Developing a new Power System Solution for an Offshore Supply Vessel
Flobakk, Frøydi Røe	White, Maurice F.	Design of a Riser Equipment Handling System for a Well Intervention Unit
Fossum, Trygve Olav	Sørensen, Asgeir Johan	Analysis and control of drilling riser dynamics in dual gradient drilling
Gallala, Joakim Rise	Asbjørnslett, Bjørn Egil	Hull Dimensions of a Semi-Submersible Rig
Geyssel, Johannes Joachim Kalevi	Greco, Marilena	Numerical and Experimental Investigation of Parametric Roll
Gilje, Kristian Malde	Steen, Sverre	Airborne Wind Turbines for Ship Propulsion
Grieg, Thomas Willumsen	Asbjørnslett, Bjørn Egil	Simulation and Rescheduling of Operation for a RoRo-fleet
Grødeland, Alexander	Utne, Ingrid Bouwer	Total Equipment Monitoring
Grønevik, Arild	Larsen, Carl Martin	Simulation of drilling riser disconnection - Recoil analysis
Hallaren, Andreas Gustavo	Asbjørnslett, Bjørn Egil	Concept development of gas-only fuel supply systems for platform supply vessels
Han, Xu	Sævik, Svein	Wave and Vortex Induced Vibration (VIV) Fatigue Analysis of Drilling Riser
Hanssen, Erik Byholt	Leira, Bernt Johan	Coupled Analysis of a Moored Sevan Hull by the use of OrcaFlex
Hanto, Tarjei Jordal	Valland, Harald	Engine Testing of Diesel Fuels
Harildstad, Erling	Leira, Bernt Johan	Effects of BOP Stack Modelling on Estimated Wellhead Fatigue Damage
Hauge, Jacob	Steen, Sverre	Oscillating foil propulsion
Haugen, Sunniva Fossen	Ehlers, Soren	Konseptutvikling av en offshore supply base plassert i Barentshavet
Haukanes, Andreas	Leira, Bernt Johan	Effects of BOP Stack Modelling on Estimated Wellhead Fatigue Damage
Henningsgård, Sondre	Vinnem, Jan Erik	Operational Risk in the Norwegian Barents Sea
Homb, Hans Ranøyen	Larsen, Carl Martin	Fatigue Analysis of Mooring Lines on the Floating Wind Turbine Hywind Demo
Ims, Bjarte	Vinnem, Jan Erik	Emergency preparedness in Arctic oil and gas exploration
Johannessen, Peter-Emil S	Greco, Marilena	Statistisk Analyse av Dimensjonerende Laster for et Fartøy: Slamming Laster
Jordal, Lars Otto Bauer	Greco, Marilena	Statistisk Analyse av Dimensjonerende Laster for et Fartøy: Slamming Laster
Kilhavn, Benny Kristian	Ellingsen, Harald	Nye regler, sikrere havbruk?
Kjønsøy, Øyvind Austbø	Larsen, Carl Martin	Design storm analysis simplification study for flexlay installation systems
Kristiansen, Line	Amdahl, Jørgen	Analysis and Design of Columns in Offshore Structures subjected to Supply Vessel Beam Collisions
Krogseth, Ida Bohne	Skjetne, Roger	Dynamic fault-detection in shipboard electric load sharing
Larsen, Espen	Steen, Sverre	Impact Loads on Circular Cylinders

Candidate	Supervisor	Title
Larsen, Marianne Mellbye	Amdahl, Jørgen	Time-Domain Simulation of Floating, Dynamic Marine Structures using USFOS
Laugen, Lars	Asbjørnslett, Bjørn Egil	An Environmental Life Cycle Assessment of LNG and HFO as Marine Fuels
Lausund, Anne Mari	Asbjørnslett, Bjørn Egil	Optimization of a Deck Structure due to Modularization of Cabins
Legard, Kjetil	Leira, Bernt Johan	Modelling and Analysis of a Cylindrical Flare Tower
Lehn, Madeleine Sende	Leira, Bernt Johan	Response Analysis of Jacket Structure During Loadout Phase
Lejlic, Emir	Larsen, Carl Martin	Vortex Induced Fatigue Damage of a Steel Catenary Riser near the Touchdown Point
Lindstad, Halvor Borgen	Leira, Bernt Johan	Contour Methods for Estimation of Multi-dimensional Extreme Riser Response
Liu, Ling Fei	Ellingsen, Harald	Study on backscattering from fish school near pump intake
Liu, Sui	Sævik, Svein	Fatigue Crack Rrowth Simulation Using xEtended Finite Element Method
Liu, Zongfei	Utne, Ingrid Bouwer	Feasibility analysis of mooring system for Statoil CAT.I in Arctic operations
Lohne, Paal Øvrebø	Sørensen, Asgeir Johan	Study of Critical Imaging Parameters and Variables for Environmental Monitoring Using an ROV with Experimental Results
Lu, Xin	Sævik, Svein	Dynamic Response of Flexible Pipes During Installation
Luo, Yi	Greco, Marilena	Numerical Investigation of Wave-Body Interactions in Shallow Water
Lågstad, Martin Fabrin	Larsen, Carl Martin	Extreme Response Estimation of Mooring Lines on the Floating Wind Turbine Hywind Demo
Ma, Yao	Amdahl, Jørgen	Duktilitetsgrenser for rørkutepunkt
Madsen, Christian Skogheim	Vinnem, Jan Erik	Operational Safety: "The Platform Manager's Risk Control Tool"
Magnusson, Stian T	Sævik, Svein	Flexible Pipeline for LNG Offloading System
Malin, Steinar	Steen, Sverre	Application of CFD to seakeeping
Meese, Andreas Nordby	Amdahl, Jørgen	Analysis of Ice-Induced Vibrations and Comparison with Full-Scale Experimental Data
Moksnes, Morten	Steen, Sverre	Assessment of the Vindskip&trade
Molnes, David André	Ehlers, Soren	The influence of ice classification on design of an offshore supply vessel
Myhre, Torstein	Amdahl, Jørgen	Iceberg shape characterization for damage assessment of accidental impacts with ships and offshore structures
Neuenkirchen Godø, Sjur	Leira, Bernt Johan	Dynamic Response of Floating Wind Turbines
Neumann, Karoline Mali	Leira, Bernt Johan	Probabilistic Design of Midship Panel based on Model scale compressive Ice Test
Nilsen, Andreas	Steen, Sverre	Eksperimentelt finne hydrodynamiske egenskaper for et laste og losse system for LNG
Nordbø, Henrik	Asbjørnslett, Bjørn Egil	Optimal configuration of supply logistics for remote oil and gas fields
Oleivsgard, Gry Mehlgård	Asbjørnslett, Bjørn Egil	Planning and disruption challenges in the logistical offshore supply chain based on a simulation model

Candidate	Supervisor	Title
Olsen, Raimon Andreas	Valland, Harald	Analysis and Simulation of the Rate of Heat Release (ROHR) in Diesel Engines
Ona, Stian Sumstad	Hagen, Arnulf	Modularization of ship equipment in a complex vessel
Overvåg, Christoffer	Ehlers, Soren	Application of Steel Sandwich Panels in Offshore Vessels
Pan, Qi	Steen, Sverre	The influence of using a ducted propeller on the motions and speed loss of a ship in waves
Pedersen, Christopher S	Larsen, Carl Martin	Global Analysis of a Floating Bridge
Pedersen, Ole Henrik F	Asbjørnslett, Bjørn Egil	Simulation and Rescheduling of Operation for a RoRo-fleet
Pedersen, Roy Andre	Ehlers, Soren	The Influence of Ice Classification on Design of an LNG Tanker
Pedersen, Thor Dagfinn	Leira, Bernt Johan	Estimation of extreme response for drilling risers
Pfeifer, Ryan	Asbjørnslett, Bjørn Egil	The development of a maritime freight modeling framework with an application in LNG shipping
Rahman, A.D.M. Abdur	Ehlers, Soren	Risk-Based Design Methodology for an Ice-Classed Multipurpose OSV
Richardsen, Truls Dahl	Amdahl, Jørgen	Structural Mechanics and Numerical Simulation of Ship Grounding
Risholm, André Roaldsen S	Andersen, Trond Michael	Fleet-Oriented Spare Parts Management
Rosenlund, Even	Greco, Marilena	Nonlinear Hydrodynamic Effects for Bottom - Fixed Wind Turbines
Runde, Stian Aurvåglid	Steen, Sverre	Propulsion in waves
Rønholt, Jørgen	Asbjørnslett, Bjørn Egil	Simulation and Rescheduling of Operation for a RoRo-fleet
Selvåg, Anders	Steen, Sverre	Wave Impact Forces on complex structures during lowering through the splash zone
Shetelig, Haakon	Hagen, Arnulf	Shipbuilding Cost Estimation
Sollid, Magne-Petter	Pedersen, Egil	On a Decision-support System for Early Warning of the Risk of, and Growth-rate of, Icing on a Ship?s Superstructure
Steine, Caroline Mortmannsgård Gams	Asbjørnslett, Bjørn Egil	A New Small-Scale LNG Distribution and Bunkering Facility
Stensland, Marius	Vinnem, Jan Erik	Combined Risk Indicator for Major Accident Precursors and Barriers in the Trends in Risk Level Project
Stokkeland, Lina Marie Storås	Amdahl, Jørgen	Steel weight optimisation with respect to stiffener spacing and plate thickness of mid ship structure for cargo vessels
Strand, Ida Marlen	Sørensen, Asgeir Johan	Modeling of Hydroelastic Response of Closed Flexible Fish Cages due to Sea Loads
Strandenes, Håkon	Pettersen, Bjørnar	Numerical Simulations of Wake Flows with and without Discrete Particles
Sture, Balder Een	Larsen, Carl Martin	Higher Order Loads from Steep Waves on Drilling Risers
Sundland, Mika Nikolai	Skjetne, Roger	Guidance and control of iceberg towing operation in open water, with experimental testing
Suul, Martin Aunemo	Sævik, Svein	Sprekkvekst av rørsveiser under S-installasjon
Svoren, Daniel Frøland	Sævik, Svein	Fatigue Analysis of Flexible Risers
Syvertsen, Tor Eivind	Myrhaug, Dag	Numerisk modellering og design av forankringsystemet til UBC

Candidate	Supervisor	Title
Sætre, Jan Børge Mork	Amdahl, Jørgen	Collision Between Platform Deck and Service Vessel Wheelhouse
Sævik, Elizabeth	Ehlers, Soren	Development of an Ice Condition Prediction Model for the Arctic Sea
Thingbø, Sunniva Selstad	Pettersen, Bjørnar	Simulation of viscous Flow around a circular Cylinder with STAR-CCM+
Topphol, Rolf Arild	Steen, Sverre	The Efficiency of a Mewis Duct in Waves
Tornes, Stian Bakke	Steen, Sverre	Comparison of efficiency of pushing and pulling thrusters
Troncoso Abelleira, Maria Teresa	Pedersen, Eilif	Batteries for marine applications
Tunold, Simen Østmoe	Asbjørnslett, Bjørn Egil	Risk-Based Stability Assessment for Semi-Submersible Platforms
Tveråmo, Camilla	Sævik, Svein	Pipeline Walking of High Pressure/Temperature Flowlines
Wang, Daming	Larsen, Carl Martin	Vortex Induced Vibrations Of Slender Marine Structures
Wu, Min	Leira, Bernt Johan	Dynamic Analysis of a Subsea Module During Splash-zone Transit
Zhang, Rui	Moan, Torgeir	Comparative Study On Dynamic Responses of a Semi-submersible Wind Turbine Using a Simplified Aerodynamic Model and a BEM Model
Zhao, Boyang	Sævik, Svein	Fatigue Analysis of Flexible Riser - Effect of Mean Stress Correction Procedures

All Master thesis publications can be viewed at www.diva-portal.org

PhD candidates

In 2013, the Department of Marine Technology had 19 PhD candidates, of whom 4 were female. The geographical distribution of the origin of PhD students was as follows:

- Norway: 33 %
- other European countries: 21,7 %
- China: 16,5 %
- Other Asian countries: 20 %
- Other regions: 8,7 %

Graduated PhD candidates (2013)

Date	Name	Sex	Title	Land	Principal supervisor
18.01	Decao Yin	Male	Experimental and Numerical Analysis of Combined In-line and Cross-flow Vortex Induced Vibrations	China	Carl Martin Larsen
23.04	Adi Kurniawan	Male	Modelling and geometry optimization of wave energy converters	Indonesia	Torgeir Moan
07.05	Nabil Al Ryati	Male	Technical condition indexes doe auxiliary marine diesel engines	Jordan	Magnus Rasmussen
24.05	Reza Firoozkoohi	Male	Experimental, numerical and analytical investigation of effect of screens on sloshing	Iran	Odd Faltinsen
31.05	Babak Ommani	Male	Potential-Flow Predictions of a Semi-Displacement Vessel Including Applications to Calm Water Broaching	Iran	Odd Faltinsen
31.05	Yihan Xing	Male	Modelling and analysis of the gearbox in a floating spar-type wind turbine	Singapore	Torgeir Moan
03.06	Océane Balland	Female	Optimization models for reducing air emissions from ships	France	Stein Ove Erikstad
03.06	Dan Yang	Female	Transitional wake flow behind an inclined flat plat – Computation and analysis	China	Bjørnar Pettersen
06.06	Abdillah Suyuthi	Male	Prediction of Extreme Loads and Fatigue Damage for a Ship Hull due to Ice Action	Indonesia	Bernt Leira
14.06	Pedro Ramirez	Male	Ageing management and life extension of technical systems- Concepts and methods applied to oil and gas facilities	Spain	Ingrid Utne
20.06	Zhenju Chuang	Female	Experimental and Numerical Investigation of Speed Loss due to Seakeeping and Maneuvering	China	Sverre Steen
25.06	Mahmoud Etemaddar	Male	Load and Response Analysis of Wind Turbines under Atmospheric Icing and Controller System Faults with Emphasis on Spar Type Floating Wind Turbines	Iran	Torgeir Moan
20.08	Haakon Lindstad	Male	Strategies and measures for reducing maritime CO_2 emissions	Norway	Bjørn Egil Asbjørnslett
23.08	Sabril Haris	Male	Damage interaction analysis of ship collisions	Indonesia	Jørgen Amdahl
26.09	Mohamed Shainee	Male	Conceptual Design, Numerical and Experimental Investigation of a SPM Cage Concept for Offshore Mariculture	Maldives	Bernt Leira
01.11	Lars Gansel	Male	Flow past porous cylinders and effect of biofouling and fish behavior on the flow in and around Atlantic salmon net cages	Germany	Dag Myrhaug
15.11	Henrique Gaspar	Male	Handling Aspects of Complexity in Conceptual Skip Design	Brazil	Stein Ove Erikstad
29.11	Maxime Thys	Male	Theoretical and Experimental Investigation	Belgium	Odd Magnus Faltinsen
10.12	Ida Aglen	Female	VIV in Free Spanning Pipelines	Norway	Carl Martin Larsen

Recruitment events

«Jentedagen»

Female pupils at secondary school level from all over the country, with highest level in mathematics and physics, were invited to participate at the NTNU's Jentedagen recruitment arrangement (7-8 February). They were given a presentation of the study programs, visited different university stands and participated in social events. NTNU's Department of Marine technology took part in organizing this "Girl day".

Ocean Space Race (OSR)

Photo: Lars K. Steen

Friday the 8th of March, the Ocean Space Race 2013 competition took place at the Marine Technology Centre. Totally 425 participants (389 pupils and 36 teachers from 24 different secondary schools of Norway) were competing in the Ocean Basin Laboratory to have the fastest, most operative and stable ship models. Prior to this event, the participants had been working approximately half a year to design and build their ship models. During the OSR, the pupils were also listening to lectures about research projects, student's life and future work possibilities in the marine industry. This competition has been arranged annually for six years at the Marine Technology Centre. The aim is to increase the interest of pupils at secondary school level for studying mathematics and physics, and in particular for studying ocean space technology. Two videos were recorded from the arrangement in 2013, which are available on this web site: www.ntnu.no/sf-marin/osr.

Ocean Talent Camp

Photo: Kristin Lauritzsen

The Norshipping Exposition is arranged every second year at Lillestrøm. At this occasion the Ocean Talent recruitment Camp was arranged in the harbour of Oslo (on 3-7 June) and NTNU's Department of Marine Technology participated with a booth along with MARINTEK. Totally 11 000 pupils from the 8th and 9th level of different primary schools in Norway visited the Camp. The students of our recruitment team did a nice piece of work on the stand. The pupils were guided through the camp by answering different questions on ready-made cards. The questions were based on information given prior to the camp. The winners of the Ocean Space Race 2013, called "Ocean Talent Camp Ambassadors", showed their boat models to fellow pupils in a small basin close to the camp. A video from the camp event can be seen on You Tube (OceanTalentCamp2013).

Boat festival of Ålesund

Photo: Kristin Lauritzsen

As most summers, NTNU's Department of Marine Technology had a recruitment activity booth in the streets of Ålesund for the public visiting the Boat Festival (10-14 July). The students responsible for the booth were interviewed by NRK radio news and Sunnmørsposten (see www.smp.no/nyheter/article7920999.ece)

Research days and Researcher's Night

Photo: Kristin Lauritzsen

These events are organized by the Norwegian Research Council to boost the interest of the public in general, and the young people in particular, in research and technology. This year's focus was on "Sea and water". Activities were organized in the city of Trondheim (Forskningstorget, 20-21 September), on the island of Frøya (24-26 September) and at NTNU's campus Gløshaugen (Researcher's Night, 27 September). The two first activities focused on children and the broad public, whereas the latter was specifically directed towards pupils from the secondary school level.

Marine technology days

Photo: Rune Magnusson

This event (Marintekniske dager) was arranged as a lunch to lunch seminar at the Marine Technology Centre of Trondheim, 9-10 October. The aim was to present the Centre's new research and technology results to internal employees and students. Collaborating partners were also involved as speakers in the seminar. The Marine technology days usually take place every second year and is organized by MARINTEK, NTNU's Department of Marine Technology and the student organisation. In 2013, there were 112 participants in total.

Visitors to campus Tyholt

Norwegian and international guests visit the Marine Technology Centre at campus Tyholt the whole year through. The most frequent visitors are pupils and teachers from both primary and secondary school levels from all over the country. Other visitors are guest researchers, representatives from the marine industries, politicians, voluntary associations, NTNU technical personnel and external students. During 2013, 16 different kinds of visits were organized to the campus.

INFRASTRUCTURE

Available research facilities at the Dept. of Marine Technology

	Facility	Description	Operational institution	Building year
1	Ocean basin	LxWxD=70x50x10 m. Waves from two directions, variable water depth, winds and currents	MARINTEK	1981
2	Large towing tank (tank I+III)	LxWxD=260x10x5-10 m. Waves in the direction of the tank, two carriages, max 10 m/s	MARINTEK	1939 and 1979
3	Cavitation laboratory	Circulating water tunnel with controlled pressure; measurement section of 1.2 m in diameter, velocity up to 12 m/s.	NTNU and MARINTEK	1967
4	Small towing tank	LxWxD=25x2x1 m. Towing tank for educational purposes.	MARINTEK and NTNU	1958
5	Marine cybernetics lab (MCLab)	LxWxD=35x3.5x1.6 m. Waves from one direction, advanced towing carriage and instrumentation for control system experiments.	NTNU	2000
6	Wave tank	LxWxD=13x0.6x1.0 m. For 2-D studies of wave kinematics.	NTNU	2001
7	Flume tank	LxWxD=2.50x0.61x0.61m. Flume with a test section, velocity of 0.03-1.0 m/s, laminar flow	NTNU	2009
8	Marine Structures Laboratory	Static and dynamic testing of structures and structural components	NTNU and MARINTEK	1979
9	Machinery lab	Equipment for testing of marine engines, fuel, and new concepts	MARINTEK and NTNU	1979

AUR-Lab

Environmental mapping and monitoring of the ocean surface, water column and seafloor are of utmost importance for a sound management of the marine resources. AUR-Lab was created in 2011 because functional engineering solutions demand a strong technical and scientific expertise. Its scientific focus areas are:

- Development of technology for guidance, navigation and control of underwater vehicles (ROVs and AUVs)
- Underwater acoustic communication
- Environmental monitoring and mapping at sea surface, water column, and sea bed
- Operations under ice in the arctic
- Study of any object of interest (bio-geo-chemical objects)
- Inspection/surveillance for environmental agencies, oil industry, ecotoxicology
- Evaluation of seabed properties and habitat
- Complex deepwater underwater operations including inspection and intervention
- Deep water archeology

The cooperation between marine technology and science in research-based education through use of the AUR-Lab is a tool for further development of underwater robotics and sensors.
In 2013 the new AUV called «REMUS» arrived at NTNU. During a joint cruise with FFI, Ecotone, Statoil and NGU, the FFI operated AUV HUGIN mapped the Tautra ridge, several site in the Agdenes area and the Trondheim harbour. Among the objects was a dumping field where considerable amounts of ammunition from WWII were located. The alarming discovery that the ammunition was located in an erosion zone caught media interest.
See: www.ntnu.no/aur-lab

AquaCulture Engineering (ACE) facility

ACE is a large-scale laboratory providing suitable sites, salmon cage farm facilities , control and monitoring instruments and expertise to facilitate research, education and innovation in the field of aquaculture technology. The facilities are accessible to a broad range of users, i.e. researchers, students, aquaculture producers and suppliers of technology to the sector. NTNU is co-owner of ACE; with SINTEF as the main shareholder. The main research facility, including a service vessel and equipment are located at the island of Frøya.
See: www.aceaqua.no

Ocean space centre

Ocean Space Centre is planned to be a new world-leading cross-disciplinary knowledge centre for development of ocean space science and technology that can contribute to global food, energy and environment challenges. An extended business plan for the new centre was developed by MARINTEK and Department of Marine Technology, and handed over to the external examiner Metier. The business plan was approved by Metier, and following that approval the Norwegian Government granted 15 mill NOK to start the preproject phase of Ocean Space Centre. The preproject will start in 2014.

SCIENTIFIC PUBLICATIONS

Books

Amdahl, Jørgen; Ehlers, Sören; Leira, Bernt Johan. Collision and Grounding of Ships and Offshore Structures. CRC Press 2013 (ISBN 978-1-138-00059-9) 345 s

Leira, Bernt Johan. Optimal Stochastic Control Schemes Within a Structural Reliability Framework. Springer 2013 (ISBN 978-3-319-01404-3) 98 s. Springer Briefs in Statistics (2013)

Næss, Arvid; Moan, Torgeir. Stochastic Dynamics of Marine Structures. Cambridge University Press 2013 (ISBN 978-0-521-88155-5) 422 s

Book chapters

Ehlers, Sören. A particle swarm optimization-based procedure to obtain a crashworthy ice-classed LNG tanker. I: Collision and Grounding of Ships and Offshore Structures. CRC Press 2013 ISBN 978-1-138-00059-9. s.233-240

Ehlers, Sören; Benson, Simon; Misirlis, Konstantinos. Ultimate strength of an intact and damaged LNG vessel subjected to sub- zero temperature. I: Collision and Grounding of Ships and Offshore Structures. CRC Press 2013 ISBN 978-1-138-00059-9. s.289-296

Erceg, Sandro; Ehlers, Sören; Ellingsen, Ingrid H.; Slagstad, Dag; von Bock und Polach, Rüdiger; Erikstad, Stein Ove. Ship Performance Assessment for Arctic Transport Routes. I: Volume 6: Polar and Arctic Sciences and Technology. ASME Press 2013 ISBN 978-0-7918-5540-9

Johnsen, Geir; Volent, Zsolt; Dierssen, Heidi; Pettersen, Ragnhild; Ardelan, Murat Van; Søreide, Fredrik; Fearns, Peter; Ludvigsen, Martin; Moline, Mark A. Underwater hyperspectral imagery to create biogeochemical maps of seafloor properties. I: Subsea optics and imaging. Woodhead Publishing Limited 2013 ISBN 978 0 85709 341 7. s.508-535

Kim, Ekaterina; Amdahl, Jørgen. Review of existing methods for the analysis of the accidental limit state due to ice actions. I: Collision and Grounding of Ships and Offshore Structures. CRC Press 2013 ISBN 978-1-138-00059-9. s.221-231

Kim, Ekaterina; Storheim, Martin; Amdahl, Jørgen; Løset, Sveinung; von Bock und Polach, Rüdiger. Drop tests of ice blocks on stiffened panels with different structural flexibility. I: Collision and Grounding of Ships and Offshore Structures. CRC Press 2013 ISBN 978-1-138-00059-9. s.241-250

Leira, Bernt Johan; Næss, Arvid; Næss, Ole Erik Brandrud. Reliability analysis of corroding pipelines by enchanched Monte Carlo simulation. I: Research and applications in structural engineering, mechanics and computation. CRC Press 2013 ISBN 978-1-138-00061-2. s.2053-2058

McGuinness, Edgar; Dypvik, Tora Gjermstad; Utne, Ingrid Bouwer; Holmen, Ingunn Marie. Risk and reliability centered maintenance for maritime operations in the Arctic - experience from fishing. I: Volume 6: Polar and Arctic Sciences and Technology. ASME Press 2013 ISBN 978-0-7918-5540-9

Tomac, Tomislav; Klanac, Alan; Katalinic, M; Ehlers, Sören; von Bock und Polach, Rüdiger; Suominen, M; Montewka, Jakub. Numerical simulations of ship resistance in model ice. I: Developments in Maritime Transportation and Exploitation of Sea Resources: IMAM 2013. CRC Press 2013 ISBN 978-1-138-00124-4. s.847-851

Journal papers

Abrahamsen, Bjørn Christian; Faltinsen, Odd Magnus. Scaling of Entrapped Gas-Pocket Slamming Events at Dissimilar Euler Number. Journal of Fluids and Structures 2013; Volum 40. s.246-256

An, Song; Faltinsen, Odd Magnus. An experimental and numerical study of heave added mass and damping of horizontally submerged and perforated rectangular plates. Journal of Fluids and Structures 2013; Volum 39. s.87-101

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NTNU – Trondheim
Norwegian University of
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