EFCA
YOUNG PROFESSIONAL OF THE YEAR
2016

Personal details

Full name: **Arnt Gunvald Fredriksen**

Nationality: Norwegian

Age as of 31/03/2016: 31

Company: Multiconsult ASA

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Section A. EMPLOYER'S RECOMMENDATION

Arnt Fredriksen was nominated by Multiconsult to the Norwegian Association of Consulting Engineers (RIF) "Young Professional of the year – 2015" competition, which he won. Our motivation to nominate Arnt is based on the exceptional skills he has shown the past years in his role as an expert engineer to develop innovative solutions needed by our clients.

One of the foremost young experts within his field
With a background from a MSc in marine hydrodynamics from the Norwegian University of Science and Technology (NTNU), and two years employment in Multiconsult, Arnt completed in 2015 a Doctorate in Marine Hydrodynamics at the Norwegian Centre of Excellence CeSOS (Centre for Ships and Ocean Structures at NTNU). Prof. Odd Faltinsen was his main supervisor. Prof. Faltinsen is one of the foremost international experts in hydrodynamics and is known to be a supervisor who sets very high quality requirements to his students.

Arnt wrote his doctorate on physical and numerical modelling of the response of a floating structure (vessel) with an open pool ("moonpool"), see reference [3]. He has published the results of his research in renowned international journals, including the "Philosophical Transactions of the Royal Society" ([4], [8] and [10]).

In his daily work as a consulting engineer at Multiconsult, Arnt works with topics related to marine technology and in particular with the development of innovative engineering methodologies and numerical tools. He has a special focus on challenges related to the response of floating structures in harsh and challenging environments, such as arctic ice-infested waters or exposed coastal areas. Arnt has an important contribution by combining his theoretical marine technology expertise with practical engineering to develop innovative numerical tools to solve complex engineering problems. Arnt sets himself high quality standards both with respect to technical level and practical application of his work.

An innovative engineer
When solving traditional projects (engineering and consulting) as well as when developing new tools, Arnt is dedicated in finding new solutions and applying the most efficient engineering tools or methods to solve the project. Arnt is proactive and with a strategic approach; he manages to convert advanced theories to innovative practical applications.

This has resulted in important contributions for several innovation projects in particular related to floating structures, marine aquaculture installations and road & transport engineering. Here are some examples:

- Already in 2008 Arnt had a main contribution in the development of Multiconsult first numerical tool for simulation of floating structures in ice (SimShipIce). He contributed both to the development of physical models and to their implementation in an effective numerical tool. This tool was among the first of its kind, and still is one of the main simulation tools within arctic marine technology. The Norwegian oil company Statoil also uses the tool, and they have been an important partner and contributor to this work. The numerical development is renowned at an international level and Arnt has contributed to the publication of the results at renowned international technical conferences (see [9], [11] and [12]). This innovative technology was also used in projects for Shell's technology group in The Hague, where Arnt has played a crucual role.
- Experience has shown that marine operations at an aquaculture farm location are one of the main factors increasing the risk for damage of the farm and fish escape. Multiconsult has had a long partnership with a main salmon producer, Lerøy Sea Group, which has had focus in minimizing these risks. Arnt has been a key contributor in the development

of a new tool for Lerøy Sea Group for monitoring, planning and management of marine operations at a fish farm (the tool called Lerøy Safe Guard - LSG). The system spans over multi-disciplinary technology fields and is a result of successful collaboration of consulting engineers and experts from all relevant fields, including aquaculture technology, oceanography, geophysics, hydrodynamics, marine structures, telecommunications and instrumentation. Arnt has contributed as an expert within hydrodynamics and marine structures. He has been responsible for developing a key numerical module that applies an innovative methodology for simulating the loads and response of the fish farm. This tool represents an innovative way of planning safe marine operations for the fish farming industry. The tool combines the monitoring and forecasting of both the physical environment (wind, current, waves) and the structures behaviour (fish farm and operating vessels). The safety of the planned marine operations can thus be assessed in advance and monitored continuously. The tool is foreseen to have a wider application area as operational decision support tool for diverse marine coastal infrastructures, including floating bridges or oil and gas terminals.

- One of the Norwegian Public Roads Administration's technological challenge is realization of a “Ferry-free” E39, the European road along the Norwegian west coast. The road has to cross several wide and deep fjords. Multiconsult performed a feasibility assessment for the crossing of the Sulafjord, the crossing for the road is presenting the harshest coastal environment. The crossing is 3 to 5 km wide and exposed to large ocean swell with a heights of 2 to 4 meters. Experts from Multiconsult and partners have looked at the possibility of developing a new suspended floating bridge concept optimized for the local conditions. Arnt had a main contribution to the development of one of the floating bridge concepts. He proposed innovative floating supports concepts for the bridge in terms of catenary anchored elliptical floaters with 2 moon-pools. Arnt applied the results from his doctoral research that showed that moon-pools can be used to control the motion of floaters in waves. By optimizing the floater shapes, the bridge excitation under the action of swell can thus be reduced. If realized, the concept will be an innovative solution for solving the fjord crossing challenge.
- During his PhD study, Arnt developed a new numerical tool to study the hydrodynamic response of floating structures with moon-pools. The tool is based on 2D studies including measurements, which is unique as it combines two theoretical models, the potential theory and the viscous flow theory. This results in both higher accuracy and computational efficiency when estimating the behaviour of complicated marine structures in waves. Much of this work is taken further into development of new calculation tool conducted by the Marine Technology department at NTNU. In the long term, this could be an important contribution to the next generation tool for simulation of floating structures.

Pushing technology barriers

Arnt is dedicated to push technology barriers through both academic contributions and engineering excellence:

- His PhD research resulted in new, useful results and tools, which he has published.
- His continuous involvement and collaboration with the academic community through several research collaborations through supervision of trainees, MSc and PhD students and contributions to R&D projects at Multiconsult and NTNU.
- His contribution embraces development of innovative solutions, tools and methodologies (see previous Section)

- He contributes to the development of new standards, e.g. Eurocode for current and wave loads where Arnt has brought forward inputs and quality insurance of the proposed contents.
- He has applied cross-disciplinary expertise from offshore technology to coastal technology. This multi-disciplinary approach leads to better and safer design of coastal structures.

Ability to communicate and share his knowledge
Arnt is keen to share his expertise, and uses several communication channels:

- Articles in internationally renowned academic journals (see [4], [8]).
- Conference publications and presentations at international scientific conferences (see [5], [6], [7], [8], [9], [11] and [12]).
- Academic presentations and lectures (including presentations of research work in internal seminars at NTNU for other researchers).
- Promotion of Multiconsult and marine technology, in particular towards the university and students through contributions at events and seminars.

Promoting the engineering consultancy branch
By the publication and presentation of his own and Multiconsult's R&D results, Arnt is contributing to the promotion of Multiconsult and the engineering consultancy expertice within marine technology among the other industry players such as research institutions, contractors, and O&G companies.

Arnt's collaboration with the university (research, supervision, and by representing Multiconsult) also helps to position the engineering consultancy branch as an attractive workplace for academic specialists and experts.

Arnt's contribution helps to raise the marine technology and hydrodynamics expertise level within the engineering consultancy branch. It is important for the branch to present a strong expertise within these fields. This will help to reinforce the position of engineering consultancy by taking a leading role within engineering and consultancy services towards the offshore and coastal industry. Examples are the development of infrastructure solutions for the fjord crossing along the western Norwegian coast, or technological advancements within the fish farming industry (see examples in Section above), seafront structures in general, floating residential buildings, infrastructure at exposed coastal locations.

Arnt contributions on projects for major international players and towards research institutes are raising the reputation of Norwegian players on the international market.

A unique young professional
To sum-up, Arnt represents unique qualities as a young professional:

- Arnt is a competence driven engineer and academic expert. He is always looking for personal developments and to contribute to advances within his field of expertise.
- He manages to convert theoretical expertise into practical engineering applications resulting in innovative solutions strengthening our customers.
- Arnt has a unique expertise that few engineering consultants possess. He is representing a key expertise required for several of the major industrial developments that will take place in the near future along the Norwegian coast. Examples are the developments of

crossings through the wide Norwegian fjords. Arnt strengthens the position of the engineering consultancy branch as a key player for these developments.

Arnt has during the past years added substantial strength to himself, Multiconsult, our clients and the engineering consultancy branch.

Those who know Arnt will describe him as a dedicated hardworking successful professional. He has quickly gained great confidence - both internally and externally.

Name: Basile Bonnemaire, PhD

Job title: VP Marine Technology

Managerial relationship to candidate: Department manager

Section B. THE PROJECT

The past year, Arnt has had significant contributions to two major innovation projects at Multiconsult. These two projects including Arnt's specific contributions aredescribed hereunder:

PROJECT1 - Lerøy Safe Guard (LSG): Planning of safe marine operations at fish farms

B.1 - Project description:

Client: Lerøy Sea Group, one of the world's largest aquaculture producer.

Period: End 2014 – Beginning 2016

The fish farming industry and the relevant authorities focus on reducing the environmental impact of the industry, in particular the risk of fish escape from the breeding cages. Experience has shown that incidents related to marine operations at the fish farm locations are one of the main causes for fish escapes.

Multiconsult has been contracted by Lerøy Sea Group to develop a system to monitor, forecast and plan marine operations at a fish farm. The system includes:

- Real time monitoring of the physical environment at the fish farm, including wind, current, wave conditions.
- Real-time communication and internet display of measurements.
- Enhanced self-learning weather forecast for the location including oceanographic parameters.
- Real-time monitoring of forces under marine operations.
- Planning and simulation of marine operations including risk forecast.

Norut has been a partner on instrumentation and communication. Norut Northern Research Institute is a Norwegian research and innovation company that produces knowledge with practical applicability relevant to the High North within technology and social science. They carry out research commissions for both private and public sectors.

A major challenge was to develop the module allowing the simulation of marine operations. Fish farms are complicated large flexible structures, and the effect of marine operations and human decisions are challenging to simulate. In addition, the system needs to be fast and reactive to be accepted as a user-friendly decision support tool.

A prototype of the system was successfully installed at one fish farm, and the system is now being deployed at 4 new locations.

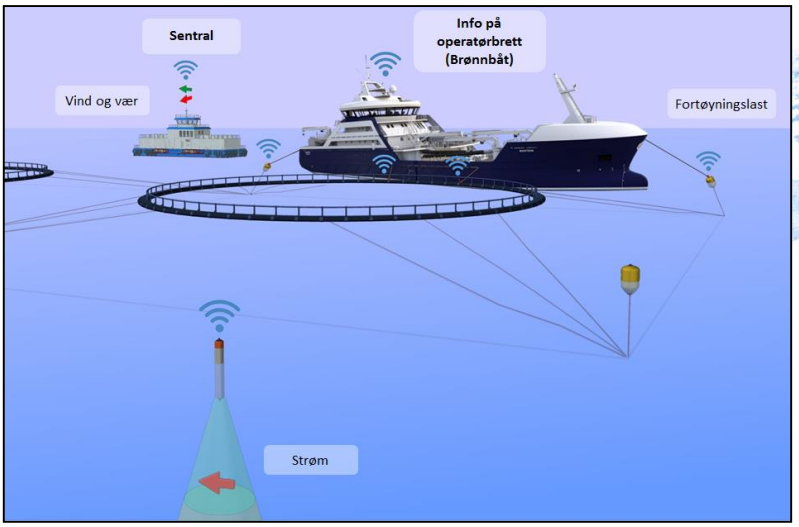

Figure 1 Overview sketch of the LSG monitoring system

B.2 - Innovative characteristics of the project:

Monitoring and forecasting of the effect of marine operations on a fish farm structure has not been possible so far. The fish farms are mainly below the water level and deformations under load cannot be observed. This is critical during marine operations when vessels moor into the fish farm is steadily becoming larger.

The LSG system is innovative as it allows the simulation of planned operations in advance and visualise the effects (increased loads, deformations or rupture risk). It thus gives a forecast for the planned operations and represents a useful decision support tool to plan safe marine operations. It also monitors loads during operations allowing the operator to abrupt operations if critical levels are reached.

A necessary and critical innovation was the development of a simulation engine able to simulate in a fast and realistic matter the deformation of the fish farm under the combined actions of the environment and the marine operations.

B.3 - The YP's role in, and specific contribution to, the project:

Arnt was in charge of the development of numerical engine simulating the fish farm response and effect of marine operations. In order to ensure the success of this development Arnt had to ensure:

- Effective and optimized interfaces ensured through close collaboration with experts within aquaculture technology, oceanography, geophysics, structures, telecommunications and instrumentation.
- Purpose-fit design, development and implementation of a numerical simulation engine.

The development of the simulation engine required to apply advanced hydrodynamic theory and manage to find applicable simplifications that fitted the purpose and ensured computational efficiency. He also had to manage the software developer in charge of the software code implementation.

B.4 - Communication with the client/end user:

Arnt played key roles in the communication with the client:

- When selling the innovative concept, it was important that the client became confident that Multiconsult's team would be able to solve the technological innovation challenge.

Arnt managed to gain this confidence by showing a clear view on how to solve the challenge.

- Under the development, it was essential to communicate the project advances to maintain the client's confidence. This required to regularly present the development status and manage to communicate difficult technical challenges in a simple way.

In both cases, the main challenge was to be able to communicate advanced technical and theoretical aspects to the client that did not have this expertise inhouse. Arnt has shown good skills in adapting his communication level to ensure good communications.

B.5 - Describe the project end results and the benefits to the client/end user:

The project end result is an interactive tool/interface which the fish farm operators are using daily. The fish farm operators have come with positive feedbacks as the LSG system gives them a much better real-time overview of the environmental situation of the fish farm and the associated stresses in the structure.

The LSG system allows quantifying the risk associated to planned marine operations at the farm, which was not possible before the LSG system was developed. Our client can show to the fish farming industry and business that they are willing to invest in innovative solutions to reduce the environmental risk, being ahead of common practice and regulatory requirements.

PROJECT2 – Crossing of Sulafjord with a Floating Suspension Bridge

B.1 - Project description:

Client: Norwegian Public Roads Administration

Period: 2015

The Norwegian Public Roads Administration (NPRA) has an ambition to replace all ferry connections along the European road E39 along the Norwegian west coast. This includes fjord crossings of several kilometres.

Multiconsult with partners were engaged to assess the feasibility of the crossing of the Sulafjord with a floating bridge, floating tunnel or suspended bridge. The Sulafjord crossing is 3 to 6 km wide, 400 m deep and characterised with intrusion of ocean swell.

Crossing of the fjord with a bridge or floating tunnel means developing a world record-breaking structure, which is both a technical and economical challenge.

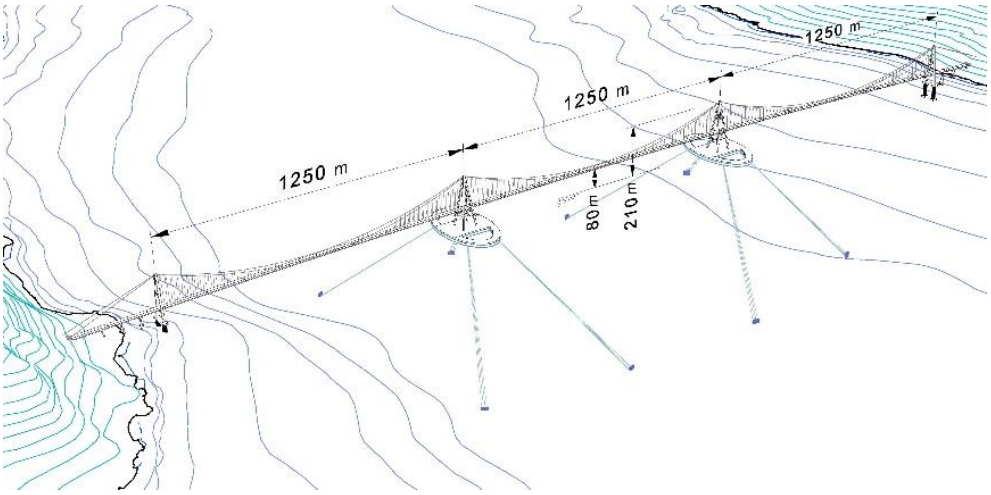

Figure 2 Sketch of the proposed three span floating suspension bridge with moonpool floaters

B.2 - Innovative characteristics of the project:

Multiconsult's team looked in particular at the feasibility of a 3-span 4 km-long suspended bridge supported on catenary moored floating foundations (floaters). One challenge is to design the floaters so that they present minimum motions under the action from e.g. waves or traffic.

Based on experience from the design of offshore floating platforms, Multiconsult assessed the feasibility and performance of traditional floating platform concepts. Based on Arnt's PhD research results, a new type of floater was also proposed, an ellipse shaped floaters with 2 round moon-pools. The particular hydrodynamic properties of the new floater resulted in a bridge concept that had better performance (in terms of e.g. regularity) and lower estimated costs than the bridges with traditional floaters.

B.3 - The YP's role in, and specific contribution to, the project:

Arnt was acting as a lead hydrodynamic expert in the project and had a key role in the development of the new floater concept. Arnt managed to apply the theoretical findings of his PhD in the development of a floater that gave a minimum excitation of the bridge while remaining economically attractive.

Arnt proposed the concept, refined the geometry, performed preliminary assessments of the performance and finally adapted the code he developed under his PhD to confirm the performance evaluations.

Based on this contribution, Multiconsult was able to propose an alternative bridge design combining good performance and lower cost potential than using traditional floaters.

B.4 - Communication with the client/end user:

The challenge for Multiconsult was to convince the client that this innovative floater concept had good enough performance. The performance estimates relied on Arnt's research results. This meant that Arnt had to present the results from its high-end research in a comprehensive way to the client.

Arnt also played a key role in producing results that quantified the new bridge concept performance and compared it to the other concepts. This meant calculating performance numbers that were meaningful to the client such as extreme acceleration on the bridge deck or percentage of downtime due to combined wind and wave action.

Arnt is also publishing a paper presenting the new concepts and its performance at a renowned hydrodynamic conference this summer, ref. [1].

B.5 - Describe the project end results and the benefits to the client/end user:

The project end results was a feasibility report presenting the selected crossing structures alternatives. This included a comprehensive technical report on the global hydrodynamic analyses that documented the innovative floater concept's hydrodynamic performance.

The results of this study provides a strong background for the next project phase for the design of a crossing over Sulafjord. The innovative concept proposed herein is also a strong candidate for other crossings along the E39.

Section C. CLIENT'S APPRECIATION OF THE CANDIDATE

Below are selected feedbacks that we received about Arnt contribution in 2015, as a researcher (from his PhD evaluation) and as a young professional on the projects presented in the previous Section.

PhD defence evaluation
The comments from Prof. Bernard Molin from Ecole Centrale de Marseille that headed the evaluation committee for Arnt's PhD defence, is showing that Arnt is one of the foremost young academic expert in his field. Prof. Bernard Molin is France's most renowned hydrodynamic expert and is acknowledging Arnt's expertise and ability to disseminate his knowledge:

«*From reading the thesis, it is obvious that the author has done a lot of work. He has demonstrated strong capability in developing numerical models, in devising and running experiments, and in making the best of their results. He has published two papers in Applied Ocean Res. and in the Phil. Trans. R. Soc. A. His report is well organized, easy to read and will be quite useful for incoming investigators*»

PROJECT1 - Lerøy Safe Guard (LSG): Planning of safe marine operations at fish farms

See attached appreciation from Lerøy

Name: Ole Hermann Strømmesen

Job title: Operation Coordinator

Company: Lerøy Aurora AS

PROJECT2 – Crossing of Sulafjord with a Floating Suspension Bridge
The national agencies responsible for air, sea, rail and road (Norwegian air traffic authority, Norwegian Coastal Administration, Norwegian National Rail Administration and Norwegian Public Roads Administration) have presented a long term National Transport Plan (NTP, see http://www.ntp.dep.no/English) which outlines how the Government intends to prioritize resources within the transport sector in the next 10 years.

This plan provides a comprehensive basis on which to make decisions and is always followed by a white paper from the Government, which is presented to the Parliament. This white paper is the basis for the annual state budgets in the Norwegian transport sector.

The National Transport Plan is published every four years, lately in the beginning of 2016. The latest version reviewed the engineering studies performed under the European road E39 crossing project.

The latest version includes a review of the feasibility study of the Sulafjord crossing undertaken by Multiconsult with partners and where Arnt had a key contribution in developing a new floating bridge concept:

"A 5-year project is initiated to assess the technical challenges related to a ferry-free crossing of the Sulafjord (between Hareid and Sulesund). The goal is to land on a recommendation regarding the crossing location in the course of 2016. The project involves Norway's most competent experts in the relevant matters of offshore technology and bridge engineering"

Section D. CV OF THE CANDIDATE

Curriculum Vitae

Personal information

First name(s) / Family name(s)	**Arnt Gunvald Fredriksen**
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Phone number(s)	+47 77 62 26 48 Cell: +47 97 50 45 22
E-mail address	arnt.fredriksen@multiconsult.no
Nationality	Norwegian
Date of birth	1 June 1984

Work experience

Dates	2008 -
Occupation or position held	Specialist engineer marine hydrodynamic
Main activities and responsibilities	Responsible for the hydrodynamic modelling in various project. See project references
Name and address of employer	Multiconsult
Type of business or sector	Engineering
Dates	2009-2012
Occupation or position held	PhD. Student at CeSOS within Marine Hydrodynamics
Main activities and responsibilities	Research
Name and address of employer	Norwegian University of Science and Technology
Type of business or sector	Academic

Education and training

Dates	2009-2015
Title of qualification awarded	PhD. In Marine Hydrodynamics
Name and type of organisation providing education and training	Norwegian University of Science and Technology
Level in national or international classification	PhD
Dates	2003-2008
Title of qualification awarded	MSc. in Marine Technology
Name and type of organisation providing education and training	Norwegian University of Science and Technology
Level in national or international classification	MSc
Dates	2006-2007
Title of qualification awarded	Student exchange
Name and type of organisation providing education and training	Berkeley, University of California

Personal skills and competences

Mother tongue(s) **Norwegian**

Other language(s) **English, German**

Self-assessment	Understanding		Speaking		Writing
European level (*)	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	B2	B2	B2
German	A2	A2	A1	A1	A1

Organisational skills and competences

Follow-up and quality control of various activities at the Marine Technology department in Multiconsult. Appointed as co-chair for a session at OMAE 2016.

Technical skills and competences

- Development of numerical methods for engineering application with focus on physical bound approximations to accurately predict the behaviour of for instance a ship moored in ice.
- Analytical and numerical methods within marine hydrodynamics
- Development of numerical methods for fluid dynamics applicable within marine hydrodynamics.
- Performing experimental model scale tests within wave flumes.

Computer skills and competences

Familiar with commercial softwares such as: WAMIT, Riflex, Simo, Sima, Multisurf, 3Dstudio Max,
Familiar with open source softwares such as: openFoam, waves2Foam, OceanWaves3D
Programming skills: Matlab, Fortran, C++, Java

Hobbies and activities

Hiking, running, skiing, fishing

Public speaking experience

1. PhD. thesis defence lecture
2. PhD. Trial lecture on topic “Their occurrence, physics and load effects on marine structures”
3. Presentation of conference paper “Investigation of gap resonance in moonpools at forward speed using a non-linear domain-decomposition method”

Papers published

1. **Fredriksen A. G.,** Bonnemaire B., Lie H., Munkeby J., Nesteby A., Buckholm B., Tan X. (2016): Comparison of global response of a 3-span floating suspension bridge with different floater concepts. *Accepted for publication at OMAE2016*
2. Lie H., Fu S., Fylling I., **Fredriksen A**., Bonnemaire B., Kjersem G. (2016) Numerical modelling of floating and submerged bridges subjected to wave, current and wind. *Accepted for publication at OMAE2016*
3. **Fredriksen A. G**. (2015): A numerical and experimental study of a two-dimensional body with moonpool in waves and current. *Doctoral thesis at NTNU, 2015:98*
4. **Fredriksen A. G.**, Kristiansen T., Faltinsen O. M. (2015): Wave-induced response of a floating 2D body with moonpool. *Phil. Trans. R. Soc. A 373 20140109*
5. Metrikin I., Gürtner A., Bonnemaire B., Tan X., **Fredriksen A.**, Sapelnikov D. (2015): SIBIS: A Numerical Environment for Simulating Offshore Operations in Discontinuous Ice. *POAC 2015 Trondheim*
6. Metrikin I., Teigen S. H., Gürtner A., Uthaug E. S.,Lundamo T., Bonnemaire B., **Fredriksen A.**, Ervik Å., Sapelnikov D. (2015): Experimental and numerical investigations of a ship-shaped, Turret-Moored floating structure in intact and managed sea ice conditions. *ATC 2015 Trondheim*
7. Bonnemaire B., Tan X., Serré N., **Fredriksen A.**, Metrikin I., Gürtner A. (2015): Post-simulations of Ice Basin Tests of a Moored Structure in Broken Ice – Challenges and Solutions. *ATC 2015 Copenhagen*
8. **Fredriksen A. G.**, Kristiansen T., Faltinsen O. M. (2014): Experimental and numerical investigation of wave resonance in moonpools at low forward speed. *Applied Ocean Research (47) pp. 28-46*
9. Bonnemaire B., N. Serré, T. Lundamo, **A. Fredriksen**, A. Jensen, A. Gürtner and S. Teigen (2013): Ice breaking and accumulation around a moored structure: ice basin tests and numerical simulations. *OTC 24579, ATC 2013, Houston.*
10. **Fredriksen A. G.**, Kristiansen T., Faltinsen O. M. (2012): Investigation of gap resonance in moonpools at forward speed using a non-linear domain-decomposition method. *27th International workshop on water waves and floating bodies (IWWWFB), Copenhagen, Denmark*
11. Bonnemaire, B, Lundamo, T, Serre, N, **Fredriksen, A** (2011): Numerical simulations of moored structures in ice: influence of varying ice parameters. *POAC'11 - Port and Ocean Engineering under Arctic Conditions Conference, Montreal,Canada.*
12. Bonnemaire, B, Sagerup, T, Lundamo, T, **Fredriksen, A**, Liferov, P and Le Marechal, G (2011): Simulation methodology for assessing sea ice downtime of a floating platform. *POAC'11 - Port and Ocean Engineering under Arctic Conditions Conference, Montreal, Canada.*

Selected project references

2016	Hydrodynamic modelling of an offshore based fish farming concept Client: NSK / Nordlaks
2016	Nonlinear shallow water wave loads on gravity based structure Client: LMG Marin
2015-2016	Lerøy Safe Guard. See description in Section B. Client: Lerøy
2015	Feasibility study of Sulafjorden. See description in Section B. Client: NPRA
2014-	Responsible for the hydrodynamic modelling of the "Chain floating bridge" Client: Internal and research council
2013-	Part of team to develop a new Eurocode based on ISO 21650: *Actions from waves and currents on coastal structures*
2013-2014	Responsible for the hydrodynamic models in the development of SIBIS, a numerical tool to calculate response of a ship moored in broken ice conditions Client: Statoil
2013-2014	Modelling of Inocean's drillship concept CatI in various broken ice conditions Client: Inocean
2013	Hydrodynamic analysis of Aasta Hansteen floater with regards to sea-spray icing Client: Statoil
2009	Pre-modelling of ice tank model test of Shtokman FPU Client: SDAG
2009	Downtime analysis of the proposed FPU for the Shtokman field due to ice. Client: SDAG
2008-2009	SimShipIce: Internal development of numerical tool to simulate a ship moored in ice

Sted: Tromsø Dato: 17.03.2016
Vår ref: Ole-Hermann Strømmesen

Telefon: 918 06 420

E-post: ohs@leroyaurora.no

CUSTOMER STATEMENT ARNT FREDRIKSEN, MULTICONSULT.

Leroy Aurora AS is a fish farming company located in the county of Troms and Finnmark, in the northern parts of Norway. The company has more than 300 employees and holds 25 licenses for growing salmon. Leroy Aurora AS is owned by Leroy Seafood Group, the second largest supplier of salmon worldwide.

Our sea sites is often located in places with a lot of current and waves, and sometimes ice. Both the governmental and our internal demands for the safety of the operation is very high.

The good and long-term experience with the services from Multiconsult made them our choice as supplier of services, development and project management of “Leroy Safe Guard”.

“Lerøy Safe Guard” (LSG) is a management system for optimal and safe operation of aquaculture sea-sites

- Continuous monitoring and prognoses of environmental conditions
  - Safer dimensioning
  - Safer operation
- Significantly reducing risk of human errors.
  - Defining safety parameters on specific sea-site operations.
- LSG control impact from wellboat on the cage and mooring-system.
  - Continuous calculating border-values, load calculations and real time measurements secures the fishfarm from damage.
- Calculates from historic data, real-time measurements og prognoses on important parameters, eks:
  - Wind
  - Waves
  - Current
  - Forces in morings

Lerøy Safe Guard contributes significantly in selecting optimal feeding times, increasingly important as sea sites get more exposed. This reduce the footprint on the environment and increase ROI.

Arnt Fredriksen has been one of the key players in the process of developing Lerøy Safe Guard. He has the leading role in the making of the main engine of LSG, the continuous, rapid calculation of the combined forces on a fishfarm.

Arnt Fredriksen has a gentle, friendly and professional way of co-operation and communication with Lerøy Aurora. We consider him highly skilled and are very satisfied with his work.

If there is any questions, feel free to contact Operation Coordinator

Ole Hermann Strømmesen at +47 918 06420 / ohs@leroyaurora.no

Best regards

Ole-Hermann Strømmesen