Department of Civil Engineering

News and figures 2010

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Department of Civil Engineering

news and figures 2011

AALBORG UNIVERSITY

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Welcome to our department

Within all of our core areas: research, teaching and collaboration with external partners, 2011 proved to be another very busy year for our department as we welcomed new students and employees and signed several new external contracts.

Our generally increasing activity level and sound financial situation enabled us to welcome more than 30 new Danish and international employees – hereof 17 new PhD students. Furthermore, the department expanded by adding a new division as the Center for Food Science, Design & Experience joined us and became the Division of Food+Design (cf. pp. 8-9).

2011 was also the year when our moving plans to our new facilities finally gained momentum. Our vision for the building is that it will communicate how and what we are working with through its materials, facade, and interior layout; the intent is for it to become a living laboratory! If all goes well, we hope to be moving into our new premises in August 2014.

2012 looks to be another interesting year for our department, as we turn our attention to internal co-operation within our department, as well as increased formal international co-operation for both students and staff. Also, we will proceed with the pedagogic course of development which we started in 2011 (cf. pp. 16-17) in order to continuously upgrade our employees' skills within this important area.

Peter Frigaard
Head of department

Meet the management

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Introduction to our department

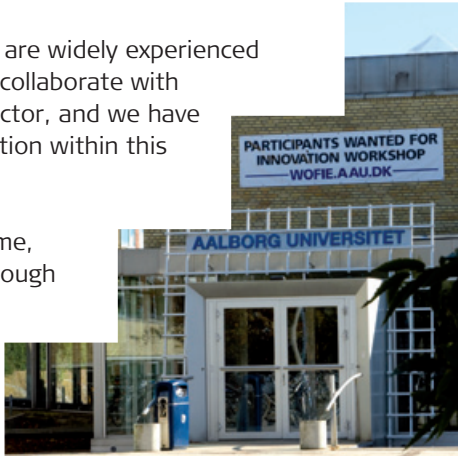
The Department of Civil Engineering focuses on research concentrated on developing and impacting the building sector in the future. Research and teaching are conducted in areas which centre on understanding environmental causality and planning people's physical environment.

Our department is divided into four divisions covering our main competence areas:
- Division of Architectural Engineering
- Division of Food+Design
- Division of Structures, Materials and Geotechnics
- Division of Water & Soil

We undertake contractual research projects for government institutions as well as private companies. Numerous experiments are carried out in our laboratories, which offer the best equipment along with a knowledgeable staff. While some equipment can be adjusted for an experiment, other equipment can be built specifically for a project or task.

Regarding both student and research projects, we are widely experienced in collaborating with external partners. We mainly collaborate with companies within the building and construction sector, and we have a profound knowledge of the demands and legislation within this area.

New projects and co-operations are always welcome, as new thoughts and ideas are best developed through dialogue!



Division of

Architectural Engineering

Associate Professor Kjeld Svidt
Head of division
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Research field

We work with research and education in analysis, design, construction and operation of engineering systems for commercial, industrial and institutional facilities. Our main research areas are energy-efficient building design, indoor environment and building informatics.

Research groups

'Building Informatics' and 'Indoor Environmental Engineering'.

We focus on an integrated, multidisciplinary approach to achieve optimal building designs and pay special attention to their impacts on the indoor as well as the surrounding environment. This implies integration of architectural design with engineering systems such as structural systems, communications and control, lighting, acoustics, fire protection, plumbing, heating, ventilation and air conditioning as well as close co-operation with other key players in all areas of the building process.

Laboratories

Our advanced laboratories and measurement equipment play an important role in most of our research projects. In indoor environment, we have facilities for full-scale measurements of airflow including smoke visualisations, air velocity distributions, temperature profiles and tracer gas equipment. We use different methods to simulate

the effect of heat and contaminant sources including thermal mannequins with breathing function.
Regarding energy-efficient design of buildings, we have several set-ups where we can investigate different aspects of the building envelope. This includes a number of 'hot-boxes' where we under controlled conditions can simulate indoor and outdoor conditions and measure the energy performance of window solutions, wall types, concrete slabs etc. We also have an outdoor facade laboratory for studying the performance of facade solutions under real weather conditions.

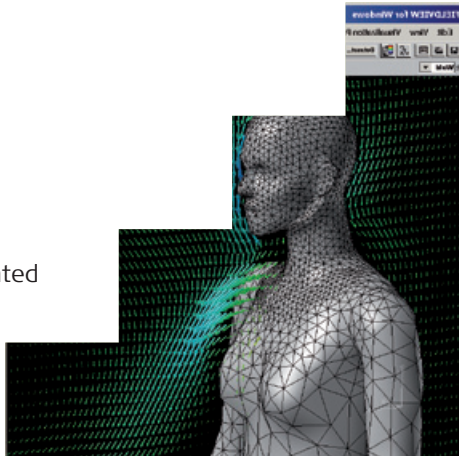
2012 outlook

We will maintain our focus on important research opportunities including:

- Development of zero energy/emission building concepts for new constructions and extensive energy renovations of existing buildings
- Integration of building constructions, building services and renewable energy systems
- Development of new active building technologies and components, building integrated renewable energy and HVAC systems
- Model-supported collaboration between designers, contractors and users of buildings

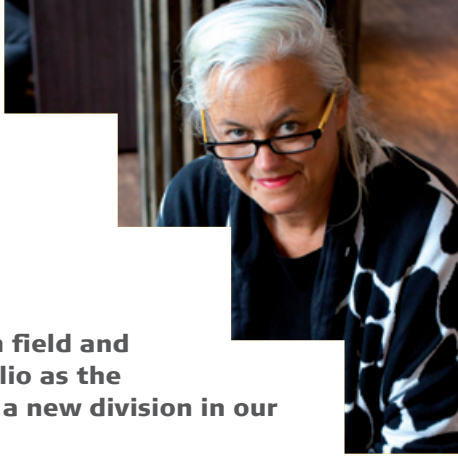
Our research activities will be within:

- Net Zero Energy Buildings
- Integrated Building Design Approach
- Reliable Building Performance Prediction
- User Behaviour and Building Energy Use
- Multifunctional Facades
- Natural and Hybrid Ventilation
- Activation of Building Constructions
- Energy Storage and Passive Cooling
- ICT systems and digital models to support the integrated building design process
- Activation of Building Constructions
- Energy Storage and Passive Cooling



Introducing division of

Food+Design



Associate Professor Anna Marie Fisker
Head of division
Contact: amf@civil.aau.dk, +45 9940 9911

In 2011, we were joined by another research field and consequently expanded our research portfolio as the area of food experience and design became a new division in our department.

As a new research division, how do you see your role here at the department?

- Food+Design has always co-operated well with the Department of Civil Engineering, and when the chance to become an independent division was presented, it provided a unique opportunity to strengthen our research and development effort and at the same time contribute to the already comprehensive portfolio of the department.

- Our research group's work has always been highly interdisciplinary, focusing in particular on design-methodological, process-oriented and interdisciplinary collaboration in the development process of new meal and food-related experiences. Within these aspects, we perceive great synergy effects through co-operation with the other research areas of the department.

What are your main research areas?

- In the division, we work from an integrated and multidisciplinary understanding of design focusing on food-related research. Our research and development projects are primarily focused on core areas such as experience and health.

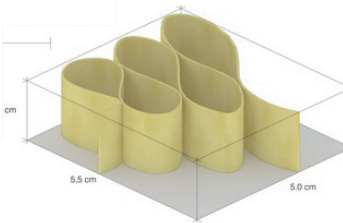
The interdisciplinary work is carried out as projects that investigate e.g. how the physical surroundings influence the experience of the meal or the possibilities for gastronomic optimisation of hospital meals. Additionally, we focus on the business-oriented research and knowledge transfer within product innovation for SMBs, packaging development, communication etc. Add to this a good effort within planning, development, teaching and conducting food-related tests, products and events that are carried out as research-based experiments aimed at collecting documented evidence.

- Our focal point is the holistic meal; and the projects are developed and optimised through a research-based approach in close co-operation with other key actors in the food sector.

What are your plans for 2012?

- Apart from continuing our current projects within experience-based and design-related food research, in 2012, we will work with expanding the national project Madkulturen (The Food Culture), which will have a satellite at our office in Hirtshals by Nordsøen Research Park. With regard to this, we are looking forward to participating in developing the Danish 'food culture' of the future.

- Furthermore, we will initiate new research collaborations with several of our significant external partners regarding the meal experience at our future super hospitals within meal provision and also the surrounding physical environments such as textiles and interiors.



Division of

Structures, Materials and Geotechnics

Professor Lars Damkilde
Head of division
Contact: lda@civil.aau.dk , +45 9940 7648

Research field

The research field revolves around both theoretical and numerical modelling and experimental verification within the field of structural mechanics, structural materials and geotechnics.

Research groups

'Innovative Structures', 'Offshore Foundations', and 'RISK'.

In 2011, the department implemented an organisational change which among other things has meant that structures and geotechnics have been placed together in the same division. This was a very agreeable development, as it has resulted in an even closer collaboration within the area of offshore wind turbine foundations. In relation to laboratories, it has also meant that the division now has a very high activity level in experimental work.

Working in laboratories

The laboratory facilities of the division are divided into three areas: geotechnical, materials and structures. The geotechnical laboratory is well-equipped and could be termed as leading in Denmark.

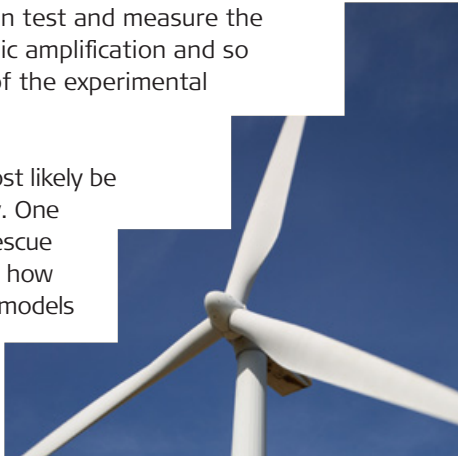
There has been intense activity in the division; large experiments have for instance been conducted in connection with the Siri platform (oil drilling rig). The experiments included part of the foundation structure being exposed to cyclic loads. The concrete research laboratory is also well-equipped, and externally funded fatigue studies of so-called grouted jointings have been carried out among other experiments. This particular issue has arised in connection with offshore wind turbines on monopiles where the jointing between tower and monopile is grouted. The structural laboratory has the conventional facilities, and experiments have been carried out for a glulam manufacturer who wanted to develop a new jointing method.

Plans for 2012

In 2012, the laboratory activity will hopefully increase additionally with new external projects. Within high-strength concrete, a number of fatigue tests must be done in connection with Forida Towers, a EUPD-funded project aiming at constructing the bottom part of a wind turbine tower in high-strength concrete.

Within the structural area, computer-based models have replaced experimental work to a large degree, but in the division, there is a constant need to introduce the students to the often quite complicated and abstract calculation methods. A small dynamic laboratory has been established where the students can test and measure the dynamic phenomena such as natural oscillation, dynamic amplification and so forth. The division plans for a continued enlargement of the experimental work with a pedagogical coherence.

Concerning the RISK centre in Esbjerg, the division will most likely be involved in another type of experiments than traditionally. One of the main tasks of the RISK centre will be to simulate rescue operations. In this connection, we need to be able to see how people behave under stress so that the computer-based models can include this central effect.



Division of

Water & Soil

Associate Professor Morten Lauge Pedersen
Head of division
Contact: mlp@civil.aau.dk, +45 9940 8477

Research field

The research focuses on several areas including uncertainty modelling, reliability assessment and risk analysis of buildings, bridges, offshore structures, coastal structures, wind turbines and wave energy devices. The other major research area is centred on modelling hydrological processes in urban areas and modelling chemical processes in sewage systems and drinking water supply systems along with hydraulics in aquatic ecosystems. Studies of anthropogenic use of natural resources such as rivers, groundwater, forests and landscapes are central areas of research.

Research groups

'Structural Dynamics, Reliability and Risk Analysis', 'Marine Structures' and 'Water, Environment and Landscape'.

Integrating current knowledge

Over the past year, we have undergone changes, which has meant that our scientific focus has shifted towards integrated research areas focusing on four major areas: marine, coastal and wave energy structure; structural dynamics; reliability and risk of structures; and water in urban areas. In addition, several other research areas are still a part of the division's portfolio including landscape processes, streams and rivers and environmental hydraulics.

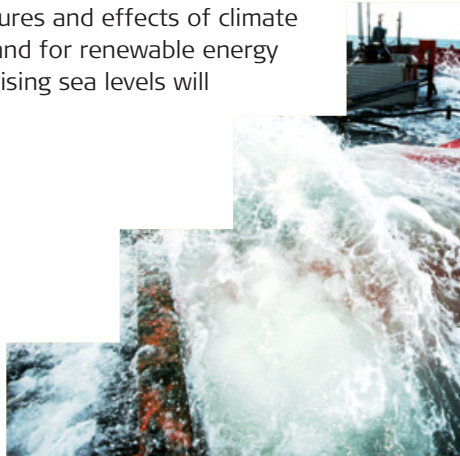
The division will continue to integrate and develop both teaching portfolio and research activities in order to meet societal demands.

Strengthening the focus in 2012

We have ambitious goals for 2012. One focal point will be to consolidate a strong research group on 'Structural Dynamics, Reliability and Risk of Structures', including renewable energy structures using state-of-the-art methods. We are engaged in several European projects and have established co-operation with a Chinese university together with a strong team of two professors, promising assistant professors and several talented PhD students.

Having integrated new researchers in chemical and biological processes in water, we are now capable of focusing our research in all aspects of water in urban areas. Measurement and forecasting of precipitation using weather radar and predictions of storm water flow are key aspects. Flow and processes in both sewers and clean water systems can now be integrated in the urban water research, and focus can be put on effects of future climate changes on all aspects of water in the built environment as well as on effects in the receiving waters.

We will continue to work with renewable energy structures and effects of climate change on coastal structures in the future as the demand for renewable energy is increasing dramatically and coastal protection from rising sea levels will continue to be an important issue.



Meet an Industrial PhD student

Julia Fernandez Chozas
Industrial PhD student, Contact: jfch@civil.aau.dk

Julia is one of the Industrial PhD students connected to our department. In 2009, she started working at Spok ApS, a marine renewable energy consultancy firm, where she is connected to the Wavetrain2 project, funded by the Marie-Curie FP7 programme of the European Commission.

How did you come to find the Industrial PhD work with our department?
- When I first went to Spok, they explained the aim of the Industrial PhD programme. It sounded simple both in terms of organisation and administrative work, as well as a challenging opportunity; so I simply applied for it.

What does your work consist of?
- Basically, I do research on wave energy. I am currently involved in a project looking into the predictability of wave and wind energy and integrating their resources into future electricity markets. This is a collaborative work among Aalborg University, Spok ApS, Energinet Denmark and three wave technology developers. I also assist in some lectures and teaching and I give a hand with Spok day-to-day tasks.

How do you divide your work between Spok and the Department of Civil Engineering?
- Rather than dividing my time I would say it is a continuous collaboration between me and them. It usually depends on the particular research stage whether I am working with one

more than the other. I see it as having a larger work environment with more colleagues instead of two different working places.

What do you find especially rewarding working as an Industrial PhD student?

- The outreach of my work. Through Spok, I can gain the know-how on technology development whereas through Aalborg University, I can access the expertise and knowledge of a department with 30 years of experience in wave energy. I would say an Industrial PhD is more than a three-year study programme. It is not only the opportunity to get a PhD, but also to face and deal with actual industry challenges. I think the academia and industry environment of the Industrial PhD together give an added value to my career.

Visit the Spok website: spok.dk

At present, Julia is one of the 47 PhD students in total enrolled in our department, and each year, we add to this number with more PhD students. Learn more about our PhD programme on our website civil.aau.dk.

PhD Students	2009	2010	2011
Enrolled	10	14	17

Finished PhDs in 2011:

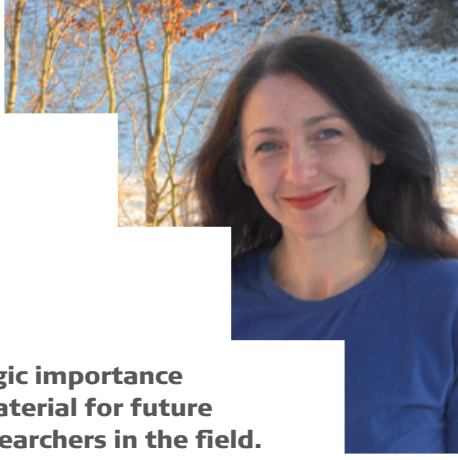
Jose Guadalupe Rangel Ramirez, "Reliability Assessment and Reliability-Based Inspection and Maintenance of Offshore Wind Turbines"

Li Rong, "Study of Ammonia Emissions in a Ventilated Pig Pen"

Camilla Brunsgaard, "Understanding of Danish Passive Houses based on Pilot Project Comfort Houses"

Mahdi T. Sichani, "Estimation of Extreme Responses and Failure Probability of Wind Turbines under Normal Operation by Controlled Monte Carlo Simulation"

The Pedagogic Innovation Project



Assistant Professor Dorina Gnaur

Let's do it differently this time!

Improving the quality of teaching is of strategic importance to the department as our students are the material for future generations of competitive engineers and researchers in the field.

Pedagogic development is thus a core matter, the challenge being how to find ways to integrate learning and development (L&D) initiatives so as to fully meet our particular needs. The innovative process should, according to our head of department, be user driven and based not only on the actual needs, but also on the consensus and active engagement of the users.

That was how Dorina Gnaur, assistant professor and consultant from Department of Learning and Philosophy & Learning Lab, found her way to our department as a part-time employee to observe and inculcate into her L&D approach the way we think and act in our department - in other words, become part of our culture before proceeding to identify core areas for pedagogic innovation.

Three main areas for L&D have been identified in our department:

1. Pedagogic optimisation regarding structural inhibitors to effective teaching and learning on the one side and the full exploitation of the learning potential on the other side.
2. Enhancing the co-operation and synergy between architectonic and engineering disciplines in order to stimulate renewal of the community of practice and adapt the recruitment criteria to a new type of students.
3. Rethinking the problem-based learning approach in terms of teaching methods and curriculum planning with regard to the learning potential in the social media and digital technologies.

The Pedagogic Innovation Project is thus structured in three stages: the first is aimed at the identification of areas for L&D development based on user involvement; in the second stage, a few project proposals are outlined, of which the one that has greatest interest and active support among us - the users - will be selected for implementation; and the third stage, which covers the implementation of the pilot project and the subsequent rolling out of the learning acquired at a larger scale in the department.

By approaching pedagogic innovation in this way, we aim at sustainable development with durable effects.

Palle Thoft-Christensen

50 years of service

On April 26 2011, we proudly celebrated professor emeritus Palle Thoft-Christensen's 50th anniversary at the department.

Palle Thoft-Christensen became M.Sc. in Structural Engineering from the Technical University of Denmark (DTU) in 1960, and in 1963, he obtained his PhD degree there. He subsequently went to the United States to work as a researcher at Brown University, and in 1964, he was appointed lecturer at DTU.

In 1966, he became professor of mathematics at the building section of the Engineering Academy in Aalborg, which in 1974 became part of Aalborg University. Palle Thoft-Christensen then worked as Head of the Department of Building Technology (now Civil Engineering) for 15 years. He has been involved in a range of academic activities, both nationally and internationally, and he has written a number of academic articles and books, some of which have been published as educational books. Moreover, he has functioned as supervisor for a large number of PhD students.

Palle Thoft-Christensen has headed several international conferences within his fields; primarily reliability, optimisation of structures and bridge management.

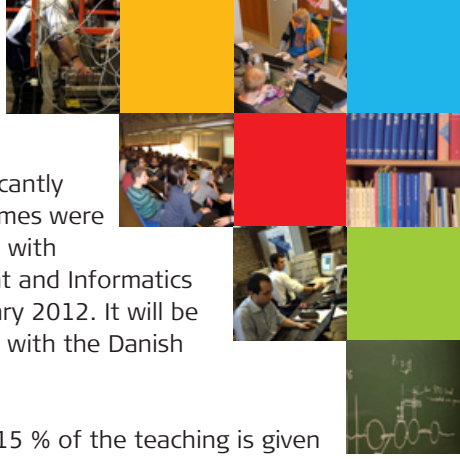
He has been a guest professor at several universities, among others in Japan, China, England, the United States, Korea and Poland. He has furthermore been active in various organisations such as IFIP (International Federation for Information Processing), where he has held a number of chairmanships over the years.

Palle Thoft-Christensen has received professor Ostenfeld's gold medal and IFIP's silver medal. In 1984, he received the Danish Royal Order of Chivalry, and in 1999, he was appointed honorary president at the International Association for Bridge Maintenance and Safety.

In 2003, he became professor emeritus at Aalborg University, and to this day, he still involves himself in international research. So much in fact that in December 2011, one of his publications was the most downloaded out of all at Aalborg University.

For the past nine years, Palle has kept himself busy on a daily basis by contributing to the department's research and daily life. He still involves himself in the day-to-day business of the department, and we are pleased that we can still bump into him in the hallway!

Teaching



Our study programme portfolio has increased significantly during the past few years. Eight new study programmes were added in 2010, and in 2011, we expanded yet again with the addition of the M.Sc. programme - "Management and Informatics in the Building Sector" - to be commenced in February 2012. It will be taught at our campus in Copenhagen in cooperation with the Danish Building Research Institute (SBi).

Besides from our research staff of 126 employees, 15 % of the teaching is given by industrial partners. We emphasise that our students come into contact with the surrounding world via e.g. guest lectures or actual courses held by co-operation partners. This not only creates valuable bonds between our students and potential future employers; it also facilitates knowledge sharing at a high level between the academic universe and industry to the benefit of society.

Descriptions of study programmes and courses are available at en.ses.aau.dk.

Despite the global recession in recent years, our graduates quickly find jobs. For instance, out of the 15 graduates from M.Sc. in Civil Engineering in 2010, 13 found jobs immediately after graduation. Hence, we preserve an optimistic view to the future and continue to educate increasing numbers of engineers as in 2011.

Graduates from the Study Board of Civil Engineering (Masters and Bachelors of Engineering in Aalborg and Esbjerg)			
	2009	**2010**	**2011**
M.Sc. in Civil Engineering (cand.scient.techn. – new 2009*)	*	15	33
M.Sc. in Indoor Environmental Engineering	5	4	15
M.Sc. in Management in the Building Industry	12	12	21
M.Sc. in Mechanical Engineering	6	7	14
M.Sc. in Transportation Engineering	10	8	13
Master in Physical Geography	2	0	2
M.Sc. in Structural and Civil Engineering	28	36	40
M.Sc. in Water and Environment	7	4	4
In all	70	86	142

Further information

The School of Engineering and Science - en.ses.aau.dk

- Head of School, associate professor, Henrik Brohus (hb@ses.aau.dk / +45 9940 8539)
- School Secretary, Gitte Bach (gb@ses.aau.dk / +45 9940 8530)
- School Secretary, Nicole Winther Nedergaard (nwn@ses.aau.dk / +45 9940 8517)

The Study Board of Civil Engineering

- Chairman of the Study Board, associate professor, Christian Frier (cf@civil.aau.dk / +45 9940 8582)
- Study Board Secretary, Ann Cathrine Criddle (acc@civil.aau.dk / +45 9940 8532)

2011 Highlights

Special events

Anniversary

In 2011, we were happy to celebrate the anniversary of two our colleagues. Senior Clerk Bodil Jensen celebrated 40 years and consequently received the royal Medal of Merit, and Professor Emeritus Palle Thoft-Christensen celebrated his 50th anniversary (read more about Palle on pp. 18-19).

Retirements

In 2011, three of our colleagues retired after many years at the department:

- Professor Per Christiansson
- Professor Kjeld Schaarup-Jensen
- Knud Erik Olesen

Royal Order of Chivalry

Professor Søren R. K. Nielsen received The Order of Dannebrog of The Royal Orders of Chivalry.

New professors

Poul Henning Kirkegaard and John Dalsgaard Sørensen were both given the title of professor.

Teacher of the year

The title as Teacher of the Year 2011 was given to Assistant Professor Henrik Stensgaard Toft.

Conferences

NORBS2011 – the eighth Nordic Benthological Meeting 2011

On 9-12 May, the Division of Water & Soil hosted the conference NORBS2011. The key theme for the conference was "Food Webs and Climate Change". Of its 35 participants, the conference had people from all of the Nordic countries.

Social Events

i6 Runners

In April, a group of employees decided to establish i6 Runners, a runners' club for the department. The club became quite popular, and in an effort to both strengthen social ties and to get fit, a group of employees now run together a few times a week during spring and summer.

International Evenings

Our international employees hosted two separate international evenings with food and cultural features for all of the department's employees to enjoy:
Indian Evening and Russian Evening.

Research Event

The annually recurring Research Event presents the department's research and growing expertise in engineering. The event is open to all.

The 2011 programme

Presentations of selected PhD projects

Division of Water & Soil

- "Performance assessment of Wave Energy Converter" by Arthur Pecher
- "Weather radars - a look into the future" by Jesper E. Nielsen
- "Innovative Technologies for Safer European Coasts in a Changing Climate" by Jørgen H. Nørgaard
- "Effect of Drainage Conditions on Cone Penetration Testing in Silty Soils" by Rikke Poulsen

Division of Architectural Engineering

- "Integration of the Phase Change Material in the Buildings Constructions" by Michal Pomianowski
- "Intelligent Glazed Facades - an experimental study" by Frederik V. Winther
- "Energy Renovation of Danish Single-Family Houses" by Andrea Mortensen

Division of Structural Mechanics

- "Transition Pieces for Offshore Wind Turbine Foundations made of CRC (Compact Reinforced Composite) by Anastasia Nezhentseva

After the PhD - then what?

by Henrik S. Toft

Newly appointed professors on their research

- "Risk and Reliability within Civil Engineering and Wind Energy" by John D. Sørensen
- "On Innovative Design of Structures" by Poul Henning Kirkegaard

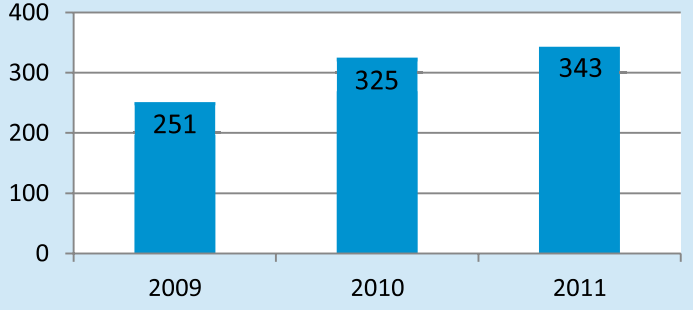
For further information on the 2012 Research Event programme, held on April 11, please visit us at civil.aau.dk.

Research publications

Our researchers are productive people and produce many research publications. In 2011, their work resulted in the highest number yet with 343 registered research publications.

All of the department's research is registered in VBN – Aalborg University's research database – which holds an impressive body of work from all of the university's researchers.

Number of research publications



Most downloaded publications in 2011

Title and author	Downloads
"Design of Offshore Wind Turbine Support Structures: Selected topics in the field of geotechnical engineering" by Christian LeBlanc Bakmar	3930
"Papers, Volume 1 1962-1985" by Palle Thoft-Christensen	2803
"Papers, Volume 2 1986-1989" by Palle Thoft-Christensen	2750
"Papers, volume 5 - 1997-2000" by Palle Thoft-Christensen	1883
"Reliability Assessment and Reliability-Based Inspection and Maintenance of Offshore Wind Turbines" by José Rangel Ramirez	1312

To see full lists of publications, projects, activities and press clippings from our department, please visit vbn.aau.dk.

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