



## Christian LeBlanc Thilsted

Structural and Geotechnical Engineer

### Positions held

- Partner & Director  
Wood Thilsted Partners Ltd,  
November 2015-present

Past positions in Ørsted:

(formerly Dong Energy)

- 2012-2015 Head of Department, Geotechnical Engineering (20+ FTE),
- 2010-2012 Head of R&D offshore structures,
- 2008-2010 Geotechnical specialist,
- 2005-2008, Industrial PhD, Oxford University / AAU,
- 2004-2005, Project engineer, Offshore substations,

\* formerly Dong Energy

### Qualifications

- PhD Geotechnical Eng. (2008)
- MSc Structural Eng. (2004)
- BSc Civil Eng. (2002)

### Professional memberships

- Member of Danish Geotechnical Association

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### Summary

Christian has held key positions in the Offshore Wind Industry for more than a decade and has expert knowledge in effective execution of site investigations through to detailed design and optimization of offshore structures ensuring a holistic overview of critical activities across all phases. He has an engineering specialist background with an excellent academic track record provides the ability to apply engineering efficiently to optimize value and minimize risks of offshore wind farm developments. He has developed engineering software applied for detailed design of wind turbine foundations widely applied in numerous offshore wind project projects and has been a central figure in the industry pushing forward the technical development and quality processes with respect to design, fabrication and installation of offshore structures and cables.

### Specialisations

- **Geotechnical engineering** finite element modeling, cyclic soil behavior, installation assessment, detailed design and certification.
- **Offshore structural engineering** Piled foundation, gravity base foundations, jacket and caisson based structures,
- **Offshore wind farm site maturation**  
Due diligence, scoping, planning, procurement and management of offshore geotechnical site investigations, laboratory testing, ground modelling and risk assessment
- **Engineering quality and effectiveness**  
Optimisation, standardization and automatization of engineering software and processes
- **Research and development projects;**  
Start-up, management and supervision

### Project highlights – Offshore Wind Farms

#### Various offshore wind project in Taiwan (2016-present)

Foundation design responsible for the FEED design of monopile and jacket foundations for in Taiwan. Consultancy work has included derivation of geotechnical soil profiles, evaluation of liquefaction potential, in-house design of jacket piles and earthquake analysis.

#### Kriegers Flak Offshore Wind Farm (2016- present)

Foundation design manager for the FEED design and detailed geotechnical design of monopiles. Consultancy work has included ground modelling, ground risk assessment, preparation of site assessment, ice load assessment, monopile concept, in-house design of monopile foundations and evaluation of cost optimization potentials. Preparation of geotechnical

## Nationality

Danish

## Other professional activities

- Nominated as voting member for Denmark on International Society for Soil Mechanics and Geotechnical Engineering Technical Committee 209 Offshore Geotechnics
- Judging panel member of the Ground Engineering Awards
- Journal reviewer for *Geotechnique*
- Speaker at numerous international conferences
- Supervisor for MSc and PhD students

## Honours and awards

Talent Award 2011 by Danish Wind Industry Association; most talented in the Danish windpower industry 2011

TK Hsieh Award 2010 by Institution of Civil Engineers (ICE) UK; best scientific paper in the field of structural and soil vibration caused by mechanical plant, waves or seismic effects

## Publications

Author of numerous publications please see attached list for details.

interpretive reports, design soil profiles, geotechnical design methodologies and detailed geotechnical design and certification.

### **US Offshore Wind Project (confidential project) (2016-present)**

Consultancy work included a wide variety of engineering services ranging from early due diligence, through survey management, ground risk assessment and writing of construction and operating plan (COP) to FEED design of foundations, substations export cable route design and burial assessments.

### **Canadian Offshore Wind Project (confidential project) (2016-present)**

Due diligence, risk assessments, survey planning and FEED design of gravity base foundations.

### **Mermaid and Seastar Offshore Wind Farms (2017-present)**

Lead engineer for FEED design of monopile foundations and evaluation of cost optimization potentials.

### **Vesterhav Syd and Nord (2017- present)**

Lead engineer for preparation of geotechnical design methodologies, detailed geotechnical design and certification.

### **Fryslan Offshore Wind Farm (2017)**

Lead engineer for FEED design of monopile foundations and evaluation of cost optimization potentials.

### **WTG turbine development (confidential client) (2016-2017)**

Lead engineer for FEED design of monopile foundations and evaluation of cost optimization potentials.

### **Triton Knoll Offshore Wind Farm (900MW) (2016 – 2017)**

Foundation design manager for the FEED design of monopile foundations for the Triton Knoll Offshore Wind Farm. Consultancy work included in-house design of monopile foundations and evaluation of cost optimization potentials.

### **Hornsea Project 1 Offshore Windfarm (1200MW) (2010 – 2015)**

Geotechnical manager for the site investigations, ground modelling and in-house design of the 150+ WTG foundations (monopiles and jackets on suction buckets) and scour protection systems. Technical review and quality assurance of offshore substations, cables routing and burial assessments.

### **Walney Extension Offshore Windfarm (600MW) (2012 – 2015)**

Geotechnical manager for the site investigations, ground modelling and in-house detailed design of monopiles for 7-8MW turbines and scour protection systems. Geotechnical FEED design for piled jackets. Technical review and quality assurance of offshore substations, cables routing and burial assessments.

### **Race Bank Offshore Windfarm (580MW) (2014 – 2015)**

Geotechnical manager for the ground modelling and in-house detailed

design of the monopiles for 7MW turbines and scour protection systems. Technical review and quality assurance of offshore substations, cables routing and burial assessments.

**Burbo Extension Offshore Windfarm (580MW) (2012 – 2015)**

Geotechnical manager for the site investigations, ground modelling and for the in-house detailed design of monopiles 8MW turbines. FEED design substation on bucket foundations. Technical review and quality assurance of offshore substations, cables routing and burial assessments.

**Gode Wind Offshore Windfarm (582MW) (2012 – 2015)**

Geotechnical manager for the ground modelling and in-house detailed design of monopiles 6MW turbines. Liaison with German Authorities for approval of ICP method for use in German waters. Proof of pile capacities by dynamic pile testing for the offshore substation.

**Borkum Riffgrund I Offshore Windfarm (312MW) (2012-2015)**

Geotechnical manager for the in house detailed design of the monopile foundations for 77 3.6 MW turbines. Proof of pile capacities by dynamic pile testing for the offshore substation

**Westermost Rough Offshore Windfarm (210 MW) (2012-2014)**

Technical review of detailed design of 35 monopiles for 6MW turbines incl. new pile design methods for monopiles in chalk.

**Gunfleet Sands III (12 MW) (2010 – 2012)**

Lead Geotechnical engineer for the detailed design of the first monopile foundations for the Siemens 6MW turbine.

**West of Duddon Sands Offshore Wind Farm (389 MW) (2010 – 2013)**

Lead geotechnical engineer for the detailed design of 108 monopiles for 3.6MW turbines.

**Anholt Offshore Wind Farm (400 MW) (2009-2012)**

Technical review of ground modelling and detailed design of 111 monopiles for 3.6MW turbines. Installation risk assessment.

**London Array Offshore Wind Farm (630 MW) (2009-2012)**

Technical review of detailed design of 175 monopiles for 3.6MW turbines.

**Frederikshavn Offshore (36MW) (2009)**

Lead geotechnical engineer for geophysical and geotechnical site investigations. Foundations concept design.

**Horns Rev II Offshore Windfarm (312MW) (2007-2009)**

Technical review of detailed design.

## **Project highlights – R&D projects**

**Geotechnical design methodology for monopiles (2016-present)**

Independent assessment and evaluation of the results of the PISA project. Re-interpretation of ground parameters, modeling of test piles using 1D and 3D FE models. Development of improved design methods including a cyclic degradation model validated on basis of laboratory test results and PISA pile test results.

**OptiMon – Software for detailed design of monopiles (2009-2011)**

Initiated and developed DONG Energy's in-house software "OptiMon" applied for automated and optimized detailed design monopile of foundations. The software is certified by DNV and applied by DONG Energy for detailed design of monopiles in all projects.

**MP2X – Monopiles for deep water and large turbines (2011-2013)**

Initiated and lead MP2X - an in-house development project in DONG Energy aimed at improving the monopile concept to enable deep water application in combination with large turbines in the 5-10MW class.

**PISA Project (2013 – present)**

Initiated the successful £3m joint industry project to develop new pile design methods for monopiles on basis of field testing of monopiles.

**Prototype testing of Twisted Jacket Concept (2012)**

Board member for the prototype testing of Keystone's twisted jacket to support a met-mast in the North Sea.

**Implementation of structural monitoring systems (2011-2015)**

Established processes to ensure systematic instrumentation and monitoring of foundations in DONG Energy's wind farms to allow for life-time extensions and design improvements.

**Installation of monopiles using vibratory hammers (2012)**

Initiated and lead the execution of full-scale installation trials on two monopiles at Anholt Offshore Wind Farm using vibratory hammers.

**Foundation prototype testing: Suction Bucket Jacket (2013-2014)**

Technical review of design methods. Installation risk assessment. Liaison with German Authorities for certification of the suction bucket jacket.

**Foundation prototype testing: The Mobile Met Mast (2008)**

Installation prediction, risk assessment and offshore supervision for installation of a suction bucket foundation "The Mobile Met Mast" installed at Horns Rev 2.

### List of Publications

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Jardine, R.J., **Thilsted, C.L.**, Thomsen, N.V. & Mygind, M. 2015. *Axial capacity design practice for North European Wind-turbine projects*. in Meyer eds. *Frontiers in Offshore Geotechnics III* Taylor & Francis Group, London, 581-586.

Kallehave, D., Byrne, B.W., **Thilsted, C.L.** & Mikkelsen, K. (2015): Optimisation of monopiles for offshore wind turbines, *Philosophical Transactions of the Royal Society*. A 373: 20140100

Kallehave, D., **Thilsted, C.L.** & Troya, A. (2015): *Observed variation of monopile foundation stiffness*. Proceedings of 3rd International Symposium on Frontiers in Offshore Geotechnics, Oslo, Norway

Muir Wood A., Mackenzie B., Burbury D., Rattley M., Clayton C.R.I., Mygind M., Wessel Andersen K., **LeBlanc Thilsted C.** and Alberg Liingaard M. (2015): *Design of large diameter monopiles in chalk at Westernmost Rough offshore wind farm* in Meyer eds. *Frontiers in Offshore Geotechnics III* Taylor & Francis Group, London, 723-728.

Schroeder, F.C., Merritt A.S., Sorensen K.W., Muir Wood, A., **LeBlanc Thilsted C** and Potts D.M. (2015). *Predicting monopile behaviour for the Gode Wind offshore wind farm* in Meyer eds. *Frontiers in Offshore Geotechnics III* Taylor & Francis Group, London, 735-740.

**Thilsted, C.L.**, Kallehave, D. & Skov-Gretlund, J. (2013): *Vibro-driving of Monopiles - Experiences from Anholt Offshore Wind Farm*. EWEA Offshore 2013, Frankfurt, Germany.

Kallehave, D. & **Thilsted, C.L.** (2012): *Planning of a full scale measurement campaign on monopile support structures for offshore wind turbine*, Nordic Geotechnical Meeting 2012, Copenhagen, Denmark.

Kallehave, D., **Thilsted, C.L.** & Liingaard, M. (2012): *Modification of the api p-y formulation of initial stiffness of sand*. Proceedings of the 7th Int. Conf. on Offshore Site Investigation and Geotechnics, Society for Underwater Technology, London, UK

**LeBlanc, C.**, Houlsby, G. T. & Byrne, B. W. (2010): Response of stiff piles in sand to long-term cyclic lateral loading. *Geotechnique*. 60, No. 2, 79-90  
(TK Hsieh Award 2010)

**LeBlanc, C.**, Byrne, B. W. & Houlsby, G. T. (2010): Response of stiff piles to random two-way lateral loading. *Geotechnique*. 60, No. 9, 715-721

Ibsen, L. B., **Thilsted C. L.** (2010): *Numerical study of piping limits for suction installation of offshore skirted foundations and anchors in layered sand*, Proceedings of 2nd International Symposium on Frontiers in Offshore Geotechnics (ISFOG), Perth, Australia. 421-426

Ibsen, L. B., **Thilsted C. L.** (2010): *Numerical study of piping limits for installation of large diameter buckets in layered sand*. Proceedings of Numerical Methods in Geotechnical Engineering (NUMGE), Trondheim, Norway. 921-926

**LeBlanc, C.**, (2009): *Design of offshore wind turbine support structures – selected topics in the field of geotechnical engineering*. Ph.D. thesis. Aalborg University, Denmark

Hald, T., Mørch, C., Jensen, L., **LeBlanc, C.** & Ahle K. (2009): *Revisiting monopile design using p-y curves – Results from full scale measurements on Horns Rev*. Proceedings of the European Offshore Wind Conference, 14<sup>th</sup> - 16<sup>th</sup> September 2009, Stockholm, Sweden

**LeBlanc, C.**, Nielsen, S. A., Ahle K., Ibsen, L. B. (2009): *The monopod bucket foundation – recent experience and challenges ahead*. Proceedings of the European Offshore Wind Conference, 14<sup>th</sup> - 16<sup>th</sup> September 2009, Stockholm, Sweden

**LeBlanc, C.** & Randolph, M. F. (2008): *Interpretation of piezocones in silt, using cavity expansion and critical state methods*. Proceedings of the 12<sup>th</sup> International Conference of International Association for Computer Methods and Advances in Geomechanics (IACMAG), 1<sup>st</sup> - 6<sup>th</sup> October 2008, Goa, India. 822-829

**LeBlanc, C.**, Hededal, O. & Ibsen, L. B. (2008): *A modified critical state plasticity model for sands – theory and implementation*. DCE Technical Memorandum No. 8. Department of Civil Engineering, Aalborg University, Denmark