TECHNISCHE UNIVERSITÄT BERGAKADEMIE FREIBERG
Die Ressourcenuniversität. Seit 1765.

GICON® ESG
Edelstahl und Umwelttechnik

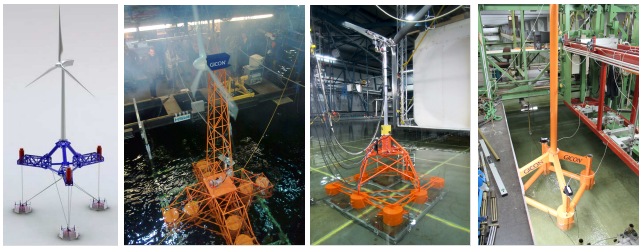
FABRICATION AND INSTALLATION OF A TLP PILOT PLANT FOR WIND TURBINES

Research insights from the last years

Frank Adam (Technical University Freiberg), Denis Matha (University Stuttgart), Frank Dahlhaus (Technical University Freiberg)*
** Presenting Author*

PATH OF DEVELOPMENT – TLP SUBSTRUCTURE

The challenging work for the research project called 'Floating platform for offshore wind turbines' started in 2009. The GICON®-Group and their key partners, e.g. TU BERGAKADEMIE FREIBERG and the company ESG have been developing a TLP solution for offshore wind turbines with vertical and angled tensioned ropes. Based on the fundamental experience from experimental and numerical studies the current design was established.



Advantages:

- deployable from 20 meters to 350 meters and more
- portside assembly and transport of the entire structure to the deployment location
- modular construction resulting in more flexibility in the supply chain
- several anchoring options
- reduced impact on site subsoil via heavy weight foundation
- Ease of maintenance
- If needed, entire structure can be completely replaced

Comparison of the structures:

Design value	2009	2012	2013	2014
TLP Mass in t	≈ 2000	2214	1790	742
Width in m	70	68	50	32
Height in m	25	24	39	28
Max. righting arm in m	N/A	5.30	7.60	2.50
CoG	N/A	8.90	10.50	10.91
# of anchor points	3	4	4	4

SCIENCE & RESEARCH

Currently ongoing research includes the comparison of calculated data with actual experimental data obtained through wave tank experiments with the scaled models. These tests have provided insights regarding the dynamic characteristics of the GICON®-TLP by analyzing the measured time series RAO´s or decay test results.

Research insights from the last years are:

- the added mass coefficients belonging to the comparison of measured results compared with simulated one yielded to $C_{a\_pipe} = 0.6$ and $C_{a\_bb} = 0.2$ → published from *Adam, F., Steinke, C., Dahlhaus, F., and Großmann, J.*, 2013. "**GICON-TLP for wind turbines – Validation of calculated results**". Proc. ISOPE 2013 Anchorage, vol. 1, pp. p: 421–427.
- Validation of the calculation model via decay test results an confirmation of the added mass coefficients → published from *Adam, F., Myland, T., Dahlhaus, F., and Großmann, J.*, 2014. "**Scale tests of the GICON®-TLP for wind turbines**". Proc. OMAE 2014, Paper-No. 23216, San Francisco.
- Evaluation of internal force superposition on a TLP for wind turbines → published from *Adam, F., Myland, T., Schuldt, B., Großmann, J., and Dahlhaus, F.*, 2014. "**Evaluation of internal force superposition on a TLP for wind turbines**". Renewable Energy.

FABRICATION

As work on the GICON®-TLP was able to begin in July 2014, the first elements of the floating offshore foundation are now in assembly or have already been completed. In a first phase, the secondary steel is being manufactured. Four pipes which interconnect the buoyancy elements of the TLP have already been completed. At 2.80 meters in diameter, they are of sufficient size to withstand the tremendous forces at sea.

ACKNOWLEDGMENT

We like to express our sincere gratitude to the German Federal State of Mecklenburg-Vorpommern, for the financial support provided to the ESG GmbH, a member of the GICON group (project number: V-630-1-260-2012/103).

Dipl.-Ing. Frank Adam
TU Bergakademie Freiberg | I Institute of Mining Engineering and Special Civil Engineering | Department of Concrete Structures and Structural Design | Gustav-Zeuner-Str. 1A | 09599 Freiberg | Phone: 03731 / 39-2130 | Frank.Adam@tu-freiberg.de | DeepWind 2015 | 04. - 06. February 2015