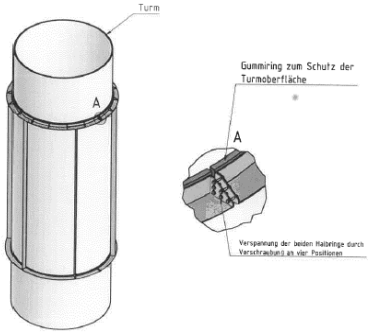
Fin plate

Reduced vibration for wind turbine tower construction

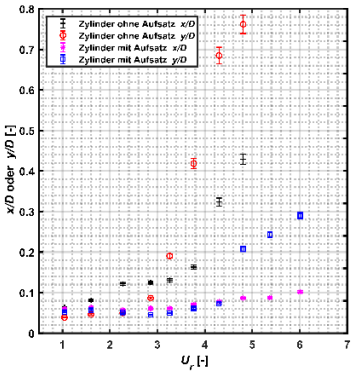
Invention

Air flow around blunt bodies (structure) creates vortex shedding in their wake. This applies forces perpendicular to the direction of flow, causing vibration in the bodies. If the structure's natural frequency is close to the vortex shedding frequency, the resulting resonance can greatly reduce structure service life.



Fin plate structure

To reduce this vibration and eliminate the service life impairment during transport and erection of wind turbine towers, the University of Duisburg-Essen has developed a modularly attachable apparatus (fin plate). Damage to the tower surface is to be avoided and there should be no stress concentration. The space requirement should be low. The fin plate consists of two horizontal circular rings to which small plates with sharp edges are attached. The two-part structure allows it to be attached to the tower from two sides. This makes assembly and disassembly easy.



Vibration amplitude in flow direction *x* and perpendicular to flow *y* normalized with cylinder diameter *D* thanks to reduced velocity U_r for a cylinder with and without apparatus

Commercial Opportunities

This apparatus is especially advantageous during transport and erection of wind power systems. Vortex-induced vibration is greatly reduced or even eliminated. In principle, the apparatus can be used with all cylindrical structures (such as pillars) that require protection from vortex-induced vibration.

Current Status

The function principle of the "fin plate" invention has been analyzed experimentally at model scale, showing that vibration amplitude reduction perpendicular to flow is reduced by up to 96% and in the flow direction by up to 45%. A patent application has been submitted to the German Patent and Trade Mark Office; internationalization is an option.

At the behest of the University of Duisburg-Essen, PROvendis offers interested companies licenses to the invention and the opportunity for technology refinement.

Relevant Publications

Youssef, M., el Moctar, O., El Sheshtawy, H., Tödter, S. and Schellin, T. E. (2022) Passive flow control of vortex-induced vibrations of a low mass ratio circular cylinder oscillating in two degrees-of-freedom, In: Ocean Engineering 254, pp. 111366, DOI: https://doi.org/10.1016/j.oceaneng.2022.111366.

An invention from University of Duisburg-Essen.

Competitive Advantages

- Extended tower service life
- Modular structure
- Can be removed
- Protects the tower surface
- Little space required
- Unidirectional effect

Technology Readiness Level

1 2 3 **4** 5 6 7 8 9

Technology validated in lab

Industries

- Wind power
- Cylindrical components

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