Hanzehogeschool Groningen
University of Applied Sciences

Assignment student EnTranCe Energy Transition Community

Project title: Small Wind Turbines/Fortis 1/ Rotor blade geometry optimization

Suitable for students of: *Multiple choices are possible*

O MBO
O Buiten Werkplaats Built Environment (2nd yr, 1 block)
O Vastgoed lab V&M (3rd yr)
x Bachelor graduation assignment (4th yr)
O Bachelor internship (limited possibility in daily guidance)
O Research assignment in curriculum year…….
x Honors research assignment
x Master thesis

Study Program: Ba/ Ma Mechanical Engineering, EMRE, Physics, Aeronautics

Period: semester 2 2017/2018

Language: English, Dutch, German

Client: Fortis Wind Energy; Ir. J. Kuikman; www.fortiswindenergy.com; kuikman@fortiswindenergy.com

Internal client: EnTranCe; RAAK-MKB Project PUMSwindT; Ir. R. A. Alberts

Background (facts, situation sketch and parent/organization goals)

Fortis Wind Energy is a company that produced hundreds of Small Wind Turbines(**SWT**) over the last decades and installed these wind turbines all over the world. There are three sizes available:

- F1; P=1,5 [kW]; E(electr)=ca. 1.500 [kWh/y]; D(rotor)= 3 [m]; C(F1)=ca. 8.000 [€]
- F2; P=5,0 [kW]; E(electr)=ca. 5.000 [kWh/y]; D(rotor)= 5 [m]; C(F2)=ca. 20.000 [€]
- F3; P= 10 [kW]; E(electr)=ca. 10.000 [kWh/y]; D(rotor)=10 [m]; C(F3)=ca. 40.000 [€]

Problem (description of the undesirable situation)

Because the price-performance of Solar PV- and big wind turbine(**BWT**)-systems went up the last decade where that of the SWT didn't. So the market position for the SWT marginalised, except for some niche markets, like rural stand alone farms.

SWT manufacturers did not have the capabilities and capital of the BWT manufacturers so couldn't keep up with the latest scientific insights and lagged behind.

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With regard to the rotor blade geometry, expressed in the Cp-coefficient, the Cp(max, BWT)=0,5 and the Cp(max, SWT)=0,3. The specific relation Cp and rotor blade geometry is not fully clear as well as the relation Cp and yearly energy production. The SWT of Sky Stream, USA has a relative high CP value as well as a high yearly energy production(Test report is available)

Objective (description of the desired situation)

Research all relevant aspects of the energy production of rotor blades for SWT and design an theoretical optimal geometry for the different rotor blades
Make an optimised prototype for the three rotor blades(F1,F2,F3)
Test the prototypes and verify the test data with the theoretical performance
Write a Ba/Ma report, with all the relevant project data.

Result deliverable/product (what is ready if the project is finished) with list of part results

A theoretical model for designing an optimal rotor blade geometry
Optimized redesigns for F1, F2, F3 as well as production of Prototypes
Design of a test set up for the prototypes and validation.
A Ba/Ma report, with all the relevant project data.

Competence level

3

Connected to Change Agency ETC

Multiple choices are possible

O Sustainable Building
O Sustainable Mobility
O Local Communities

Interested or further information

You will be working in a multidisciplinary team. For detailed information on this assignment contact *A.S.J. Joosse* (EnTranCe), etc@org.hanze.nl

How to respond to the vacancy

Send a motivation letter and CV to EnTranCe, Energy Transition Community, etc@org.hanze.nl Attn. Mrs. Jacqueline Joosse, Office Manager EnTranCe. Note: If the job does not fit directly with your specific interest, please visit our website to discuss other possibilities.

Website: www.en-tran-ce.org