

Final report

1.1 Project details

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| Project title | Single Blade exchange without Crane |
| Project identification (program abbrev. and file) | 64014-0550 |
| Name of the programme which has funded the project | EUDP |
| Project managing company/institution (name and address) | Liftra |
| Project partners | None |
| CVR (central business register) | 10110122 |
| Date for submission | 20-12-2017 |

1.2 Short description of project objective and results

DK:

"Single Blade exchange without Crane" er færdigudviklet, og der er produceret en prototype. Denne testes sammen med en kunde. Fra 1. marts skal Liftra i gang med at skifte vingelejer kommercielt med Single Blade exchange without Crane (Blade Way systemet).

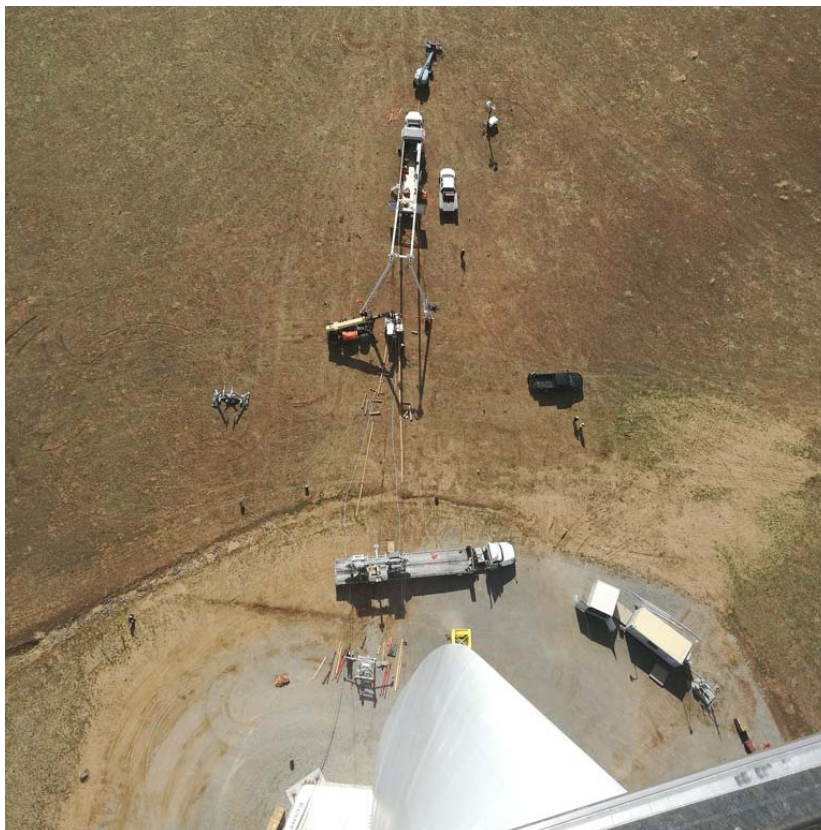
Liftra har fået en kontrakt på 100 møller, der skal skiftes vingelejer på, over det næste år.

Liftra er samtidigt i forhandling med yderligere 3 kunder om brug af Blade Way til skift af vinger, vingelejer og til upgrade af vinger samt ny installation. Liftra har desuden fået godt 3 millioner fra markedsmodningsfonden til at videreudvikle Blade Way til at passe til flere møller og vinger og mølletyper og til demonstration.

UK:

The development of "Single Blade exchange without Crane" (Blade Way) is finished and a prototype has been produced. The Blade Way is going through test at the moment together with a customer. From the 1st of March Liftra is starting to change pitch bearings with the Blade Way at a commercial scale.

Liftra has received a contract on exchange of pitch bearings on 100 turbines over the next 2 years. Liftra is at the same time in negotiation with additional 3 customers on use of the Blade Way to change blades and pitch bearings and to upgrade of blades and finally on new installation of new turbines. Liftra in addition has got 3 million DKK from "Markedsmodningsfonden" for further developing the Blade Way to fit on more turbines and blades and for demonstration.



Setup of the Blade Way, only 2 trucks is needed.

1.2 Executive summary

The Blade Way is fully developed into a working prototype, and a 2nd generation is under development together with "Markedsmodningsfonden". The product is now a commercial product that Liftra is selling both as a product and as a service. Liftra is negotiating with 4 different customers and has made one service contract for exchange of pitch bearings on 100 turbines.

Liftra expects to sell minimum 10 systems and operate additional 5-10 systems with the next 4 years.

The Blade Way is a platform for a new product group for Liftra.



Lifting of the Tip and Root clamp up to the blade

1.3 Project objectives

The objective of the project was to develop a system to exchange blades or blade bearing without use of traditional mobile cranes. The objectives have successfully been obtained with "only" 6 months delay. The reason for the delay was mainly do to lack of a customer to cooperate with. The project evolved in general as expected. The only stop on the way was that it took about 6 months longer than expected to find a customer and the total amount of development hours was increased with almost 50%.



Installation of the Tip and Root clamp on the blade

1.4 Project results and dissemination of results

The technical results of the of the project have give the following new technologies for Liftra:

- A 2 x 5 ton winch for 2x 1000m wire with a new spooling guide.
- A new 5 ton puller winch
- 2 new blade clamps that has developed in to stand alone products.
- A much bigger understanding on how to lift a blade in friction and understanding what parameters influence the friction coefficient between blade and lifting pads.

Commercially Liftra has sold a service contract on exchange of pitch bearings on 100 turbines and is dialog and negotiation with additionally 4 customers either for renting or selling of the Blade Way.

The project has not yet increased Liftras turnover but we expect very much to see an increase in 2018. Liftra has during the development hired 5 new engineers and expect to hire between 6 and 15 new technicians in 2018.

The Blade Way has been shown in 6 exhibitions in EU, USA and China over the last 3 years.

The Blade Way has been on the front page on Windtech international in January 2016 see the following link:

<https://www.windtech-international.com/editorial-features/blade-exchange-without-cranes>

The Blade Way is a very big part of why Liftra won the EY Entrepneur of the year innovation price in 2017 see the following link:

<http://www.ey.com/dk/da/newsroom/news-releases/ey-pm-20171130-eoy-innovation>

<https://jyskebank.tv/eoy-vinderinterview-liftra-arets-innovative>



Lowering of the blade from the hub

1.5 Utilization of project results

The result of the EUDP project is a specific product "The Blade Way" for further details see: <http://liftra.com/product/lt1100-blade-way/> in addition to that several partial products has been developed:

- A 2 x 5 ton winch for 2x 1000m wire with a new spooling guide.
- A new 5 ton puller winch
- 2 new blade clamps that has developed in to stand alone products. See: <http://liftra.com/product/lt1100-1-202-blade-tip-yoke/> or <https://youtu.be/NaBML1FacTk?t=51> (The tip clamp on the blade is a direct "by product" from the EUDP project)
- A much bigger understanding on how to lift a blade in friction and understanding what parameters influence the friction coefficient between blade and lifting pads.

The Blade Way is becoming a big part of Liftras strategy in developing system to change major components on turbines without use of traditionally mobile cranes. The Blade Way is becoming a central part of Liftras product portfolio.

Liftra expects to sell and rent out 15-20 systems over the next 4 years. Liftra is the first company with a system that can change blades and blade bearings on multiple turbines and blade types with the same system, but several systems are under development and is expecting to hit the market within the next year to 1½ year. So time to market is important to keep the distance to the competitor's for Liftra.

Liftra has taken out 2 patents and they have both been granted in Denmark and Liftra is applying for the patent in EU, USA, China and India.

The Blade Way generally helps to lower the cost on service on wind.



Blade half way down

1.7 Project conclusion and perspective

The objectives of the EUDP project has been fulfilled with a 6 months delay on the project. The project has resulted in the main product the Blade Way and one direct spin off product "Blade tip clamp" and 3 other technology developments. The projects are only the first step on the way to change blades and blade bearings on turbines to generally reduce the service price for exchange of blades and blade bearings. As the turbines gets bigger and the blades get longer and heavier, the Blade Way will become more and more competitive.



Blade at ground level

Annex

<https://www.windtech-international.com/editorial-features/blade-exchange-without-cranes>

<http://www.ey.com/dk/da/newsroom/news-releases/ey-pm-20171130-eoy-innovation>

<https://jyskebank.tv/eoy-vinderinterview-liftra-arets-innovative>

<http://liftra.com/product/lt1100-blade-way/>

<http://liftra.com/product/lt1100-1-202-blade-tip-yoke/>

<https://youtu.be/NaBML1FacTk?t=51>