

# CASE STUDY; CONTROLLED ENVIRONMENT IN UP-TOWER BLADE REPAIR

BLADEFENCE - VILLE KARKKOLAINEN

WINTERWIND 2019

UMEÅ, SWEDEN – 5 FEBRUARY 2019

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# AGENDA

- BLADEFENCE IN SHORT
- WHAT'S SO DIFFICULT IN BLADE REPAIRS?
- MITIGATING WEATHER AS A FACTOR
- COSTS OF WEATHER DOWNTIME





# BLADEFENCE IN SHORT

- ESTABLISHED IN HELSINKI, FINLAND 2010
- LEADING INDEPENDENT BLADE SERVICE PROVIDER IN NORTHERN EUROPE
- BLADEFENCE CANADA STARTED OPERATIONS IN 2016
- BLADEFENCE USA OPENS IN CHICAGO IN 2019
- GROUP REVENUE 2018 ~ \$14M CAD
- TOTAL PERSONNEL ~ 75





# BLADEFENCE IN SHORT

## PROJECT SERVICES:

- VISUAL AND NDT INSPECTIONS
- BLADE REPAIRS
- BLADE RETROFITS (PROTECTIVE TAPE, AERODYNAMIC DEVICES)
- BLADE CLEANING AND ANTI-/DE-ICING
- BLADE BALANCING

## SPINDURANCE BLADE MAINTENANCE AGREEMENT

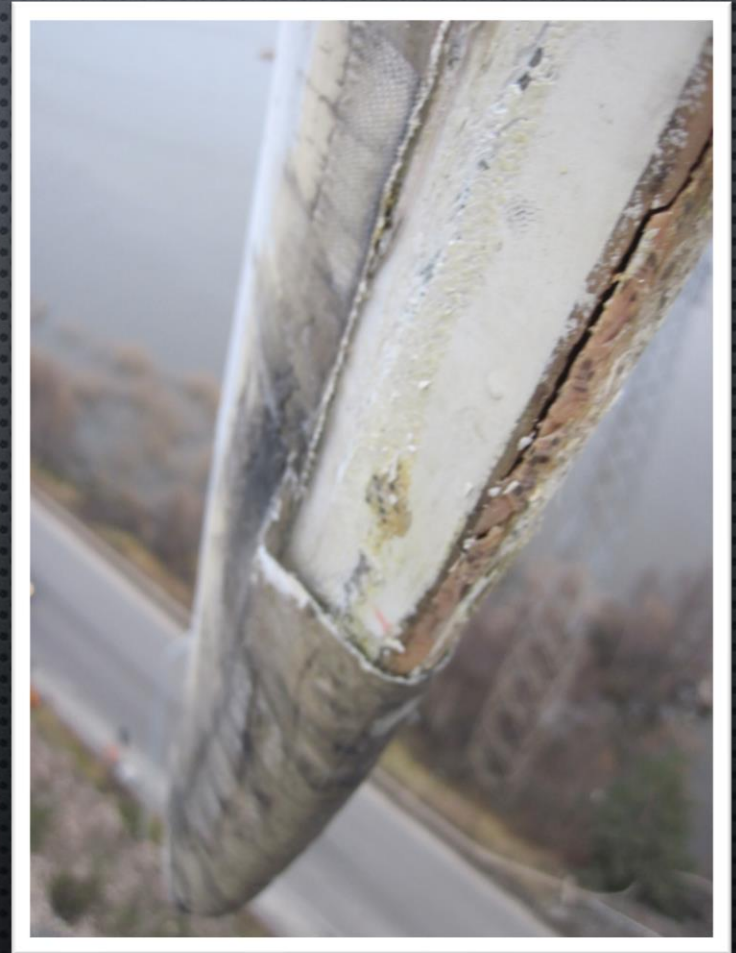
- LONG-TERM CONTRACT (3 OR MORE YEARS)
- PRE-EMPTIVE MAINTENANCE
- REDUCED TURBINE DOWNTIME AND INCREASED PRODUCTION



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# WHAT'S SO DIFFICULT IN BLADE REPAIRS?

- REPAIR MATERIALS
- WORKING AT HEIGHT
- WEATHER





# REPAIR MATERIALS

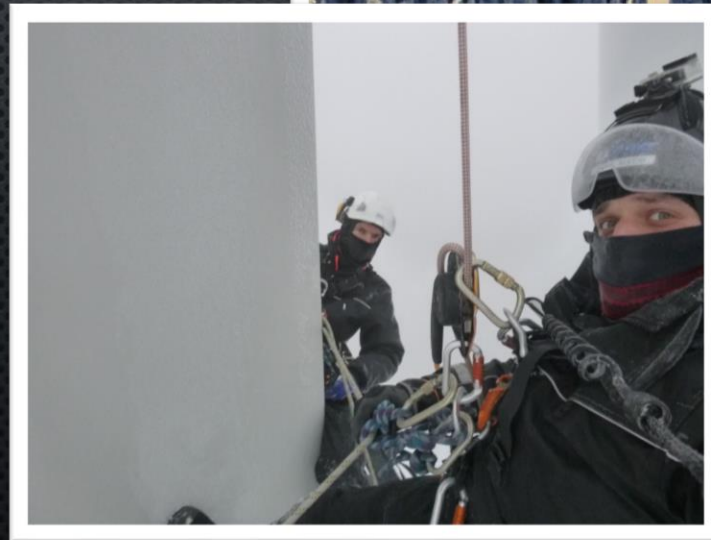
- CONVENTIONAL BLADE REPAIR MATERIALS OFTEN REQUIRE AN AMBIENT TEMPERATURE OF +15 OR MORE AND RELATIVE HUMIDITY BELOW 60%.
- CURING TIMES ARE TYPICALLY MEASURED IN HOURS
- ON-SITE MEASUREMENTS FOR 2 COMPONENT SYSTEMS CAN BE INACCURATE
- MOST MATERIALS ARE BEST SUITED FOR FACTORY ENVIRONMENT





# WORKING AT HEIGHT

- H&S CONSIDERATIONS
- SET-UP TIMES
- DIFFICULT WORKING POSITIONS
- BLADE MOVEMENT
- TURBINE DOWNTIME



# WEATHER

- TYPICAL WEATHER RESTRICTIONS ARE DUE TO
  - HIGH WIND
    - 8 M/S OR 12,5 M/S
  - LOW TEMPERATURE
    - $< +15^{\circ}\text{C}$
  - HIGH HUMIDITY
    - $\text{RH} > 60\%$
  - RAIN
  - LIGHTNING
- SOME LIMITATIONS CAN BE OVERCOME BY USING ADVANCED MATERIALS





## ➤ MITIGATING WEATHER AS A FACTOR



## ➤ MITIGATING WEATHER AS A FACTOR

- DESIGNED, TESTED AND CERTIFIED FOR S90HLA BRONTO SKYLIFT WITH 350 KG LOAD
- RAPID SET-UP (~1 HOUR)
- WIND SPEED LIMIT 12,5 m/s
- INCLUDES HEATER AND DEHUMIDIFIER
- ABILITY TO WORK ON ALL SIDES OF THE BLADE



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# ➤ MITIGATING WEATHER AS A FACTOR



➤ AVAILABLE NOW IN CANADA

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# MITIGATING WEATHER AS A FACTOR

## ➤ IMPACT ON DOWNTIME, COSTS AND WORK SCOPE

			Weather waiting						
	Project	Total Project hrs	TOTAL weather waiting hrs	TOTAL weather waiting hrs, %	Due to high wind	Due to high humidity, low temperature or light rain *reduced by Bladefender	TOTAL weather waiting hrs using Bladefender	TOTAL weather waiting hrs using Bladefender, %	increase of working hrs by using Bladefender, %
1	Project A	358	155	43,16 %	126,5	28	127	35 %	8 %
2	Project B	253	48	18,77 %	47,5	0	48	19 %	0 %
3	Project C	153,5	35	22,80 %	14	21	14	9 %	14 %
4	Project D	827,5	311	37,55 %	230,75	80	231	28 %	10 %
5	Project E	185	74	39,73 %	27,5	46	28	15 %	25 %
6	Project F	95,5	40	41,36 %	14	25,5	14	15 %	27 %
7	Project G	86	44	50,58 %	27,5	16	28	32 %	19 %
8	Project H	168,5	79	46,88 %	44	35	44	26 %	21 %
9	Project I	391,5	93	23,63 %	68	24,5	68	17 %	6 %
12									
	<b>TOTAL</b>	<b>2518,5</b>	<b>875,75</b>	<b>36 %</b>	<b>599,75</b>	<b>276</b>	<b>600</b>	<b>24 %</b>	<b>11 %</b>
	Low temperature is; < +15 C								
	High humidity is; RH > 60%								
	June - September 2018, across several sites in Northern Europe								



THANK YOU!

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