**Technical Report doc. BIR-21791/2099-Rev10**

**Inspection Blades S/N 2099 in Maple Ridge 256 Bl-3 - United states WTG NM82 2000**

*Vestas Mediterranean Blades Operation*



**Oaxaca 1 –**

**Created By**: magmi

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# Contact Details

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# Introduction

* 1. On 25 marts, 2015, inspection has been performed in all blades of turbine no. 21791 installed in Maple Ridge 256 Bl-3 (United states) wind farm.
  2. The inspection has been taken from the ground, by means of telescope and high resolution camera by MED Blade Operation Department.
  3. The aim of this report is to detail the results of the inspection activities held in wind turbine 21791, investigate damages detected and provide root cause analysis, repair solutions and recommendations, if any.
  4. Data concerning the case:
     + Site: Maple Ridge 256 Bl-3
     + Customer: #CUSTOMER#
     + WTG: NM82 2000
     + WTG No.: 21791
     + WTG Local ID: 0016
     + Blade Rotor: 2099
     + Commissioning date: 2006-01-11
     + Inspection date: 25 marts, 2015

# Glossary

| **Term or abbreviation** | **Definition** |
| --- | --- |
| Blade radius | A specific point on the longitudinal axis of the blade  measured from the exact centre of the hub. Note that  the size of the hub is not the same in the various wind  turbine types. For example, the V90 wind turbine has a  1 m hub radius, which means that blade radius 20 of the  44 m blade is the point located 19 m from the blade root  end. (20-1=19) The term is used regardless of whether  the blade is mounted on the turbine or not. Blade radius  is sometimes stated in mm, for example R 20,000 mm. |
| Edgewise load | Loads in the edgewise direction of the blade. |
| Flapwise load | Loads in the flapwise direction of the blade. |
| Leading edge (LE) | The leading edge of the blade, i.e. the ‘nose’ that is  heading into the wind during operation. |
| Leeward (LW) | In the manufacturing the LW shell is the upper shell.  It is the side of the blade which faces the tower during  turbine operation.  On the 44 and 49m blades, vortex generators are installed  on this side.  The leeward side is also known as the suction side. |
| Pre-preg (PP) | Pre-preg is short for ‘Pre-impregnated’ – it is a combined  material made of fibres and resin which is used  for building the blade. |
| Sandwich | The function of the sandwich – laminate/core material/  laminate - is to give the shell stiffness in unsupported  areas between spar and TE/LE. A sandwich construction  provides geometrical stability to the shape of the  blade. |
| Shell | The function of the shell is to give an aerodynamic profile. |
| Spar | This is the structural part of the blade. It is positioned  between the shells and has to resist loads and forces.  The sides towards the leading and trailing edge are |
|  |  |

*Table 3‑1: Glossary.*

# Damage Inspection

## Blade 2099

Blade S/N 2099 has been inspected by telescope and high resolution camera from the ground. Results of inspection are showed in the pictures below:

|  |
| --- |
| IMG_7880 |
| Picture 01: TE close to the root: No damages noted |
| IMG_7878 |
| Picture 02: TE in the middle of the blade: No damages noted |
| IMG_7874 |
| Picture 03: TE in the tip area: No damages noted |
| IMG_7794 |
| Picture 04: LE close to the root of the blade: No damages noted |
| IMG_7796 |
| Picture 05: LE in the middle of the blade: No damages noted apart some dirty area in the LE |
| IMG_7802 |
| Picture 06: LE in the tip area: No damages noted |
| IMG_7758 |
| Picture 07: LW side close to the root: No damages noted |
| IMG_7760 |
| Picture 08: LW side middle of the blade: No damages noted |
| IMG_7773 |
| Picture 09: LW side Tip end: In the tip there is a probably external impact. Cat 3 |
|  |
| Picture 10: LW side Tip end: In the tip there is a probably external impact; fiber glass is visible. Cat 3 |
| IMG_7824 |
| Picture 11: WW side close to the root: No Damages noted |
| IMG_7826 |
| Picture 12: WW side middle of the blade: No damages noted |
| IMG_7832 |
| Picture 13: WW side Tip end: No damages noted apart some dirty and pin hole close to the tip. Cat 2 |
|  |
| Picture 14: WW side Tip end: dirty, due to grease (blue) and pin hole (red) close to the tip. Cat 2 |

# Root Cause

Blades have been inspected according to the relevant work instruction issued by Vestas R&D and damage detected has been classified according the below:

* Condition Monitoring of Vestas Blades, document no. 0014-3811.

In particular:

**Blade A** has Cat 3 damages due to an external impact, probably due to a bird impact that scratches the tip. Tip area in Vestas blades is reinforced with PUR glue, so this damage is not too serious, but due to that fiber glass is visible we recommend fixing within six month.

**Blade B** haven’t damages that needs to be fixed

**Blade C** has the cover blade detaching. It is Cat 3 and need to be fixed within six month in order to avoid detaching completely and falling to the ground.

For the above mentioned topic damages, a categorization of damage has been done, as shown in the below table

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# Repairing solutions

# Raw Materials for repair

# Conclusions and Recommendations