

Note on Engineering Details

No: DWM-StSca-extern-001

Title: Automatic Lubrication System for Yaw Gears, Minimum Safety Factors S_H against Pitting in Yaw Gears

Ref.: GL Wind "Guideline for the Certification of Wind Turbines", Edition 2003 with Supplement 2004
Sections 7.8.4.1 and 7.8.4.3 (3)

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Within the next revision of the "Guideline for the Certification of Wind Turbines", Edition 2003 with Supplement 2004, the below mentioned changes will be implemented. In the meantime we appeal to the voluntariness of the wind turbine manufacturers to implement these changes in their design calculations, specifications and documentation.

Damages like scuffing, pitting and corrosion on the gears of the yaw bearings (slewing rings) of wind turbines are observed in several cases in the field after a comparatively low operation time of the wind turbines.

Main reasons for these damages are:

- insufficient lubrication conditions on the gear flanks during operation due to only manual lubrication at standard turbine maintenance intervals (e.g. 6 months),

- low surface durability of the slewing ring gear material if only quenched and tempered ring gears are used instead of gears with surface hardened gear flanks,

- unexpected increase of surface pressure on gear flanks due to misalignment, bending of pinion shafts with overhung pinion and teeth crowning of pinions.

Therefore GL Renewables Certification plans to increase the safety factors against pitting S_H named in table 7.8.1 and table 7.8.2 in section 7.8.4.1 of the "Guideline for the Certification of Wind Turbines", Edition 2003 with Supplement 2004 from $S_H = 0,6$ to $S_H = 1,0$ within the next regular revision of the guideline.

Regarding the lubrication of yaw gears, the section 7.8.4.3 (3) of the "Guideline for the Certification of Wind Turbines", Edition 2003 with Supplement 2004 is planned to be changed within the next regular revision of the guideline to the following extent:

(3) It shall be shown that adequate lubrication and removal of the old lubricant is ensured for the nacelle bearing and that an adequate film of lubricant is always provided between the balls or rollers and the track surface. If this cannot be ensured by the maintenance intervals, an automatic lubrication system shall be provided. **For the teeth of the nacelle bearing, if applicable, an automatic lubrication system is mandatory in general. The functionality of the lubrication system is to be documented (installation plan, lubrication intervals, lubricant distribution).**

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