Case Study

ACFM Technique for Bolted Flange End of Life Wind Farm Towers

Project: Use of alternating current field measurement to assess the integrity of the wind turbine bolted flange welds and ensure no fatigue cracking were present.

Scope: Assess the condition of welds to determine if there are any early signs of fatigue cracking, which are not detectable by visual inspections due to paint coatings being present, and potentially masking any defects .

Challenges:

1. Heavy paint coatings being present and logistically trying to remove these coatings by grit blasting a 60 meter high wind turbine would create potential health and safety issues. There is also a possibility of interfering with the wind generators electrical components, due to fugitive dust which would have being created during the grit blasting process.

2. Access issues to the bolted flange welds was another challenge due to limited room for probes to access the bolted flange welds located behind the bolts.

Solution:

1. Remove the need to grit blast heavy paint coatings by using the Alternating Current Field Measurement (ACFM) technique which can detect fatigue cracks through coatings up to 4mm thick
2. The use of a long angled pencil probe which gives access to welds located behind bolts. This unique bespoke probe was utilised giving 100% access to bolted flange welds.

Photo 1. – 60 METER TURBINE

Photo 2. Long angled pencil probe gaining access to welds behind bolted flanges.

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Benefits:

The top advantages of using the ACFM technique to assess the integrity and ensure no fatigue cracks are present on wind farms which are reaching end of design life are detailed below.

1. The requirement to remove paint coatings for traditional NDT techniques such as MPI is removed. By using the ACFM technique there is no requirement to remove heavy paint coatings which has a huge cost saving for the client. MPI takes 20 days versus ACFM which takes 5 days on a cost base analysis which includes the cost of having to remove paint coatings and reapplying after MPI is completed.

2. More efficient inspections reducing potential downtime on wind turbine productivity as ACFM can be completed in service.

3. All data acquired during the ACFM inspection is recorded and time stamped and fully auditable for Insurance purposes, or for risk based analysis for the client for end of design life.

4. Health and safety issues which would arise due to having to grit blast welds within the tower sections would create both logistical and environmental concerns.

5. The by product of grit blasting welds is large amounts of dust particles. These fugitive dust particles can in turn damage electrical components and have the potential for it to get into some of the bearings which has been seen to cause damage elsewhere.

6. ACFM equipment is battery operated with no need for any electrical connections and can be easily lifted into the nacelle, reducing the potential risk of carrying heavy equipment in confined spaces.

Result:

The use of the ACFM technique on wind turbines saves the client excessive costs and provides the reassurance that their assets, although they are reaching end of design life, can be monitored annually and kept in service reducing the need to decommission until a suitable time frame. Pro-active funding presents itself for the wind operator to replace these ageing assets without the loss of production.

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