Monitek, Inc. Case Study
1.5 MW Wind Turbine Step-up Gearcase

1. Background

The 1.5MW Wind Turbine containing a Winergy Model PEAS 4390 Step-up Gearcase operates 8,700+ hours per year with average revenues of $1500 per day. A significant intermediate shaft non drive-end bearing inner race defect was detected through vibration analysis at the first on-line recording and progressively deteriorated over the next several months. The intermediate shaft non drive-end (NDE) bearing is highlighted in red within Figure No.1.

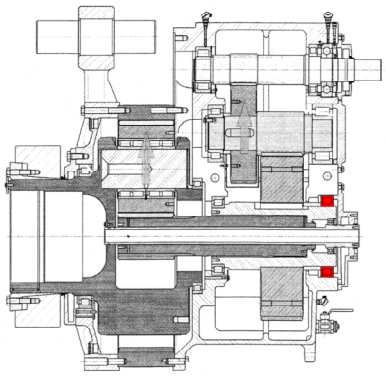

Figure No.1 - Winergy PEAS 4390 Gearcase

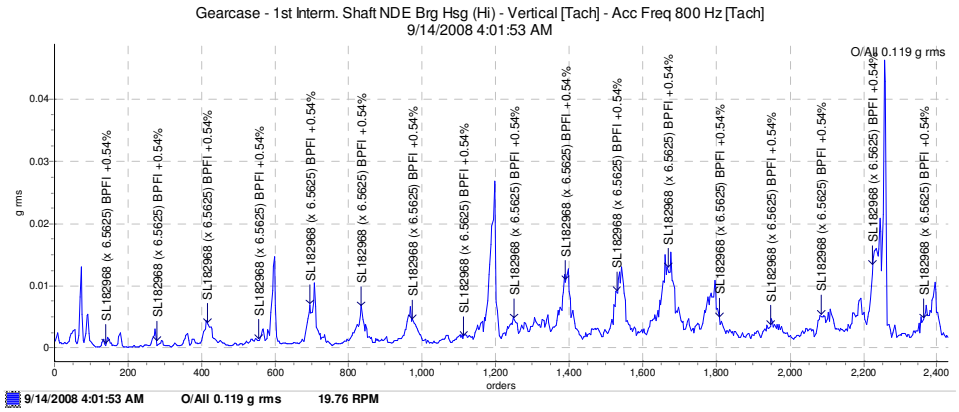

Figure No.2 - 1st Intermediate Shaft NDE Measurement Location Spectrum

2. Indications

Figure No.2 shows the significant bearing inner race defect vibration components highlighted in the 1st Intermediate Shaft NDE Measurement Location baseband spectrum at the data recording just prior to the planned in-situ replacement of the bearing.

The changes in bearing defect indications over several months led to the conclusion that remedial action was necessary before further deterioration caused an unplanned shutdown of the plant. Hence, a decision to replace the bearing at the next maintenance opportunity was made.

3. Strip Down Inspection

The Intermediate shaft bearing was replaced at a planned shutdown. Inspection of the components confirmed that the bearing inner race had experienced significant condition as illustrated in Figure No.3.

Figure No.3 – 1st Intermediate Shaft NDE Bearing Inner Race Defects

4. Cost Benefit Analysis

	Planned Repair Costs	Catastrophic Failure Costs
$1,980 Monitoring Costs over 36 months	The planned change out without any secondary damage is $11,000 parts and labor costs plus 3 days lost production. Total cost: Approximately $15K.	Catastrophic failure would include $11k costs as per Planned Repairs plus estimated $200K consequential damage and crane access charges, plus 10 days lost production. Total cost: Approximately $226K.
Return on Investment	**1330%** (based on 1 event per 36 month period)	