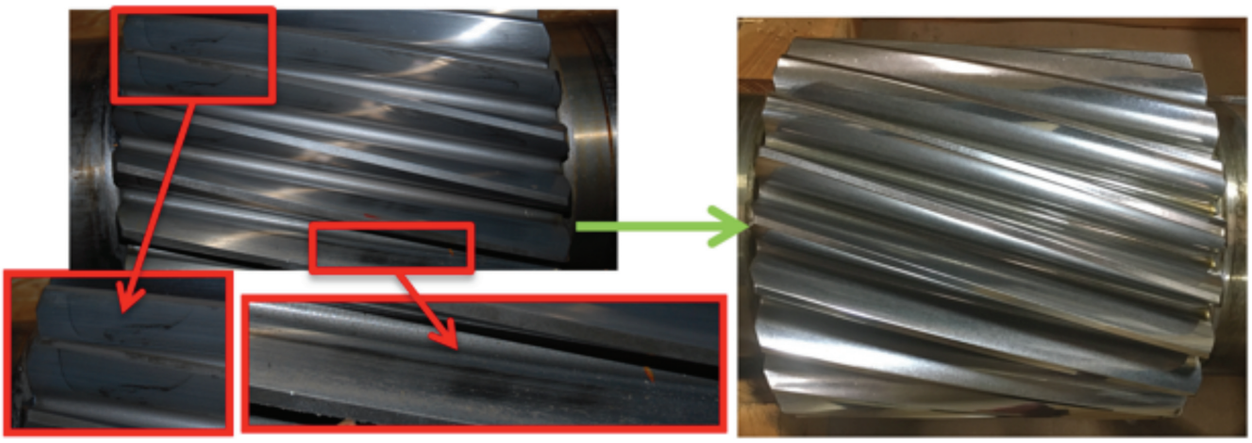
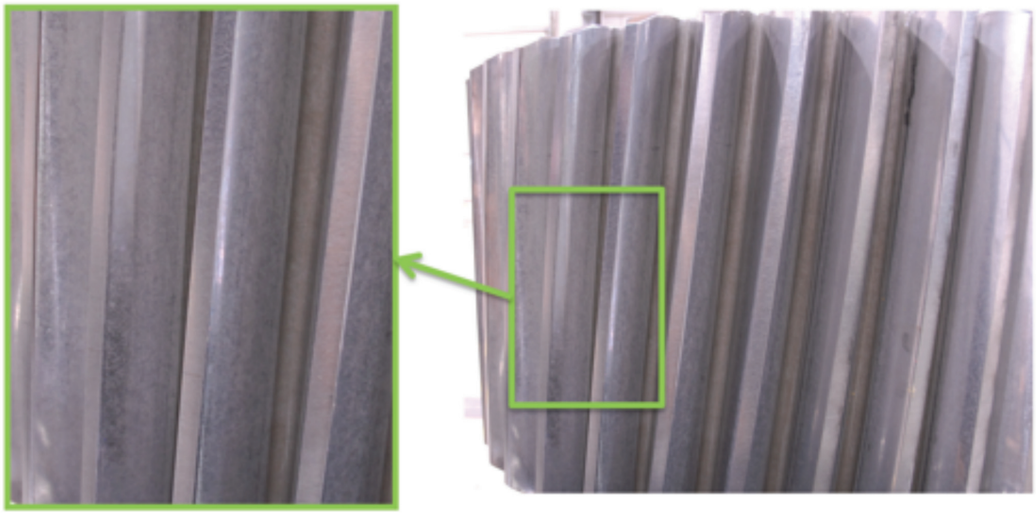
required service. Its surface condition is vastly superior to that of the sun pinion from the first case study, but it still displayed early stage micropitting and a very defined contact pattern. This intermediate pinion was also repaired via isotropic superfinishing, removing all micropitting and wear patterns.

shown in the case studies, these isotropically superfinished components will have significantly reduced surface roughnesses as well as increased lambda ratios, micropitting safety factors, and component life expectations. All of these characteristics represent future cost savings via reduced O&M costs. However, there are advanced components such as the low speed assembly (low speed helical gear plus hollow shaft/coupling) and intermediate assembly (intermediate pinion and high speed helical gear) in their assembled state, eliminating the costs of separating these components as well as the risk of damaging one or both components during the separation process.



Damaged, ground intermediate pinion (left), the same intermediate pinion after isotropic superfinishing (right)



Isotropically superfinished planet gear after over five years of operation

The third case study is of a fully isotropically superfinished wind turbine input planetary stage that was taken out of service due to a bearing failure after over five years of operation. The planets, sun pinion, and ring gear all displayed no signs of wear or even a discernable contact pattern.

Potential applications

Isotropic Superfinishing can be utilised on all common wind turbine components. As shown in the case studies, these isotropically superfinished components will have significantly reduced surface roughnesses as well as increased lambda ratios, micropitting safety factors, and component life expectations. All of these characteristics represent future cost savings via reduced O&M costs. However, there are advanced applications of the ISF Process that can further increase cost savings in the immediate repair process. The ISF Process can repair integral bearing races and gear flanks simultaneously on wind turbine planet gears; other technologies would require two discrete operational steps to perform these repairs. Due to the controllability of the ISF Process nitrided components such as ring gears can be repaired, when they would otherwise have to be scrapped. The ISF Process is also able to repair assembled components such as the low speed assembly (low speed helical gear plus hollow shaft/coupling) and intermediate assembly (intermediate pinion and high speed helical gear) in their assembled state, eliminating the costs of separating these components as well as the risk of damaging one or both components during the separation process.

Additional benefits of the ISF Process as compared to regrinding are that no part drawing is required, there is no risk of in process scrapping, and no post-process nital etch required.

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