



Repair Services

Steam path and blading repair



Reliability and Availability

Efficient processes for quality work and reducing outage time

With a wealth of experience on both impulse and reaction technologies, GE offers proven repairs to prolong blade life and reduce operating and maintenance costs.

Background

In addition to the thermal and mechanical stresses of operation, blades may experience the following:

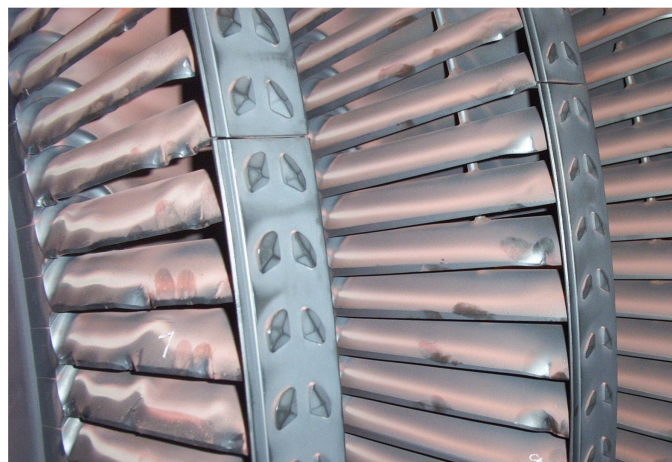
- Corrosion, caused by steam impurities, affecting the blading of the High Pressure (HP) and Intermediate Pressure (IP) cylinders.
- Impact damage, or Solid Particle Erosion (SPE), due to material carried over from the boiler.
- Water droplet erosion, caused by condensation in the latter stages of the Low Pressure (LP) cylinder. The resulting damage to leading and trailing edges results in performance loss and, in some cases, failure.

When elements of a steam path fail, typically they pass down the turbine, resulting in further damage and, potentially, failure of the machine.

Solution

GE offers a range of repair techniques for both fixed and moving blades. These range from the dressing and reforming of cracks or surface defects, to welding and partial blade replacement. Repair can be a cost-effective alternative to component replacement, and many repair procedures can be performed on site without the need to remove the blades from the rotor.

Here follow some typical repair methods:



Blade damage on an IP rotor

TENON REPAIR

Moving blade, tenon repairs can be done in-situ or with blades removed from the rotor. Machining solutions are used to reduce blade height and may allow for restoration, either to the original geometry, or a modified one if improved erosion protection is required. Welding, and post-weld heat treatment solutions enable reforming of the tenon to the original blade height.



Blade tenon repair

An alternative method of dealing with cracked or missing tenon features is to plug-weld the shrouding to the blade tip

DIAPHRAGM REPAIR

Fixed blades and diaphragms can often be repaired by cutting out the affected area and welding in an insert. This is then ground and dressed to form the proper aerofoil shape. For significantly damaged diaphragms, the repair can extend to a full steam path replacement. Similar options exist for the web and ring supporting the fixed blades.

Diaphragm segments often experience distortion and dishing due to creep. This may lead to rotor rubbing and damage. GE has developed a repair solution that not only can return the diaphragm section to its original shape but may reduce the subsequent effects of creep.



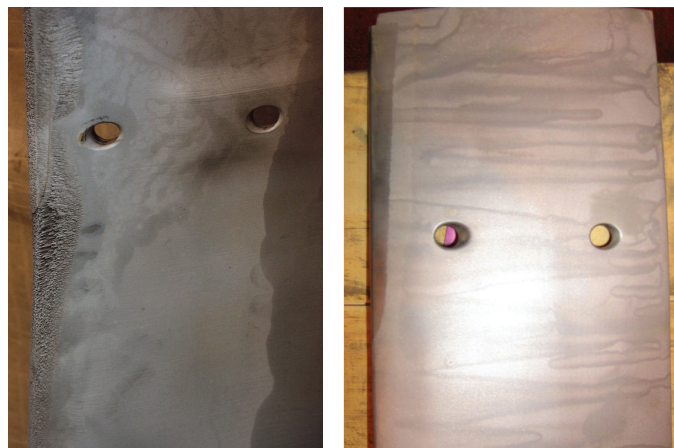
Diaphragm insert repair prior to dressing

EROSION REPAIR

Erosion repair is mainly addressed by weld-buttering and reforming of the blade geometry.

The most typical and severe cases of erosion occur to the Last Stage Blades (LSBs) of the LP turbine, due to droplet content in the steam. To mitigate this issue, LSB leading edges are often protected by material hardening or a shield insert. GE can replace this protection, or provide it where it hasn't been used before. New shield inserts are usually attached by brazing and a range of options are available to suit every application.

GE blading repairs are backed by a comprehensive suite of specifications and processes, covering the full range of materials. These include: carbon manganese; low and high alloy steels, and cast iron.



LSB leading edge repair with shield insert

Benefits

- Reduced cost and lead time compared with part replacement
- Possibility of completion within normal outage period
- Practical choice in a forced outage situation
- Blade repairs done on and off the rotor
- Improved life and reliability
- Performance recovery

Applicability

Our blade repairs can be applied to all types of steam turbine, whether of GE or non-GE manufacture.

References

GE has an extensive list of blade repair references from around the world.

To learn more about this offering, contact your GE sales representative or visit powergen.gepower.com.