

Technical upgrades – Blade design improvements



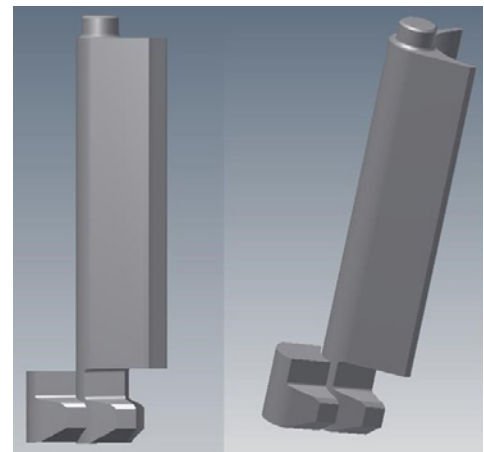
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During inspection performed by Sulzer a steam turbine showed signs of heavy erosion to the outside diameter faces of the rows four and five disks. The disks need to be weld repaired to return it to the original shape. Sulzer proposed to change the blade design in order to prevent erosion damage to the disk and improve overall reliability and durability of the design.

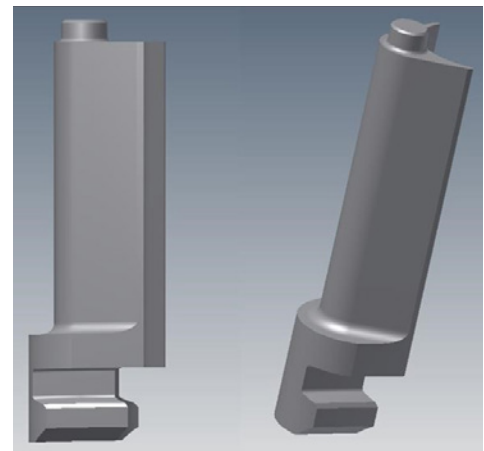
As it can be seen from the pictures provided, the platform is added underneath of the airfoil to eliminate the overhanging edges and spacer is made integral. The airfoil height and radial position remained unchanged, while the overall blade height increased due to addition of the platform. This is achieved by machining the root section of the disk at a new (smaller) radius after performing the weld repair.

In addition to addressing the disk erosion problem, this design change provides the following improvements:

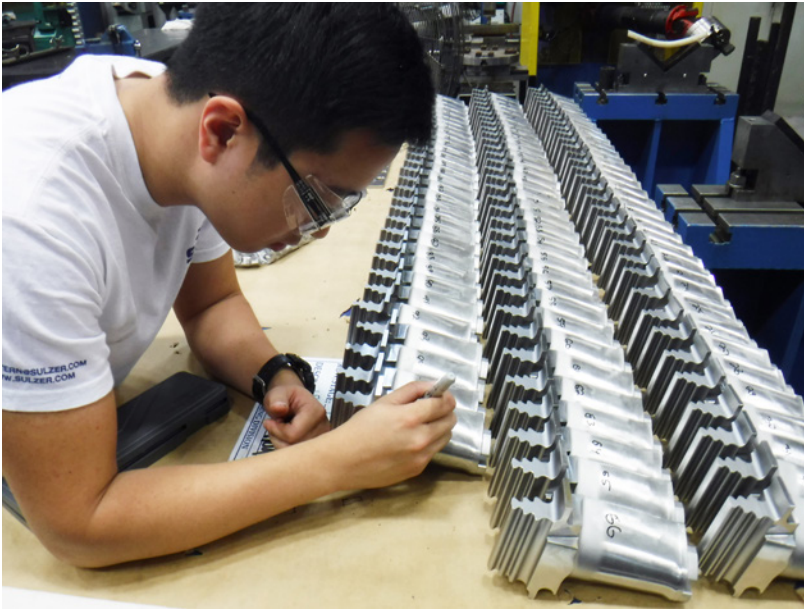
- Increased circumferential pitch and therefore contact area at the root.
- One piece design reduces total number of pieces in the blade pack, therefore increasing the rigidity of the blade row. A good blade pack is essential in radially loaded blades.
- Added platform helps reduce steam entrance to the blade root as well as adds a generous transition fillet between airfoil and root. The edge between the overhanging airfoil and root in the original blade is a location known for its possibility for fatigue crack initiation due to its sharp geometry and direct exposure to steam.



Original blade design



Sulzer upgraded blade design



Engineering services capabilities/service offering:

- Alignment tracking
- Machinery diagnosis
- Field balancing
- Performance rerates
- Technical upgrades (blade design improvements)
- Root cause failure analysis
- Rotordynamic analysis
- Turbomachinery engineering seminar series



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