LAMBDA Technologies Group

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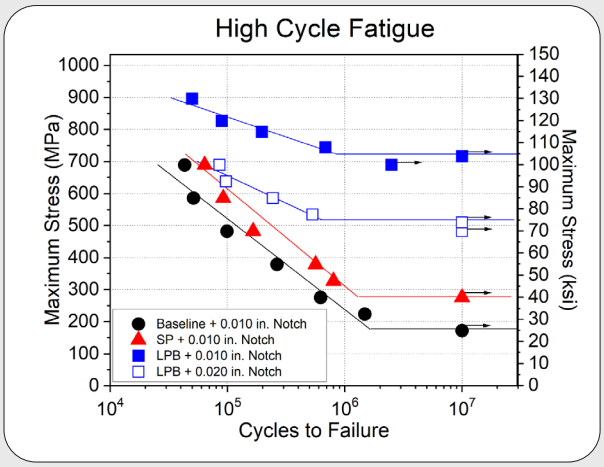
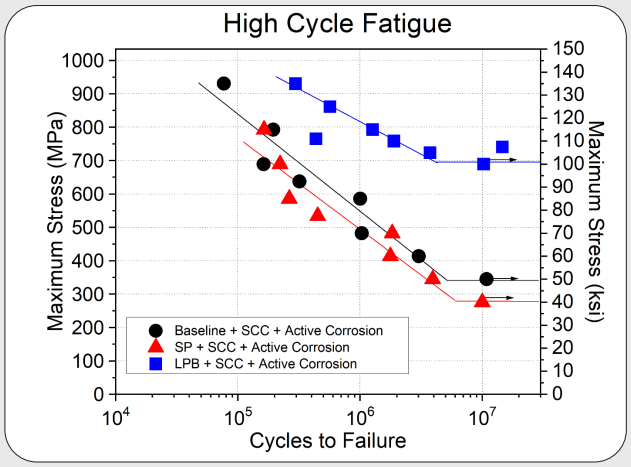
Improving Component Life and Performance

Steam Turbine Blades

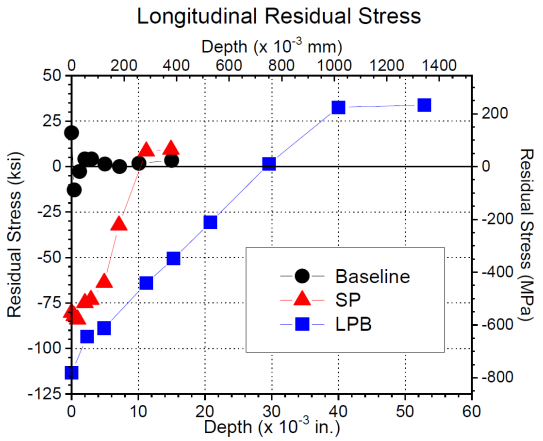
Steam turbines power approximately 80% of the world. The blades in these turbines operate under high-cycle vibratory loads in moist environments. These conditions often lead to corrosion pitting, stress corrosion cracking (SCC), and fatigue failures in the turbine blades. Blade replacement can take months and cost utilities millions in repairs and lost generation. Even with identical part replacements and welding, about 50% of failures recur, making extended outages a costly and unsustainable pattern. Faced with rising costs and repeat issues, operators began seeking a more sustainable, long-term solution.


LPB Processing of Steam Turbine Blade





SOLUTION: Low Plasticity Burnishing (LPB®) was applied to 410 stainless steel specimens to introduce a deep, stable layer of compressive residual stress in damage-prone regions. X-ray diffraction confirmed surface compression exceeding –100 ksi, with a depth of over 1 mm—far surpassing the reach of common surface damage. Compared to shot peening, LPB-treated samples showed significantly improved high-cycle fatigue strength, with life extended by over 100× in notched and corrosion-fatigued conditions. SCC initiation was entirely suppressed under simulated service conditions, validating LPB as a long-term mitigation strategy.



IMPACT: LPB® treatment significantly extended the operational life of steam turbine blades by increasing fatigue strength and corrosion resistance beyond conventional methods. Utilities reported avoiding forced outages and achieving multi-year service life extensions without recurring failure modes. LPB® effectively restores residual compressive stresses and strength lost during weld repairs, mitigating weld-related fatigue and corrosion issues. As a scalable, production-ready process that can be applied to new or existing blades, LPB® gives operators a predictive and preventive tool to manage blade degradation, reduce downtime, and protect critical generating assets under demanding operational loads.

Contact us to discuss how replacing shot peening with LPB can improve your manufacturing process.

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