LAMBDA Technologies Group

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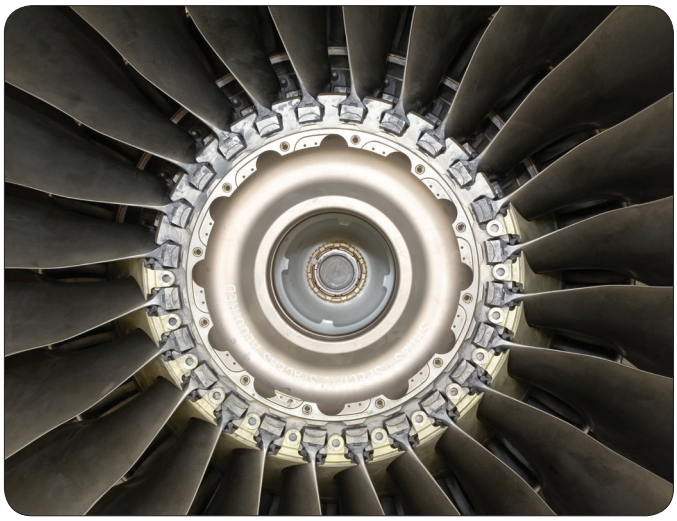
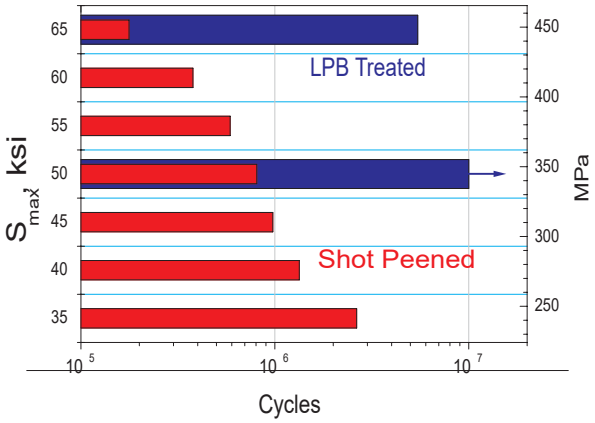
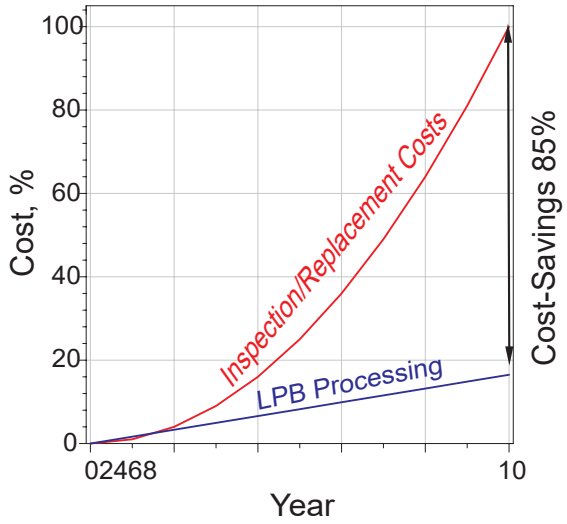
Improving Component Life and Performance

Gas Turbine Blade Airfoils

Considered one of the hardest working jet engines with excellent support from the OEM, the CFM56 family of engines power more than 13,400 commercial and military aircraft worldwide and follow a rigorous maintenance and overhaul routine. Despite being commercial workhorses, the HPC1 (1st stage high pressure compressor) blades of the CF56-7 series can be prone to fretting induced microcracking in the dovetail edge of contact region, posing a safety concern. To address this, frequent stringent inspection of the blades is required. Previous requirements stated that if damage was found, the entire shipset was to be replaced. In addition to the cost of inspections and blade replacement, this routine required a substantial amount of downtime, impacting operating costs and time on wing. These maintenance requirements were proving too costly, so end users of the engine sought out a solution.







SOLUTION: Lambda Technologies developed a solution to extend fatigue life and improve damage tolerance of the affected blades. Using low plasticity burnishing (LPB®), Lambda engineers apply a deep, stable layer of designed residual compression to the dovetail region of the blades. By putting the edge of contact region in compression much deeper than the shallow shear cracks formed by fretting, fatigue cracks cannot propagate and the chance of failure is eliminated. When applied to a blade with existing fretting fatigue damage, LPB provides better than 10x life improvement over that of a new blade. Because LPB doesn't require any changes to the material or existing design of the part, LPB applications are FAA sanctioned alterations of original components and do not fall under the Parts Manufacturing Authority (PMA).

IMPACT: The FAA issued a Supplemental Type Certificate (STC), number SE03036CH, to Delta Airlines "to apply a deep compressive stress using the LPB process on CFM International, S.A. CFM56-7 Series Engine Stage 1 High Pressure Compressor (HPC) blade dovetails." A turnkey LPB system was installed in a maintenance, repair and overhaul shop. The airline began implementing the LPB process. Upon successful implementation, the airlines, in consultation with the OEM, changed the inspection and replacement requirements. This change in the requirements led to a significantly improved total ownership cost to airlines.

To learn how engineered compression can extend the life of your blades, contact Lambda Technologies at 1-800-883-0851 or visit our website at www.lambdatechs.com.

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