

ERS-Toolbox[®]

Rapid design and optimization of residual stress surface treatments



HILL
ENGINEERING
Predict. Test. Perform.

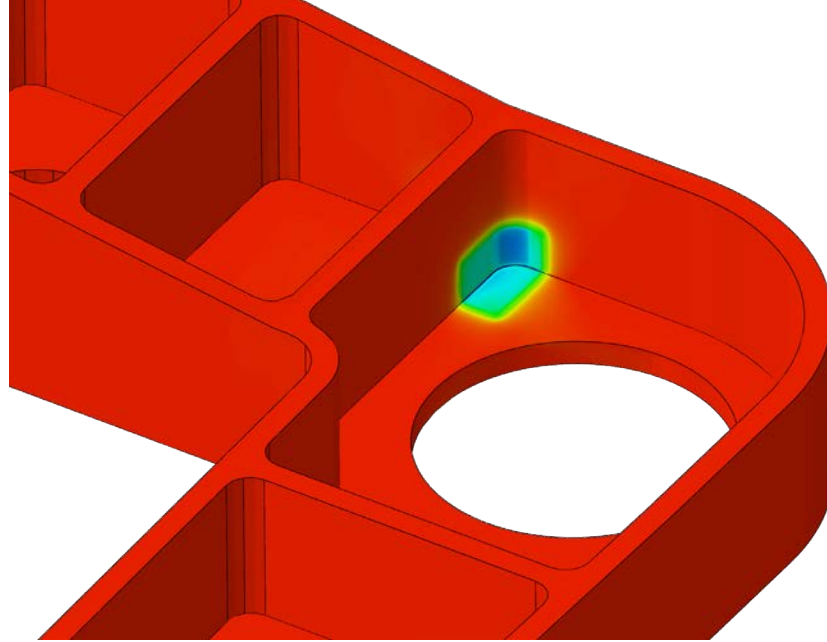
Predicting the effects of residual stress surface treatments

ERS-Toolbox® by Hill Engineering quickly provides accurate and reliable predictions of residual stress and distortion resulting from surface treatment processes including shot peening, laser shock peening (LSP), and cold-hole expansion.

Using an award-winning methodology, ERS-Toolbox® maps process information from our database directly into leading finite element modeling tools for easy integration with your existing internal tools and workflow.

ERS-Toolbox® is for engineers and analysts who need to design, analyze, and optimize the use of engineered residual stress surface treatments to maximize the performance of critical structural details. ERS-Toolbox® outputs the full 3D residual stress and distortion resulting from the surface treatment process, which can be used as the input for subsequent analysis of fatigue performance and more.

ERS-Toolbox® has proven to be successful for targeted airframe and engine applications and Hill Engineering is constantly improving the software to expand its capability, applicability, and reach. ERS-Toolbox® has been validated against residual stress and distortion measurements for various applications including titanium airfoils and aluminum aircraft structural details. Outputs from ERS-Toolbox® have been used by aerospace OEMs to substantiate the use of laser shock processing on aircraft to extend inspection intervals.



Enhance the performance of your parts

- Compressive residual stress can significantly improve fatigue life and corrosion resistance
- Effectively utilize compressive residual stress treatments to add value to your parts

Take credit for residual stress benefits

- Output the residual stress state for subsequent fatigue analysis
- Validated against residual stress and distortion measurements
- Supports the demands of probabilistic-based methods

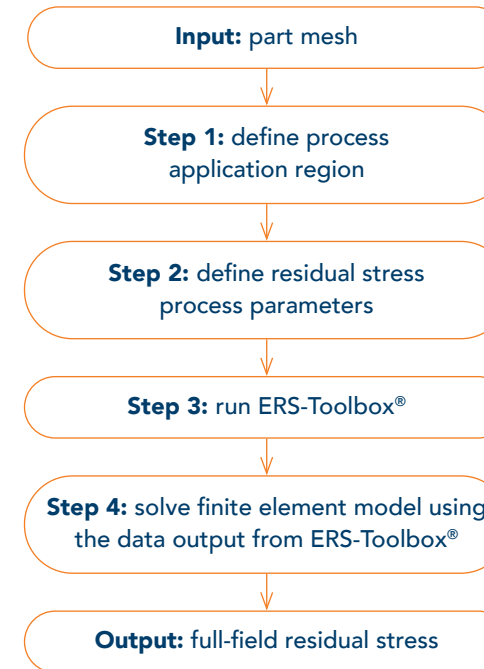
Shorten the surface treatment design cycle

- Evaluate the impact of candidate surface treatments in minutes and optimize a design in days
- Perform your design and optimization in the virtual space saving valuable time and money

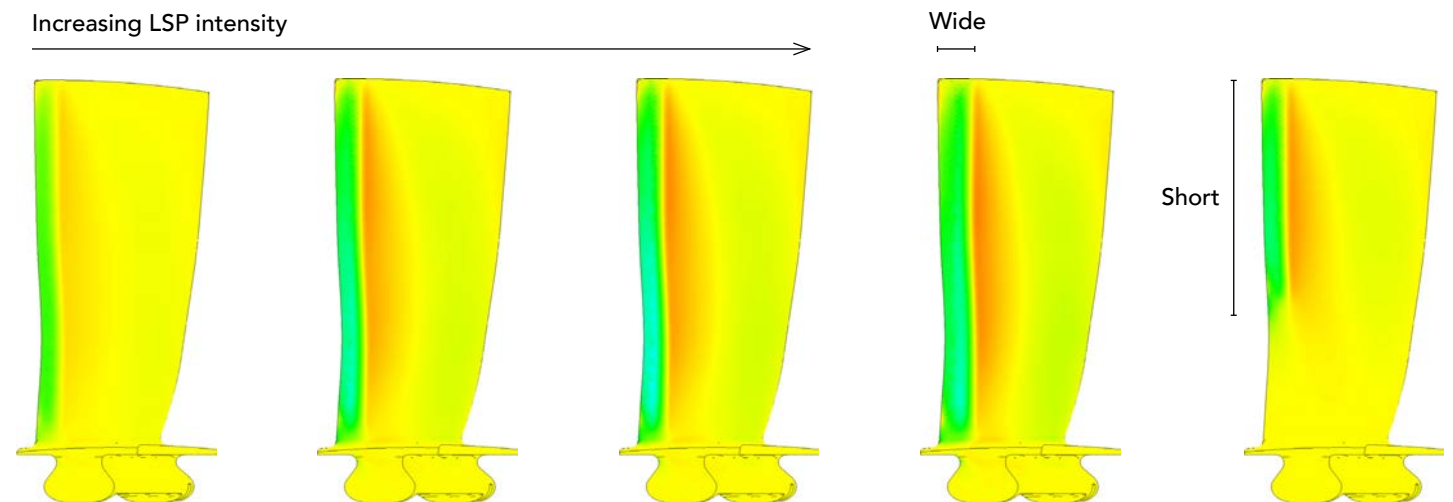
Leverage unique features and capabilities

- Evaluate different engineered residual stress processes including laser shock peening, shot peening, and cold-hole expansion
- Aluminum and titanium structural alloys included (possible to add others)
- Compatible with leading finite element modeling tools Ansys and Abaqus

ERS-Toolbox® Process



The ERS-Toolbox® process is outlined in the flowchart. The operator can input a finite element model, specify the process region size, type, and specific process parameters, and quickly execute ERS-Toolbox®.



ERS-Toolbox® Example

A legacy OEM application of a residual stress surface treatment on an airfoil required at least six experimental iterations and five years to implement the process into production. With ERS-Toolbox® only one experimental iteration is required.

Approximate run time:
ERS-Toolbox®: 10 min
FEA Solution: 15 min

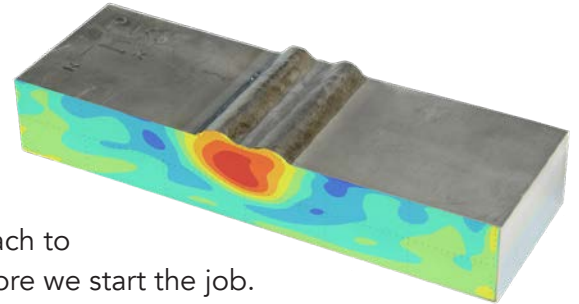


A global leader in predicting and measuring the behavior of materials.

We are a trusted partner and advisor to engineering leaders in government and private industry, delivering cogent advice and data-driven solutions across design, manufacturing, and operations.

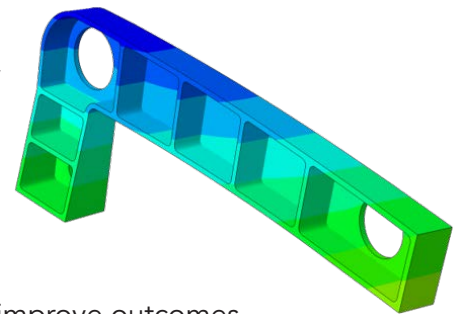
Residual Stress Measurement

For an engineer seeking residual stress measurements, Hill Engineering is a trusted source for a broad range of best in class measurement capabilities including: contour, TrueSlot®, slitting, hole-drilling, ring core, deep hole drilling, x-ray diffraction, and neutron diffraction. We work with you to determine the best approach to your engineering challenge and tell you exactly what to expect before we start the job. Organizations that select Hill Engineering receive actionable data that enable critical decisions with a high degree of confidence.



Machining Modeling

For contract machining vendors who want to produce high-quality parts efficiently and OEMs who want to maximize the productivity of their supply chain, Hill Engineering's machining process simulation service solves the problem of reducing uncertainty in machining planning and improving machining process outcomes. Hill Engineering provides results from validated models to support your decision-making process. Our models can quickly provide upfront assessments of the risk of distortion to support planning, optimize an existing machining process to reduce distortion and improve outcomes, or reduce the number of set-ups and steps for current machining processes. Hill Engineering helps your organization increase profits by eliminating inefficiencies in manufacturing.



Fatigue Analysis and Design

For an OEM, owner, or operator seeking fatigue and/or damage tolerance analysis to design, qualify, or maintain their products, Hill Engineering is a resource that delivers accurate data and reliable results. Our team is experienced in a variety of industry-standard practices as well as cutting-edge, innovative techniques. Hill Engineering helps your organization maximize component performance, longevity and develop a framework for product improvements.

