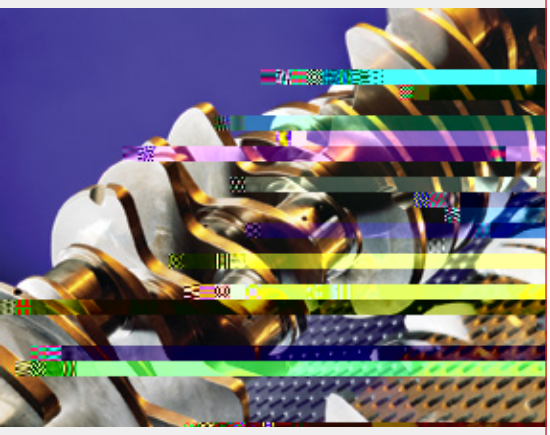
F e E e A a (FEA) ed c e a d a .c .c

COMPANY PROFILE

Curtiss-Wright Surface Technologies (CWST) offers a single source solution and point of contact for all your surface



predict areas of high stress loading, areas most susceptible to fatigue failure, stress corrosion cracking, thermal creep and/or erosion failure.

FEA ed c ee !

Curtiss-Wright Surface Technologies has developed a front end input and back end processor for the ABAQUS FEA code that describes the peening process and allows prediction in relatively high resolution of the stresses and strains developed by the peening process.

This FEA model of peening is then combined with the component's mechanical and thermal loads to iteratively design a peening process and pattern that best reduces high stress loading, minimizes any resulting tensile stress and predicts component strain. The code is normalized by peening and measuring the induced strain in respective materials by means of a crack compliance slitting technique.

FEA prediction of stress and strain lets us work hand-in-hand with customer stress analysists to identify high stress and failure prone areas of system components and to provide solutions that can quickly progress from concept to deployment.

I c ea ! a ! e e

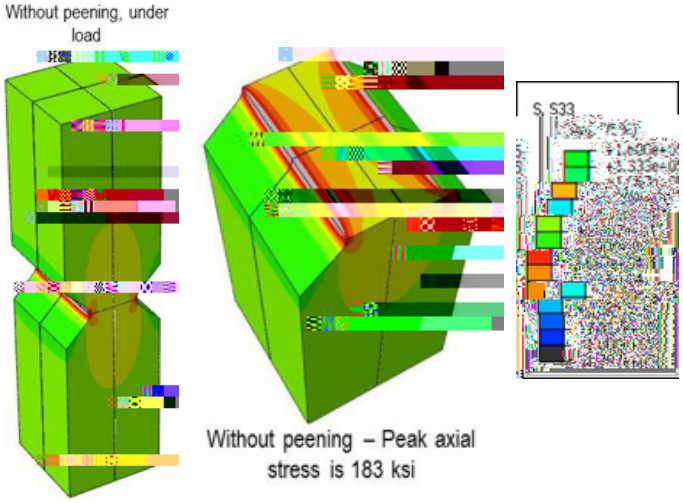
When components are in service they are subject to many physical loads which induce fatigue cracking, fretting, stress corrosion cracking, erosion and cracking due to stress induced by thermal gradients plus loading. All of these mechanisms contribute to shortened fatigue life and/or lowered fatigue strength.

Component failure can be attributed to existing tensile stresses which are often generated during manufacturing or loading stresses generated under heavy in-service operating conditions. Biasing out these manufactured residual tensile stresses and pre-biasing known loading stresses with beneficial residual compressive stress is known to protect components from premature failure due to fatigue, stress corrosion cracking and erosion.

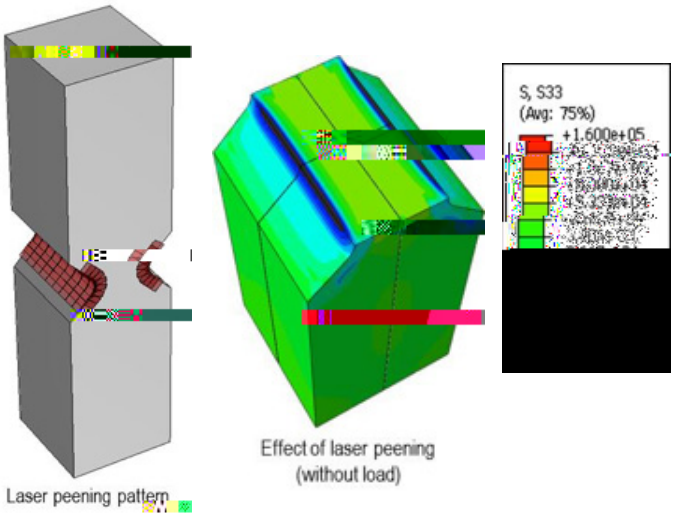
Desirable compressive stress can be generated with the application of a peening surface treatment either prior to manufacturing, during the manufacturing process or in fielded parts.

Finite Element Analysis (FEA)

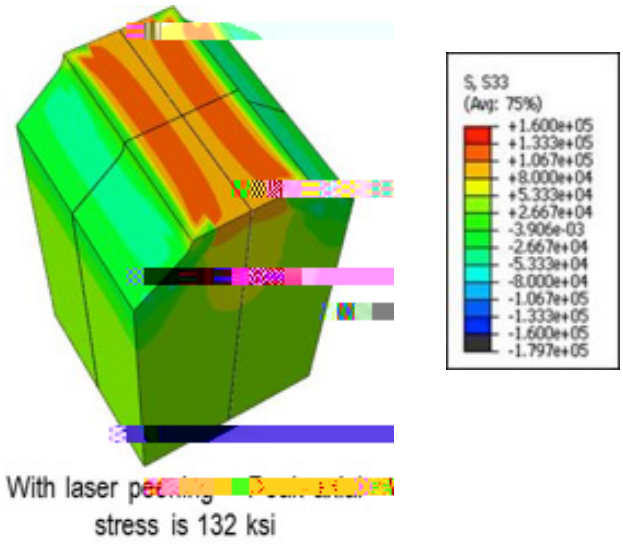
Component is modeled using continuum (3D) elements in ABAQUS. High stress areas specifically identified for treatment.



Laser peening process developed using FEA model in an iterative manner. Each square in notched area of the component represents one laser peening pulse. For each spot a thermal initial condition is set based on Eigenstrain and the model equilibrated – result shows the shape and stress state of the component after peening but without loading.



FEA model is employed to sum loaded component plus laser peening of component to generate shape and stress state of the treated component. Note that peak tensile stress is reduced by 28% and stress at surface where cracks initiate is reduced by 83%.



: FEA model is employed to analyze fatigue problem and through a rapid iterative process provide an optimum solution for reducing tensile stress and improving fatigue performance. Note that peak tensile stress is reduced by 28% and stress at surface where cracks initiate is reduced by 83%. Expectation for lifetime improvement is greater than 10-fold.