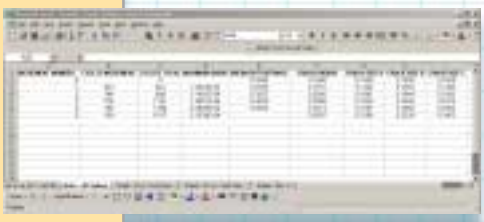
Fatigue & Crack Growth Software

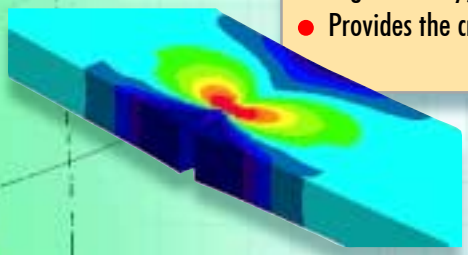
Why compromise accuracy of Life Prediction? With BEASY's fully automatic software product durability can be quickly and accurately predicted.

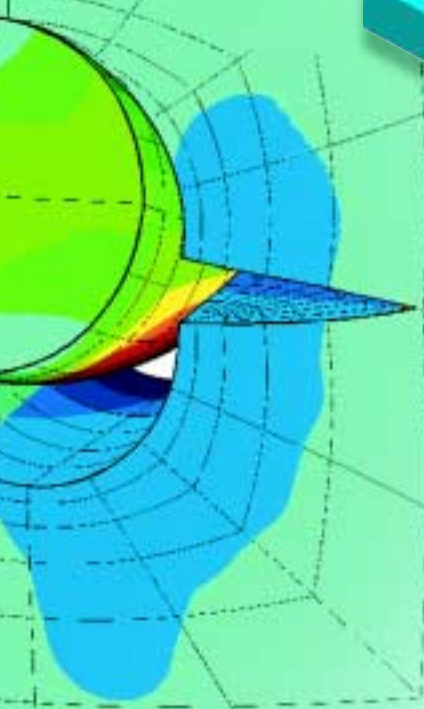
- Product durability prediction;
- Easy crack modelling;
- Automatic crack growth;
- High accuracy;
- Provides the critical information.



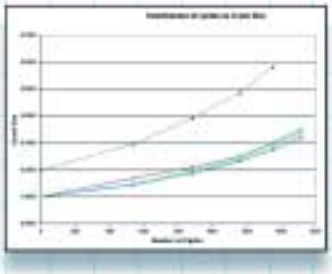
Product Durability Prediction

BEASY provides a comprehensive tool for assessment of the residual strengths of damaged structures and risk of failure. It can be used as part of the design/analysis process to predict the impact on components and structure of defects and damage caused by in service loads, manufacturing and fabrication processes, material defects.





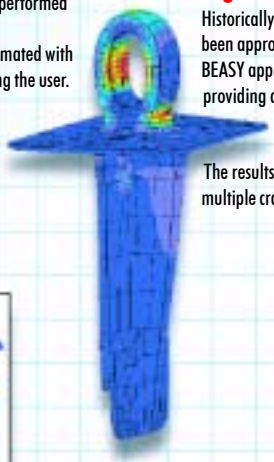
BEASY provides the critical information needed:-



- Will the crack grow?
- Will it grow in an unstable fast or stable slow manner?
- At what rate will it grow?
- To what size can the crack grow before becoming unstable?
- What is the residual strength?

Automatic Crack Growth

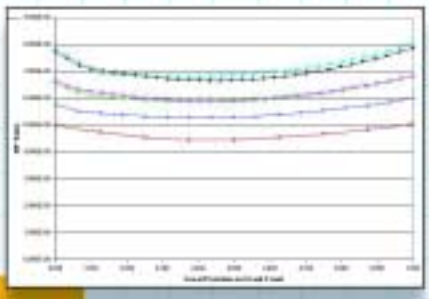
BEASY not only provides stress intensity data but can also predict how the crack will grow. Remeshing is automatically performed by BEASY where necessary.
The procedure is highly automated with a crack growth wizard guiding the user.

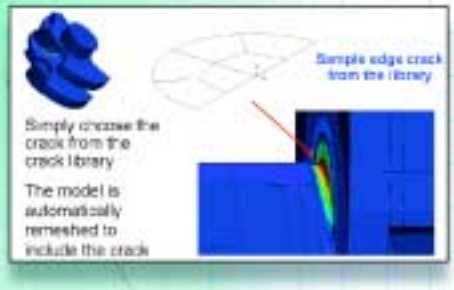


High Accuracy

Historically stress intensity factor and crack growth data has been approximated using standard reference solutions. The BEASY approach uses the real geometry, loading and materials providing a highly accurate basis for life prediction.

The results also include the effects of load redistribution, multiple cracks, true crack path and crack shape modelling.





Easy Crack Modelling

BEASY harnesses the power of BEM to automate crack modelling. It is now a simple extension of the standard stress analysis performed by engineers. Simply select the shape, size and location of the crack and BEASY will automatically remesh the model to include the crack and compute the stress intensity data.

Computer Requirements:
Windows 95, 98, NT or Unix Workstation.

BEASY is compatible with existing modelling tools such as PATRAN and IDEAS.

Windows users can also use BEASY's own modelling tools.

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Application Areas

- Life Prediction
- Damage Tolerance Assessment
- Multiple Site Damage
- Residual Strength Prediction
- Structural Integrity Assessment

Benefits

- Accurate Prediction of Product Life
- Precise and Powerful Prediction of Stress Intensity Factors
- Damage Tolerance Prediction
- Accurate prediction of the propagation path and corresponding stress intensity factors for arbitrary structures
- Rapid assessment of crack growth retardation strategies and product life

Fully Automatic Crack Growth Prediction

- Fatigue Crack Growth
- Automatic crack growth prediction
- Modelling of multiple cracks including crack branching and merging
- Fully interfaced to NASA/ESA fatigue database of material constants

Fast and Accurate Prediction of Crack Growth Data

- Automatic remeshing to insert cracks
- Automatic remeshing as cracks grow

Fatigue & Crack Growth Features

Materials Database

- NASA/ESA fatigue database
- Over 360 materials are represented
- Users can define their own material properties

Fatigue Crack Growth Criteria

- Generalised form used in NASGRO
- Paris, Rhodes, Forman etc
- Tabulated da/dN
- Retardation

Crack Growth Direction Criteria

- Maximum Principal Stress (2D only)
- Minimum Strain Energy Density

Stress Intensity Factor Computation

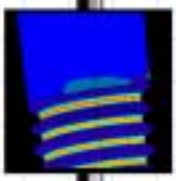
- Models I, II and III S.I.F. computed
- J-Integral (2D only)
- Crack opening displacement

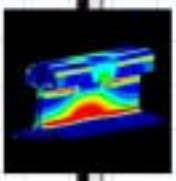
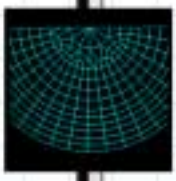
Loading

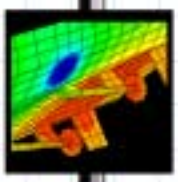
- Cyclic
- Multiaxial

Crack Modelling

- Single or Multiple cracks
- Embedded or Edge cracks
- Straight, Kinked or Curved crack fronts
- Crack modelled using dual boundary elements



Fatigue Crack Growth Results

- Stress Intensity Factors
- Crack and model deformation
- Crack and model stress field
- Crack propagation path
- Crack growth rate
- Residual strength

Element Library

- Complete range of elements including both discontinuous and continuous elements
- Hierarchical element types allow model refinement without change of mesh
- For three dimensional problems, quadrilaterals and triangles
- For two dimensional and axisymmetric problems, lines
- All elements have high order shape functions for accurate model representation

Analysis Features

- Comprehensive checking of data and of computer resources required ensures that no analysis runs are wasted
- Local error guides to give clear indication of solution accuracy
- Evaluation of total force balance
- Efficient and economical solution as at many user-specified "internal points" as required
- Step-by-step analysis option allows re-analysis to be carried out after minor changes without recalculation of matrices

Zoning or Substructuring

A model can be split into any number of zones or substructures to represent different components or materials or to simplify the model.

Interface conditions between zones include:-

- Sliding
- Interface stiffness coefficients
- Prescribed added traction
- Contact or gap
- Press fit

Boundary Conditions and Loading

- Point and line loads
- Traction
- Displacement
- Support Stiffness
- Thermal Loading
- Centrifugal loading*
- Acceleration (including gravity) in any direction

Geometry Features

- Implicit symmetry about any axis
- General zoning and substructuring

Material Properties

- Isotropic, linear elastic for 3D, 2D and axisymmetric
- Isotropic, orthotropic* and anisotropic* linear elastic for 2D

* Not applicable to dual elements

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