BLAS

Boiler Life Assessment Software

(ETD's software now available for purchase)
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BLAS is a boiler pressure-part component life assessment software developed by ETD in 2023. For a systematic life assessment, it is necessary to set up a precise and detailed life evaluation system with organised analytical/ theoretical calculational approach and data from non-destructive testing. BLAS combines all necessary calculation steps to perform analytical life assessment of boiler pressure-part components.

Software Features

The main features of the software are:

- **Creep Life Assessment**

  - Applicable to all boiler pressure parts (e.g., tubes, straight pipes, headers, pipe bends etc.) operating in the creep regime.
  - For tube life assessment:
    - Data can be manually input by the user or imported from a spreadsheet (*in a specific format*).
    - Some common materials constants are provided in the software, for other materials the constants can be input manually.
    - Stress values can be provided by the user, or they can be calculated by the software via 'reverse design' based on ASME Section I (for tubing).
    - Temperature Estimation:
      - Applicable to superheater and reheater tubes.
      - Tube operating temperature estimation based on steam-side oxide thickness measurement.
      - This temperature can be used for creep life assessment.

  - For other component geometries (except tubing), stress values can be provided by the user (e.g., from FEA), or they can be calculated by the software via 'reverse design' based on ASME Section I (for straight pipe, steam header, pipe bend).

- **Fatigue Life Assessment**

  - This procedure concerns low cycle (thermal) fatigue of nozzles / branch connections.
  - Applicable to nozzles/ branch connections, whether they are in the creep regime (e.g., SH header tube or branch connection) or below the creep regime (e.g., steam drum nozzles) etc.
  - The methodology is based on EN 12952-3.

- **Creep-Fatigue Life Assessment**

  - Applicable to nozzles/ branch connections of pressure parts that are in the creep regime but also operate under cyclic loading conditions.
  - Calculates the creep damage fraction (D_c) and fatigue damage fraction (D_f).
  - Plots the results in a Creep-Fatigue Interaction Diagram.

- **Combined Creep & Corrosion**

  - Applicable for combined creep and wall thinning (corrosion) iterative calculations for SH/RH tubes.

Software Benefits

1. Flexible and easy to use (*does not require much training, although some familiarity with EN 12952-3 would be useful when performing fatigue life assessment*) for the life assessment of various boiler components.
2. Saves time and labour for the complete evaluation of boiler life assessment.
3. Useful supporting document providing detailed guidance and background on life assessment.
4. User-friendly for industry engineers who would like to carry out boiler life assessment without going through different established codes or assessment procedures and manually performing the calculations themselves.

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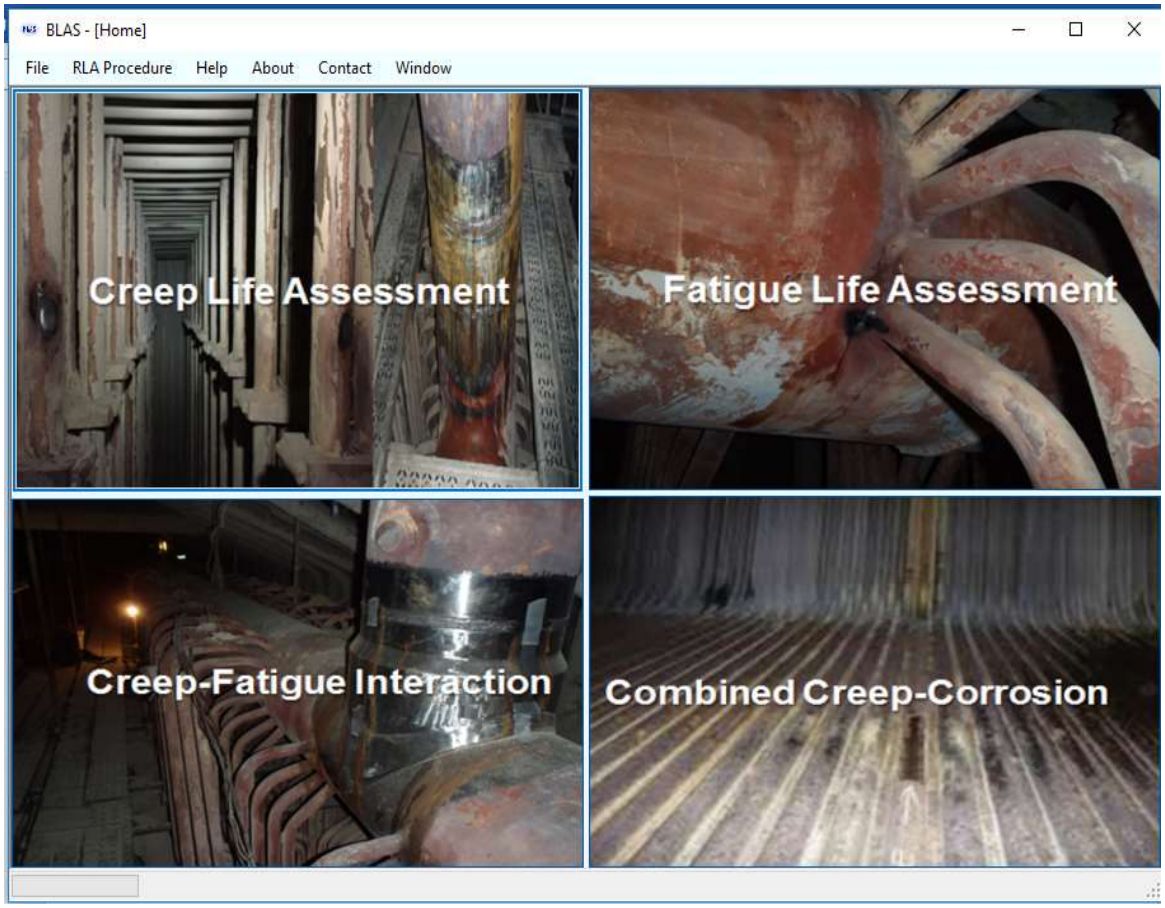
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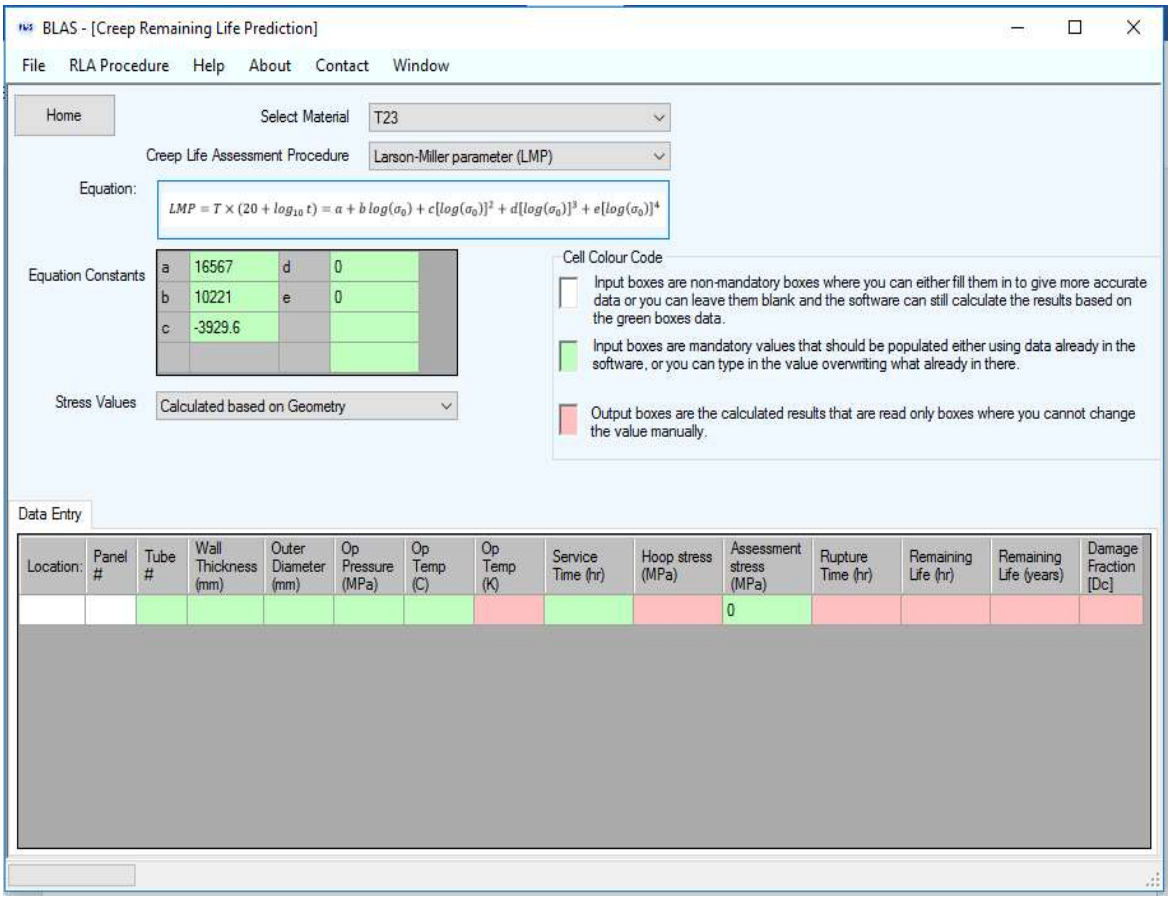
Creep Life Assessment
Fatigue Life Assessment
Creep-Fatigue Interaction
Combined Creep-Corrosion


BLAS - [Creep Remaining Life Prediction]
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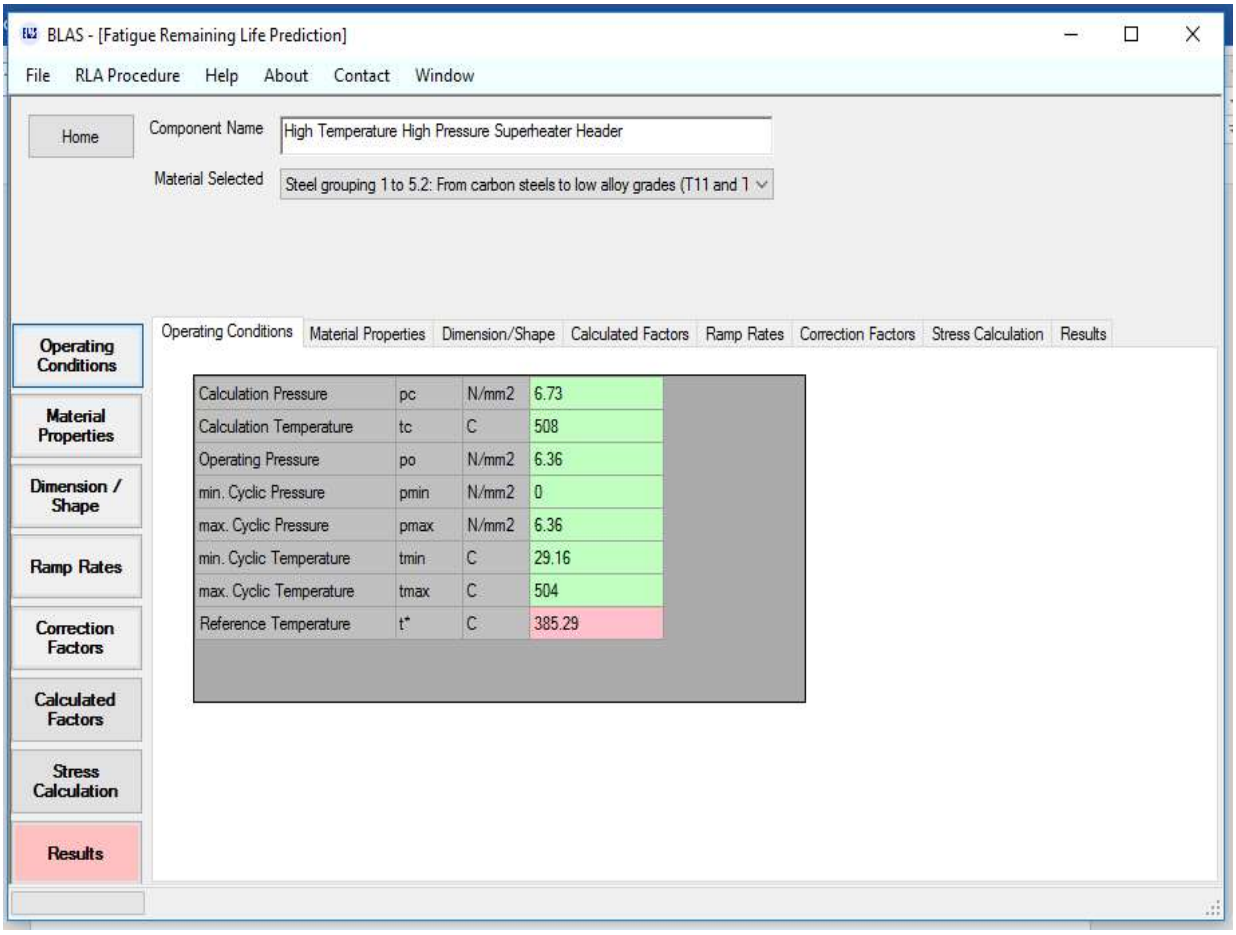
Select Material
T23
Creep Life Assessment Procedure
Larson-Miller parameter (LMP)
Equation:
$LMP = T \times (20 + log_{10} t) = a + b\,log(\sigma_0) + c[log(\sigma_0)]^2 + d[log(\sigma_0)]^3 + e[log(\sigma_0)]^4$
Equation Constants
a 16567
b 10221
c -3929.6
d 0
e 0
Stress Values
Calculated based on Geometry
Cell Colour Code
Input boxes are non-mandatory boxes where you can either fill them in to give more accurate data or you can leave them blank and the software can still calculate the results based on the green boxes data.
Input boxes are mandatory values that should be populated either using data already in the software, or you can type in the value overwriting what already in there.
Output boxes are the calculated results that are read only boxes where you cannot change the value manually.
Data Entry
Location:
Panel #
Tube #
Wall Thickness (mm)
Outer Diameter (mm)
Op Pressure (MPa)
Op Temp (C)
Op Temp (K)
Service Time (hr)
Hoop stress (MPa)
Assessment stress (MPa)
Rupture Time (hr)
Remaining Life (hr)
Remaining Life (years)
Damage Fraction [Dc]
0


BLAS - [Fatigue Remaining Life Prediction]
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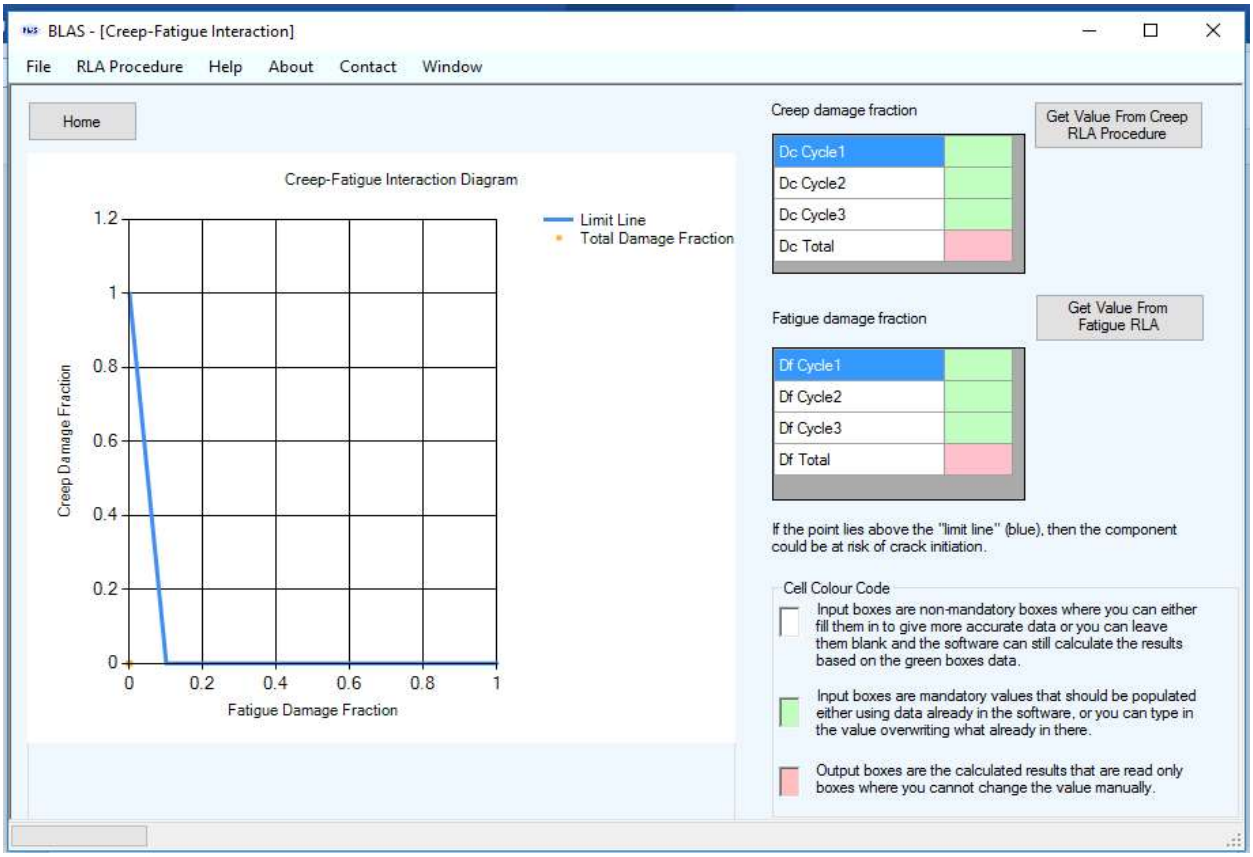
Component Name
High Temperature High Pressure Superheater Header
Material Selected
Steel grouping 1 to 5.2: From carbon steels to low alloy grades (T11 and 1
Operating Conditions
Material Properties
Dimension / Shape
Ramp Rates
Correction Factors
Calculated Factors
Stress Calculation
Results
Operating Conditions
Material Properties
Dimension/Shape
Calculated Factors
Ramp Rates
Correction Factors
Stress Calculation
Results
Calculation Pressure pc N/mm2 6.73
Calculation Temperature tc C 508
Operating Pressure po N/mm2 6.36
min. Cyclic Pressure pmin N/mm2 0
max. Cyclic Pressure pmax N/mm2 6.36
min. Cyclic Temperature tmin C 29.16
max. Cyclic Temperature tmax C 504
Reference Temperature t* C 385.29


BLAS - [Creep-Fatigue Interaction]
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Creep-Fatigue Interaction Diagram
Limit Line
Total Damage Fraction
Creep Damage Fraction
Fatigue Damage Fraction
0
0.2
0.4
0.6
0.8
1
1.2
Creep damage fraction
Get Value From Creep RLA Procedure
Dc Cycle1
Dc Cycle2
Dc Cycle3
Dc Total
Fatigue damage fraction
Get Value From Fatigue RLA
Df Cycle1
Df Cycle2
Df Cycle3
Df Total
If the point lies above the "limit line" (blue), then the component could be at risk of crack initiation.
Cell Colour Code
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