Stress Concentrations and Plasticity Corrections. Part 2

Exercise with a fitted strain-life-stress curve

Step 1. Get the fitted curve for the merged AA-7075-T6xx data and place it into a local folder. The file is linked on this page: https://fde.uwaterloo.ca/Fde/Materials/Alum/AA7xxx/aa7xxx.html

In my case, after a view source, I copy/pasted the file into a local file called "merged7075T6xx_fitted.html"

Step 2. For plotting only, create a file that draws the elastic modulus line

In my case I placed the above data into a text file called "emod69980mpa.txt" Step 3. Plot the two files in the same gnuplot window. You can use the gnuplot commands:

```
set grid
set ylabel "Stress, mpa"; set xlabel "Strain"
set xrange [0.0:0.06]
plot "merged7075T6xx_fitted.html" u 1:3 w lp lc 8, "emod69980mpa.txt" u 1:2 w l lc 7
```

You should end up with a plot that looks like this:



Step 4 : For an elastic FEA stress of 650 mpa compute the equal energy (Stress * Strain) on the cyclic curve.

i.e. Solve the formula



Note that in gnuplot the cursor co-ordinates are displayed in the lower right corner of the window.

-or use a spreadsheet like Libreoffice or Excel

AA 7xxx Series Aluminum Fatigue Data file index :

Web Page: *http://fde.uwaterloo.ca/Fde/Material/Alum/AA7xxx/aa7xxx.html* Updates: Aug.20 1999. Mar1-2009, Oct2010, Jan2012

The files in this directory are offered by the F.D.& E. committee members as a set of example files for the construction of web based material fatigue property databases. They are meant for information and research use only, not for design.

- AA 7005-T5 (Chung/Abel) Not enough long life data for good Fitted data file.
- •
- AA 7049-T6 (Ramusat/Vidal 1979) Not enough long life data for good Fitted data file.
- •
- AA 7050-T7351 (Ramusat/Vidal 1979) Not enough long life data for good Fitted data file.
- •
- AA 7075-T6 (Endo/Morrow 1969) Not enough long life data for good Fitted data file.
- AA 7075-T651 (Kurath 1984) | Fitted | Calculator
- AA 7075-T651 (Ramusat/Vidal 1979) Not enough long life data for good Fitted data file.
- Merged AA 7075-T6xx composed of above 3 files
 - Merged AA 7075-T6xx | Fitted | Calculator | Stress-Strain Simulator
 - <u>Compare plot of Fitted vs Raw Strain-2Nf</u>
 - <u>Compare plot of Fitted vs Raw Neuber-2Nf</u>

Click here

Page is at: https://fde.uwaterloo.ca/Fde/Materials/Alum/AA7xxx/aa7xxx.html

The calculator web page will present as follows:

1. Your Material (Digital-Fitted Curves):





That completes the chapter on Stress Concentrations and Plasticity Corrections. With the use of the calculator page you have also learned how to perform a fatigue life prediction for a simple FEA stress input history.

The next chapter will focus on the methods that are used to predict the fatigue damage given a plasticity corrected hot-spot stress and strain history.