

Results for plateXYZout0.95 : Crack Propagation Plate Surface Flaw

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Simulation input data:

B= 10.0 mm

W= 70.0 mm

a₀= 1.5 mm

c₀= 4.0 mm

L= 10. mm

#MATERIAL= merged_a36_fitted.html (initiation)

Kt= 2.0

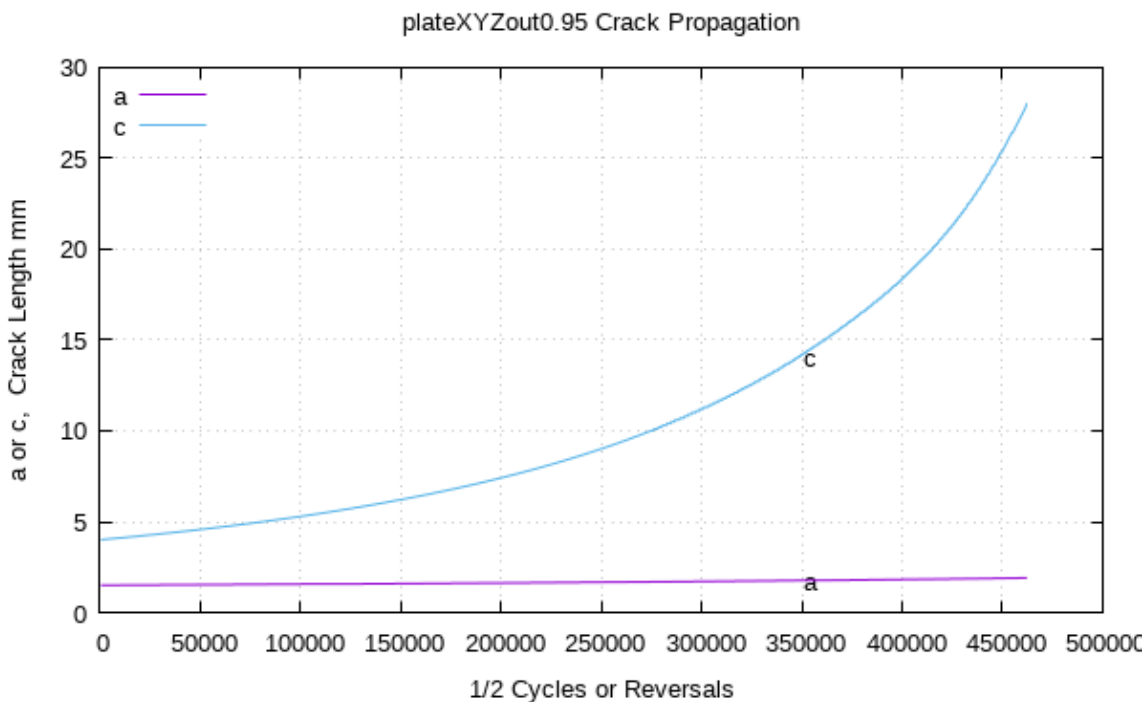
#TYPE= plate_surface_flaw

#ACTIVATE_MmMb= 1 _____#ACTIVATE_MkmMkb= 1 _____#ACTIVATE_fw= 1

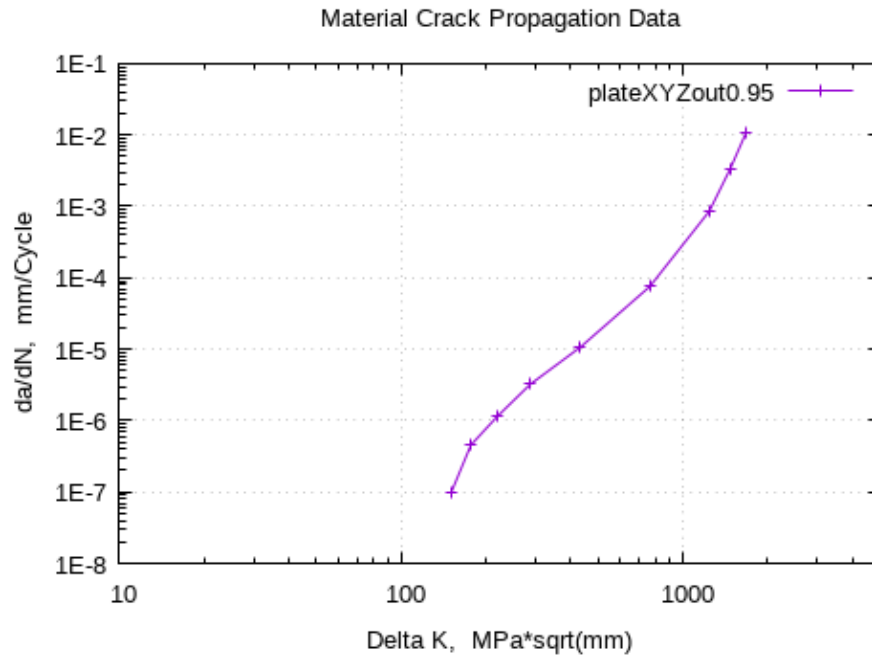
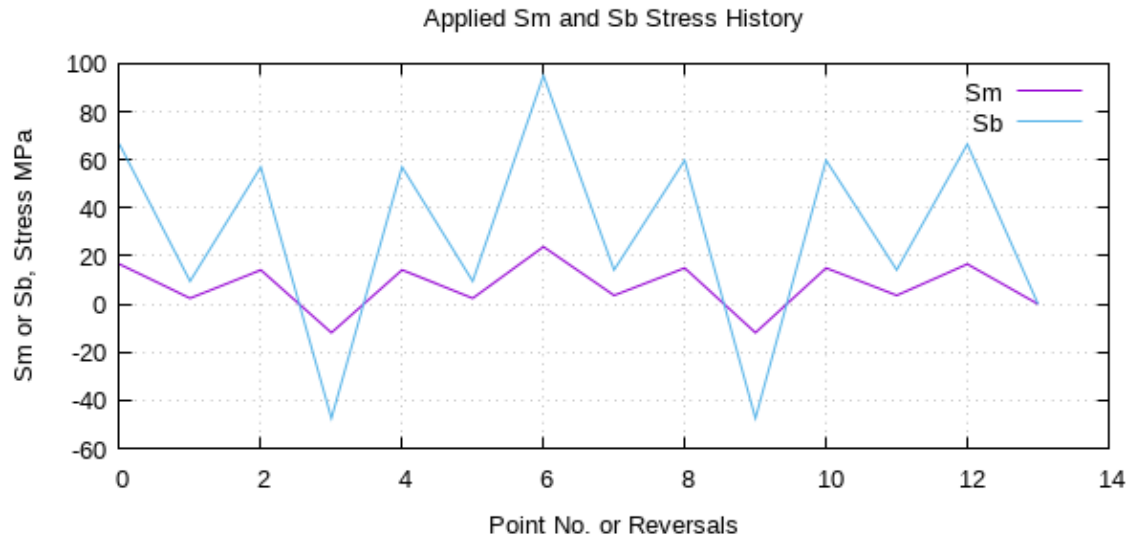
Crack Propagation Results:

(# plateWeldflaw.f vers. 4.0 # makereport1 vers. 2.4 # plateWeldFAD.f vers. 0.6 starts...)

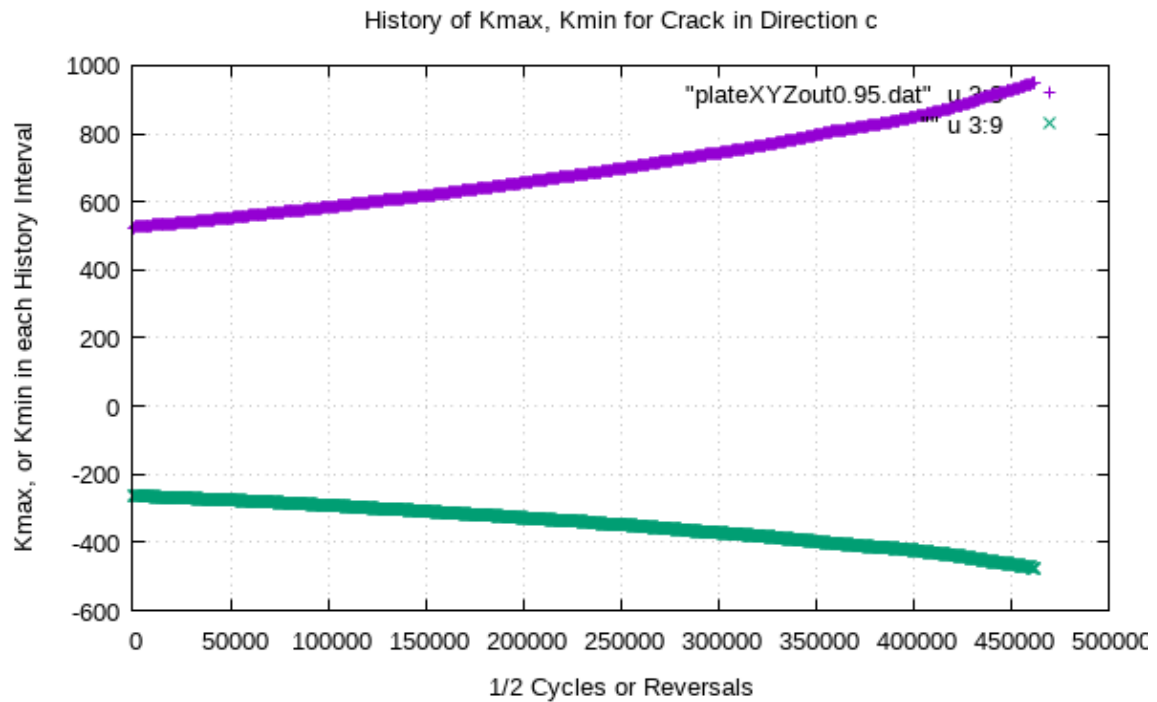
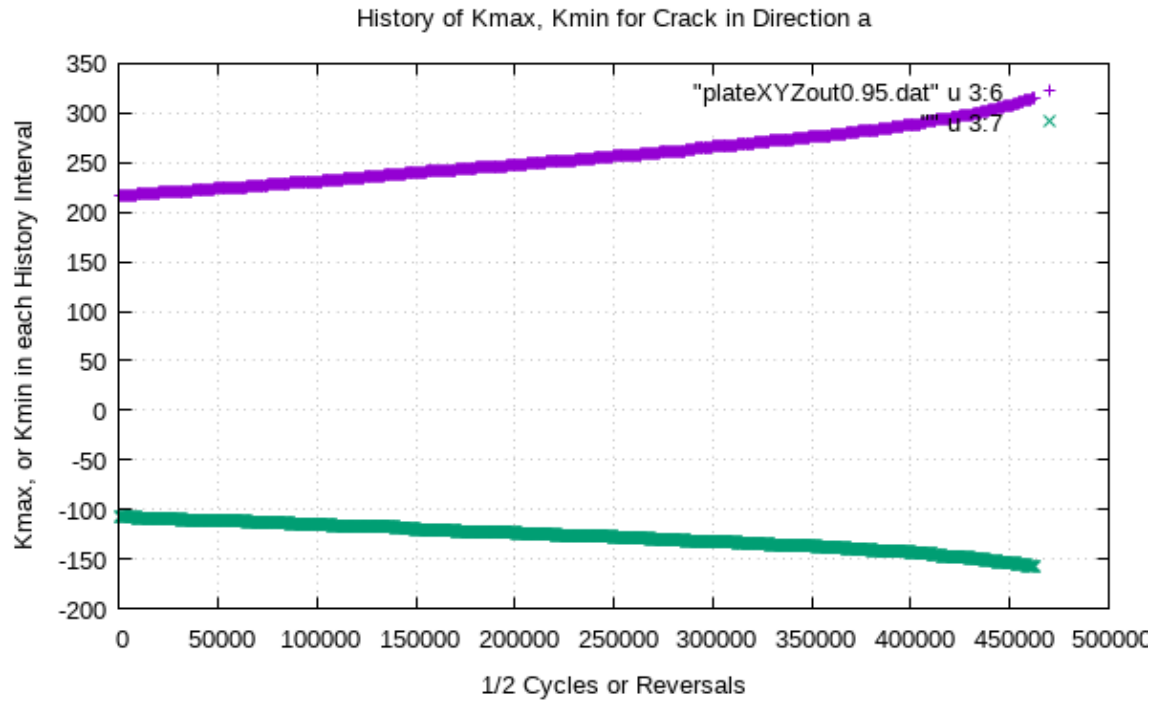
- No. of Reversals= 462217 revs. or 231108 cycles
- Final _____ **a** = 0.190E+01 mm
- Final _____ **c** = 0.280E+02 mm
- No. of History Reps.= 33016 reps. + 7 revs.
- No. records = 462218 in random access data file



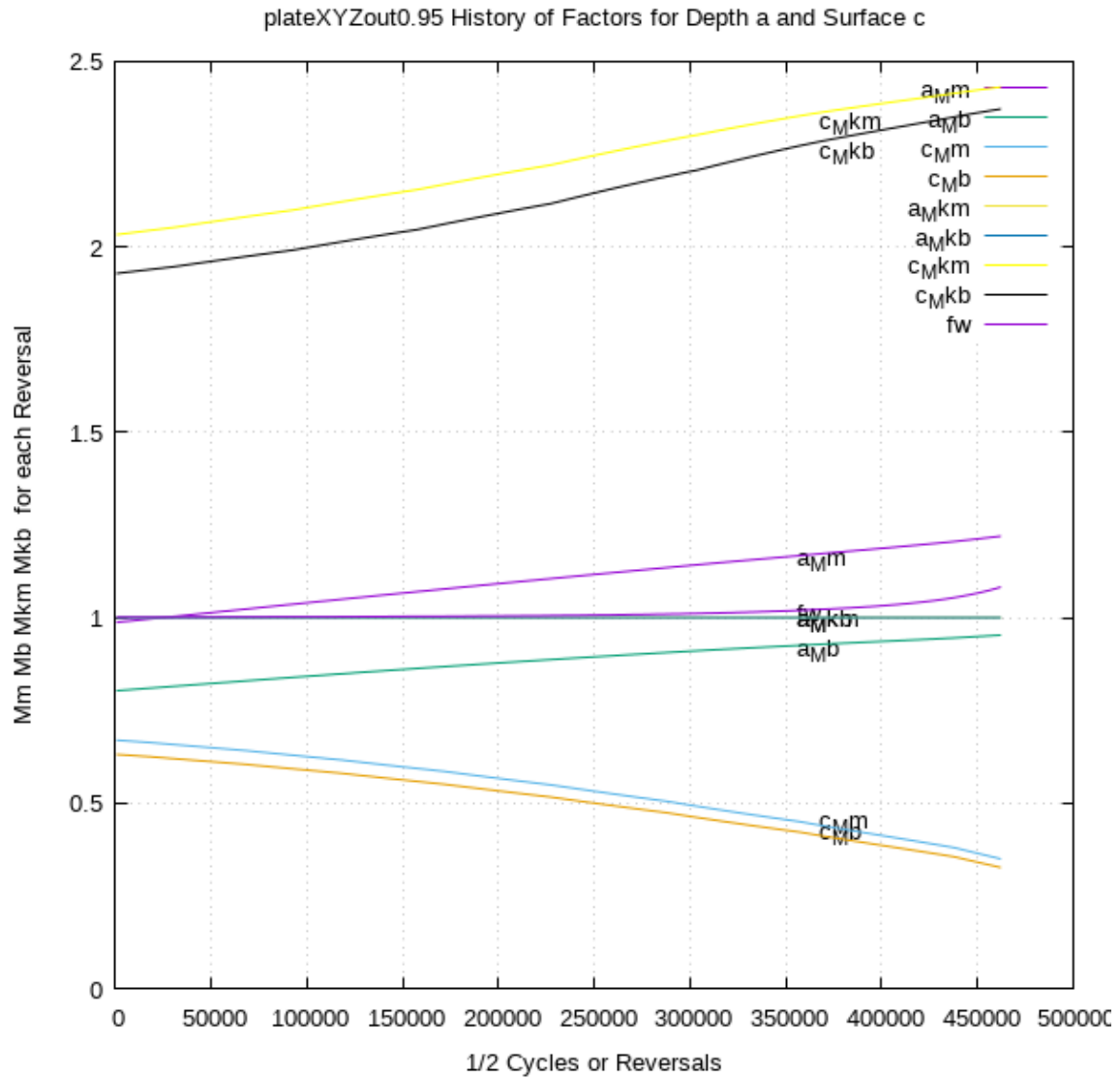
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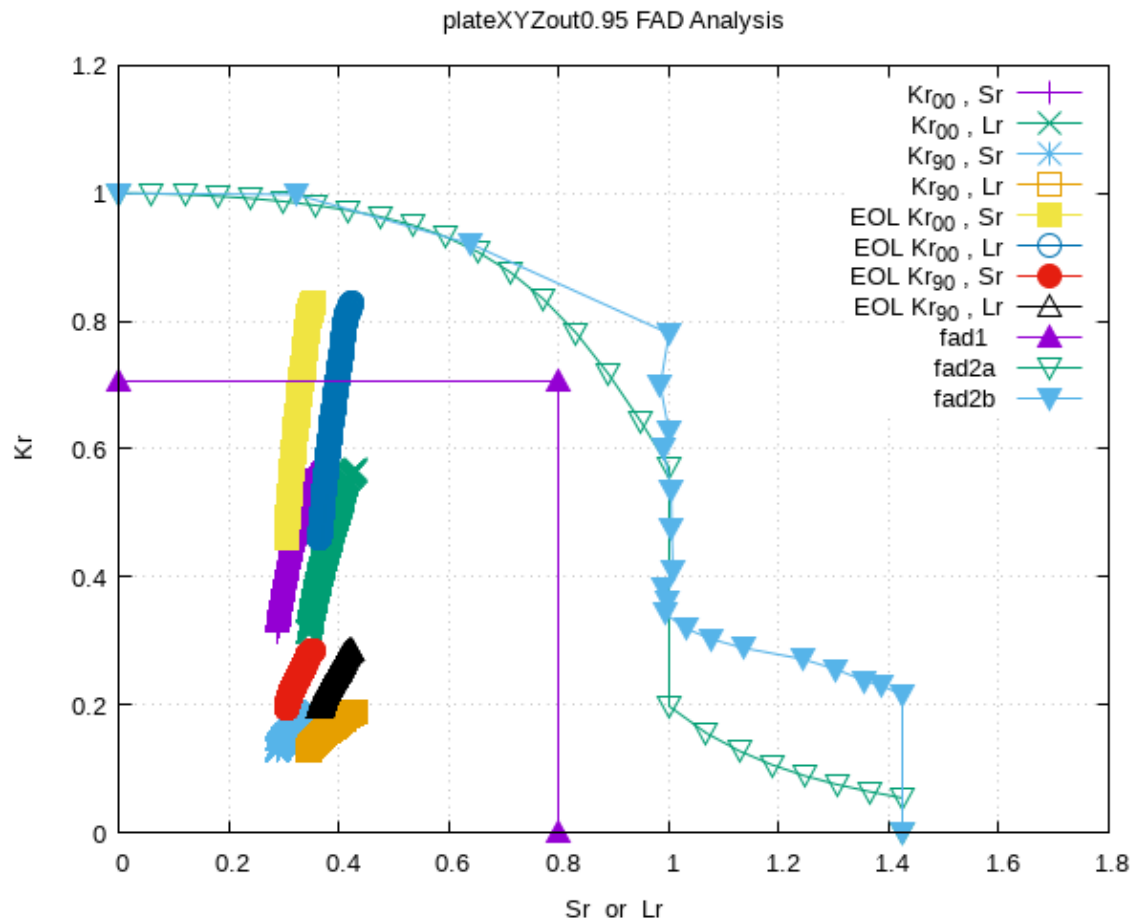
FAD Results for plateXYZout0.95

#TensileFile= a36_Mattos_mono_engrSS_FLAT.txt

#PmEOL= 70. #PbEOL= 100.

#Kmat= 1675.

#PinJoint= 0



Crack Initiation Life Results for plateXYZout0.95 (Using $K_t = 2.0$)

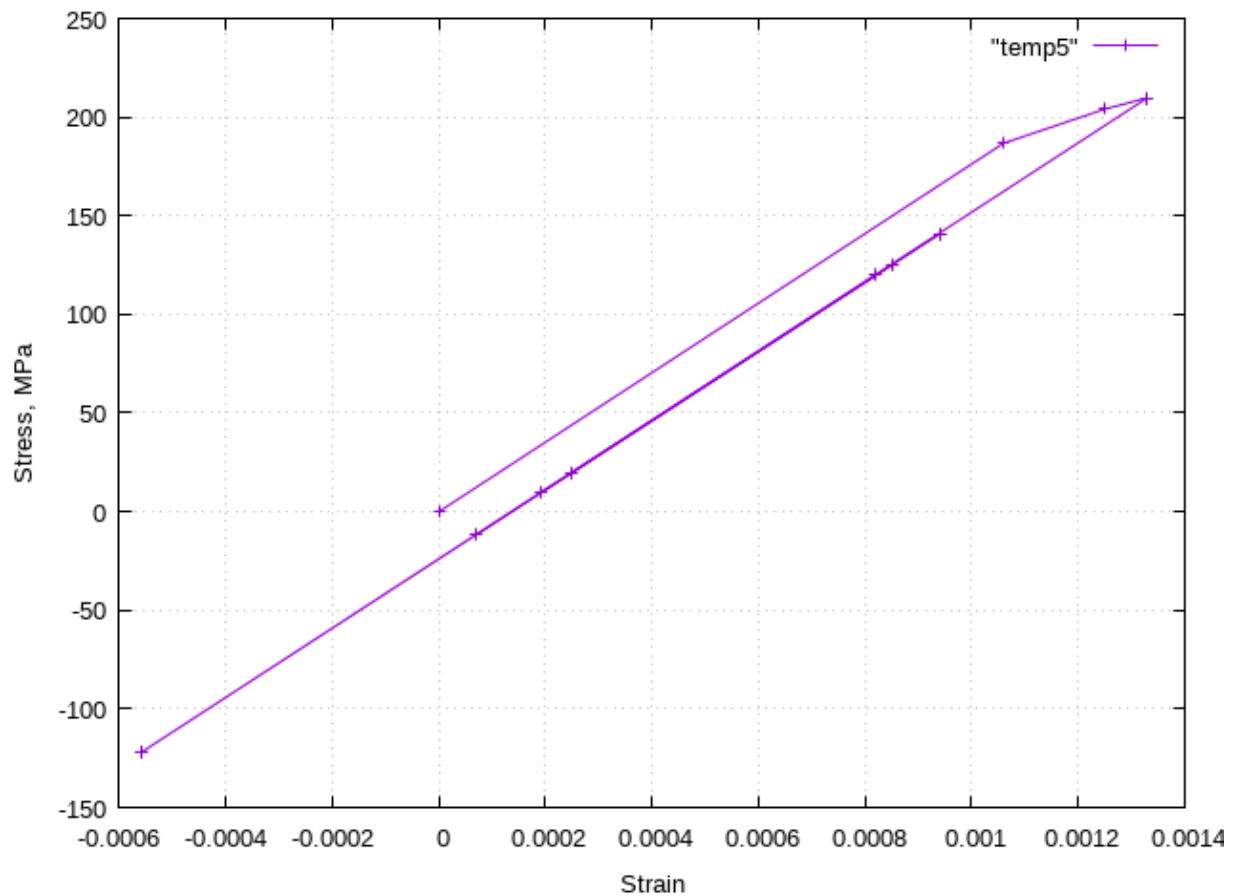
Files Used:

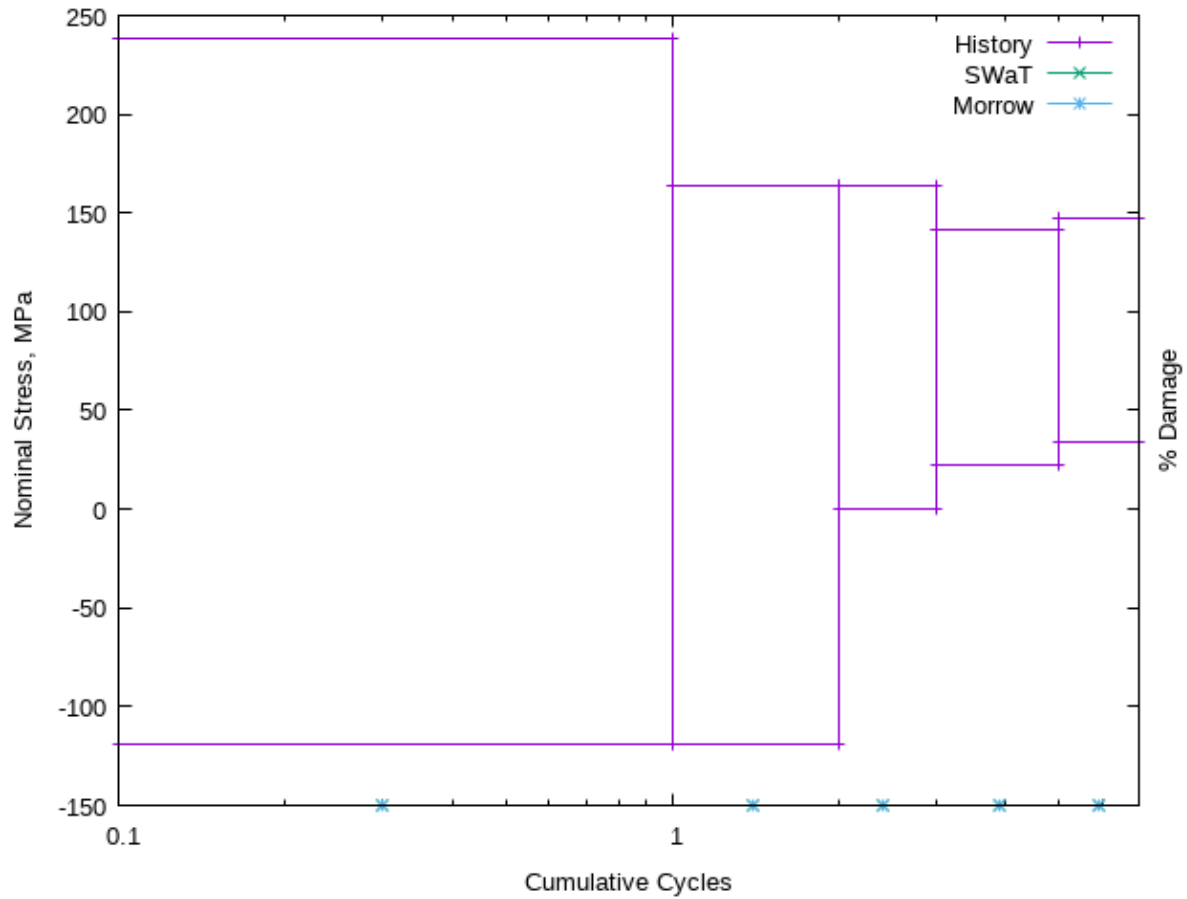
- Stress History (Sb+Sm)
- Rainflow File
- Material File

Predicted History Repetitions to Initiation:

StrainLife_Reps	SWT_Life_Reps	StressLife_Reps	Morrow_Reps	Goodman_Reps	(Reps= Repetitions)
Infinity	Infinity	Infinity	Infinity	Infinity	

Local Stress and Strain Response:



Cumulative Cycle Plot of History and Damage:

(Rectangles are Rainflow Cycle Sets: Sorted by Range: largest on Left)

Detailed Damage for each Rainflow Cycle Set:

Loop	Smax	Smin	N	Sigmax	Sigmin	Delta	Epsmax	Epsmin	DeltaEps	%Eps	%SWT	%St
1	238.0	-118.8	1.0	210.	-122.	332.	0.00133	-.00056	0.00188	0.0	0.0	0.0
2	164.0	-118.8	1.0	141.	-122.	263.	0.00094	-.00056	0.00149	0.0	0.0	0.0
3	164.0	0.0	1.0	141.	-12.	153.	0.00094	0.00007	0.00087	0.0	0.0	0.0
4	141.4	22.6	2.0	120.	9.	111.	0.00082	0.00019	0.00063	0.0	0.0	0.0
5	147.0	34.0	2.0	125.	20.	105.	0.00085	0.00025	0.00060	0.0	0.0	0.0

Appendix 1: Print of "pdprop.env" Simulation Control file

```
# This file contains the starting filenames, variables etc
# for the Crack Propagation programs. It should be edited by the
# user before each simulation run. It can also be generated from web
# page at: to be determined
#

#TYPE= plate_surface_flaw      #with or without weld using ACTIVATES:
#ACTIVATE_MmMb= 1      # Deactivate = 0
#ACTIVATE_MkmMkb= 1
#ACTIVATE_fw= 1
#
#                                #Other      #TYPE= options:
#                                # plate_long_surface_flow
```

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```
#
#                                     # plate_tru_flow
#                                     # plate_embedded_flow
#                                     # plate_edge_flow
#                                     #
#                                     # pipe_inside_flow
#                                     # pipe_full_inside_flow
#                                     # pipe_full_outside_flow
#                                     #
#                                     # rod_surface_flow
#                                     # rod_full_outside_flow

#                                     # These problem types are used to pull in the
#                                     # appropriate Fw, Mm, Mb, files etc.

# The factors described in this section may be ignored if not applicable to
# the particular problem type described above.
# (All dimensions in mm)
#B= 10.0   # plate (or pipe wall) thickness
#W= 70.0   # plate width
#ri= 200.   # Internal diameter if pipe problem. Ignored if not pipe
#azero= 1.5 # initial crack depth
#czero= 4.0 # initial 1/2 crack width at surface
#L= 10.    # Weld Feature width. Ignored if ACTIVATE_MkmMkb= 0 (above)

#HISTORYFILE= load1.txt   # historyFileName
#                   # Adjustments to load file variables:
#                   # Note that the MEANADD (below) is added AFTER the MAGFACTOR is applied.
#MAGFACTOR_m= 1.0   # Multiply factor on membrane load. Result should be MPa
#MAGFACTOR_b= 1.0   # Multiply factor on bending load term. Result should be MPa
#MEANADD_m= 0.0     # Mean shift in MPa added to membrane stress.
#MEANADD_b= 0.0     # Mean shift in MPa added to bending stress.

#MAXREPS= 1000000    # Max no. history repeats in simulation.
#                   # One repetition or application of the load history is
#                   # also called a "block" of cycles.
#
#
#MATERIAL= merged_a36_fitted.html   #File name of material fitted data
#                                     This file is used to define the cyclic
#                                     stress-strain curve, and the Neuber Product curve.
#Kt= 2.0                             #Stress Conc. Factor, presently only for crack initiation calcs.
#
#DADN= table                          # Can be "table" or "Paris"
#DADN_PARIS= 0.0 0.0 0.0 0.0 none    # Kth a m Kc units (ignored if #DADN= table )
#DADN_TABLE= a36+1015.dadn          # da/dN digitized da/dN curve for material,
#                                     including the threshold, and KIC.
#                                     If a threshold exists, put in a vertical line
#                                     (with two identical X-axis points).
#                                     If the threshold needs to be "turned off" then
#                                     do NOT put in a vertical line at low da/dN.
#                                     (Ignored when #DADN= PARIS )
#
#FAD Stuff:
#TensileFile= a36_Mattos_mono_engrSS_FLAT.txt   #enter "none" if no FAD
#PmEOL= 70.                                     #Set these so that Pm+Pb= 0.82*Syield for default.
#PbEOL= 100.
#Kmat= 1675.
#PinJoint= 0                                     #Set = 1 if struture is pinJointed (for bending)
#
#BLOCKSKIP= 1.0 percent                         # At the end of each block check if the previous
#                                               two blocks of cycles had similar damage (crack
#                                               extension) within this percentage. If TRUE then
```


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```
#
#           simply skip the simulation of the next block,
#           but just add the expected damage. Continue by
#           simulating the block after the skip.
#           A value of 0.0 will disallow skipping blocks.
#SAVELEVEL= 0          #Amount of output saved to disk:
#                       # 3=lots 2=medium 1=minimal
#                       # 0= save #crk= data into binary direct access file only
#                       # No #crk= data will be written into the text logfile.
#                       # Use for large output files with lots of cycles.
```

Appendix 2: Print of da/dN vs DeltaK Table in file plateXYZout0.95

Delta_K	da/dN				
0.1502160E+03	0.9620540E-07	0.2176716E+01	-0.7016800E+01	0.0000000E+00	0.0000000E+00
0.1769830E+03	0.4562300E-06	0.2247931E+01	-0.6340816E+01	0.7121515E-01	0.6759844E+00
0.2202350E+03	0.1160170E-05	0.2342886E+01	-0.5935478E+01	0.9495497E-01	0.4053378E+00
0.2874840E+03	0.3224090E-05	0.2458614E+01	-0.5491593E+01	0.1157272E+00	0.4438853E+00
0.4331670E+03	0.1069760E-04	0.2636655E+01	-0.4970714E+01	0.1780417E+00	0.5208793E+00
0.7637410E+03	0.7556810E-04	0.2882946E+01	-0.4121662E+01	0.2462907E+00	0.8490520E+00
0.1240590E+04	0.8520410E-03	0.3093628E+01	-0.3069540E+01	0.2106822E+00	0.1052122E+01
0.1471680E+04	0.3307300E-02	0.3167813E+01	-0.2480526E+01	0.7418513E-01	0.5890131E+00
0.1675690E+04	0.1074680E-01	0.3224194E+01	-0.1968721E+01	0.5638027E-01	0.5118057E+00

Appendix 3: Print of Stress-Strain-Init.Life file: "matfile"

```
#SAE Standard Fatigue Data File format

##

Pick one: #FDE_plot #FDE_fit ##

#
#Copyright (C) 2012 F.D.E. Committee
#This data file is free software - you can redistribute it and/or
#modify it under the terms of the GNU General Public License as
#published by the Free Software Foundation; either version 2 of the
#license, or (at your option) any later version.
#This data file is distributed in the hope that it will be useful,
#but WITHOUT ANY WARRANTY - without even the implied warranty of
#MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
#GNU General Public License for more details.
#You should have received a copy of the GNU General Public License
#along with this program - if not, write to the Free Software
#Foundation, Inc., 59 Temple Place - Suite 330, Boston, MA 02111-1307, USA
#Try also their web site: http://www.gnu.org/copyleft/gpl.html
#
# NOTE: Fitted Data !!
# A36 Steel Merged Data Sets from Refs. 1 and 2:
# Ref.1: P.Dindinger report to Fat.Des.+Eval. Comm. Apr.2012
# Ref.2: G.A.Miller and H.S.Reemsnyder, "Strain-Cycle Fatigue of Sheet and
# Plate Steels I: Test Method Development and Data Presentation,"
# SAE Paper 830175, Detroit MI, Feb28-Mar.4, 1983
#
# NOTE that original test data ends at 2Nf = 1.3million.
#
#FileType= strain_life
```

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```
#DataType= fitted
#TIMEcol= 0
#NAME= ASTM-A36
#NAME= Structural
#NAME= Steel
#Stress_units= ksi
#Strain_units= strain
#Sy= 38.4 0.2pc offset, 265 mpa
#Su= 69. ksi from Miller/Reemsnyder = 475 mpa
#eu= 0 #strain at Su not reported
#E= 29528. ksi = 203600 mpa
#FractureStrain= 0 not reported
#FractureStress= 0. not reported
#monotonic_K= 0 not reported
#monotonic_n= 0 not reported
#BHN= 138.
#%RA= 0. % not reported
#
#saedigcurve_v2.2.f starts.
# NOTE!! The Following Points are FITTED DATA:#NOTE!! Fitted Stress computed using E
# Total Strain 2Nf Stress Mean Plastic Strain Initial
# Amp Amp Stress Amp Elastic Mod.
0.88485 1 115.3 0. 0.88095 29528. #Fitted_point
0.00914 5000 52.1 0. 0.00737 29528. #Fitted_point
0.00665 10000 48.8 0. 0.00499 29528. #Fitted_point
0.00493 20000 45.7 0. 0.00338 29528. #Fitted_point
0.00344 50000 42.0 0. 0.00202 29528. #Fitted_point
0.00270 100000 39.3 0. 0.00136 29528. #Fitted_point
0.00217 200000 36.8 0. 0.00092 29528. #Fitted_point
0.00169 500000 33.8 0. 0.00055 29528. #Fitted_point
0.00144 1000000 31.6 0. 0.00037 29528. #Fitted_point
#Original test data ends at 2Nf = 1.3million.
#Points below are extrapolation:
0.00125 2000000 29.6 0. 0.00025 29528. #Fitted_point
0.00106 5000000 27.1 0. 0.00014 29528. #Fitted_point
#
#
```