

Results for plate2.0 : Crack Propagation Plate Wide Flaw

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Simulation input data:

B= 10.0 mm

W= 70.0 mm

a₀= 2.0 mm

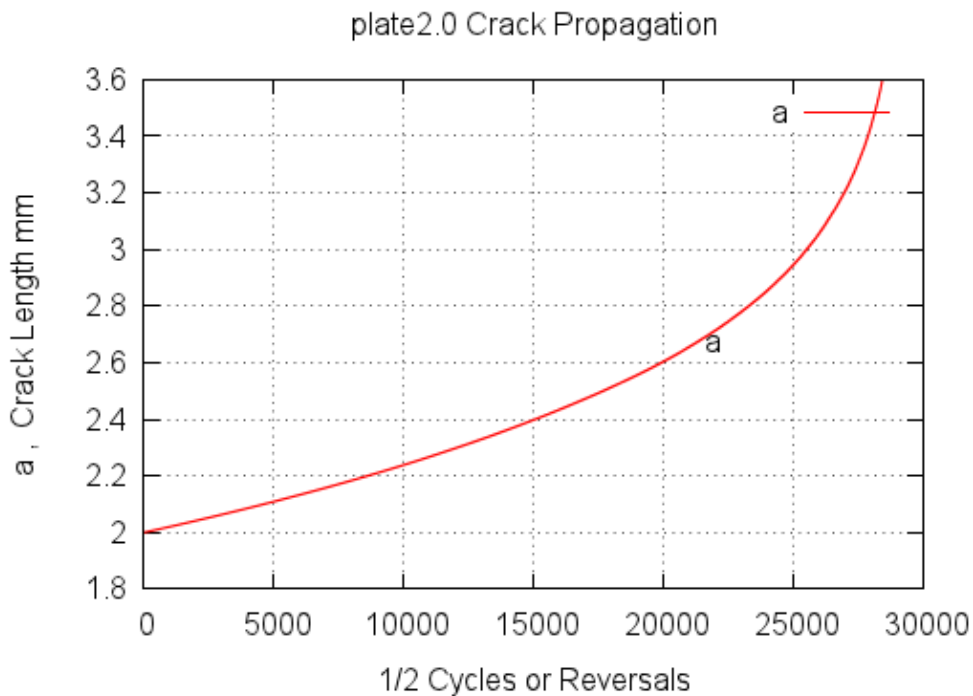
#MATERIAL= merged_a36_fitted.html

#TYPE= plate_long_surface_flaw

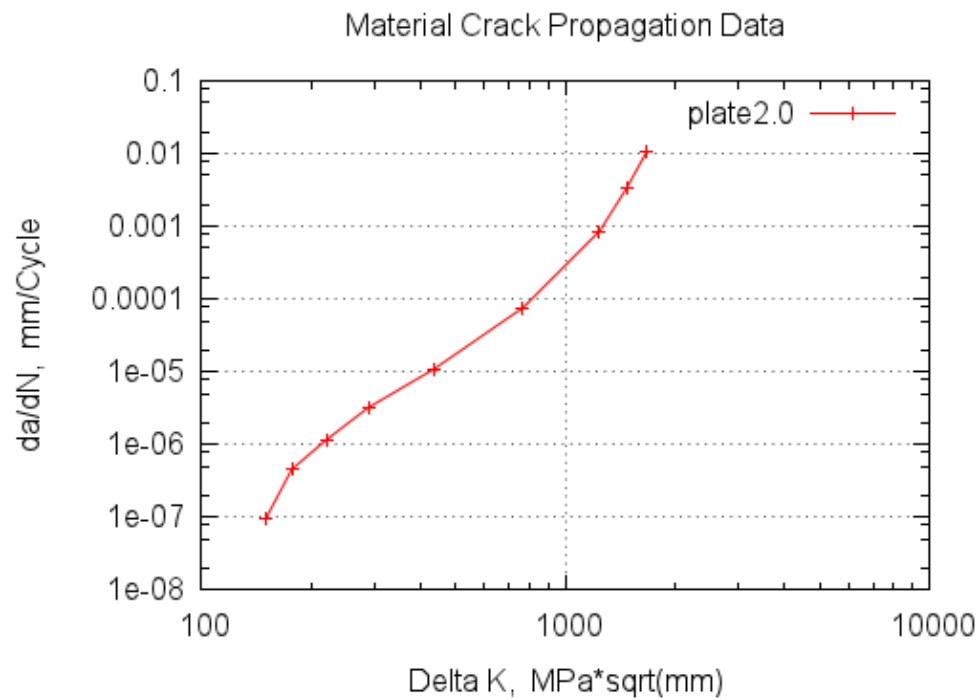
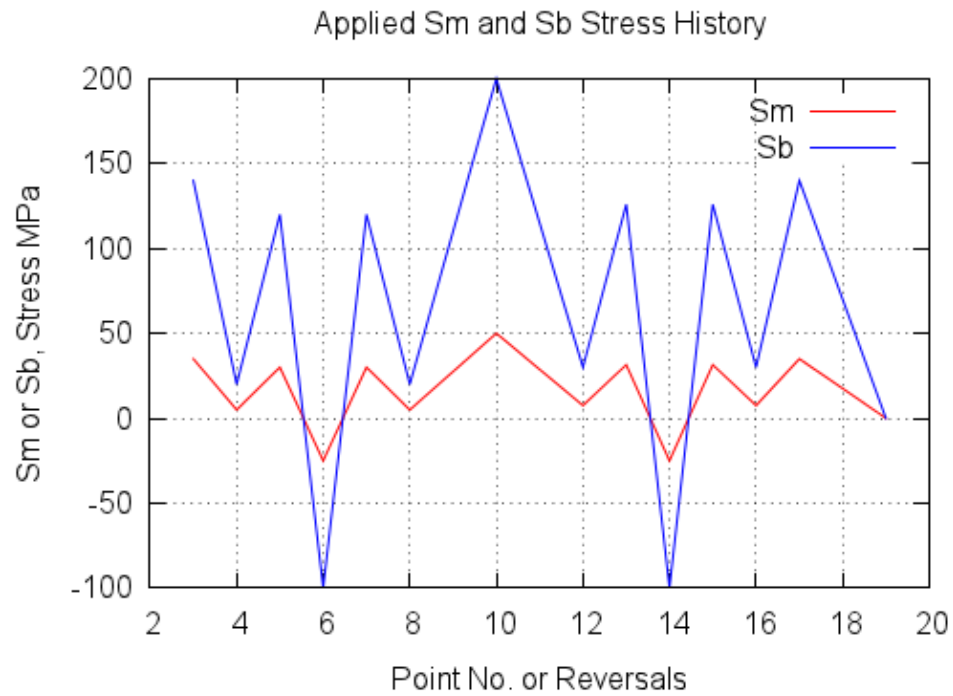
#ACTIVATE_MmMb= 1 _____ #ACTIVATE_MkmMkb= 1 _____ fw=1.0

Crack Propagation Results:

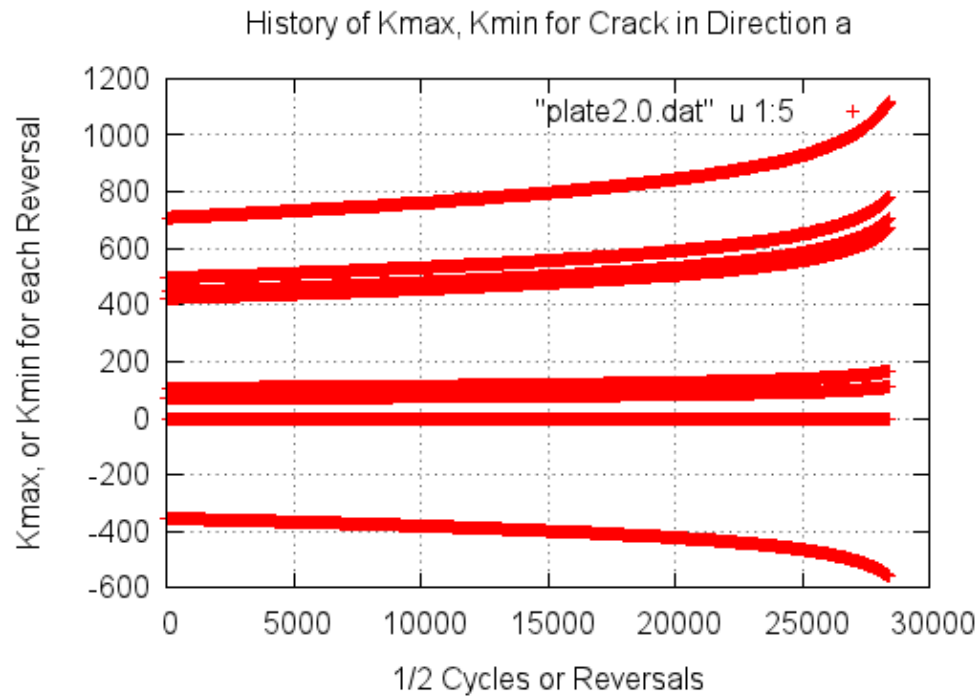
- No. of Reversals= 28416 revs. or 14208 cycles
- Final _____ **a** = 0.3593101E+01 mm
- Final _____ **c** = mm
- No. of History Reps.= 2030 reps. + 10 revs.



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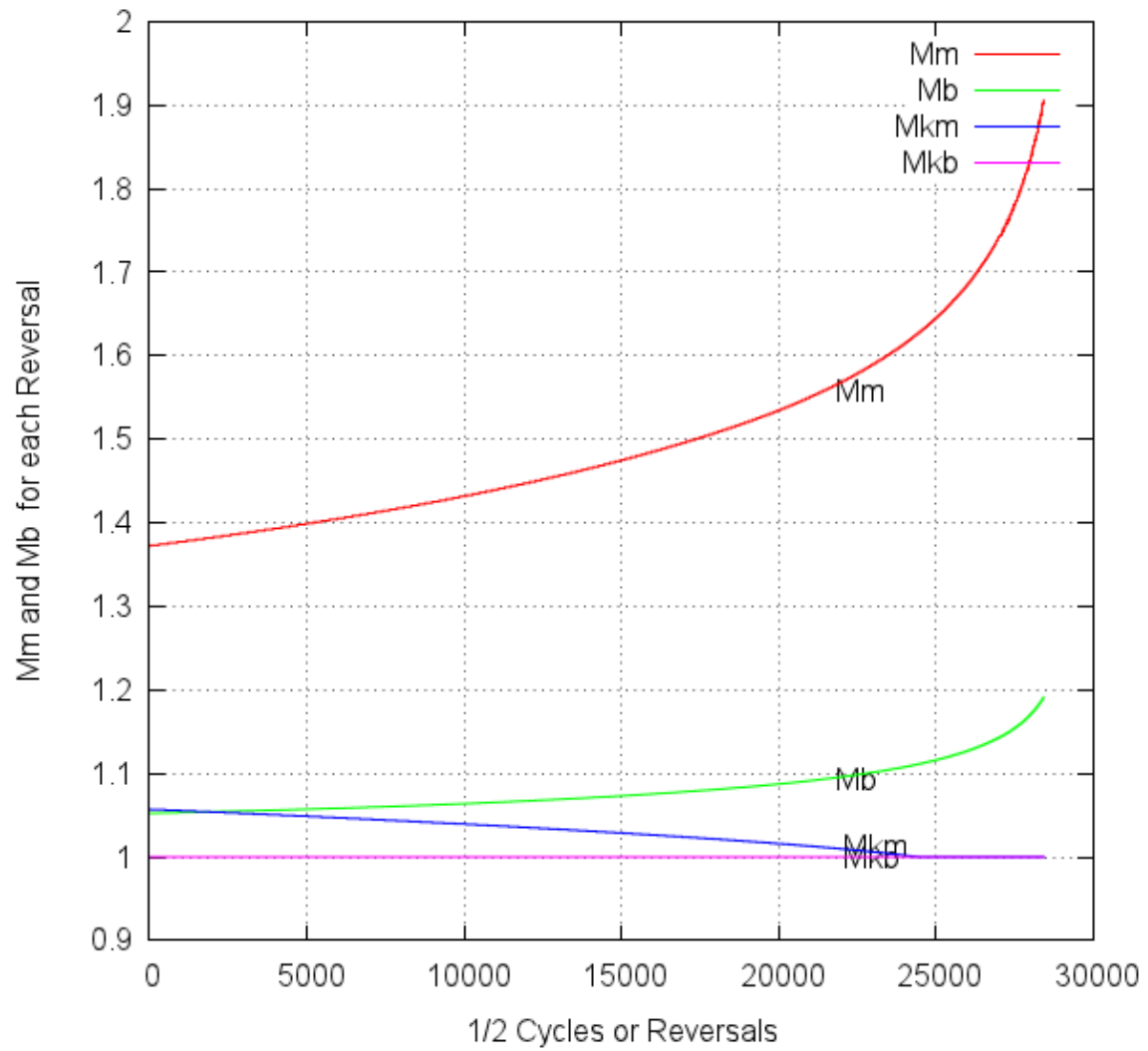


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History of Mm and Mb During Crack Prop.



Crack Initiation Life Results for plate2.0

Files Used:

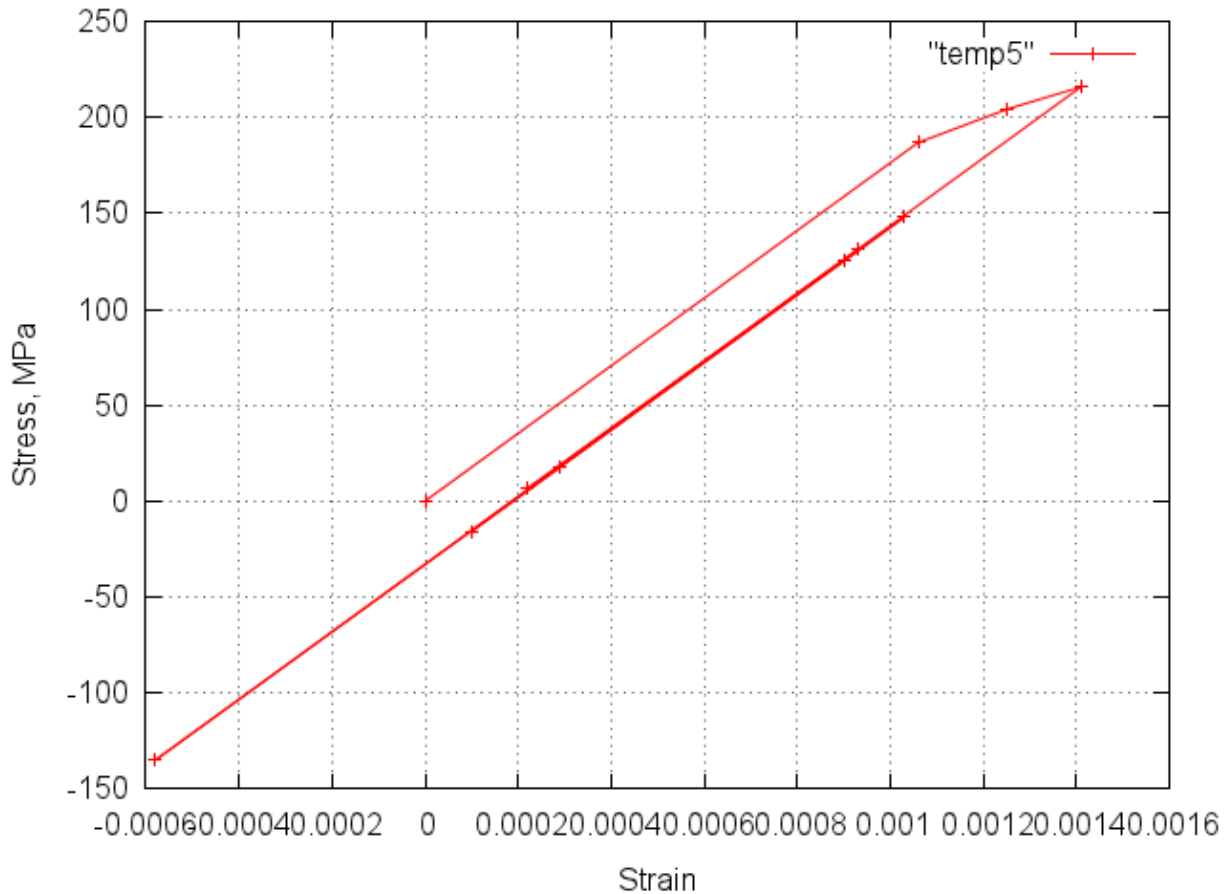
- Stress History (Sb+Sm)
- Rainflow File
- Material File

Loop	Smax	Smin	N	Sigmax	Sigmin	Delta	Epsmax	Epsmin	DeltaEps	%Eps	%SWaT	%Sts	%Morr
1	249.0	-128.0	1.0	216.	-135.	351.	0.00141	-.00058	0.00199	0.0	100.0	0.0	0.0
2	176.0	-128.0	1.0	148.	-135.	283.	0.00103	-.00058	0.00160	0.0	0.0	0.0	0.0
3	176.0	-0.0	1.0	148.	-16.	164.	0.00103	0.00010	0.00093	0.0	0.0	0.0	0.0
4	152.0	24.3	2.0	126.	7.	119.	0.00090	0.00022	0.00067	0.0	0.0	0.0	0.0
5	158.0	36.4	2.0	131.	18.	113.	0.00093	0.00029	0.00064	0.0	0.0	0.0	0.0

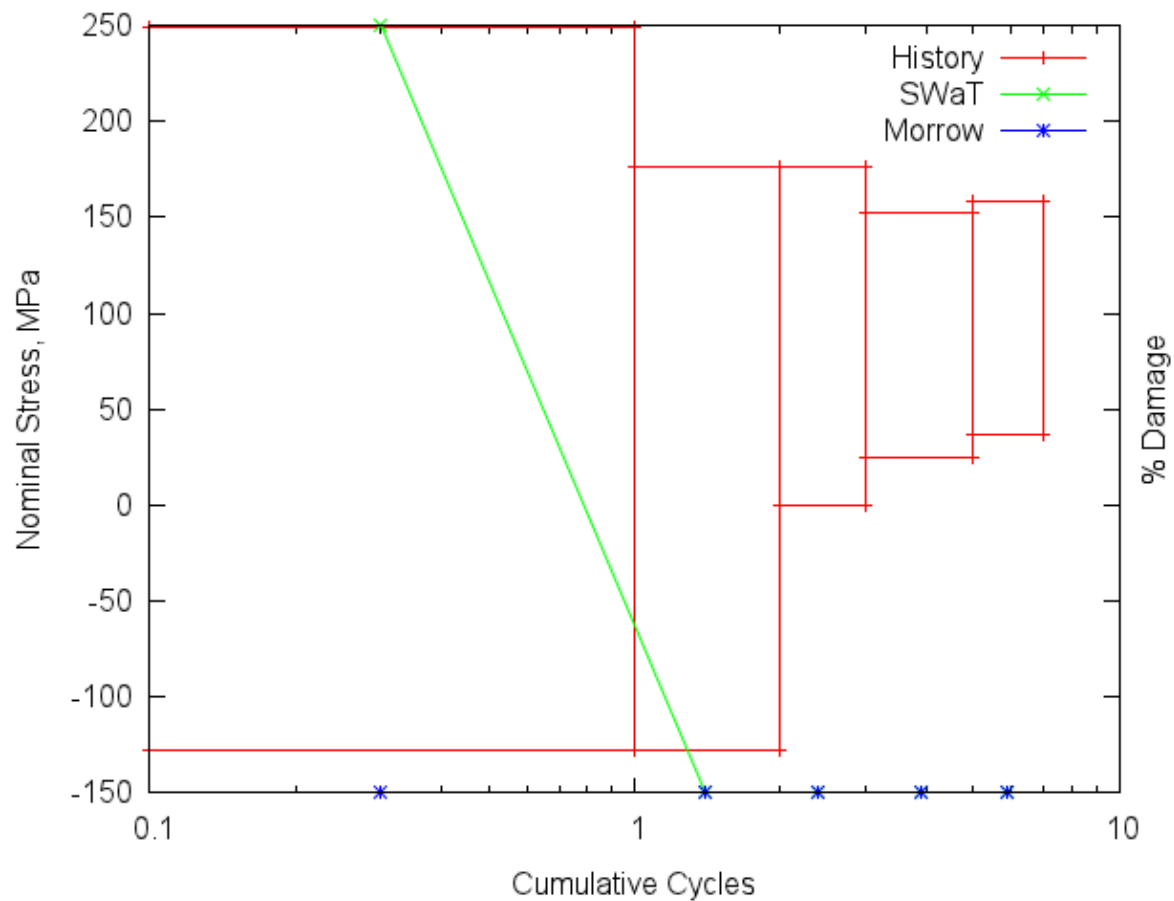
Predicted History Repetitions to Initiation:

StrainLife_Reps	SWaT_Life_Reps	StressLife_Reps	Morrow_Reps	Goodman_Reps	(Reps= Repetitions)
Infinity	1864738.6	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)

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_long_surface_flaw      #with or without weld using ACTIVATES:
#ACTIVATE_MmMb= 1 # Deactivate = 0
#ACTIVATE_MkmMkb= 1 # Deactivate = 0
#ACTIVATE_fw= 0 # Not used. See BS7910 M.3.3
#
#Other #TYPE= options:
#
#      # plate_long_surface_flaw
#      # plate_tru_flaw
#      # plate_embedded_flaw
#      # plate_edge_flaw
#
#      # pipe_inside_flaw
#      # pipe_full_inside_flaw
#      # pipe_full_outside_flaw
#
#      # rod_surface_flaw
#      # rod_full_outside_flaw
```

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```
#
#                                     # 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 (not used in plate long crk)
#azero= 2.0  # initial crack depth
#czero= 4.0  # initial 1/2 crack width at surface (not used in plate long crk)
#L= 10.     # Weld Feature width. (not important if ACTIVATE_MkmMkb = 0 )

#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.
#
#DADN= table    # Can be "table" or "Paris"
#DADN_PARIS= 0.0 0.0 0.0 0.0 x    # 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 )
#
#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
#      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= 3    #Amount of output saved to disk:
#
#      # 3=lots 2=medium 1=minimal
#
#      # (not programed yet
```

Appendix 2: Print of da/dn vs DeltaK Table in file plate2.0

Delta_K	da/dN					
0.1502160E+03	0.9620540E-07	0.2176716E+01	-0.7016800E+01	0.0000000E+00	0.0000000E+00	1
0.1769830E+03	0.4562300E-06	0.2247931E+01	-0.6340816E+01	0.7121539E-01	0.6759844E+00	2
0.2202350E+03	0.1160170E-05	0.2342886E+01	-0.5935478E+01	0.9495497E-01	0.4053378E+00	3
0.2874840E+03	0.3224090E-05	0.2458614E+01	-0.5491593E+01	0.1157272E+00	0.4438853E+00	4
0.4331670E+03	0.1069760E-04	0.2636655E+01	-0.4970714E+01	0.1780417E+00	0.5208793E+00	5
0.7637410E+03	0.7556810E-04	0.2882946E+01	-0.4121662E+01	0.2462907E+00	0.8490520E+00	6

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0.1240590E+04	0.8520410E-03	0.3093628E+01	-0.3069540E+01	0.2106822E+00	0.1052122E+01	7
0.1471680E+04	0.3307300E-02	0.3167813E+01	-0.2480526E+01	0.7418513E-01	0.5890131E+00	8
0.1675690E+04	0.1074680E-01	0.3224194E+01	-0.1968721E+01	0.5638027E-01	0.5118057E+00	9

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
#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 Experm.
# Total Strain 2Nf Stress Mean Plastic Strain Initial
# Amp Amp Stress Amp Elastic Mod.
```


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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
#					
#					