

# Results for sm\_dadn25CrMo4\_S=+-60 : Crack Propagation Plate Edge Flaw

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Affiliation:

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Simulation input data:

**B**= 10.0 mm

**W**= 24.0 mm

**a<sub>0</sub>**= 3.0 mm

#MATERIAL= all\_30-34CrNiMo+.html

#TYPE= plate\_edge\_flaw

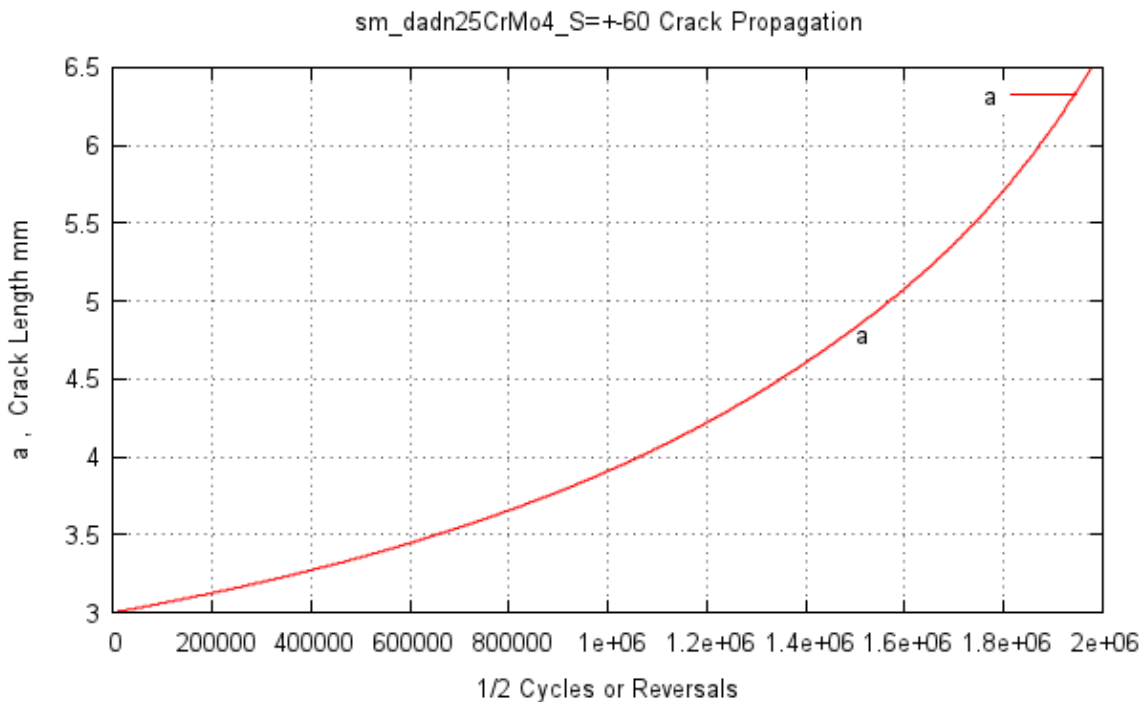
#ACTIVATE\_MmMb= 1

M=Mkm=Mkb=fw=1.0

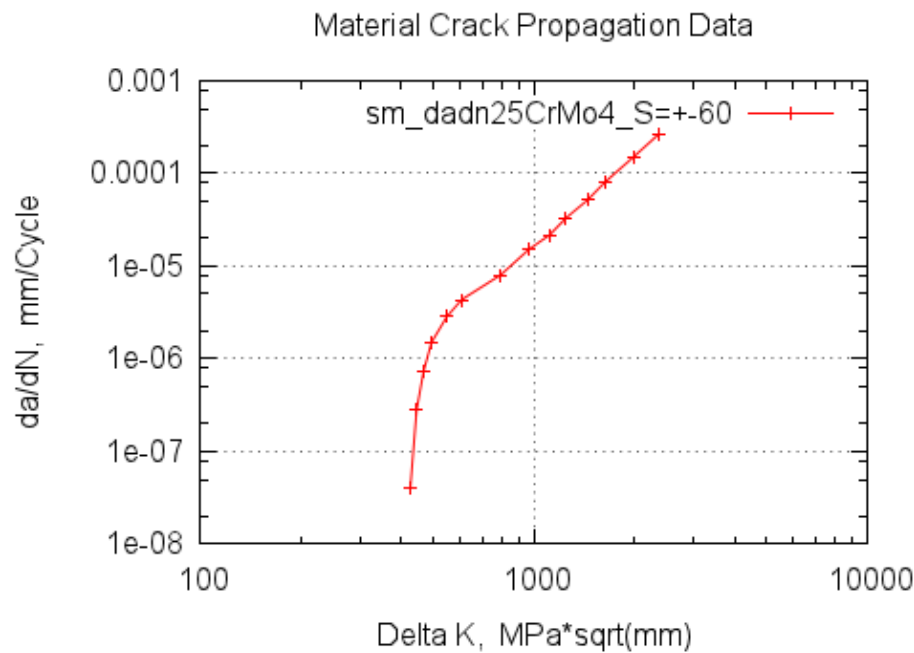
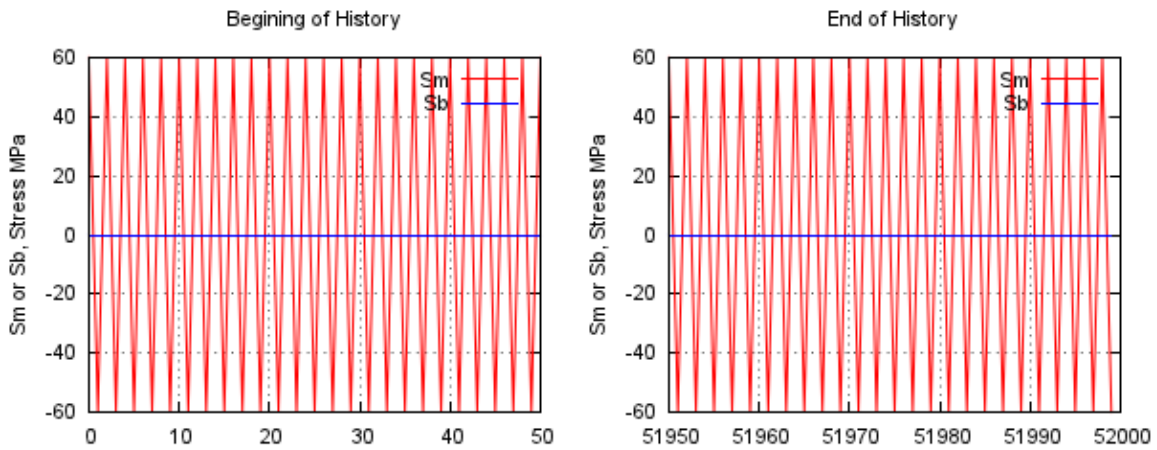
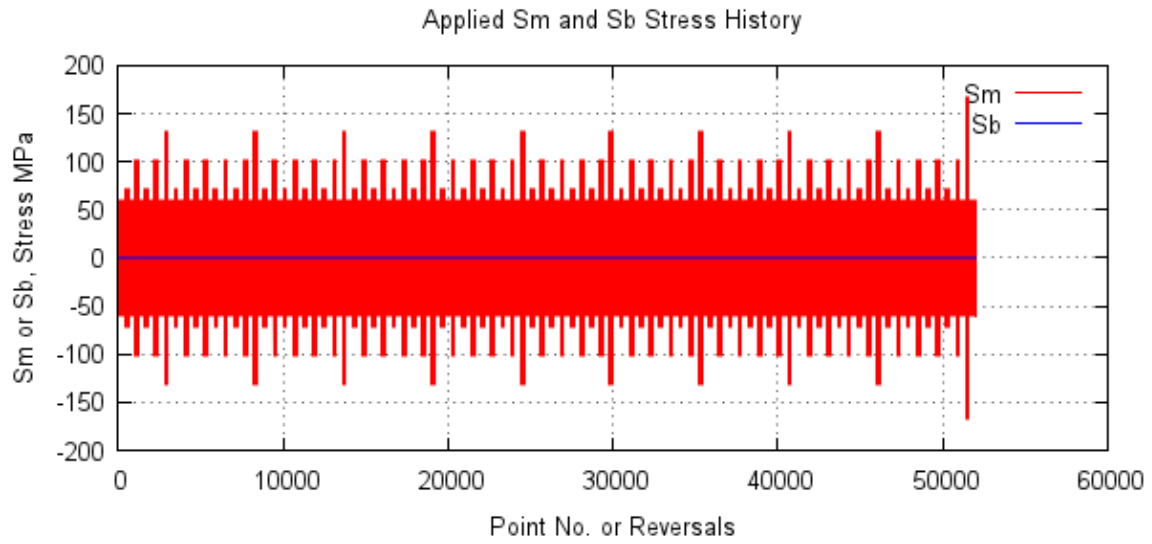
Crack Propagation Results:

( #plateEdgeFlaw.f vers. 3.11 #makereport5 vers. 2.1 )

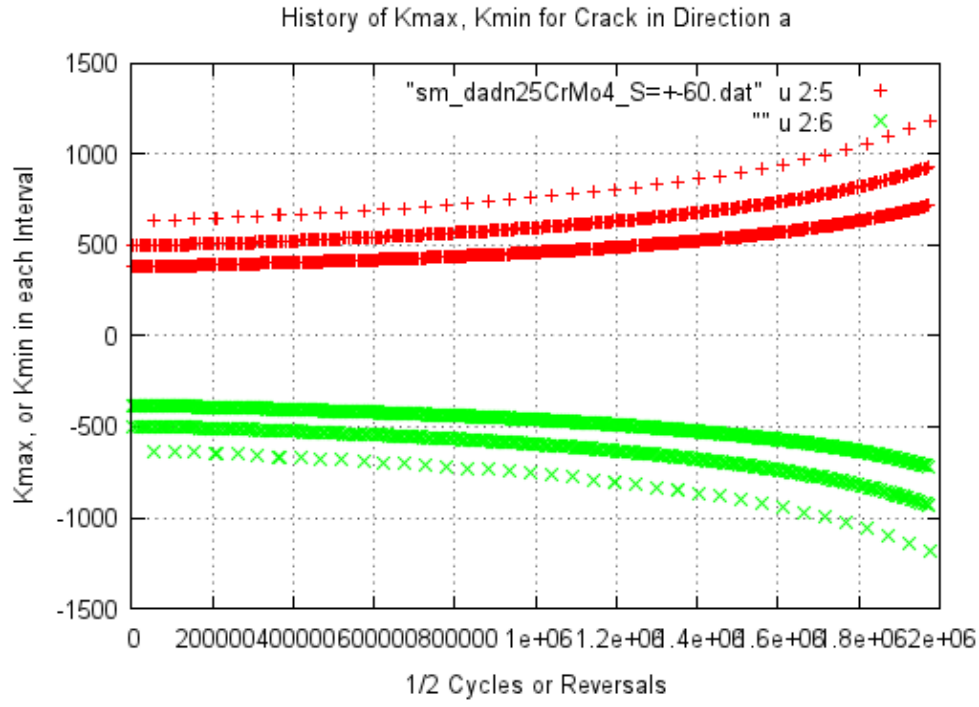
- No. of Reversals= 1975402 revs. or 987701 cycles
- Final **a** = 0.649E+01 mm
- No. of History Reps.= 38 reps. + 51402 revs.



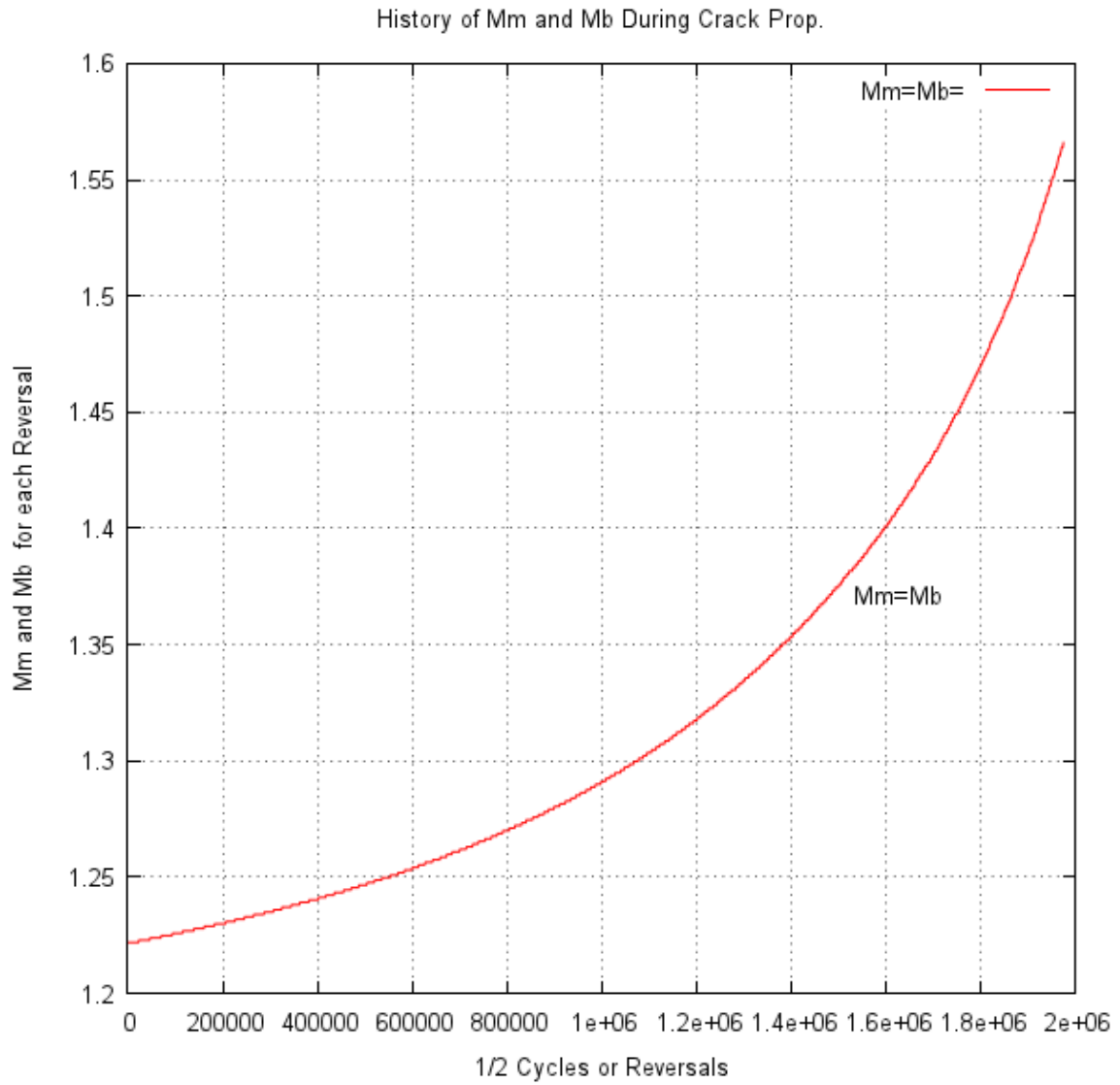
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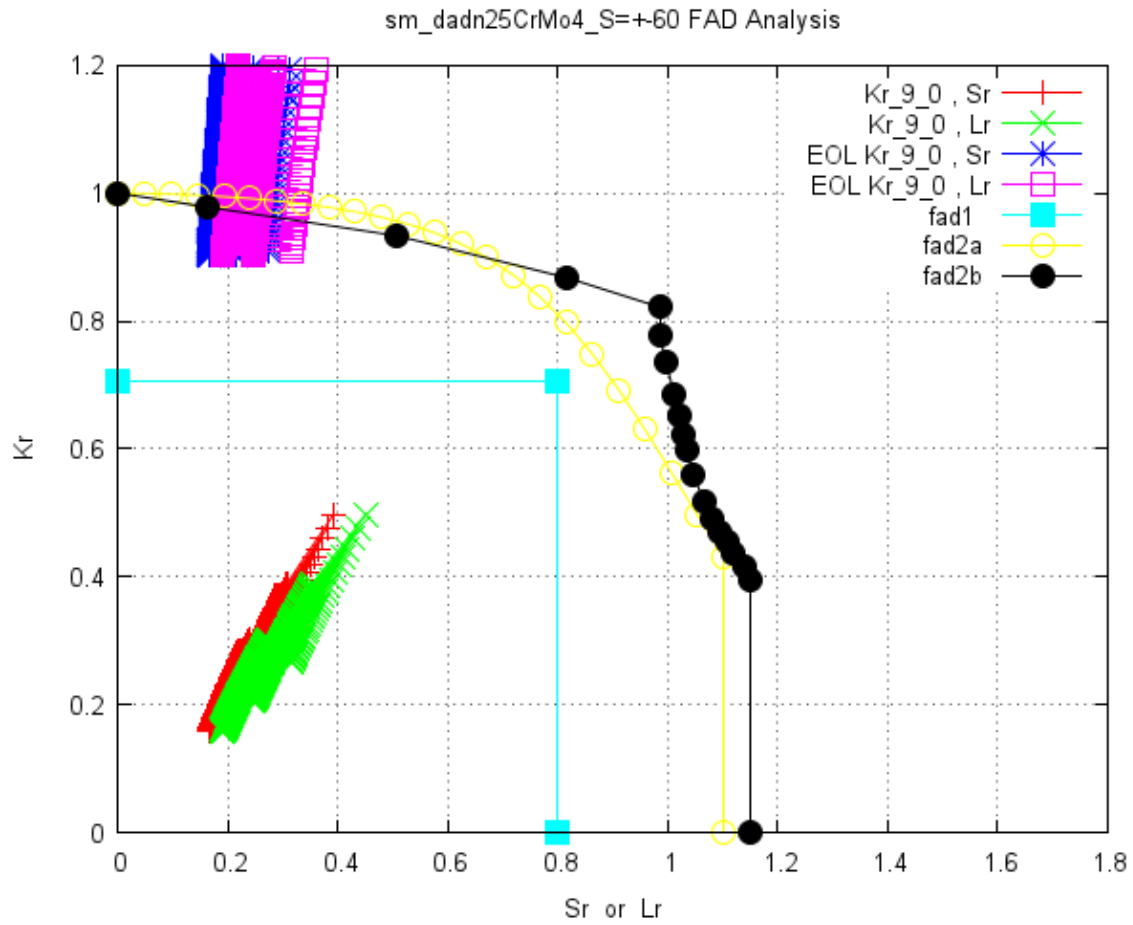


# FAD Results for sm\_dadn25CrMo4\_S=+60

## #TensileFile= boller\_30CrNiMo8cylin\_Tens.txt

#PmEOL= 524. #PbEOL= 50.  
#Kmat= 2385.

# plateEdgeFAD.f vers. 0.5



## Crack Initiation Life Results for sm\_dadn25CrMo4\_S=+-60 (Assume $K_t= 1.8$ for welds)

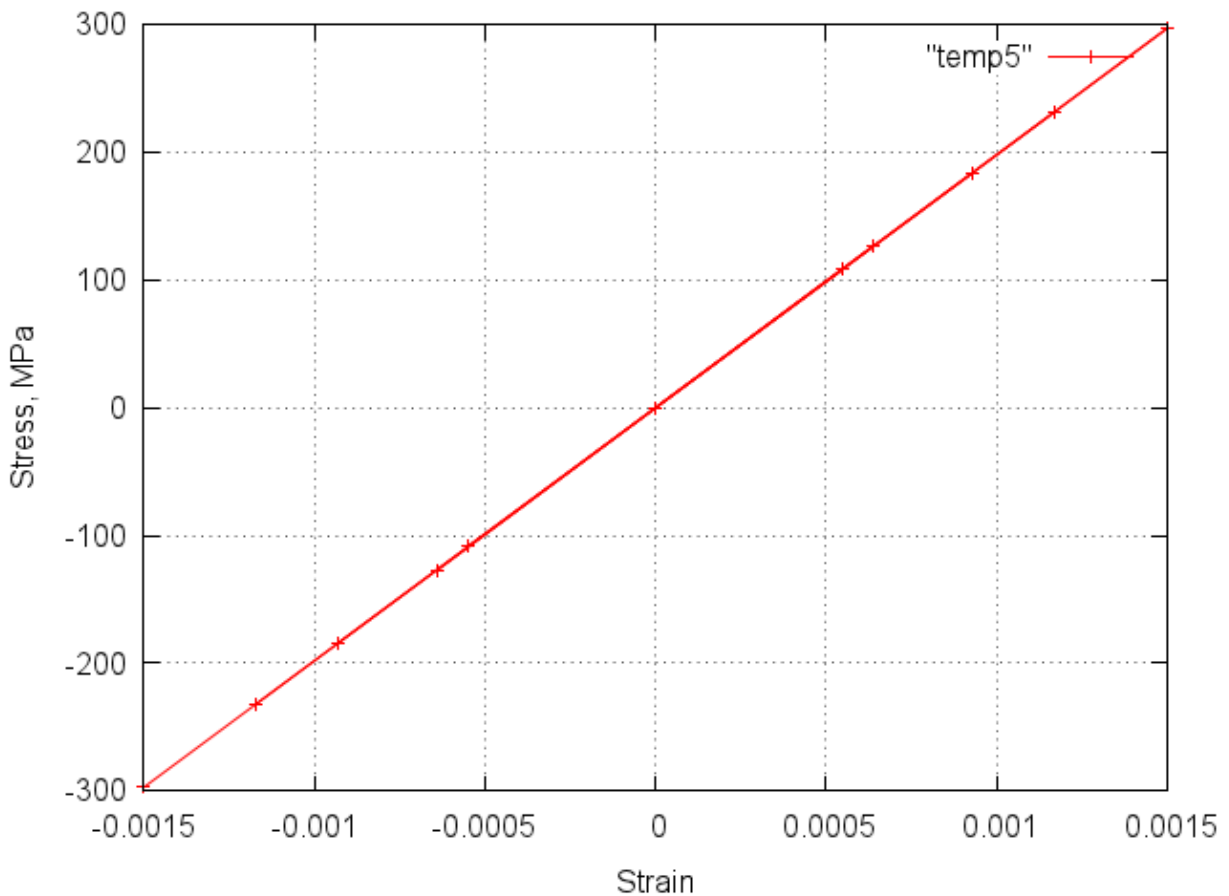
Files Used:

- [Stress History \(Sb+Sm\)](#)
- [Rainflow File](#)
- [Material File](#)

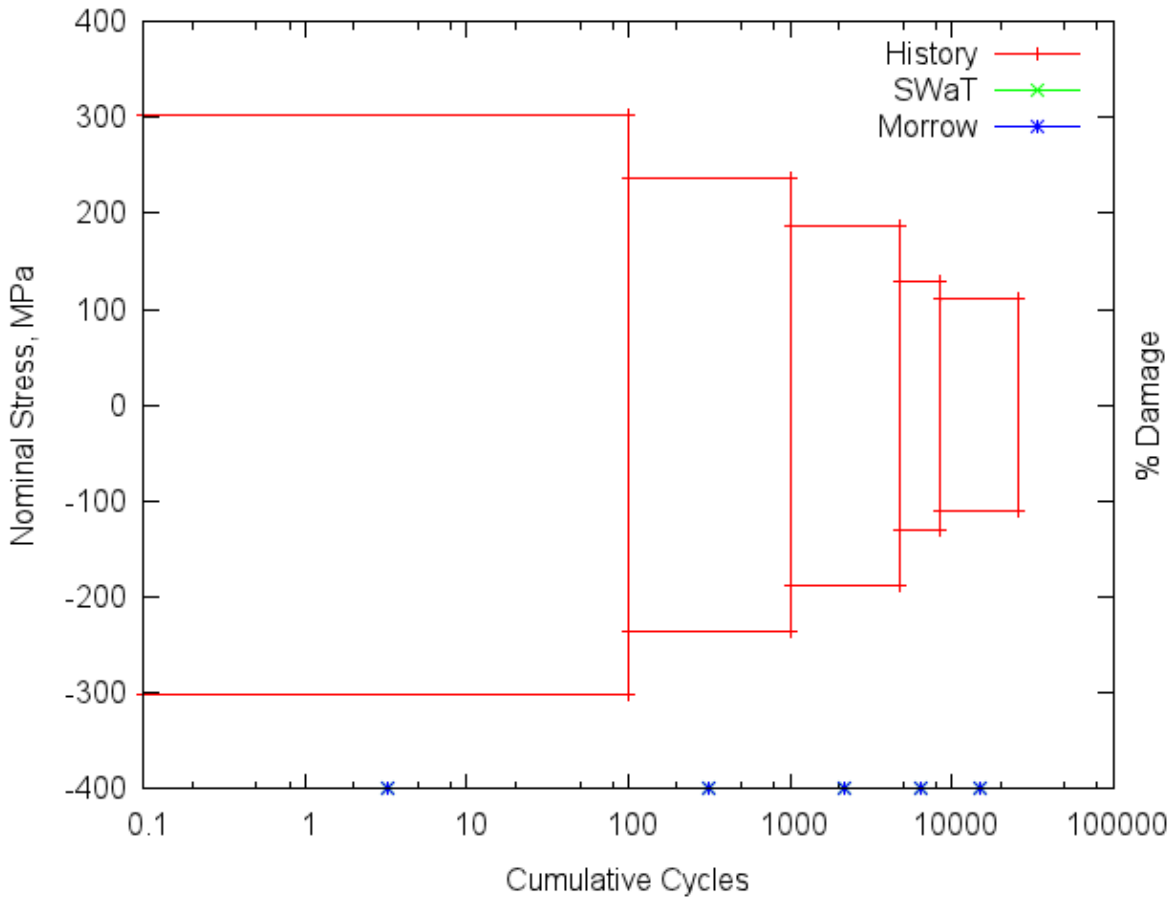
Predicted History Repetitions to Initiation:

StrainLife_Reps	SWaT_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	%SWaT	%Sts	%Morr
1	302.4	-302.4	100.0	297.	-297.	594.	0.00150	-.00150	0.00299	0.0	0.0	0.0	0.0
2	235.8	-235.8	900.0	232.	-232.	463.	0.00117	-.00117	0.00233	0.0	0.0	0.0	0.0
3	187.2	-187.2	3800.0	184.	-184.	368.	0.00093	-.00093	0.00185	0.0	0.0	0.0	0.0
4	129.6	-129.6	3800.0	127.	-127.	254.	0.00064	-.00064	0.00128	0.0	0.0	0.0	0.0
5	110.3	-110.3	17400.0	108.	-108.	217.	0.00055	-.00055	0.00109	0.0	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_edge_flaw #with or without weld using ACTIVATES:
#ACTIVATE_MmMb= 1 # Deactivate = 0
#ACTIVATE_MkmMkb= 0 # Note used in plate_edge_flaw
#ACTIVATE_fw= 0 # Note used in plate_edge_flaw
# #Other #TYPE= options:
# # plate_surface_flaw
```

## Results for sm\_dadn25CrMo4\_S=+60 : Crack Propagation Plate Edge Flaw

```
#
#           # plate_tru_flaw
#           # plate_embedded_flaw
#           # plate_long_surface_flaw
#           #
#           # pipe_inside_flaw
#           # pipe_full_inside_flaw
#           # pipe_full_outside_flaw
#           #
#           # rod_surface_flaw
#           # rod_full_outside_flaw

#           # These problem types are used to activate
#           # 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= 24.0   # plate width
#ri= 00.   # Internal diameter if pipe problem. Ignored if not pipe
#azero= 3.0 # initial crack depth
#czero= 0.0 # initial 1/2 crack width at surface
#L= 00.    # Weld Feature width. Ignored if ACTIVATE_MkmMkb= 0 (above)

#HISTORYFILE= c100histPm.txt   # historyFileName for setup only
#           # 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= all_30-34CrNiMo+.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 none # Kth a m Kc units (ignored if #DADN= table )
#DADN_TABLE= luke_dadn_25CrMo4_R=-1_fit.txt # 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= boiler_30CrNiMo8cylin_Tens.txt #enter "none" if no FAD
#PmEOL= 524. #Set these so that Pm+Pb= 0.82*Syield for default.
#PbEOL= 50.
#Kmat= 2385. #used end of dadn curve for 34CrNiMo6
#PinJoint= 0 # not used for plateEdgeFlaw.f
#
#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,
```



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```
# 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 sm\_dadn25CrMo4\_S=+-60

Delta_K	da/dN					
0.4254730E+03	0.4022000E-07	0.2628872E+01	-0.7395558E+01	0.0000000E+00	0.0000000E+00	1
0.4444530E+03	0.2794740E-06	0.2647826E+01	-0.6553658E+01	0.1895404E-01	0.8418994E+00	2
0.4665970E+03	0.7302230E-06	0.2668942E+01	-0.6136545E+01	0.2111602E-01	0.4171138E+00	3
0.4924310E+03	0.1494050E-05	0.2692345E+01	-0.5825635E+01	0.2340341E-01	0.3109097E+00	4
0.5483020E+03	0.2850010E-05	0.2739020E+01	-0.5545154E+01	0.4667449E-01	0.2804813E+00	5
0.6071950E+03	0.4332370E-05	0.2783328E+01	-0.5363275E+01	0.4430842E-01	0.1818790E+00	6
0.7940460E+03	0.7975730E-05	0.2899846E+01	-0.5098229E+01	0.1165173E+00	0.2650452E+00	7
0.9685030E+03	0.1520900E-04	0.2986101E+01	-0.4817899E+01	0.8625531E-01	0.2803302E+00	8
0.1113510E+04	0.2155650E-04	0.3046694E+01	-0.4666422E+01	0.6059313E-01	0.1514773E+00	9
0.1246410E+04	0.3276720E-04	0.3095661E+01	-0.4484560E+01	0.4896688E-01	0.1818614E+00	10
0.1448530E+04	0.5157170E-04	0.3160928E+01	-0.4287589E+01	0.6526661E-01	0.1969719E+00	11
0.1638910E+04	0.8117580E-04	0.3214555E+01	-0.4090573E+01	0.5362749E-01	0.1970153E+00	12
0.1998980E+04	0.1521150E-03	0.3300808E+01	-0.3817828E+01	0.8625340E-01	0.2727454E+00	13
0.2373600E+04	0.2658390E-03	0.3375407E+01	-0.3575381E+01	0.7459903E-01	0.2424467E+00	14

## 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 !!
# steel 30CrNiMo8 + 34CrNiMo6V merged file
# Files from Boller/Seeger, Santera/Zenner, and Liebrich merged then fitted.

#FileType= strain_life
#DataType= fitted
```

## Results for sm\_dadn25CrMo4\_S=+-60 : Crack Propagation Plate Edge Flaw

```

#Strain_units= strain
#Stress_Units= MPa
#Name= 30CrNiMo8
#Name= 34CrNiMo6V
#Name= mergedFile
#Stress_units= mpa
#Strain_units= strain

#Sy= 787 # avg of 4 reported files.
#Su= 970 # average of 4 reported files.
#eu= 0.50 #strain at Su assume 1/2 of A5= 16 to 20%
#E= 206000 mpa #rough average
#FractureStrain= 0.708
#FractureStress= 1168. mpa

#FractureStrain= 0.708
#FractureStress= 1168.
#BHN= . not reported
#%RA= 0. %

#The standard Coffin/Manson fit process worked well in this case.
#Monotonic Props.                               Cyclic Props.
#ELAS. MOD.= 29878. KSI, 206. GPA                K'          = 125.0 KSI, 862.MPA
#YIELD,0.2%= 114. KSI, 787. MPA                  N'          = 0.0609
#ULT. STRG.= 141. KSI, 970. MPA                  F. STRG COEF= 123.3 KSI, 850.MPA
#K          = 0.0 KSI, 0. MPA                    F.STRG EXP, b=-0.0398
#N          = 0.0000                              FAT DUCT COEF= 0.7949
#RED. IN AREA = 0.0                              F.DUCT EXP, c=-0.6534
#T. FRAC. STG.= 169.4 KSI, 1168. MPA            Exp Cyc Yld = 86. Ksi, 590.MPA
#T. FRAC. STR.= 0.708                            Fit Cyc Yld = 84. Ksi, 578.MPA
#No. fatigue data points= 49
#
#NOTE!! The Following Points are FITTED DATA:
#NOTE!! Fitted Stress computed using Exper. K' and n'
#TotalStrain    2Nf    Stress Mean    Plastic Strain
#Amp
0.79903         1    1081.4    0.    0.79378    206000. #Fitted_point
0.01693         500    706.0    0.    0.01350    206000. #Fitted_point
0.01185         1000    673.3    0.    0.00858    206000. #Fitted_point
0.00859         2000    642.3    0.    0.00547    206000. #Fitted_point
0.00598         5000    604.2    0.    0.00305    206000. #Fitted_point
0.00480         10000    577.8    0.    0.00199    206000. #Fitted_point
0.00401         20000    553.7    0.    0.00133    206000. #Fitted_point
0.00336         50000    525.7    0.    0.00081    206000. #Fitted_point
0.00304         100000    507.5    0.    0.00058    206000. #Fitted_point
0.00281         200000    491.7    0.    0.00043    206000. #Fitted_point
0.00260         500000    473.8    0.    0.00030    206000. #Fitted_point
0.00248         1000000    462.0    0.    0.00023    206000. #Fitted_point
0.00238         2000000    451.2    0.    0.00019    206000. #Fitted_point
0.00227         5000000    438.0    0.    0.00014    206000. #Fitted_point
0.00219         10000000    428.5    0.    0.00011    206000. #Fitted_point
0.00213         20000000    419.2    0.    0.00009    206000. #Fitted_point
0.00205         50000000    407.1    0.    0.00007    206000. #Fitted_point
#
#

```