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AERO 433: Experimental Stress Analysis

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Constants

Aluminum alloy 3004

Bad Run Data - commented out since not needed

raw = readmatrix("bad_run2.TXT"); A = raw(:,2); B = raw(:,3);

% Time vectors for numeric values ta = find(~isnan(A)); tb = find(~isnan(B));

% Extract non NaN values from raw data A = A(~isnan(A)); B = B(~isnan(B));

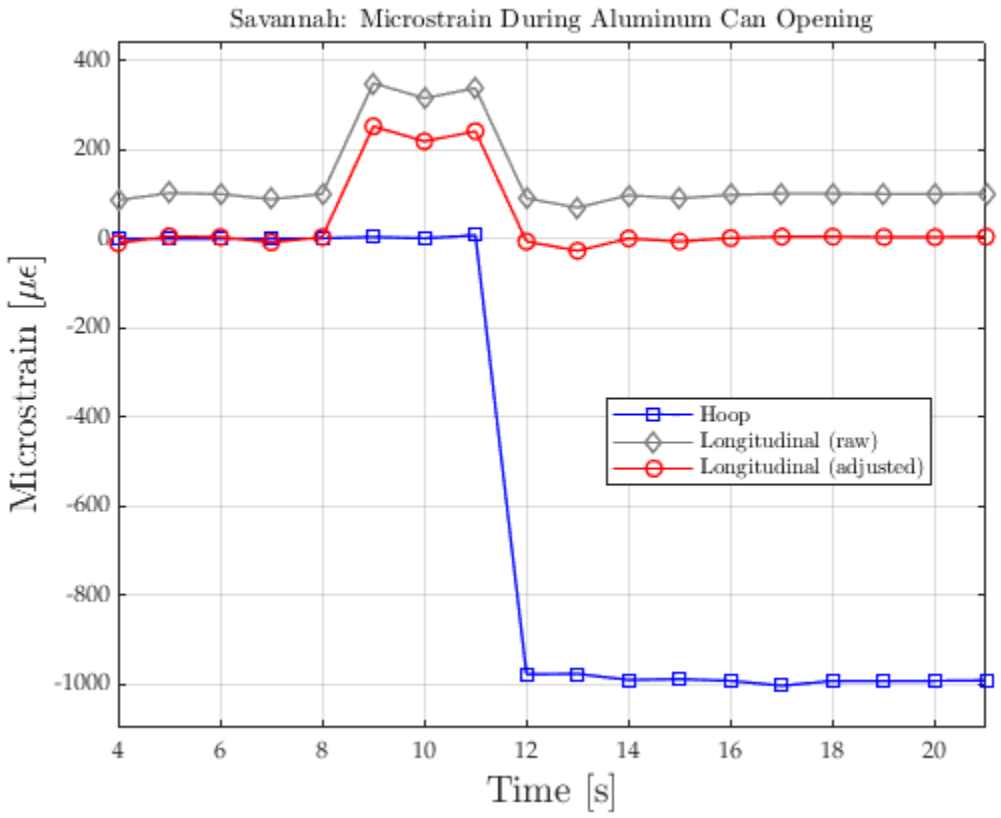
% Remove the outlier in the data figure() % Hoop % Plot before the outlier p1 = plot(ta(1:10),A(1:10),'-square','LineWidth',1); p1.Color = 'b'; hold on % Plot after the outlier p2 = plot([ta(10) ta(12)],[A(10) A(12)],'-square','LineWidth',1); p2.Color = 'b';

% Longitudinal p3 = plot(tb,B,'-o','LineWidth',1); p3.Color = 'r';

% Annotation dim = [.2 .3 .3 .3]; str = 'One outlier removed'; annotation('textbox',dim,'String',str,'FitBoxToText','on');

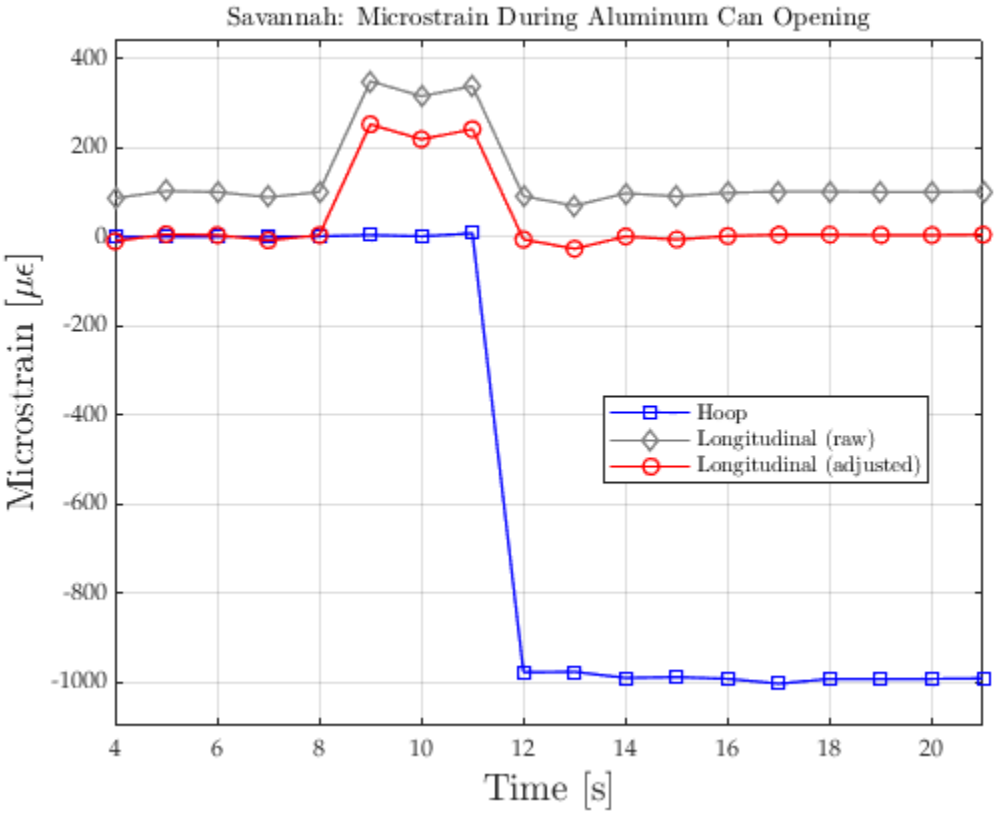
% Graph pretty ylim padded xlim tight xLab = xlabel('Time [s]','Interpreter','latex'); yLab = ylabel('Microstrain [$\mu \epsilon$]','Interpreter','latex'); plotTitle = title('Run 2: Microstrain During Aluminum Can Opening','interpreter','latex'); set(plotTitle,'FontSize',14,'FontWeight','bold') set(gca,'FontName','Palatino Linotype') set([xLab, yLab],'FontName','Palatino Linotype') set(gca,'FontSize', 9) set([xLab, yLab],'FontSize', 14) grid on legend('Hoop','','Longitudinal', 'interpreter','latex','Location', 'best')

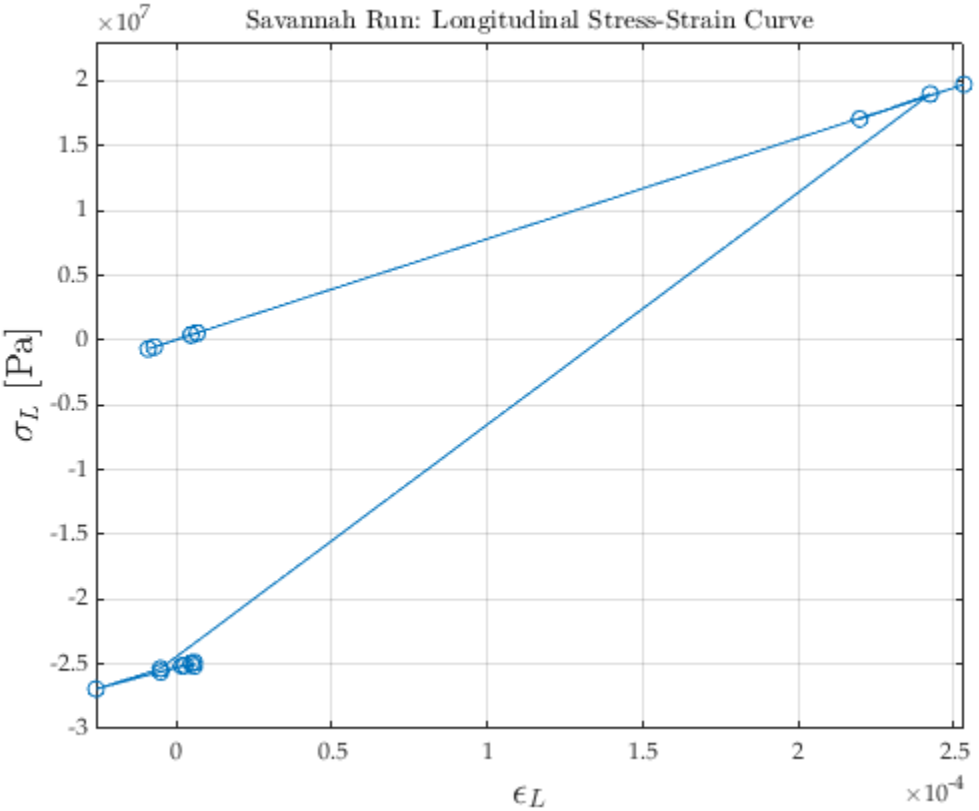
Plot Savannah's dataraw = readmatrix("justin.TXT");

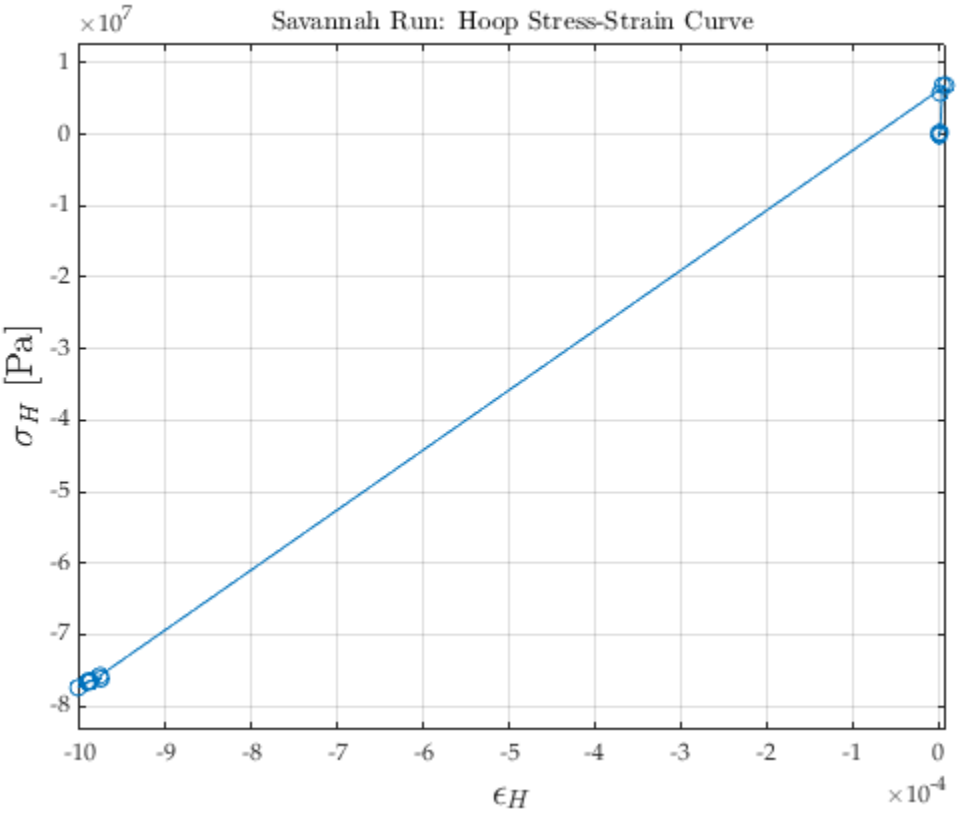


savannah analysis

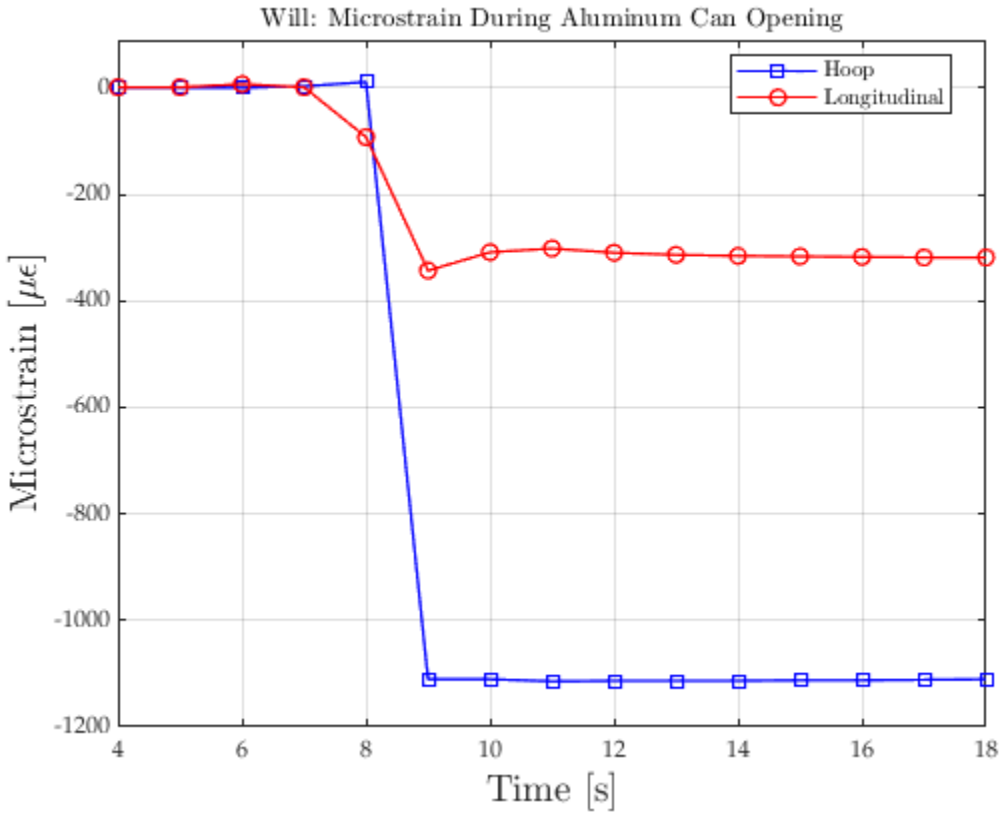
```
Savannah - Run 4
Before:
L micro-strain = 1.6941e-16
H micro-strain = 1.1836
L stress = 0.030243 MPa
H stress = 0.091646 MPa
After:
L micro-strain = -0.49315
H micro-strain = -988.5699
L stress = -25.2988 MPa
H stress = -76.5599 MPa
Run 4 - Stress Ratio (H/L) = 3.0279
H Pressure Before = 0.2966 kPa
L Pressure Before = 2.0852e-16 kPa
H Pressure After = -247.7338 kPa
L Pressure After = -0.60701 kPa
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```


Savannah: Microstrain During Aluminum Can Opening
Microstrain [$\mu\epsilon$]
Time [s]
Hoop
Longitudinal (raw)
Longitudinal (adjusted)
400
200
0
-200
-400
-600
-800
-1000
4
6
8
10
12
14
16
18
20


Savannah Run: Longitudinal Stress-Strain Curve
$\times 10^7$
σ_L [Pa]
ϵ_L
$\times 10^{-4}$
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
0
0.5
1
1.5
2
2.5


Savannah Run: Hoop Stress-Strain Curve
×10^7
1
0
-1
-2
-3
-4
-5
-6
-7
-8
σ_H [Pa]
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
ϵ_H
×10^-4

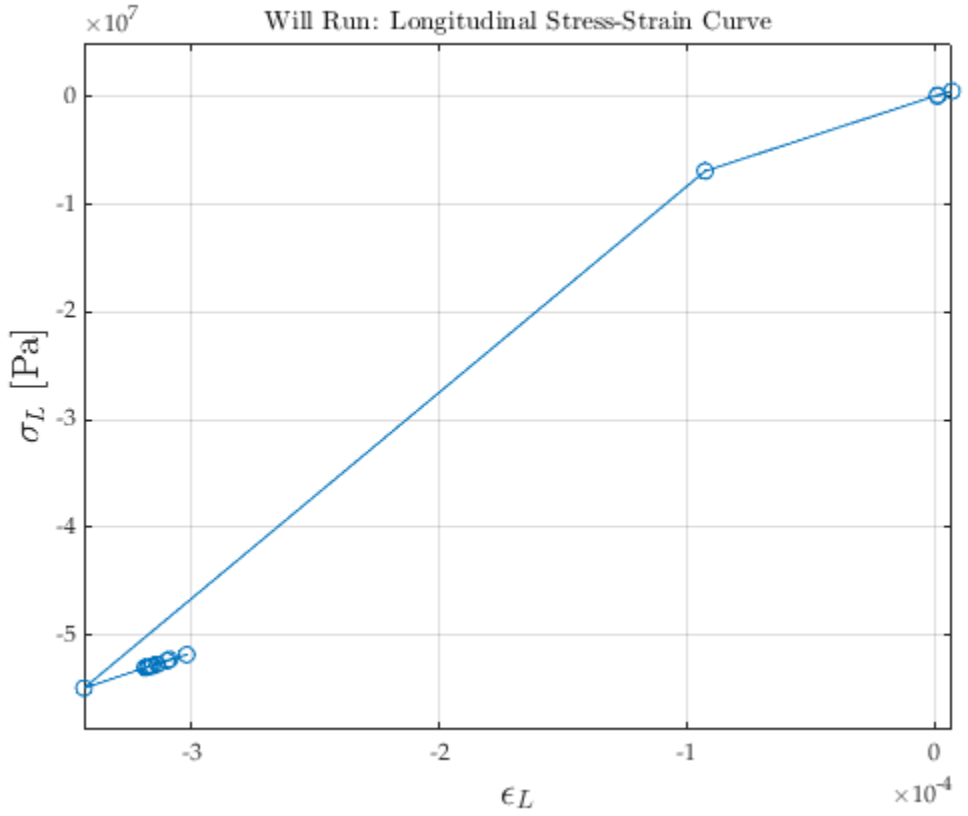
plot run 1 - Will

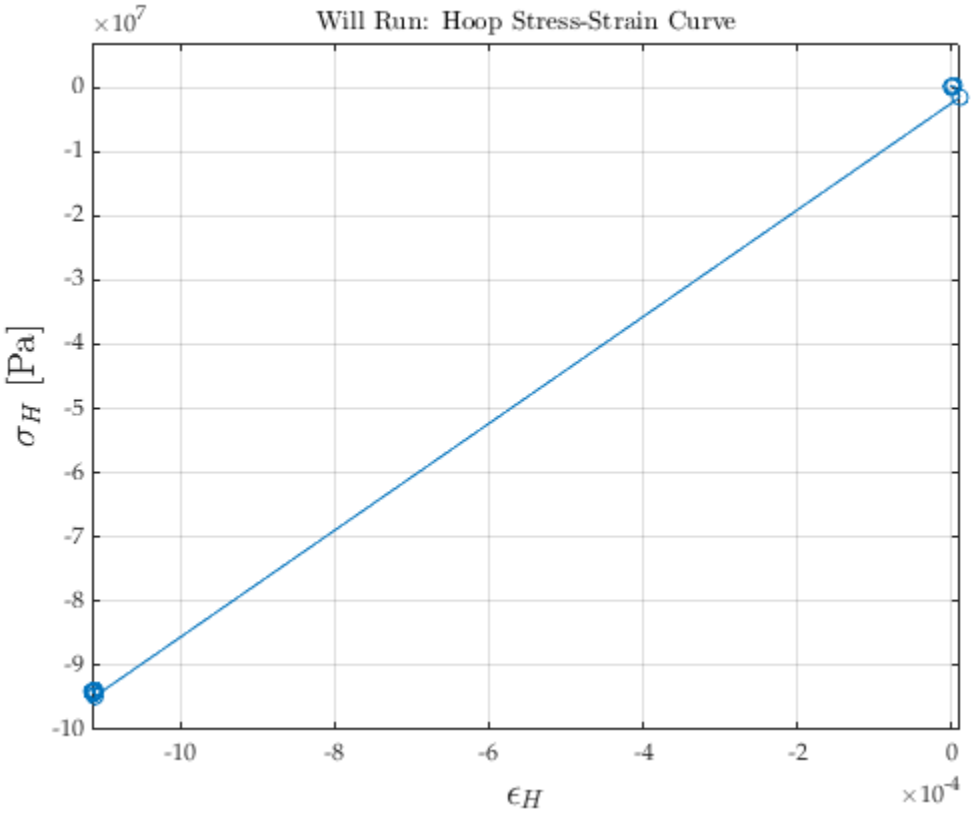


Analysis from Will's Run

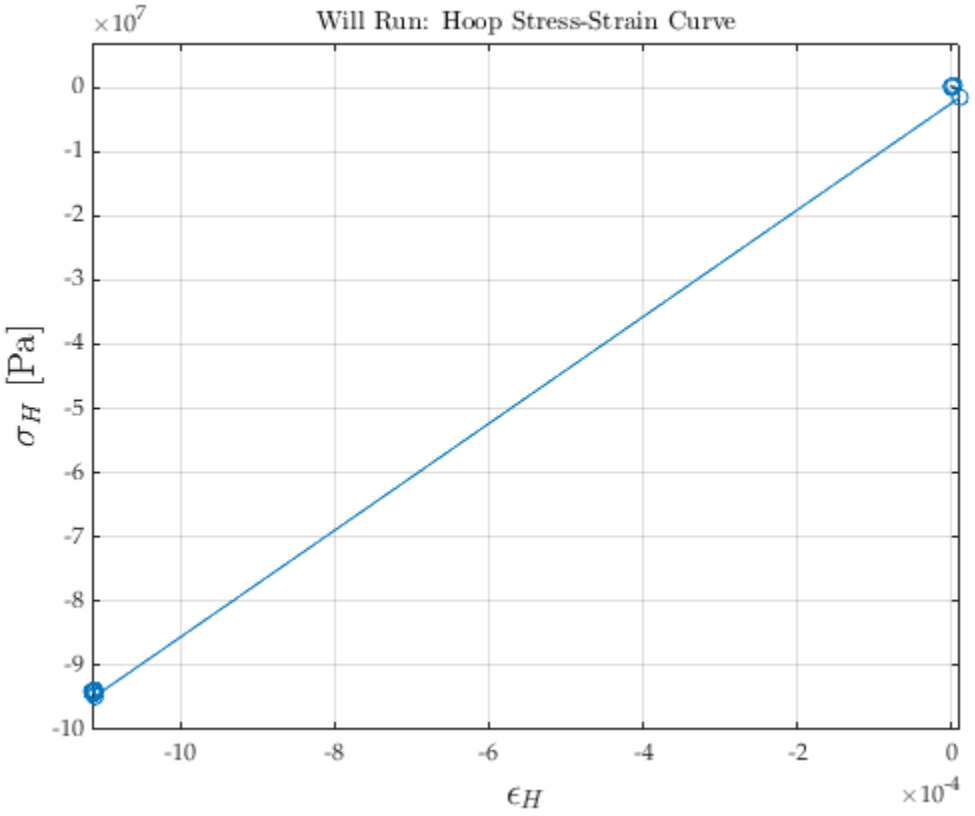
stress - strain curve

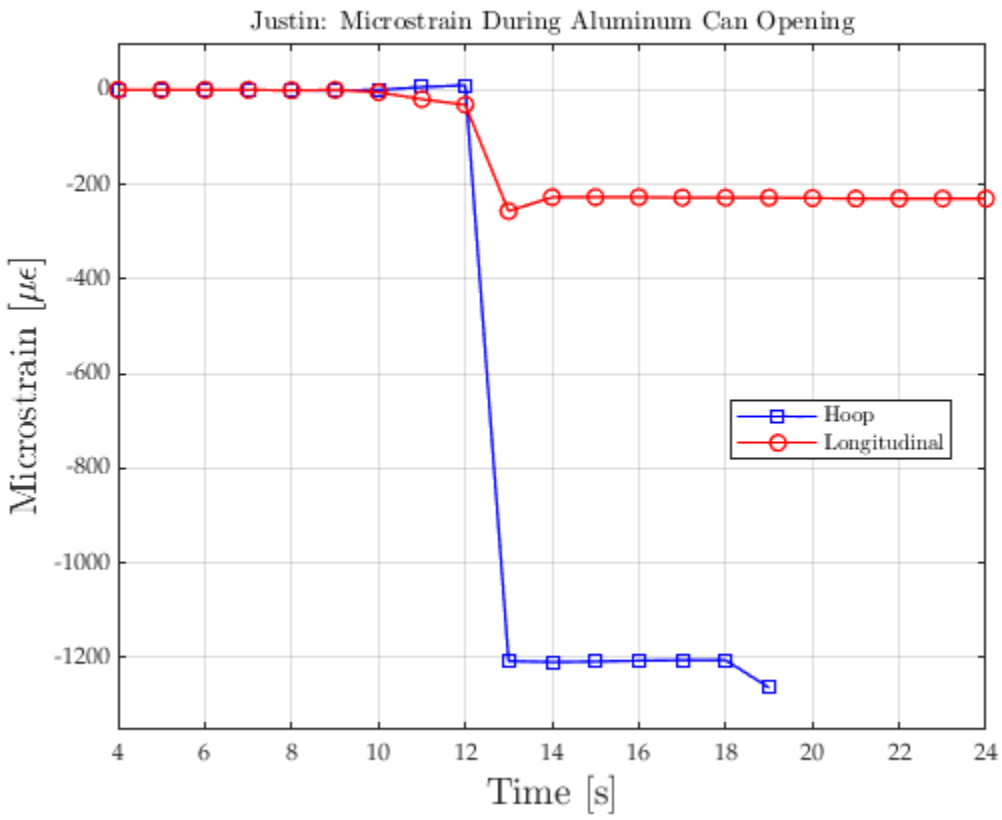
```
Will - Run 1
Before:
L micro-strain = 2.4658
H micro-strain = 0.73973
L stress = 0.20983 MPa
H stress = 0.12029 MPa
After:
L micro-strain = -313.4247
H micro-strain = -1112.5479
L stress = -52.6978 MPa
H stress = -94.1561 MPa
Run 1 - Stress Ratio (H/L) = 1.7769
H Pressure Before = 0.18537 kPa
L Pressure Before = 3.035 kPa
H Pressure After = -278.8024 kPa
L Pressure After = -385.7878 kPa
```


Will Run: Longitudinal Stress-Strain Curve
×10^7
0
-1
-2
-3
-4
-5
σ_L [Pa]
-3
-2
-1
0
ε_L
×10^-4


Will Run: Hoop Stress-Strain Curve
×10^7
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
σ_H [Pa]
-10
-8
-6
-4
-2
0
ε_H
×10^-4

plot Justin run 3

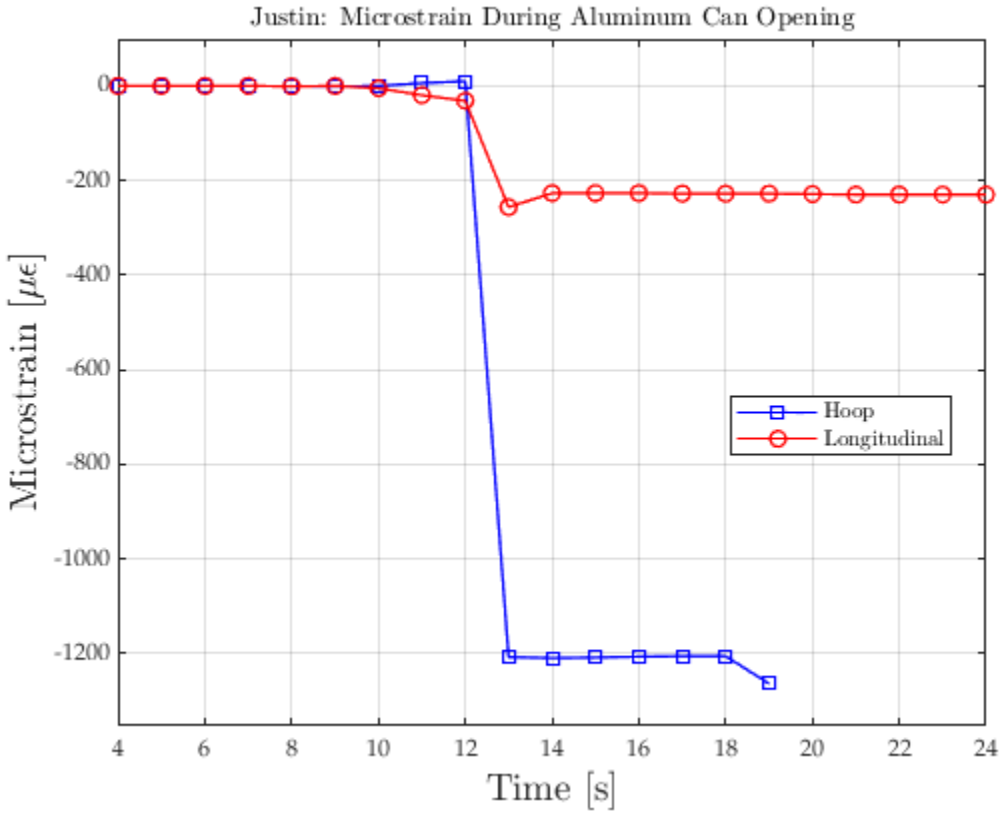


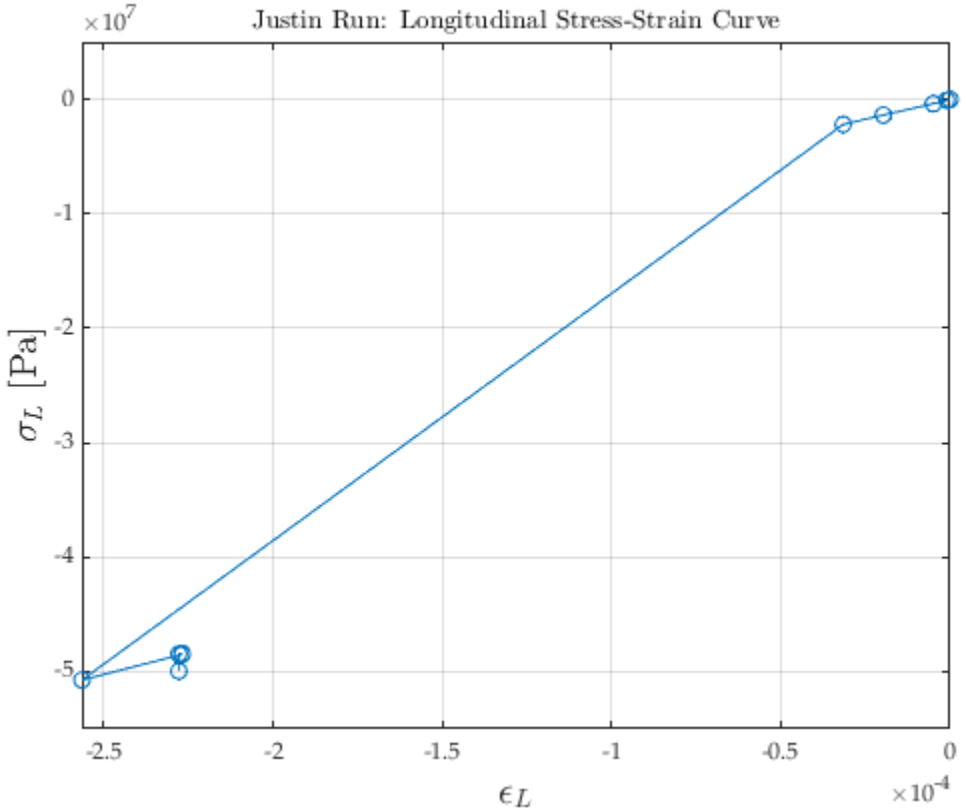


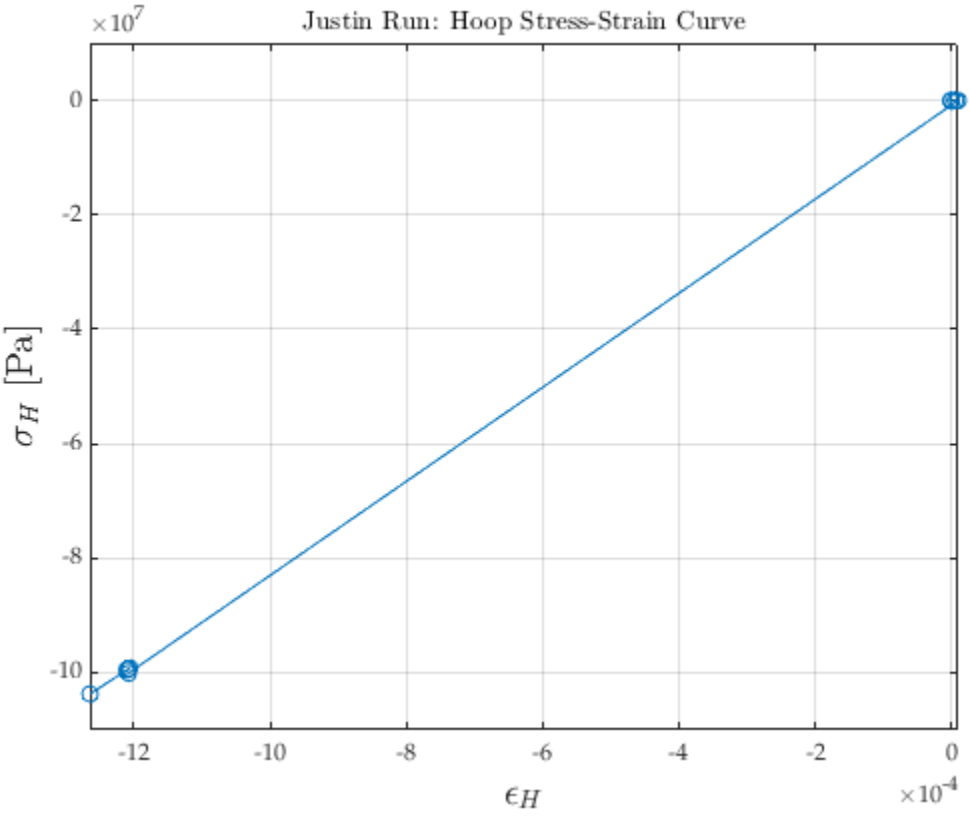
Analysis from Justin's Run

stress - strain curve

```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Justin - Run 3
Before:
L micro-strain = -6.3562
H micro-strain = 1.5342
L stress = -0.45297 MPa
H stress = -0.043617 MPa
After:
L micro-strain = -231.499
H micro-strain = -1215.9687
L stress = -48.9968 MPa
H stress = -100.0708 MPa
Run 3 - Stress Ratio (H/L) = 2.0427
H Pressure Before = 0.38448 kPa
L Pressure Before = -7.8237 kPa
H Pressure After = -304.7195 kPa
L Pressure After = -284.9473 kPa
```


Justin: Microstrain During Aluminum Can Opening
Microstrain [με]
Time [s]
Hoop
Longitudinal
0
-200
-400
-600
-800
-1000
-1200
4
6
8
10
12
14
16
18
20
22
24


Justin Run: Longitudinal Stress-Strain Curve
×10^7
σ_L [Pa]
ε_L
×10^-4
0
-1
-2
-3
-4
-5
-2.5
-2
-1.5
-1
-0.5
0



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