MATEware Tutorial

MATEware Tutorial

These lessons help users practice the software before using real samples. If problems occur during this exercise please consult the User Manual for detailed information.

Materials Required:

Assembled MATE system
Six Validation Sample Wells
Six Empty Sample Wells
Six 500g Calibration Weights

Sections:

1. Calibration Exercise
2. Analyze Exercise
3. Stimulate Exercise
4. A & S Sequence Exercise
5. Data Retrieval Exercise

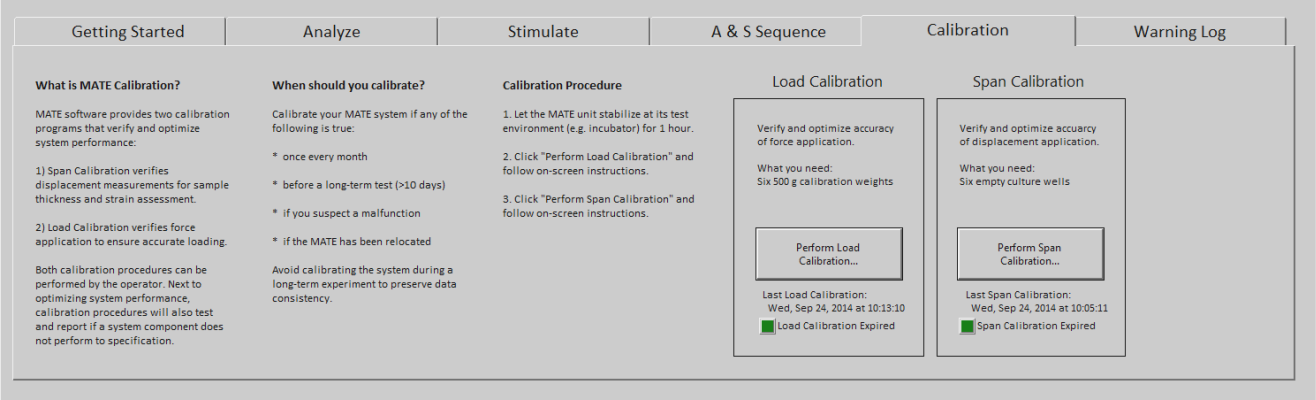
Section 1: Calibration Exercise

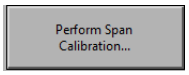
Before using the MATE, for the first time, it needs to undergo a span and load calibration. These calibrations should be repeated once a month to ensure optimal performance

1. Load the six empty **Empty Wells** into a **MATE Tray** and cover the **Tray** with a **MATE Lid**.

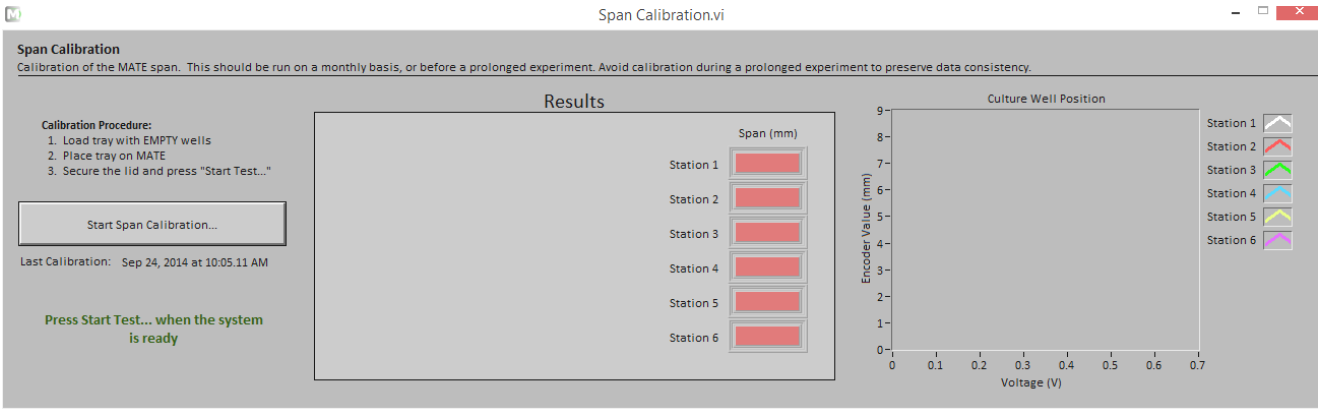
2. Double click the MATEware Icon 

3. On the MATEware main window click the **Calibration Tab.**



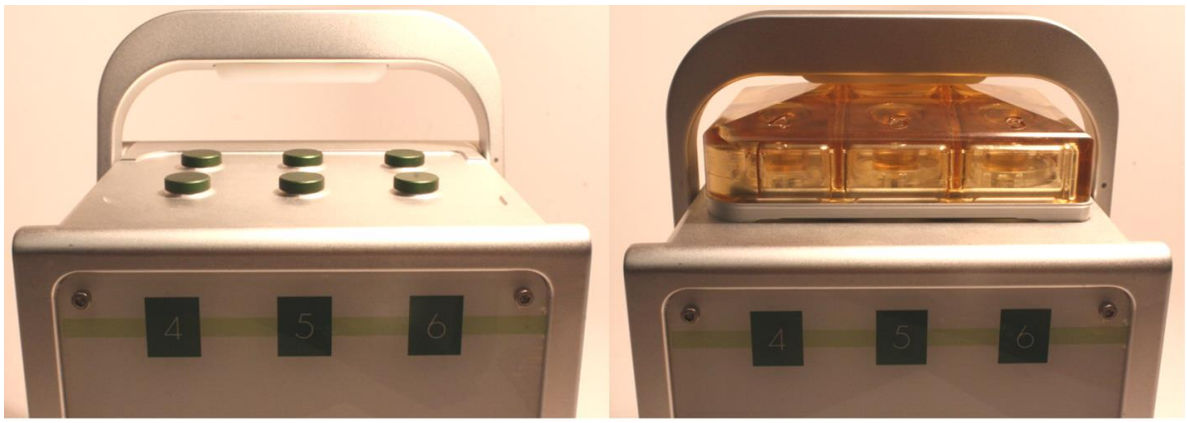
4. Click the **Span Calibration** button 

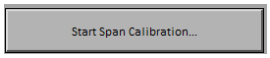
and the Span Calibration window will pop-up:



5. Load the six **Empty Wells** into a **MATE Tray** and cover the **Tray** with a **MATE Lid**.

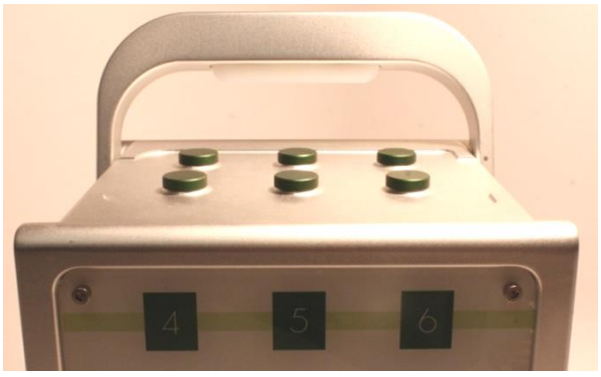
6. Place the loaded Tray on top of the **MATE**:

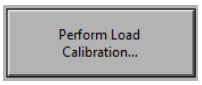


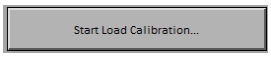
7. Click the **Start Span Calibration** button  and wait while the system automatically calibrates.

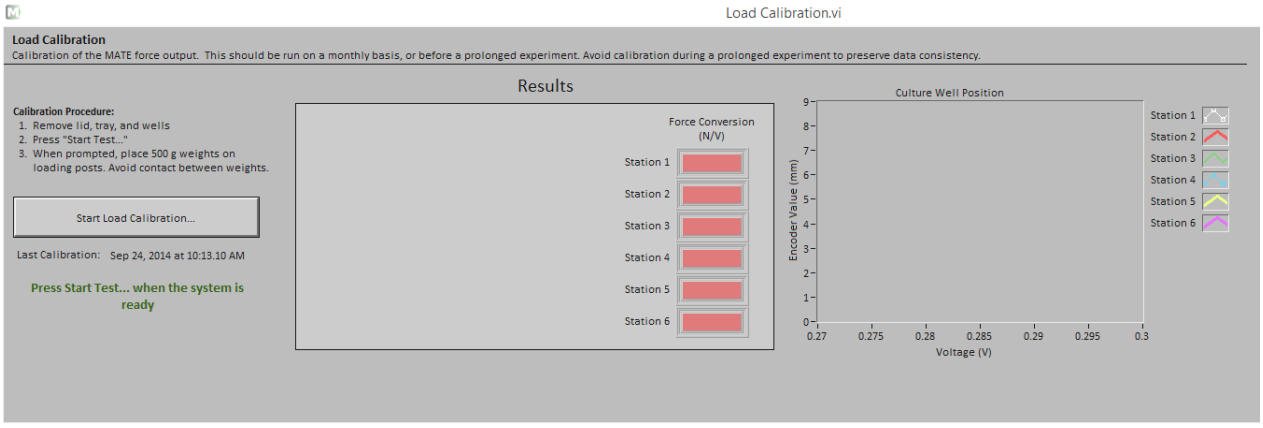
8. The Span Calibration Window will close automatically when complete.

9. Remove the **MATE Tray**, empty **Wells**, and **MATE Lid** from the MATE.

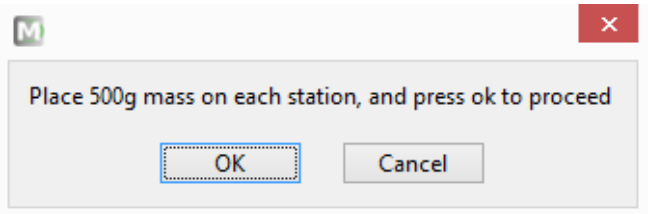


10. Return to the **Calibration Tab** and click the **Load Calibration** button 

11. Click the **Start Load Calibration** button  and wait while the system automatically calibrates.



12. A window will pop up asking that users place the **six 500g calibration weights** on the MATE loading pistons. Center the weights on each piston, then click the **OK** button.



13. The system will continue to **automatically calibrate**. Allow the program to run to completion. The window will automatically close when complete.

14. The MATE system is now calibrated. This calibration procedure should be performed once per month, but not during a long-term test series.

15. MATEware will automatically notify users when the next system calibration is due.

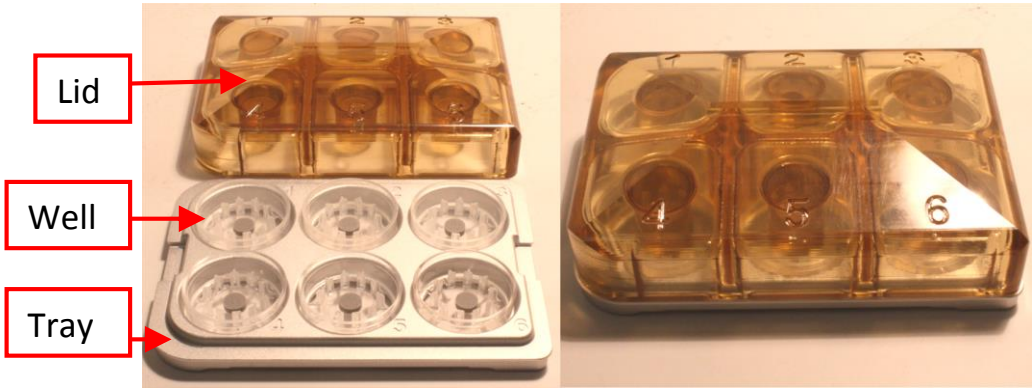
Section 2: Analyze Exercise

This exercise will determine the material proportion of six samples contained in the validation sample wells.

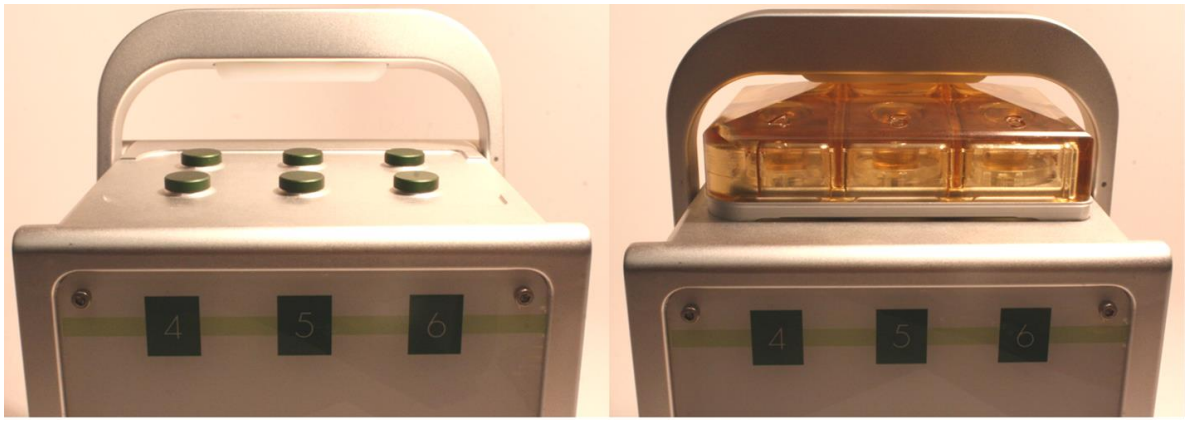
1. Double click the **MATEware Icon** 

on the desktop.

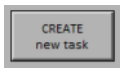
2. Load the **Validation Sample Wells** into a **MATE Tray** and cover the **Tray** with a **MATE Lid**. The validation sample wells contain samples of known material properties.



3. Place the loaded Tray on top of the **MATE**.



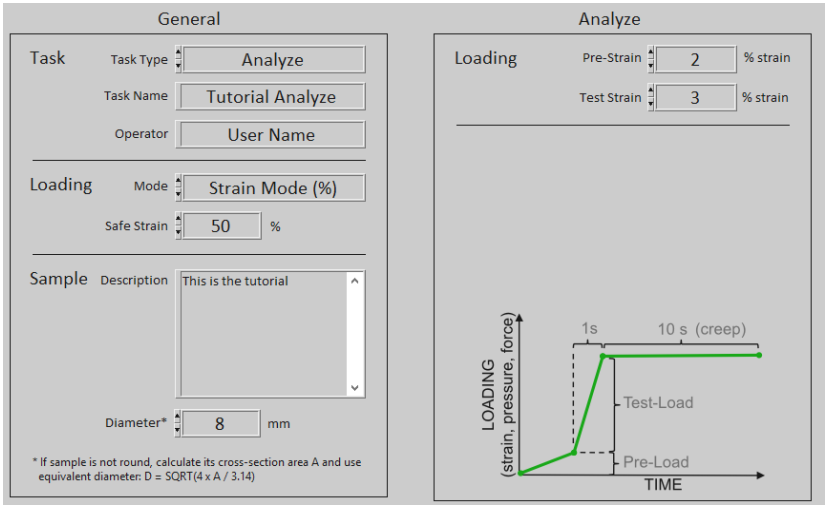
4. Close the MATEbox handle to secure the lid.

5. Click on the **Create Task** button 

on the MATEware main window.

This exercise will measure the material properties of the six samples by first applying 2% pre-strain followed by an additional 3% test strain, allowing material properties to be compared.

6. Set the values of the Configuration Window as shown:



Task Type set to: *Analyze*

Task Name set to *Tutorial Analyze*

Task Operator set to *Your Name*

Loading Mode set to *Strain Mode (%)*

Loading Safe Strain set to *50 %*

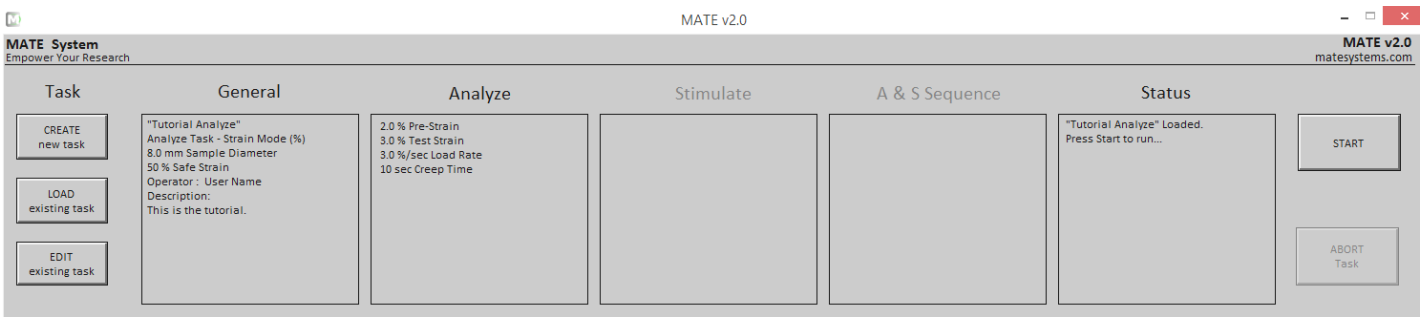
Sample Diameter set to 8 mm

Loading Pre-Strain set to *2 % strain*

Loading Test Strain set to *3 % strain*

7. Click the **Save and Close** button  to save the test configuration file.

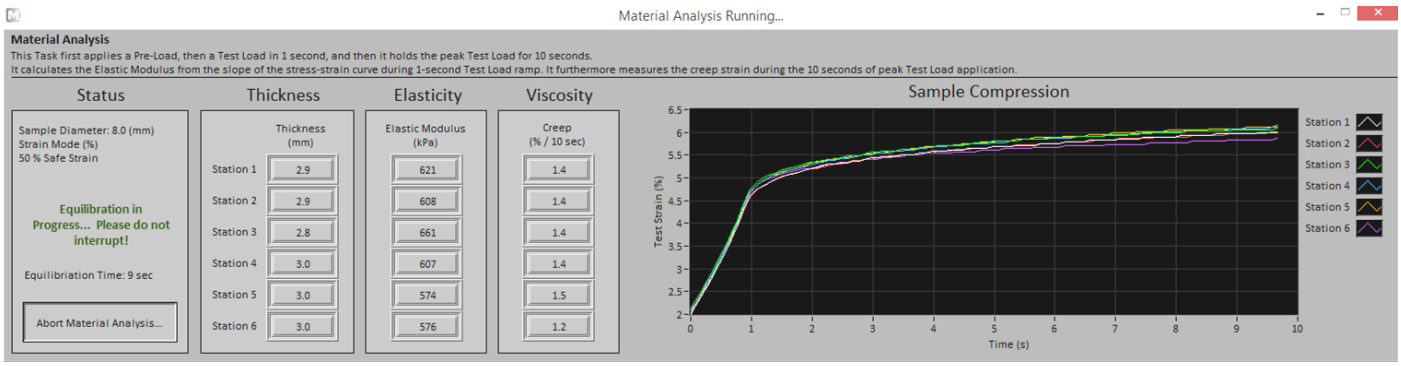
1. Look at the MATEware main window and check that the Task has been loaded into the MATEware main window as shown below:



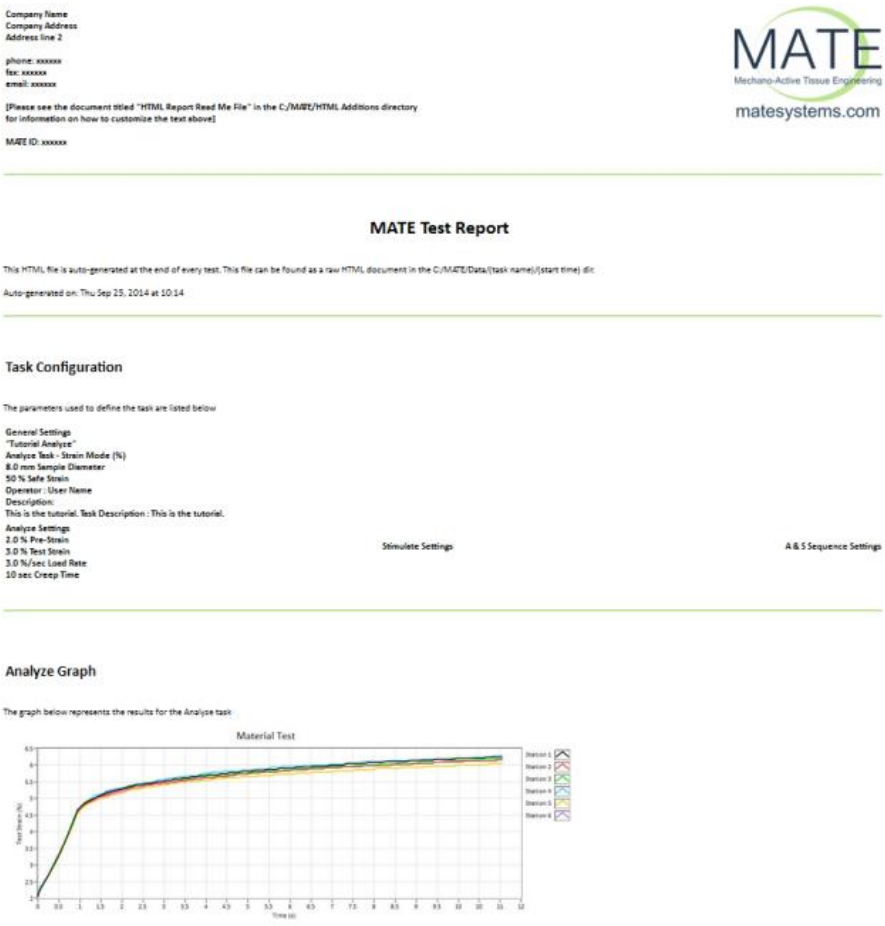
2. Click the **Start** button  to being the test.

3. Wait until the test has been completed, it should take approximately 1 minute.

4. While the test is running windows will pop-up showing real time results as shown below:

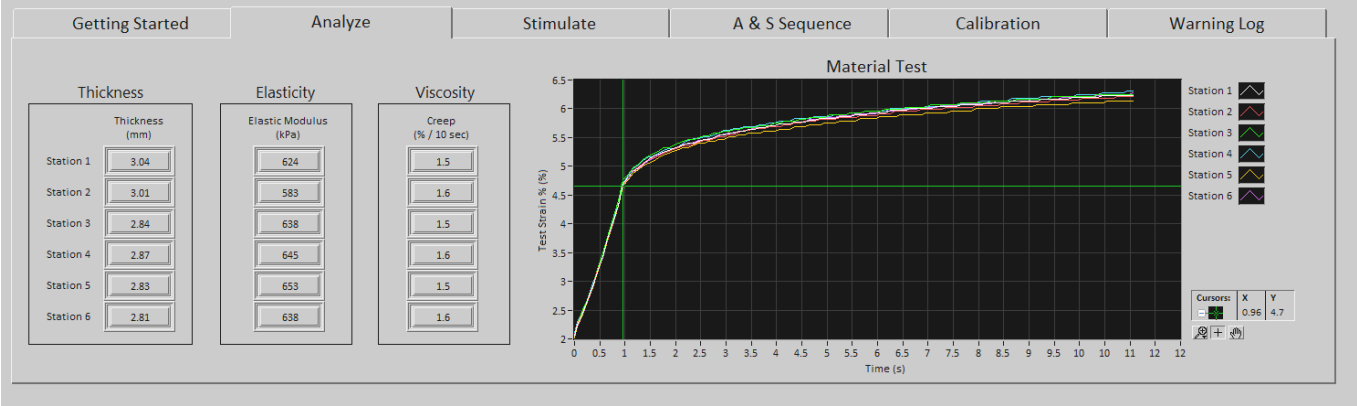


5. An HTML report will automatically pop-up in an internet browser window:



6. Minimize the HTML report.

7. Click the **Analyze Tab** and inspect the results. The results should look similar to the results shown below. Check that all measurements are consistent: thickness should be 2.9mm ± 0.2mm, elasticity should be 600kPa ± 100kPa, creep should be 1.5 %/10sec ± 0.3%/10sec.

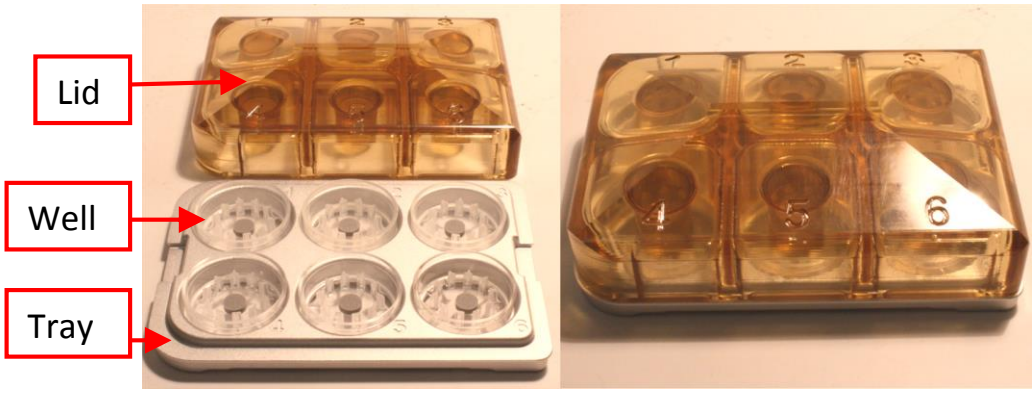


Section 3: Stimulate Exercise

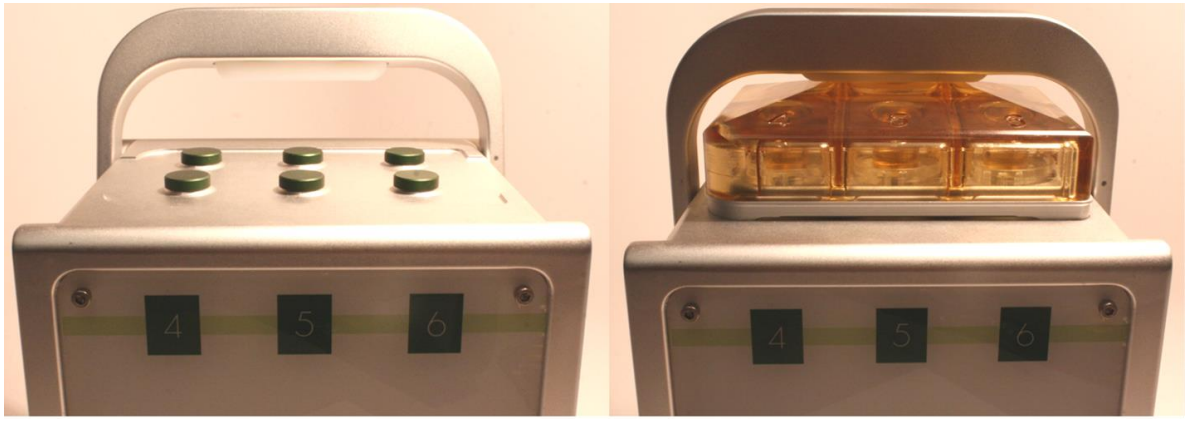
This exercise stimulates the samples of the validation sample wells. First, samples are stimulated in “peak strain optimization”, whereby the peak strain will exceed the “safe strain” therefor , which in turn will unload specimens for protection.

1. Double click the **MATEware Icon** 

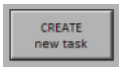
on the desktop.
2. Load the **Sample Wells** into a **MATE Tray** and cover the **Tray** with a **MATE Lid**.



3. Place the loaded Tray on top of the **MATE**.

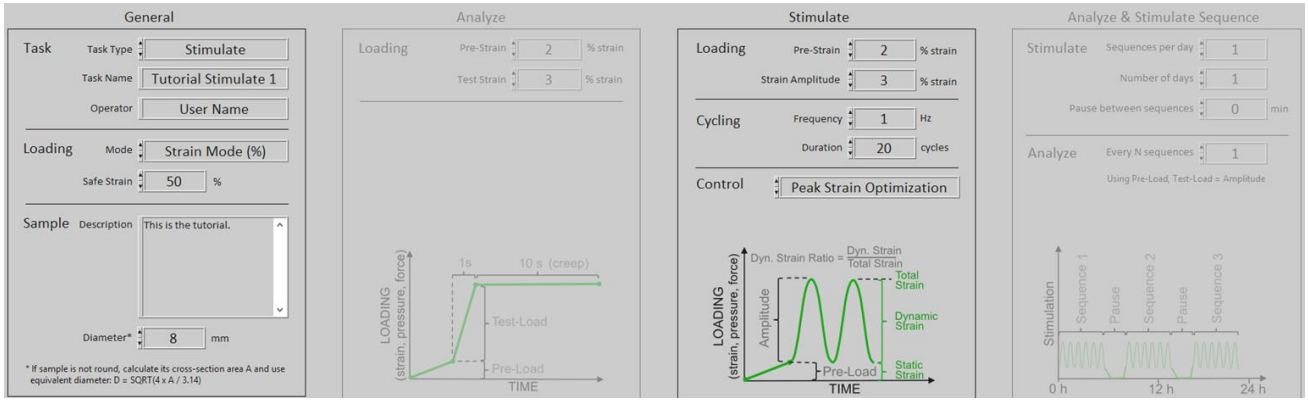


4. Close the MATEbox handle to secure the lid.

Click on the **Create Task** button 

on the MATEware main window.

5. Set the values of the Configuration Window as shown:



General

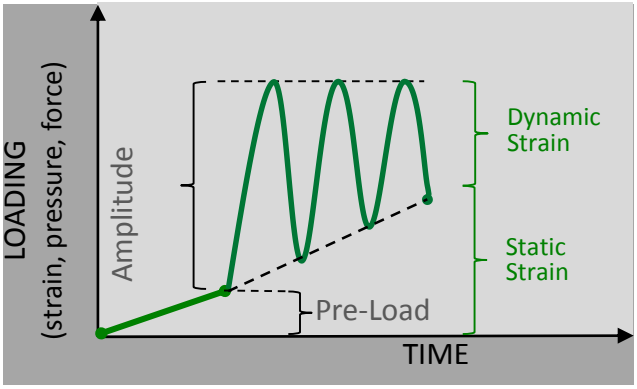
Task Type set to:	*Stimulate*
Task Name set to	*Tutorial Stimulate 1*
Operator set to	*Your Name*
Loading Mode set to	*Strain Mode (%)*
Loading Safe Strain set to	*50 %*
Sample Description	*This is the tutorial.*
Sample Diameter set to	*8 mm*

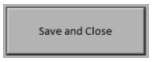
Stimulate

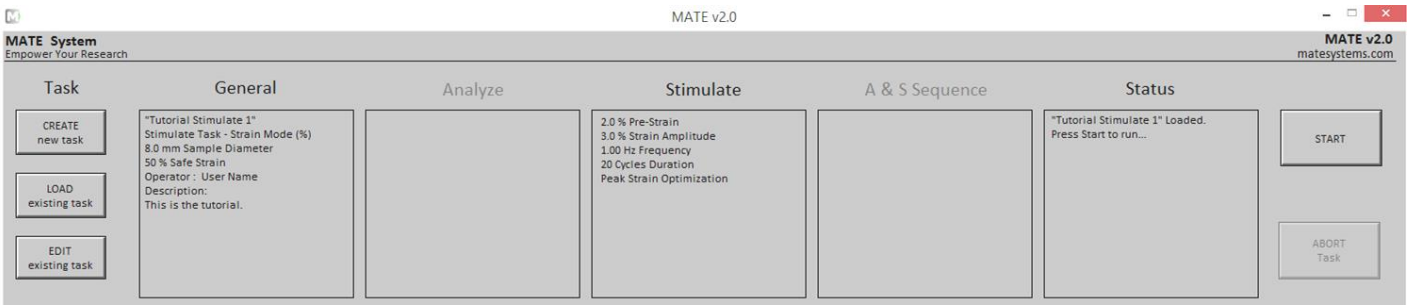
Loading Pre-Strain set to	*2 % strain*
Loading Strain Amplitude set to	*3 % strain*
Cycling Frequency set to	*1 Hz*
Cycling Duration set to	*20 cycles*
Control set to	*Peak Strain Optimization*

This exercise will stimulate the six samples by first applying 2% pre-strain, followed by an additional 3% dynamic load. The 3% dynamic load will be applied twenty times at 1Hz in **Peak Strain Optimization**.

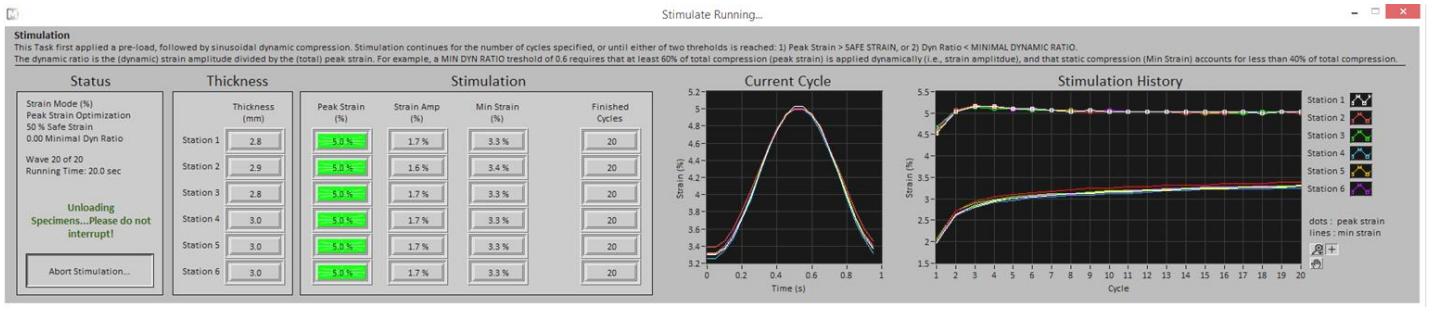
6. Peak Strain Optimization will automatically maintain a consistent peak strain of 5% (2% + 3%). Due to sample creep, the static strain can increase over time as shown in the figure below:



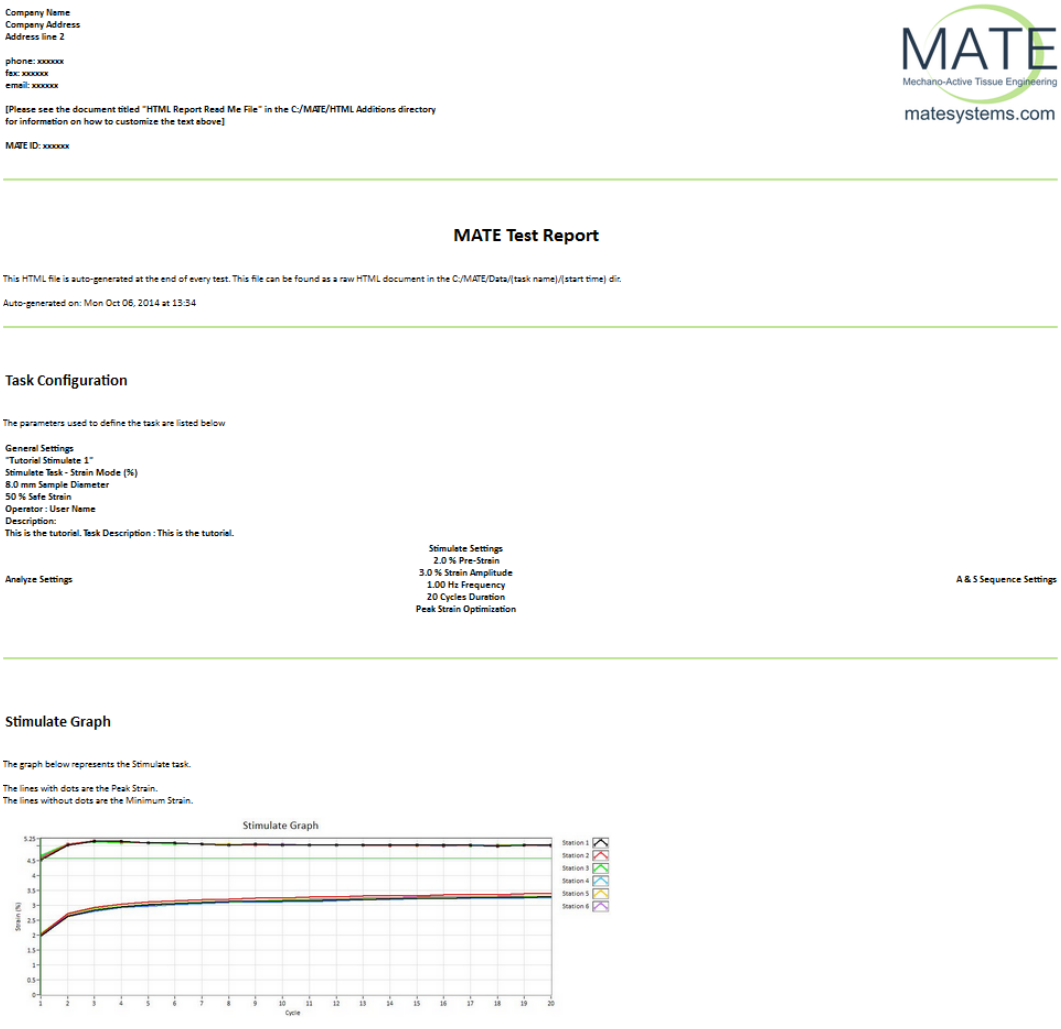
7. Click the **Save and Close** button  to save the test configuration file.
8. Make sure the Task has been loaded into the MATEware main window as shown below:



9. Click the **Start** button  to begin the test.
10. Wait until the test has been completed, it should take approximately 1 minute.
11. While the test is running windows will pop-up showing real time results as shown below:



12. An HTML report will automatically pop-up in an internet browser window:



Company Name
Company Address
Address line 2

phone: xxxxxx
fax: xxxxxx
email: xxxxxx

[Please see the document titled "HTML Report Read Me File" in the C:/MATE/HTML Additions directory for information on how to customize the text above]

MATE ID: xxxxxx

MATE
Mechano-Active Tissue Engineering
matesystems.com

MATE Test Report

This HTML file is auto-generated at the end of every test. This file can be found as a raw HTML document in the C:/MATE/Data/(task name)/(start time) dir.

Auto-generated on: Mon Oct 06, 2014 at 13:34

Task Configuration

The parameters used to define the task are listed below

General Settings
"Tutorial Stimulate 1"
Stimulate Task - Strain Mode (%)
8.0 mm Sample Diameter
50 % Safe Strain
Operator : User Name
Description:
This is the tutorial. Task Description : This is the tutorial.

Analyze Settings

Stimulate Settings
2.0 % Pre-Strain
3.0 % Strain Amplitude
1.00 Hz Frequency
20 Cycles Duration
Peak Strain Optimization

A & S Sequence Settings

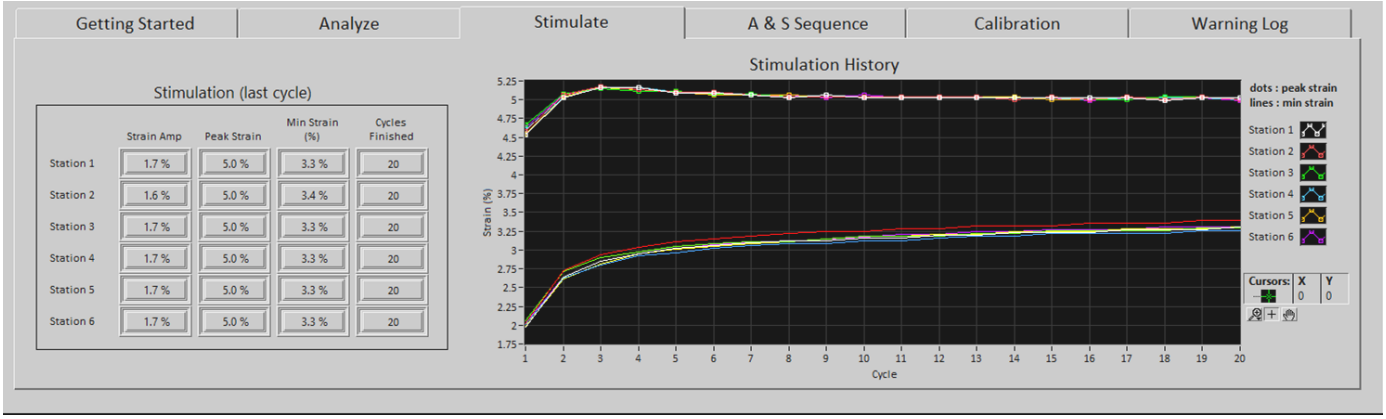
Stimulate Graph

The graph below represents the Stimulate task.

The lines with dots are the Peak Strain.
The lines without dots are the Minimum Strain.

13. Minimize the HTML report.

14. Click the **Stimulate Tab** and inspect the results. The results should look similar to the results shown below:



After a few cycles, peak strain is optimized to a constant value of 5%. With prolonged cycling, specimen creep will cause a mild increase in minimal strain (i.e., “static strain”) due to sample creep.

15. Return to the MATEware main window and click on the **Create Task** button 

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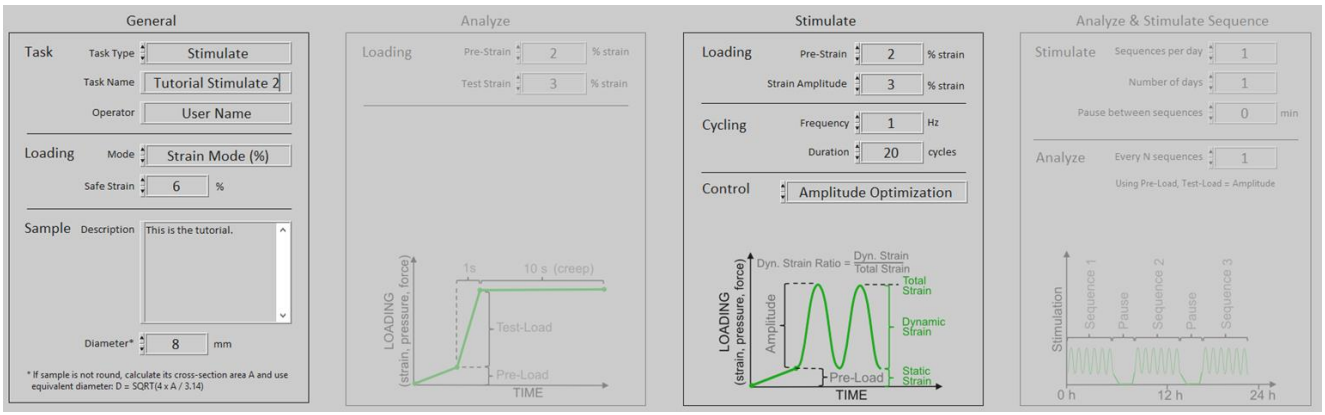
16. Set the values of the Configuration Window as shown:



General

Task Type set to:	*Stimulate*
Task Name set to	*Tutorial Stimulate 2*
Operator set to	*Your Name*
Loading Mode set to	*Strain Mode (%)*
Loading Safe Strain set to	*6 %*
Sample Description	*This is the tutorial.*

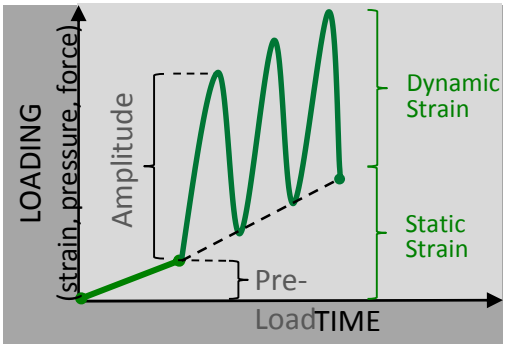
Sample Diameter set to	*8 mm*

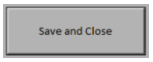
Stimulate

Loading Pre-Strain set to	*2 % strain*
Loading Strain Amplitude set to	*3 % strain*
Cycling Frequency set to	*1 Hz*
Cycling Duration set to	*20 cycles*
Control set to	*Amplitude Optimization*

17. This exercise will stimulate the six samples by first applying 2% pre-strain, followed by an additional 3% dynamic load. The 3% dynamic load will be applied twenty times at 1Hz in **Amplitude Optimization**. Be sure to set the Safe Strain to 6%.

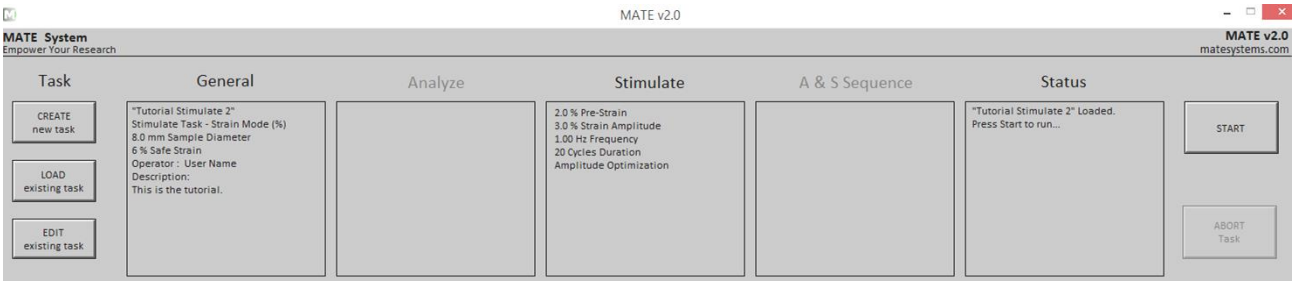
18. Amplitude Optimization will maintain a consistent strain amplitude of 3% (test strain) However, due to sample creep the peak strain can increase over time as shown in the figure below:



19. Click the **Save and Close** button 

to save the test configuration file.

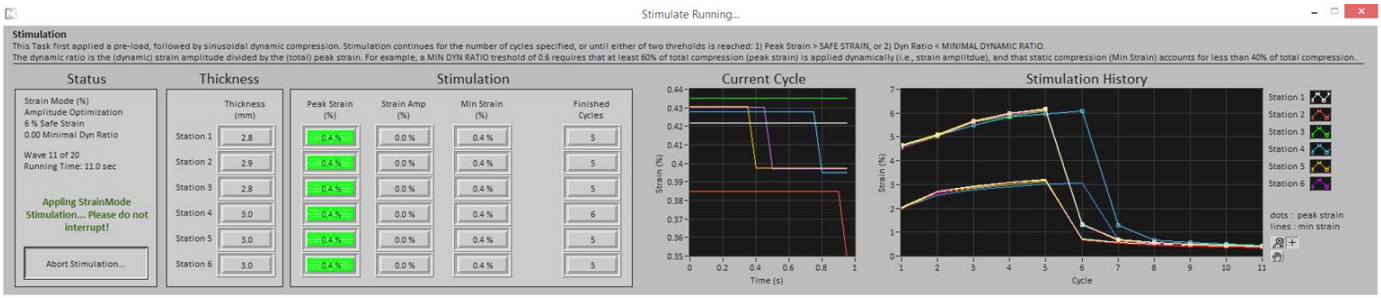
20. Look at the MATEware main window and check that the Task has been loaded into the MATEware main window as shown below:



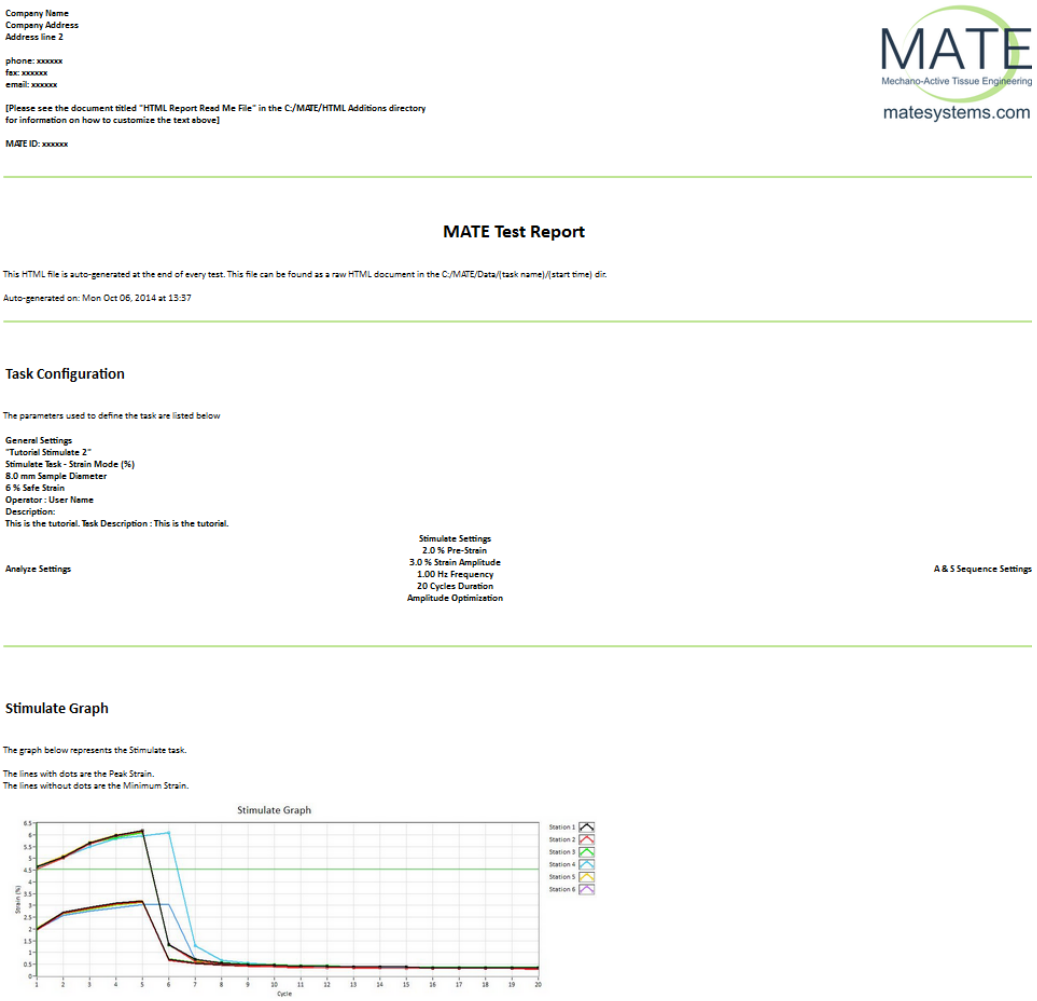
21. Click the **Start** button  to being the test.

22. Wait until the test has been completed, it should take approximately 1 minute.

23. While the test is running windows will pop-up showing real time results as shown below:



24. An HTML report will automatically pop-up in an internet browser window:



Company Name
Company Address
Address line 2

phone: xxxxxx
fax: xxxxxx
email: xxxxxx

[Please see the document titled "HTML Report Read Me File" in the C:/MATE/HTML Additions directory for information on how to customize the text above]

MATE ID: xxxxxx

MATE
Mechano-Active Tissue Engineering
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MATE Test Report

This HTML file is auto-generated at the end of every test. This file can be found as a raw HTML document in the C:/MATE/Data/(task name)/(start time) dir.

Auto-generated on: Mon Oct 06, 2014 at 13:37

Task Configuration

The parameters used to define the task are listed below

General Settings
"Tutorial Stimulate 2"
Stimulate Task - Strain Mode (%)
8.0 mm Sample Diameter
6 % Safe Strain
Operator : User Name
Description:
This is the tutorial. Task Description : This is the tutorial.

Analyze Settings

Stimulate Settings
2.0 % Pre-Strain
3.0 % Strain Amplitude
1.00 Hz Frequency
20 Cycles Duration
Amplitude Optimization

A & S Sequence Settings

Stimulate Graph

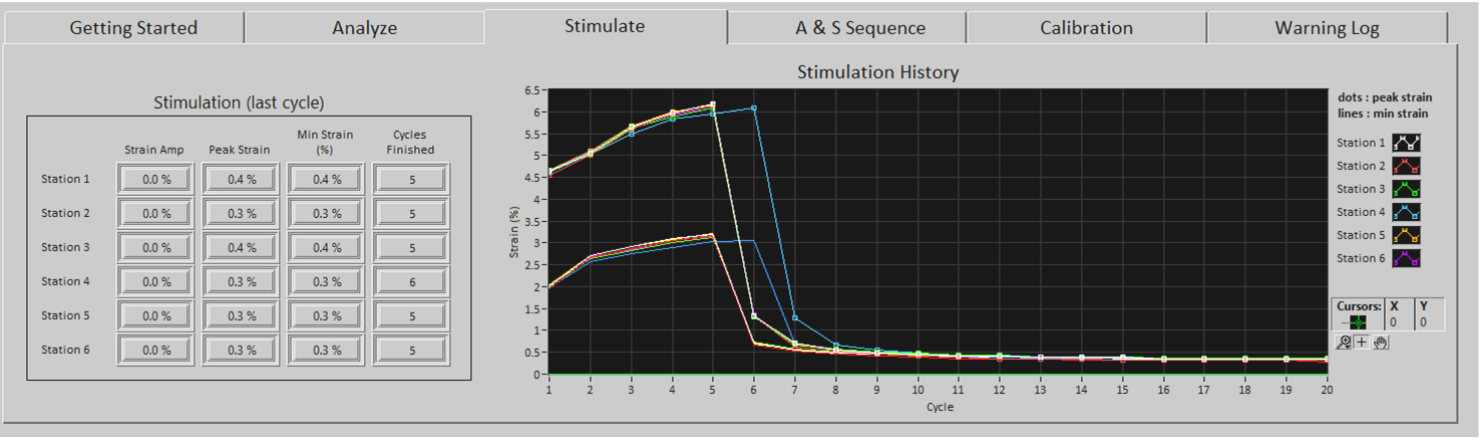
The graph below represents the Stimulate task.

The lines with dots are the Peak Strain.
The lines without dots are the Minimum Strain.

Stimulate Graph

25. Minimize the HTML report.

26. Click the **Stimulate Tab** and inspect the results. The results should look similar to the results shown below. Due to the stimulation being run in **Amplitude Optimization,** the samples were able to creep past the 6% safe strain limit. As soon as a sample exceeded the 6% safe strain threshold, loading of this sample was discontinued.

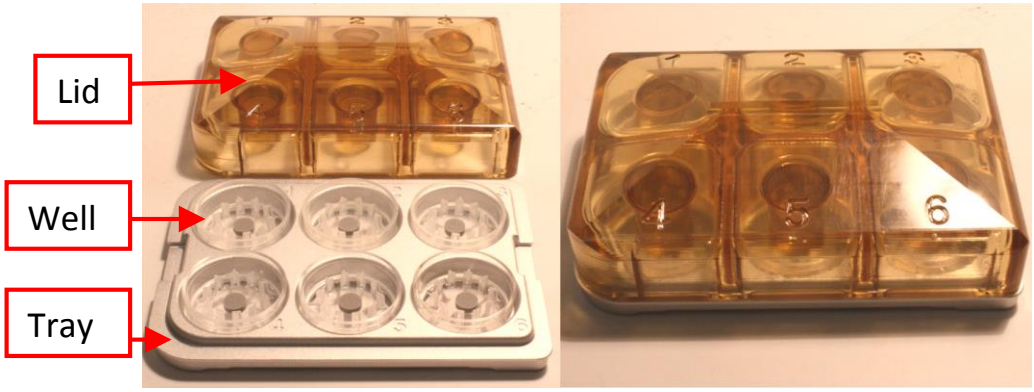


Section 4: A & S Sequence Exercise

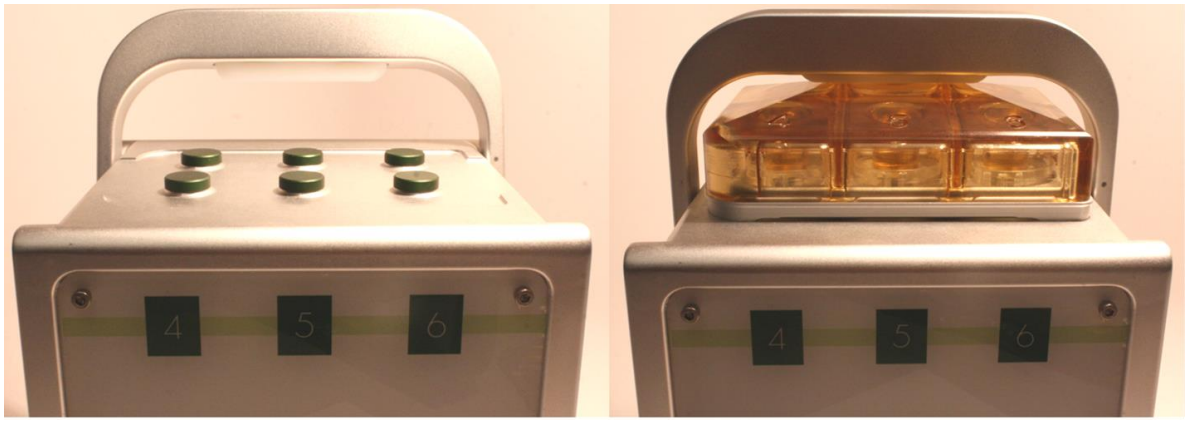
This exercise will combine Analyze and Stimulation tasks into a sequence.

1. Double click the **MATEware Icon** 

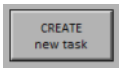
on the desktop.
2. Load the **Sample Wells** into a **MATE Tray** and cover the **Tray** with a **MATE Lid**.



3. Place the loaded Tray on top of the **MATE**.

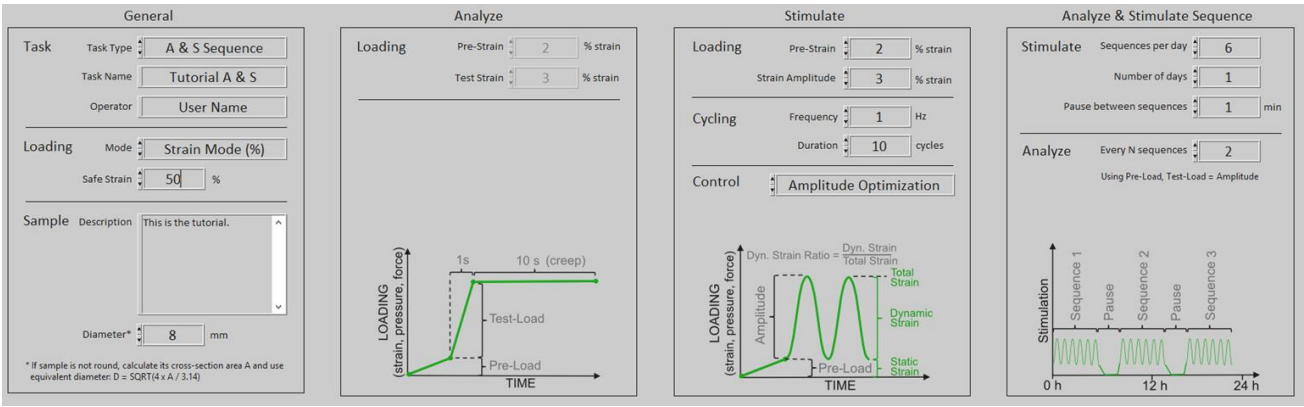


4. Close the MATEbox handle to secure the lid.

Click on the **Create Task** button 

on the MATEware main window.

5. Set the values of the Configuration window as shown:



General

Task Type set to:	*A & S Sequence*
Task Name set to	*Tutorial Stimulate A & S*
Operator set to	*Your Name*
Loading Mode set to	*Strain Mode (%)*
Loading Safe Strain set to	*50 %*
Sample Description	*This is the tutorial.*
Sample Diameter set to	*8 mm*

Stimulate

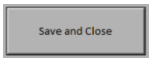
Loading Pre-Strain set to	*2 % strain*
Loading Strain Amplitude set to	*3 % strain*
Cycling Frequency set to	*1 Hz*
Cycling Duration set to	*10 cycles*
Control set to	*Amplitude Optimization*

Analyze & Stimulate Sequence

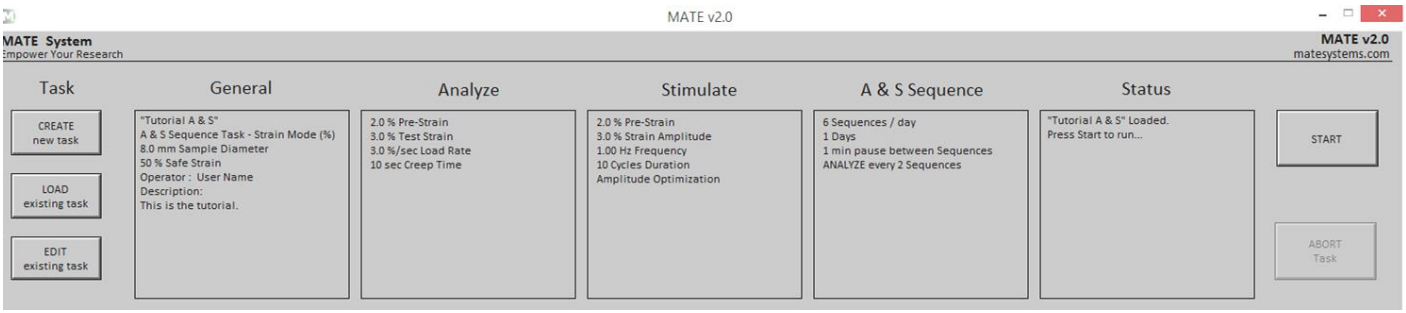
Sequences per day set to	*6*
Number of days set to	*1 day*
Pause between sequences set to	*1 min*

Every N Sequences set to *2*

This exercise will combine the Analyze and Stimulate exercises into one test that will both analyze and stimulate samples. Samples will first be analyzed with a 2% pre-strain followed by an additional 3% test strain. Ten dynamic loads will be applied to samples during the stimulate portion of the test at 1Hz. This sequence will repeat five times. The Analyze portion of the test will be run every two sequences.

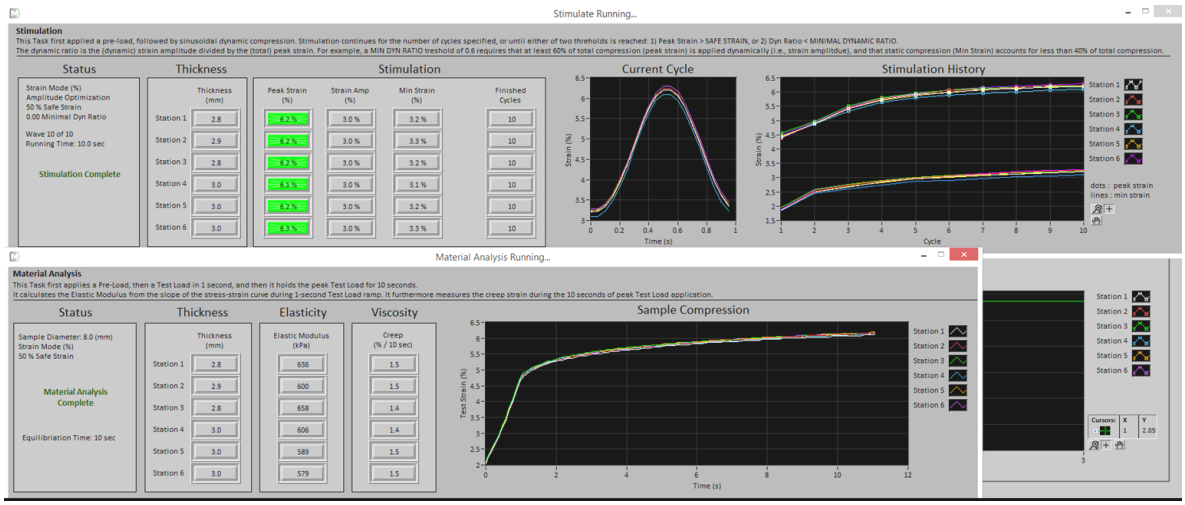
6. Click the **Save and Close** button 

to save the test configuration file.
7. Please check that the Task has been loaded into the MATEware main window as shown below:

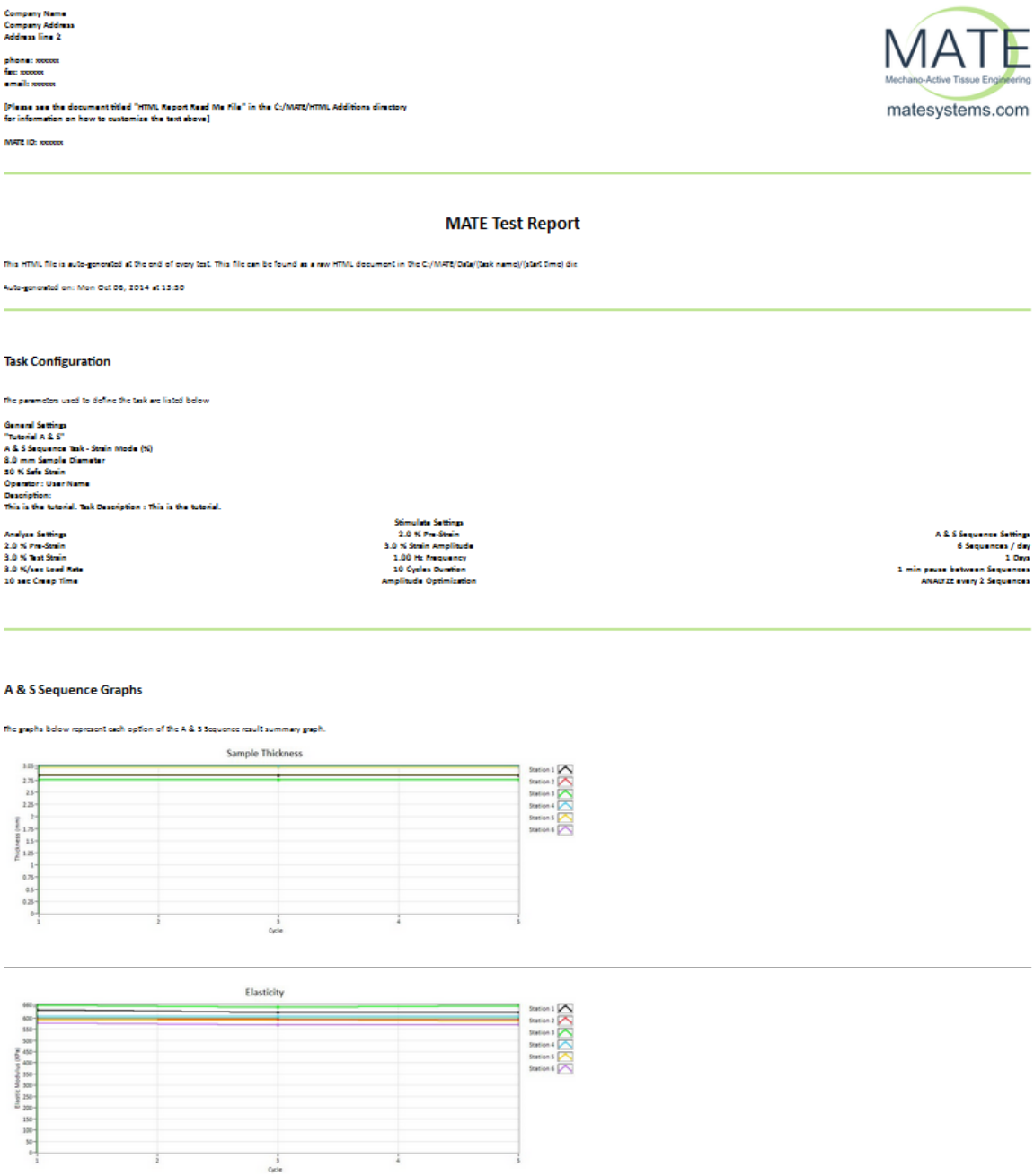


8. To begin the test click the **Start** button 

.
9. Wait until the test has been completed, it should take approximately 11 minutes.
10. While the test is running windows will pop-up showing real time results as shown below:



11. An HTML report will automatically pop up in a browser window showing the results. Notice that there are more graphs shown on this report than the Analyze or Stimulate only reports:



Company Name
Company Address
Address line 2

phone: xxxxxx
fax: xxxxxx
email: xxxxxx

[Please see the document titled "HTML Report Read Me File" in the C:/MATE/HTML Additions directory for information on how to customize the text above]

MATE ID: xxxxxx

MATE
Mechano-Active Tissue Engineering
matesystems.com

MATE Test Report

this HTML file is auto-generated at the end of every test. This file can be found as a new HTML document in the C:/MATE/Data/[task name]/[start time] dir

Auto-generated on: Mon Oct 06, 2014 at 13:50

Task Configuration

the parameters used to define the task are listed below

General Settings
"Tutorial A & S"
A & S Sequence Task - Strain Mode (%)
8.0 mm Sample Diameter
10 % Safe Strain
Operator : User Name
Description:
This is the tutorial. Task Description : This is the tutorial.

Analyze Settings	Stimulate Settings	A & S Sequence Settings
2.0 % Pre-Strain	2.0 % Pre-Strain	6 Sequences / day
3.0 % Test Strain	3.0 % Strain Amplitude	1 Days
3.0 %/sec Load Rate	1.00 Hz Frequency	1 min pause between Sequences
10 sec Creep Time	10 Cycles Duration	ANALYZE every 2 Sequences
	Amplitude Optimization	

A & S Sequence Graphs

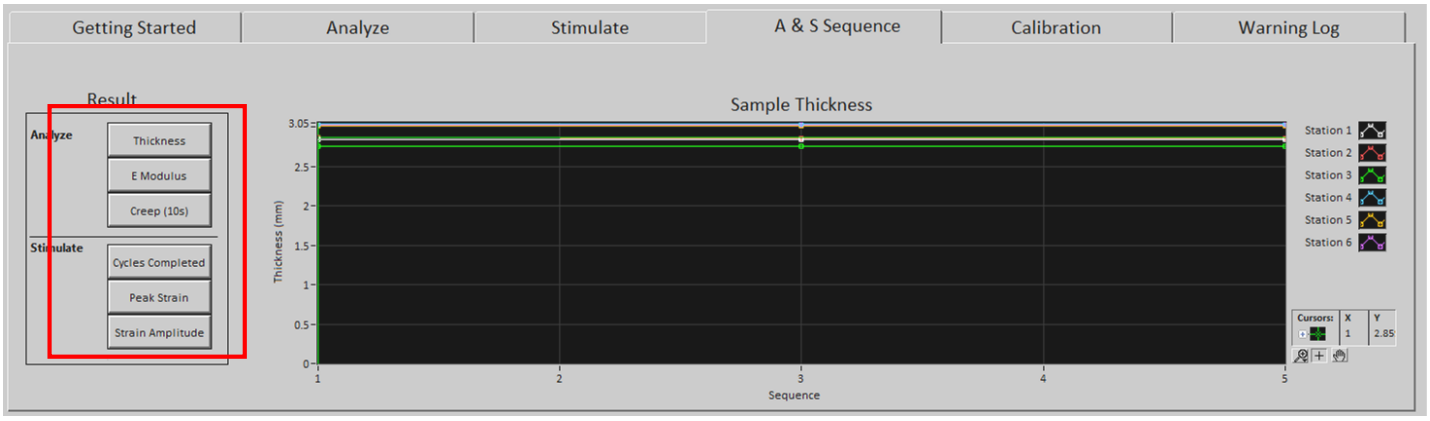
the graphs below represent each option of the A & S Sequence result summary graph.

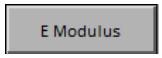
Sample Thickness

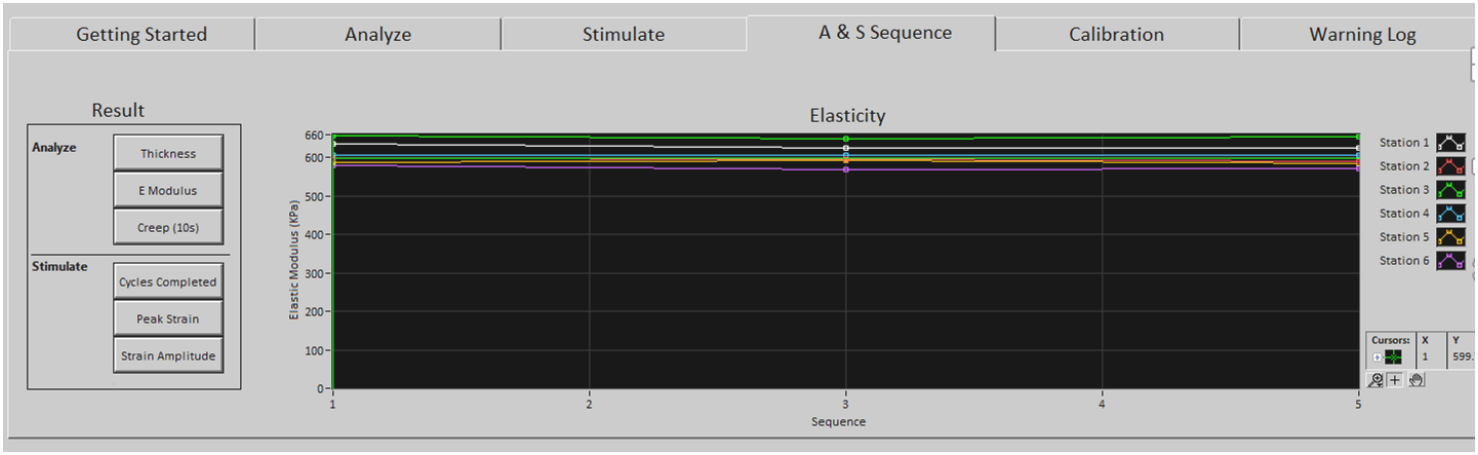
Elasticity

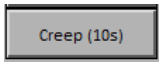
12. Minimize the HTML report.

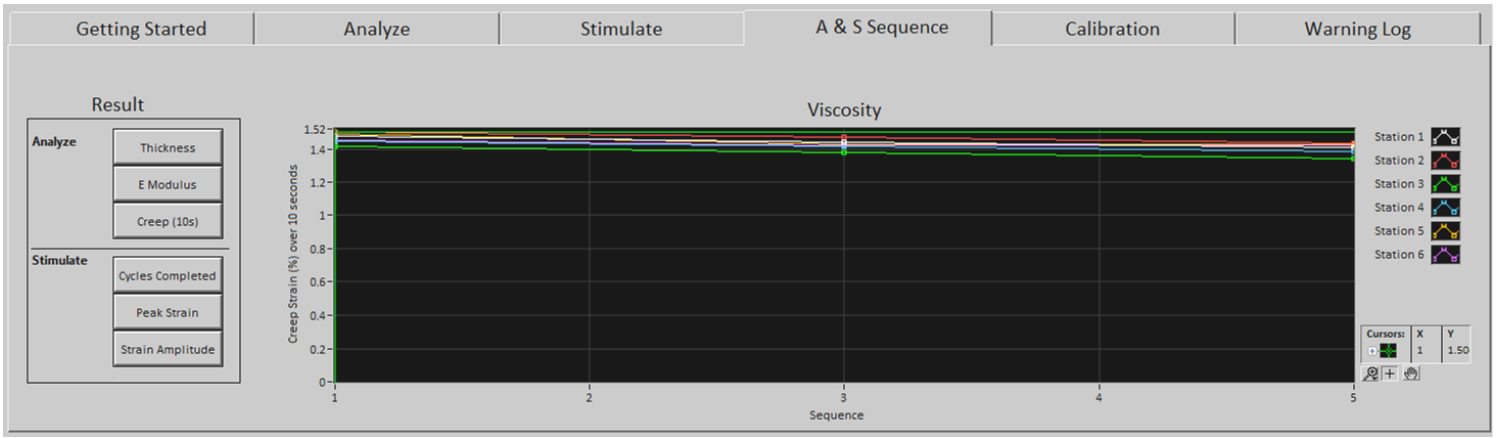
13. Click the **A & S Sequence Tab** and inspect the results. The results from both Analyze and Stimulate can be viewed by clicking the buttons on the left of the graph. The **Thickness** results should look similar to those shown below. Notice that there are only three data points due to Analyze only being run every two sequences:

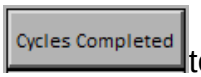


14. Click the **E Modulus** button  to view the elastic modulus measurements from each Analyze sequence.

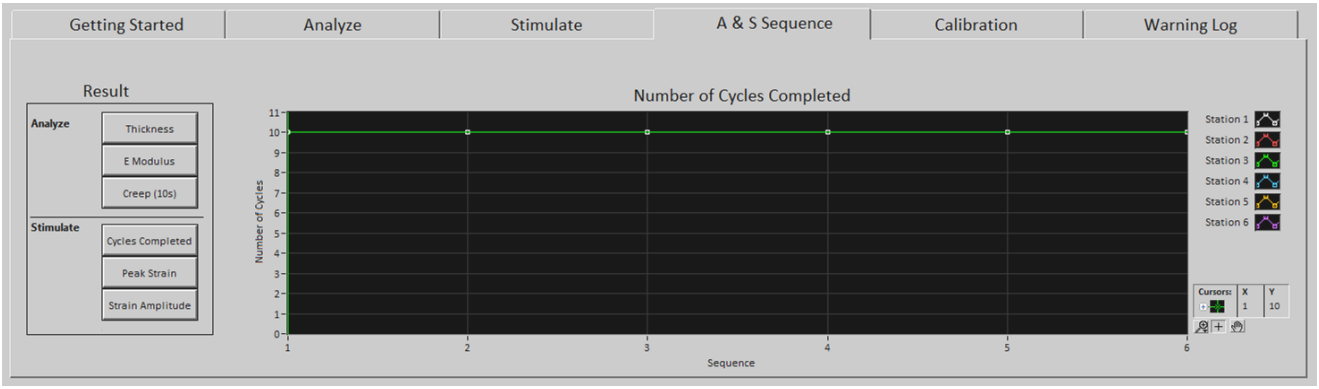


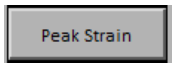
15. Click the **Creep (10s)** button  to view the creep measurements from each Analyze Sequence.



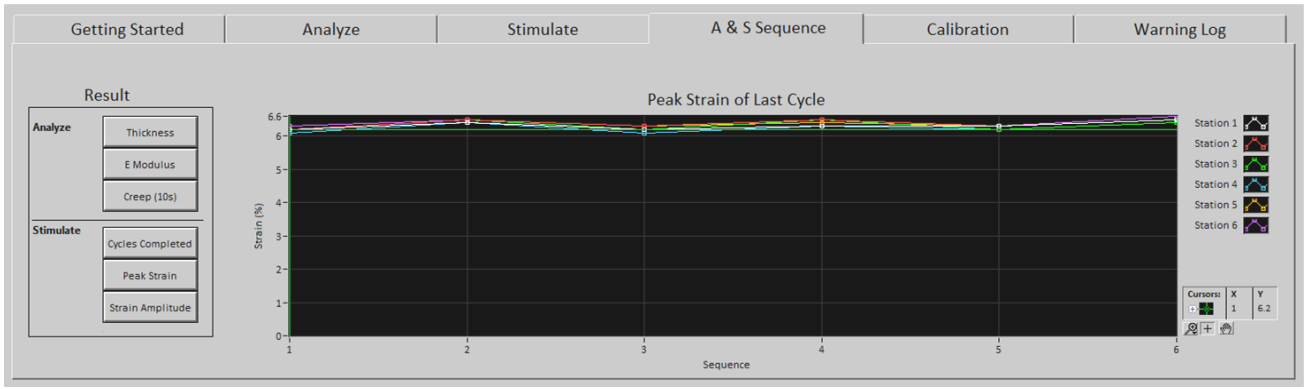
16. Click the **Cycles Completed** button 

to view the number of cycles each sample completed during each of the Stimulate portions of test. The **Cycles Completed** results should look similar to below. Notice that there are six data points for the Stimulate results corresponding to the number of sequences in the test:



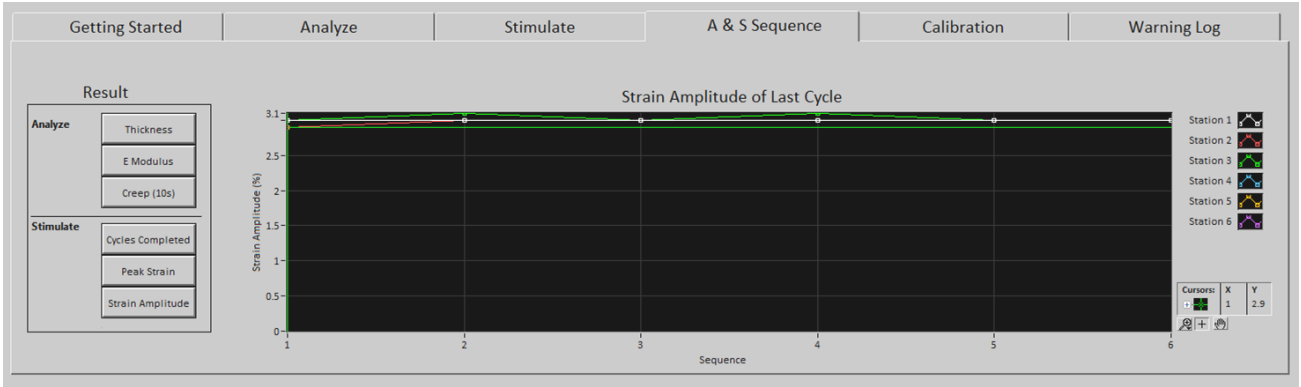
17. Click the **Peak Strain** button 

to view the peak strain each sample experienced during each of the stimulate portions of the test. The **Peak Strain** results should look similar to below:



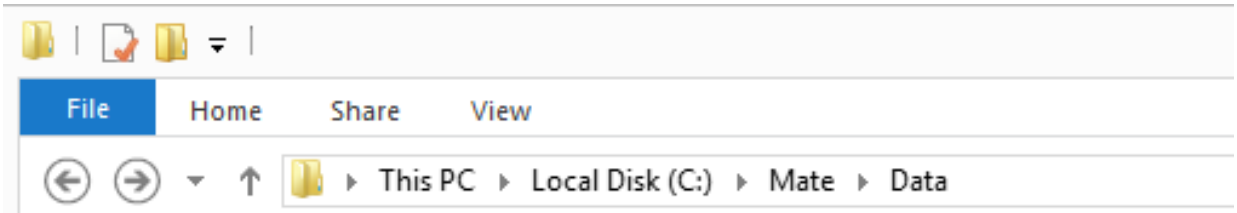
18. Click the **Strain Amplitude** button 

to view the maximum strain amplitude each sample experienced during each of the stimulate portions of the test. The **Strain Amplitude** results should look similar to below:

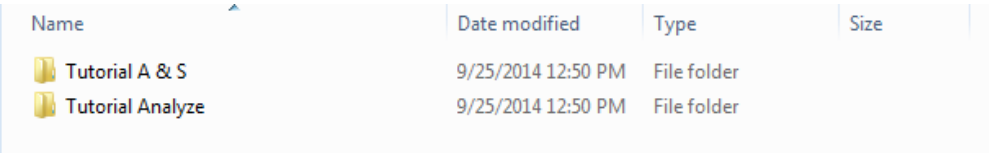


Section 5: Data Retrieval Exercise

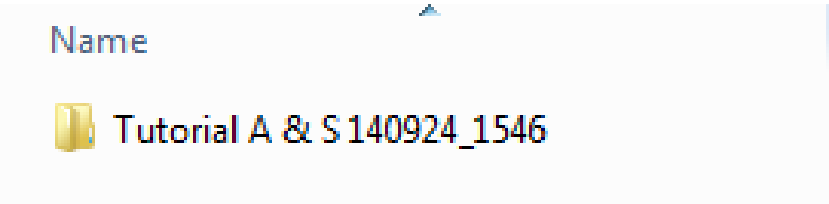
1. Retrieve the Tutorial A & S Sequence Data by clicking on **Windows File Explorer**  on the MATEpc Desktop screen.
2. Then follow the file path through the C drive shown below to access test data:



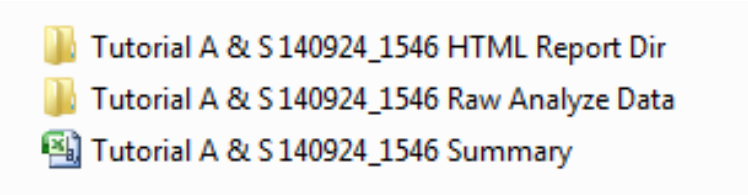
3. In the Data folder find and open the **Tutorial A & S Sequence Folder**:



4. Open the **Tutorial A & S Sequence Folder**. Inside find the folder corresponding to the last instance the task was run. Tasks of the same name are stored in the same folder with a time stamp YMD_TIME to identify each task, i.e. Tutorial A & S was run on 2014, September 24, at 15:46.



5. Find the most recent Tutorial A & S data folder and open it.



6. There are three folders present: the first is the **HTML report**, the second is the **Analyze Results** in tabular form, and the third is the **data summary** which shows all the A & S Sequence Results in tabular form.