MTS Servo Hydraulic Test System (MTS Corporation) Model: 810 system, FlexTest SE Controller – PLUS

Location of Machine: Composites Lab, INGR 1308

Location of SOP and Machine Operating & Safety Manual: Composites Lab website under resources; Composites Lab TRACS site; and Hardcopy near machine.

Emergency Contact:

- Call 911
- Call EHS & Risk Management at 512-245-3616
- Call Head Lab Technician, Dr. Ray Cook (office 512-245-2050)
- Call Dr. Jitendra S Tate (office 512-245-4872)

Before using this machine:

- You must have permission from Dr. Tate.
- You must have received formal training from technician or, trained research student (designated by Dr. Tate) related to machine safety and operation.
- You must read and understand SOP and Machine Operating & Safety Manual.
- You must use this machine under direct supervision of Dr. Tate or, Dr. Cook or, trained research student (designated by Dr. Tate).
- You must have signed "Lab Rules" document with Dr. Tate. This document must be signed every semester fall, spring, and summer (as applicable).
- If you do NOT follow above instructions you will be held responsible for your own safety and damages.

Safety Precautions:

Protective Equipment: Prior to performing this procedure, the following personal protective equipment must be obtained and ready for use: **Gloves, Safety Goggles, Lab Coat.**

Important Safeguards:

- 1. From lowermost position moving head moves 210 mm (~8 in) upward. Operator must make sure that, when moving head is at its extreme top position it is not touching to the crosshead.
- 2. Specimens can develop sharp edges as a result of testing, handling the specimens with unprotected hands can results in cuts.



MTS Machine

General information

The MTS machine is used for all different types of Mechanical testing such as tension, compression, flexure, interlaminar shear strength, fatigue, fracture etc. MTS machine is controlled by advanced test design application software, **MultiPurpose Testware** (MPT). It is operated by hydraulic power unit. Different types of materials can be tested on this machine such as composites, plastics, and metals.

Specifications:

- Loading Capacity-100KN (22 kips)
- Clamping Pressure- 3000psi
- Range of Frequency- 0-100 Hz

Accessories:

- Fixtures: ASTM Test Fixtures: <u>Tension D3039</u>; 1. <u>Compression D6641</u>; 2. <u>V-notch rail shear D7078</u>; 3. <u>Flexure D790</u>; <u>Short Beam D2344</u>; 4. <u>Boeing</u> <u>Compression after Impact D7137</u>; 5. <u>Boeing Open Hole Compression D6484</u>; 6. <u>Climbing Drum Peel Test D1781</u>.
- Flat Grips: 0-7.6mm; 7.1-14.2mm; and 11.7-19.1mm
- Round Grips: 12mm; 15mm; and 20mm
- Extensometers:
 - 0.5" gage length; Strain Range: +/- 9%
 - 1" gage length; Strain Range: 0 to 100 %

Turning and preparing the MTS for instrumented operation	
 On the pump panel: 12. Locate the red circular switch and turn it on. 12. Locate and press the blue button label Reset. These 3 switches should turn off. 12. Verify that this switch is in LOW position 	
On the controller: 12. Locate and turn on the white power switch located on the back of the controller.	
On the computer: 12. Turn on the machine. 12. Locate "Station Manager" icon on desktop and double click on it. 12. Select file ftse.cfg and click open 12. The	Open Station I xi Look n C orig Look n C orig Intervention Image: Constraint of the constrain

12. You should be able to see this window	Station Hanager City 0200307 : It-sec.dg : default > File Desky: Application: Tools Bip File Desky: Application: Tools Bip
12. The mode should be in the "Operator" mode.	Station Manager < Ctir_02003307 : ftse.cfg : Fatigue.Sergio.Jun
12. Check "Exclusive Control" box. It means now the control of the machine is acquired by software.	- Station Controls
12. Click "Reset" at Interlock 1	Interlock 1 Reset
On HPU: 12. Click low power wait for 10 sec and then click high power	HPU:
On HSM 1: 12. Click low power wait for 10 sec and then click high power	HSM 1:

At the right side on the Load frame:	
12. Unlock the upper head (cross head) by turning right lever to this position.12. Turn left lever to upper position and crosshead will move upward.	Crosshead Lift / Lock Control
In "Station Control" window:	Auto Offset Manual Control
12. Click on Manual control. 12. Click on Auto Offset 12. Two dialogue boxes will pop up.	Station Controls
In Manual Controls	
 12. Check 'enable manual command'. 12. Select the control mode displacement. 12. Bring the "Moving Head" to the zero position 	Manual Command < ftse.cfg > Manual Controls Channel: Axial Control Mode: Displacement Active Mode: Displacement Manual Cmd: 0.00 mm Image: State of the
Now the "Moving Head" can be moved. <u>Note: If you give the negative value then</u> <u>the "Moving Head" goes up and if you</u> <u>give the positive value then the "Moving</u> <u>Head" goes down.</u>	$ \begin{array}{c} & +105 \text{ mm} \\ & & \\ $

In Auto Offset 12. Click on "Auto Offset" to make all readings zero.	Signal Auto Offset < (tse.cfg > Image: Signal
In the station manager: 12. Open the meters. In this meter you can add Time, Axial displacement, Axial Force etc., and also you can change the dimensions here accordingly by clicking the ADD button (+).	Image: Second structure Image: Second structure Image: Second structure Image: Second structure Image: Axial Displacement Axial Force Image: Axial Displacement Image: Axial Force Image: Axial Displacement

TENS	ION TEST
In MPT window: 1. Go to open procedure	
 Select appropriate ASTM procedure based on the type of material being tested. These procedures are labeled '<u>ASTM</u> <u>D638 Tension Plastics',</u> <u>'ASTM E8 Tension Metallic',</u> <u>'ASTM D3039 Tension</u> <u>Composite'</u>. 	Open Procedure Image: Comparison of the comparison of
 Click on new specimen, and name the specimen. 	
On MTS: 4. Fix the desired grips onto the heads, according to the thickness of the specimen.	
5. Fix the specimen	

 Locking the grips with hydraulic grip control. 	
7. Lock the upper head (cross head)	Crosshead Lift / Lock Control
In Manual Control window:	+ Manual Command < ftse.c
8. Disable the manual command.	Manual Controls Channel: Axial Control Mode: Displacement Active Mode: Displacement Manual Cmd: mm Image: State
In Auto Offset window: 9. Click on auto offset	Signal Auto Offset < ftse.cfg > Imput Signals Station Signals Auto Offset Clear Offset Input Signals Auto Offset Clear Offset Axial Displacement: 0.00 mm 0.044 mm Axial Force: 0.00 kN 0.036 kN Axial Strain: 0.00000 in/in 0.0040 in/in Aux Input 1: 0.004 mm 0.011 mm Aux Input 2: 0.003 mm 0.005 mm Aux Input 3: 0.001 mm 0.0010 mm Aux Input 4: 0.005 mm 0.001 mm Aux Input 5: 0.009 mm 0.003 mm Aux Input 6: 0.012 mm 0.006 mm
In Meters window: 10. Click on reset procedure.	Meters 1 < ftse.cfg >
In Station Manager Window: 11. Click on program run	Master Span
12. A dialog box will pop up.13. Complete all data and click save.	

14. Graph window will pop up.	
15. After specimen breaks click the stop button	MPT Master Span
16. Unlock specimen to break the test	
17. Click New Specimen to save data.	
On MTS: 18. Unlock the grips. 19. Remove the specimen.	
In the Manual Control Window: 20. Enabling manual command. 21. Bring moving head to neutral position.	Manual Command < ftse.cfg > Manual Controls Channel: Axial Control Mode: Displacement Active Mode: Displacement Manual Cmd: 0.00 mm -105.00 105.00 If Enable Manual Command

COMPRESION TEST	
In MPT window: 1. Go to open procedure	
 Select appropriate ASTM procedure based on the type of material being tested. <u>'ASTM D6641 Compression</u> <u>Composite</u>'. 	Open Procedure ? X Look in Procedures Procedures Wu Piccerk Procedures Wu Piccerk Procedures Deskrop Procedures Deskrop Procedures My Documents Procedures Deskrop Procedures My Documents Procedures Montenents Procedures Montenents Procedures My Documents Procedure frage My Computer Procedure frage My Documents Procedure frage My Computer Procedure frage My Computer Procedure frage My Documents Procedure frage Procedure frage My
 Click on new specimen, and name the specimen. 	



In Auto Offset window:	Signal Auto Offset < ftse.cfg >
15. Click on auto offset	Station Signals
	Input signals
	Axial Displacement: 0.00 mm O 0.04 mm
	Axial Force: 0.00 kN Q -0.36 kN
	Axial Strain: -0.0000 in/in Q -0.0040 in/in
	Aux Input 1: 0.004 mm Q 0.011 mm
	Aux Input 2: 0.003 mm 0 0.006 mm
	Aux Input 3: -0.001 mm - 0.005 mm
	Aux Input 5: -0.009 mm Q -0.003 mm
	Aux Input 6: -0.012 mm Q -0.006 mm
In Meters window:	Strengthere Meters 1 < ftse.cfg >
16. Click on reset procedure.	
•	
	Axial Displacement
	<u> </u>
In Station Manager Window:	MPT
17. Click on program run	
	Master Span
18. A dialog box will pop up.	
19. Complete all data and click save.	
20. Graph window will pop up.	
21. After specimen breaks click the	MPT
stop button	
	Master Span
22. Unlock specimen to break the test	MPT
	🗀 🛯 🚹 🛢 🎇 🖾 🖸 🔒 🔺
23 Click New Specimen to save data	_ MPT
On MTS:	MTE, Crosshead Lift / Lock Control
24. Unlock the upper head (cross	. <u>.</u>
head)	
25. Remove the Compression Fixture.	
26. Loosen the screws and release	· C •
the specimen	

Active Mode: Displacement Manual Cmd: 0.00 mm I -105.00 F Enable Manual Command	In the Manual Control Window: 27. Enabling manual command. 28. Bring moving head to neutral position.	Manual Command < ftse.cfg > Manual Controls Channel: Axial Control Mode: Displacement Active Mode: Displacement Manual Cmd: 0.00 mm Image: State of the
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FLEX	URE TEST
In MPT window:	MPT
1. Go to open procedure	
 Select appropriate ASTM procedure based on the type of material being tested. <u>'ASTM D790 flexure.</u>' 	Open Procedure Image: Composite Look in: Image: Composite Wy Becert Image: Composite My Becert Image: Composite Documents Image: Composite Desktop Image: Composite Desktop Image: Composite My Documents Image: Composite
Click on new specimen, and name the specimen.	
 Fixing the specimen in the flexure fixture: 4. First select appropriate roller size from ASTM standard. 5. Find support span for the specimen from ASTM standard. 6. Fix the supporting rollers evenly on the both sides of loading nose at appropriate positions. <u>Note: There is mark in the center on the base plate to fix the supporting rollers.</u>	<image/>

 On MTS: 7. Place grips 8. Fix the cylindrical bases into the grips of moving head to support flexure fixture. 9. Mount upper plate into the crosshead. 10. Lock the grips with hydraulic grip control. 	
11. Fix the specimen12. Lock the upper head (cross head)	Cryscheed Lift / Look Canter
In Manual Control window: 13. Disable the manual command.	Manual Command < ftse.c Manual Controls Channel: Axial Axial Control Mode: Displacement Active Mode: Displacement Manual Cmd: Manual Cmd: The second s
In Auto Offset window: 14. Click on auto offset	Station Signals Imput Signa

In Meters window: 15. Click on reset procedure.	Meters 1 < ftse.cfg > Image: Second structure Axial Displacement Axial Displacement
In Station Manager Window: 16. Click on program run	Master Span
17. A dialog box will pop up.18. Complete all data and click save.	
19. Graph window will pop up.	
20. After specimen breaks click the stop button	Master Span
21. Unlock specimen to break the test	
22. Click New Specimen to save data.	
On MTS: 23. Unlock the upper head (cross head) 24. Remove the specimen.	Crosshead Lift / Look Control
In the Manual Control Window: 25. Enabling manual command. 26. Bring moving head to neutral position.	Manual Command < ftse.cfg > Manual Controls Channet: Axial Control Mode: Displacement Active Mode: Displacement Manual Cmd: 0.00 mm 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

TO QUIT I	PROGRAM
 Bring the cross head to appropriate position. 	
2. Disable the manual command.	Manual Command < ftse.c
 Uncheck the exclusive station control. 	Station Controls
 Lock the upper head (cross head) by turning lever to this position. 	Constanted Lift / Link Control
 Click on 'Reset' if interlock signal is red. 	Interlock 1 Reset
6. Click on HPU1 LOWto OFF.	HPU:
 Wait for 10 seconds and then click on HSM 1 LOWto OFF 	All:
8. Go to File, and then click on Exit.	
9. Turn OFF Controller	



Fatigue Test Design in TWElite

1. Launch TWElite by double clicking the icon



2. Go to File \rightarrow New \rightarrow Test



3. Click on Define Tab



4. Click on Procedure Tab



5. Drag the Auto Offset command from toolbox and drop it in the run section of test flowchart



- 6. In the properties tab of the Auto Offset command on the right hand of the screen:
 - a. Select Apply offset to zero signals
 - b. Click the + sign next to Signals List, select Axial Displacement, Axial Force and Axial Strain from the Select Signals popup window and transfer them into the Selected signals box using the button with a single triangle, then click ok

		Select	signals			
Available:			Selected:			
Search Display Name	1	Q				
Display Name	∀ Unit ∀		Category	Display Name	Unit	1
Э С	ther (8 items)		Axial	Axial Displacement	mm	1
Aux Input 1	mm		Axial	Axial Force	kN	1
Aux Input 2	mm		Axial	Axial Strain	mm/mm	
Aux Input 3	mm					-
Aux Input 4	mm	44				+
Aux Input 5	mm					
Aux Input 6	mm					
Running Time	sec	44				
Time	sec	10 M				
						1
					ок с	ancel

c. Error handling: Continue Test and Log error



7. Drag the Parallel Paths command from toolbox and drop it below Auto Offset in the run section of test flowchart



8. On the left-hand path:

a. Drag and drop Go To from commands toolbox on the left side of the screen inside the run portion of the test flowchart (Skip steps a through f for Tension-Compression fatigue testing)



- b. In the properties tab of the Go To command on the right hand of the screen
 - i. Channel: Axial
 - ii. Control Mode: Force
 - iii. Direction: Increase
 - iv. Rate: 330 N/s

🖌 Enable				
v General				
• Progress Ta	ble			
Channel:	Axial			-
Control Mode:	Force			•
Direction:	Increase			-
Rate:	#	330.00	N/s	-

- c. Click on the tiny box near Termination Condition so that a tick mark appears
- d. Select:
 - i. Signal: Axial Force by clicking on the more button (button with three dots)
 - ii. Comparison: Becomes greater than
 - iii. Type in your calculated F_{avg} number for value

Signal:	Axial Ford	e		
Comparison	Becomes	Greater Than	67	•
Value:	#	4000.0	N	•
Brake Distance:	#	0.0000	(kN)	Ŧ

e. Drag dwell from commands toolbox and drop in below Go To in the run section of test flowchart



f. In the properties tab of the dwell command on the right hand of the screen, type in the appropriate time for dwell (3 seconds usually) and change control mode to force

Enable				
v General				
v Progress Tab	le			
Termination				
⊙ Duration:	#	3,0000	(sec)	•
⊖Signal:				
Comparison	Becomes (Greater Than		*
Value:	#		0.	0000
Dwell at Curr	rent Value			
Advanced				
Advanced			-	=
Advanced			-	=

g. Drag Cycle+DAQ from commands toolbox and drop in below Dwell in the run section of test flowchart



- h. In the properties tab of the cycle+DAQ command on the right hand of the screen:
 - i. Timing Type: Frequency
 - ii. Frequency: As needed (usually 2 Hz or 5 Hz or 10 Hz)
 - iii. Wave Shape: Sine
 - iv. Number of Cycles: 1 million

vi. vii. viii.

Properties					
Enable					
v General					
v Progress T	able				
Timing Type:	Freque	ncy			
Frequency:	#		10.0	00 (Hz)	*
Wave Shape:			Sine		•
Number of Cy	cles:	#	1000000	(cycles)	•
Advanced	1				

v. Expand compensation by clicking the arrow nest to it: Peak Valley Amplitude Control

Compensator: Peak	-Valley A	mplitude C	ontrol	
Settings				
			E	
ontrol Mode: Force bsolute End Level 1:	\mathbf{F}_{\max}			
bsolute End Level 2:	\mathbf{F}_{\min}			
A Channels				+
Axial				+
Channels Axial Control Mode: Force				+
Axial Control Mode: Force Absolute End Level 1:	#	15000	N	+
Axial Control Mode: Force Absolute End Level 1: Absolute End Level 2:	#	15000 1500.0	N	+ • •

 ix. Click on the + Sign next to Signal List select Axial Count, Axial Displacement, Axial Force, Axial Strain from the Select Signal popup window and transfer them into the Selected signals box using the button with a single triangle, then click ok

x. xi.

ilable:				Selected:			
arch Display Name		2					
Display Name	▼ Unit ▼	٠		Category	Display Name	Unit	
Axial (14	items)			Axial	Axial Count	cycles	
Axial Active Mode ID	unitless	1		Axial	Axial Displacement	mm	
Axial Command Frequency	Hz			Axial	Axial Force	kN	
Axial Displacement Abs. Error	mm	- 11		Axial	Axial Strain	mm/mm	
Axial Displacement Command	mm						
Axial Displacement Error	mm						
Axial Force Abs. Error	kN	1					
Axial Force Command	kN						
Axial Force Error	kN						
Axial Integer Count	cycles						
Axial Output	v						
Axial Segment Trace	96	0	-				
Axial Strain Abs. Error	mm/mm		[manage	N			
Axial Strain Command	mm/mm	(J			
Axial Strain Error	mm/mm	1					1000
Digital Inpu	t (6 items)		PP				+
Digital Input 1	unitless		4				+
Digital Input 1 Ldt Out	unitless						
Digital Input 2	unitless						
Digital Input 2 Ldt Out	unitless		11076/11				
Digital Input 3	unitless						
Digital Input 3 Ldt Out	unitless						
Digital Outpu	ut (3 items)						
Digital Output 1	unitless						
Digital Output 2	unitless	- 1					
Digital Output 3	unitless	-					
Other (31	items)						
Aux Input 1	mm	_					
Aux Input 2	mm	- 1					
Aux Input 3	mm	- 1					
Aux Input 4	mm						
Aux Input 5	mm						
Aux Input 6	mm						
C-Stop 1	unitless	- 1					
Date	sec						
High Sneed System Tick Count	unitless	•					_
						OK	Cancel
			ļ				
Signal List					+		
xial Count							
	1						
xial Displacem	ent						
xial Force							
xial Strain							
						1	
als on the s	aian	- - -	п -	to 1 -	weather I'	-+	

popup window xii. In the Data Accusation Trigger Properties popup window do not change any values and click OK

Trigger Type:	Timed		•
Sample Selection	Sample Rat	te	•
Sample Rate:	#	100.72	(Hz) 👻

xiii. Click on select cycles In the Data Accusation popup window

xiv. Click on every nth cycle(linear) and type in 10 in the dialog box in the Select Cycles popup window and click ok.

-	Select Cycl	es	
Specify the cyclic selection process:			
Cycles per Decade (Logarithmic):	#	0	(count) 👻
✓ Every nth Cycle (Linear):	#	10	(count) 💌
Designate Specific Cycles:			
Start selecting cycles relative t	o when the acquisition	nprocess starts (i)	
Cycle Change Criteria Variable			Ŧ
Change Criteria Threshold:	#		0.0000
Specify the number of cycles:			
Number of Cycles to Store: #		1	(count) 👻
		ОК	Cancel

xv. Click ok on the data accusation popup window

Trigger List Trigger 1: Timed	• _
Trigger 1: Timed Collect last data point Acquire data while holding Buffer Size: # 100 (count Save data to variables? Yes, automatically map variables. • Config Starting Cycles: (i)	
Collect last data point Collect last data point Acquire data while holding Buffer Size: Starting Cycles: Config	
Acquire data while holding Buffer Size:	
Buffer Size: # 100 (count Save data to variables? Yes, automatically map variables. Config Starting Cycles: (i) # 100 (count	
 ▲ Save data to variables? Yes, automatically map variables. ✓ Config Starting Cycles: (i) # 100 (count) -
Yes, automatically map variables. Config Starting Cycles: (i) # 100 (count	
Starting Cycles: (i) # 100 (count	ure
) 🗸
Final Cycles: (i) # 100 (count) -
Index Variable:	-
Select C	cles
OK Cancel	

i. Drag Go To from commands toolbox and drop in below Cycle+DAQ in the run section of test flowchart



- j. In the properties tab of the Go To command on the right hand of the screen:
 - i. Chanel: Axial
 - ii. Control mode: Force
 - iii. Direction: Auto
 - iv. Rate: 330 N/s
 - v. Termination condition: checked
 - vi. Signal: Axial Force by clicking on the more button (button with three dots)
 - vii. Comparison: Crosses
 - viii. Value: 0 N

Properties					
🖌 Enable					
v General					
v Progress Ta	ble				
Channel:	Axia	1			•
Control Mode:	Ford	e			•
Direction:	Auto				•
Rate:	#		330.00	N/s	•
✓ Termination	Con	dition			
Signal: Axial Force			orce		
Comparison	omparison Crosses				•
Value:		#	0.00	N 000	•

- 9. On the right-hand path:
 - a. Drag and drop Break Detection from commands toolbox on the left side of the screen inside the run portion of the test flowchart



- b. In the properties tab of the Break Detection command on the right hand of the screen:
 - i. Completion: Any Break
 - Click the + sign next to signals and select axial displacement from the Select Signals popup window and transfer it into the Selected signals box using the button with a single triangle, then click ok
 - iii. Action: Program Stop Interlock
 - iv. Reference: Peak
 - v. Percentage Change: 90%
 - vi. Threshold: 25.4 mm
 - vii. Sensitivity: 10 mm

Properties				
🖌 Enable				
v General				
• Progress Tabl	e			
Completion Ar	iy Break			•
▲ Signals			+	
Axial Displacem	ent			
Reference:	Peak			•
Percent Change:	#	90,000	(%)	•
Threshold:	#	25.400	(mm)	•
Sensitivity:	#	10.000	(mm)	•
Action:	Program St	top Interlock		•

10. Click on parallel paths in the properties tab on the right hand of the screen check select all for terminal paths.



✓ Enable	
👻 General	
 Progress Table 	
Store Ending Path Value	
Variable Name:	
Terminal Paths:	
Select/Deselect All Parallel Path: Go To:Increasin	g 330 N/s, Axial Fo
Parallel Path: Break Detection	Axial Displacement
A Additional Terminal Activitie	s: + / -

11. Click on Test-run Display Tab



12. Drag and drop Signal Scope from toolbox to the designer space



13. In the properties tab of the Signal Scope command on the right hand of the screen:

- a. Run Mode: Continuous Sweep
- b. Trace Time: 10 Seconds
- c. Color: Any
- d. Y Signal: Axial Force
- e. X signal: leave unchecked

Display Name:	Signal Scope 1		
Run Mode:	Continuous Sweep		
v Visibility			
Trace Time: #	10.000	(sec)	•
* Traces		4 4	1.1
Color:	Red		•
Y Signal:	Axial Force		
🗌 X Signal:	Time		
v Line and Sy	mbol		
v Limit or Cur	ve Fit Lines	·φ. 2	y
v Y Axis			
v X Axis			
Titles and Lege	end		

14. Go file \rightarrow save as \rightarrow template



15. Template will be available under custom templates

Favorites	Name 🔺	Created	Last Modified	Туре	Description
	MTS SH Fatigue	4/1/2019 3:49 PM	4/1/2019 4:28 PM	Template	This template is designed for tens
MTS Templates	MTS SH Shear for Class	7/23/2019 10:51 AM	7/23/2019 10:53 AM	Template	This template is designed for tens
ustom Templates	Test 11	3/28/2019 12:16 PM	3/28/2019 12:23 PM	Template	
ests	Test Fatigute te,plate	8/2/2019 1:15 PM	8/2/2019 2:17 PM	Template	
ew	UPE progrssive fatigue test	4/2/2019 1:40 PM	7/22/2019 2:31 PM	Template	
Desktop					
My Documents					
My Computer					

MTS Tuning in TWE

The MTS EM Tuning Template Example is configured for a tension test using the Load Control Mode. To run a compression test, invert the polarity on the Load and Crosshead Float Signals.

- 1. Verify that the Advanced Rate Control software option is installed:
 - A. Go to Start > All Programs > MTS TestSuite > License Administrator.
 - B. Under Other Features, ensure that Custom.AdvancedRateControl appears.
- 2. Open the MTS TestSuite application.
- 3. Go to MTS Templates > TW-EM > Tuning > MTS EM Tuning Template Example.
- 4. Double-click the MTS EM Tuning Template Example to create a new test.
- 5. Install the specimen.
- 6. Clear the interlocks.
- 7. Click the run button.

8. Enter values for the Material Name, specimen dimensions, and Command activity variables. The Material Name is used to name the XML file containing the PID and tuning parameter values. Subsequent test runs will overwrite this file if the Material Name is not changed. To run a constant load test, set End Level 1 and End Level 2 to the same value and increase the Dwell Duration.

Name	Value	Unit
Material Name	Material 2011	
Width	12.700	mm
Thickness	3.175	mm
GoTo End Level 1 Rate	20.000	N/s
End Level 1	600.000	N
Dwell Duration	5.000	sec
GoTo End Level 2 Rate	20,000	N/s
End Level 2	100.000	N

9. Observe that initially the Load (blue line) does not respond to the Load Command (red line) until the kP_Load variable is increased.

Note: The maximum speed for metals is about 1 mm/min. The maximum speed for rubber is about 10 to 100 mm/min.

11. Increase the value of kP_Load by a factor of 10 and click OK until a response is seen. Then increase the value more gradually.

For example: 0.0010 OK; 0.010 OK; 0.1 OK, 0.2 OK

Name	Value	Unit
ExitVariable	Continue 👻	
kP_Load	0.00010	unitless
kI_Load	0.0000	unitless
kD_Load	0.000	unitless
DerivativeInterval	2.000	sec
MaximumSpeed	1.000	mm/min
MaximumIntegral	30.000	mm/s

- 12. Increase kI_Load.
- **13**. 12. Increase kD_Load if necessary.
- 14. 13. When tuning is complete, change the Exit Variable to "Done" and click OK to exit. The values and chart are results on the Review page. The PID and tuning parameter values are saved to an XML file in the Data Export Directory.

Name	Value	Unit	
ExitVariable	Done 🔻		
kP_Load	1.20000	unitless	
kI_Load	0.0020	unitless	
kD_Load	0.000	unitless	
DerivativeInterval	2.000	sec	
MaximumSpeed	10.000	mm/min	
MaximumIntegral	30.000	mm/s	

MTS static mechanical test with MPT