
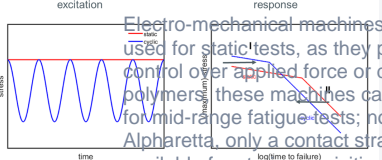
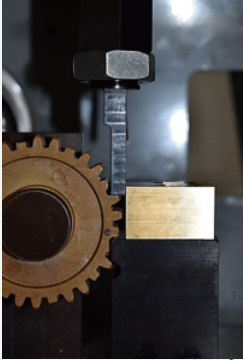
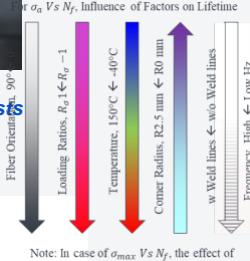



# Fatigue

APPLICATIONS	THEORY, KNOWLEDGE, & MODELS	CAPABILITIES								
<p><b>Thermal shock (busbars)</b></p>  <p><b>Thermal Shock on Demonstrator Grades prioritized for Thermal Shock characterization</b></p>	<p>Introduction to Fatigue (why does material respect SN ?)</p> <p>Difference between Fatigue and Creep</p> <p>CTD presentation - March'26</p> <p>VE presentation (more detailed) - March'26</p> <p>Definition and notations</p>	<p>Basics about Fatigue tests</p> <p>List of Fatigue data available, SSP</p> <p>Upload Fatigue data (systematically linked to material center)</p> <p><b>Core Labs Capabilities</b></p> <p>Electro-mechanical machines are generally used for static tests, as they provide better control over applied force or displacement. For polymers, these machines can also be used for mid-range fatigue tests; note that at Alpharetta, only a contact strain gauge is available for strain acquisition.</p> 								
<p><b>Gears</b></p>  <p><b>Single tooth Bending tests</b></p>	<p><b>Influence of Various Factors on Lifetime</b></p>  <p>Note: In case of <math>\sigma_{max}</math> Vs <math>N_f</math>, the effect of Loading Ratio is reversed</p>	<p><b>Effect of Fiber orientation</b></p> <p><b>Effect of Temperature</b></p> <p>Effect of Humidity</p> <table border="1" data-bbox="1333 898 1495 1024"> <tr> <td>Load</td> <td>Tem</td> </tr> <tr> <td>max</td> <td>min</td> </tr> </table> <p><b>Effect of Mean Stress / Equating Ratio</b></p> <p>Effect of Frequency</p> <p><b>Effect of Weld lines</b></p> <p><b>Effect of Sharp Edge</b></p> <table border="1" data-bbox="1333 1129 1495 1178"> <tr> <td>22Kg</td> <td>ai</td> </tr> </table>	Load	Tem	max	min	22Kg	ai		
Load	Tem									
max	min									
22Kg	ai									
<p><b>Metal to plastic applications</b></p>  <ul style="list-style-type: none"> <li>Bikes: Frames, Handle &amp; Fork</li> <li>Coffee machine handles</li> </ul>	<p>Life prediction methodologies</p> <p><b>Identified cases for the year 2025</b></p>	<p>Effect of Over molding</p> <p>Effect of Recycled fibers</p> <p>Effect of ageing</p> <p>Effect of Harsh environments (Chemical, ...)</p> <p><b>Corporate Capabilities</b></p> <p>Creep-Fatigue interactions, Self-heating at high frequency</p> <p>Multiaxiality, Multiaxial Loading</p> <p>Numerical: Effect of Mesh size, Effect of Mesh type</p> <p>Empirical law</p> <p>Stress based approach</p> <p>Energy based approach</p>								
<p><b>Compressor</b></p> <p><b>High Frequency Fatigue loadings</b></p>	<p>Life prediction methodologies</p>	<p>Stress based approach</p> <p>Energy based approach</p>								
	<p>Fatigue modeling of fiber reinforced polymers</p>	<table border="1" data-bbox="1076 1822 1495 1955"> <tr> <td>Region</td> <td>Equipment</td> <td>Load</td> <td>Tem</td> </tr> <tr> <td></td> <td></td> <td>max</td> <td>min</td> </tr> </table>	Region	Equipment	Load	Tem			max	min
Region	Equipment	Load	Tem							
		max	min							

Workflow	Life time prediction for cyclic loading	3x Servo-hydraulic machines (DIC, Extenso)	10kN	-40
	Life time prediction for thermal cyclic loading	Composite testing	100kN	-80
Validation	Contacts: Michel Houba, Dominique Delcourt			

- **ADL Capabilities**

Although tooth bending is not a classic fatigue test, this can be used to validate the FE models, with capacity to test higher frequencies.

*Tips: The current FE model for fiber filled polymers, can be applied only if the failure mode is slow crack growth controlled failure or brittle failure, which typically occurs at the root of the teeth in gear tooth bending.*

Region	Equipment	Load	Tem
		max	min
Bollate	Gear tooth bending		ai

Contacts: Matilde Scurria, Lorenzo Mancin

- **Potential external partners**

Syensqo has engaged Leartiker to generate fatigue test data (including hysteresis measurements), to support the creation of **Digi mat fatigue cards** across different temperatures. Other capabilities include **sample molding, creep analysis, advanced...**

Laboratory	Equipment	Load	1
		max	
Leartiker, Spain	Electro-mechanical MTS Insight 100 (2D & 3D)	100kN	
	Servo-hydraulic machine MTS Bionix, +Torsion	15kN	
	Metravib DMA +300, +2000	2kN	

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