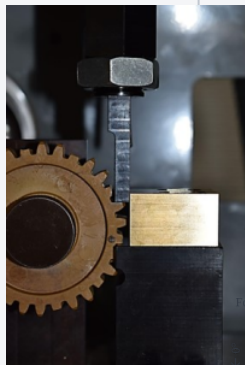


Fatigue

APPLICATIONS		THEORY, KNOWLEDGE, & MODELS		CAPABILITIES	
Thermal shock (busbars)		Introduction to Fatigue (why does material respect SN ?)		Basics about Fatigue tests	
		Difference between Fatigue and Creep		List of Fatigue data available, SSP	
		CTD presentation - March'26		Upload Fatigue data (systematically linked to material center)	
		VE presentation (more detailed) - March'26			
		Definition and notations		• Core Labs Capabilities	
		Thermal Shock on Demonstrator		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.	
		Physical Background		The effect of fiber orientation at Bollate is designed to evaluate the lifespan of films, but it is limited to film materials only and can only test thicknesses between 250 and 350 microns.	
		Grades prioritized for Thermal Shock characterization		Effect of Humidity	
Gears		Influence of Various Factors on Lifetime		Effect of Mean Stress / Equating Ratio	
		Single tooth Bending tests		Effect of Frequency	
		Note: In case of σ_{max} Vs N_f , the effect of Loading Ratio is reversed		Effect of Weld lines	
		Fiber Orientation: 90° $\leftarrow$ 0°		Effect of Sharp Edge	
		Loading Ratios, $R_{-1} \leftarrow R_0 \rightarrow -1$		Effect of Over molding	
		Temperature: 150°C $\leftarrow$ -40°C		Effect of Recycled fibers	
		Corner Radius, R2.5 mm $\leftarrow$ R0 mm		Effect of ageing	
		w/ Weld lines $\leftarrow$ w/o Weld lines		Effect of Harsh environments (Chemical, ...)	
		Frequency: High $\leftarrow$ Low Hz		• Corporate Capabilities	
				Creep-Fatigue interactions, Self-heating at high frequency	
				Multiaxiality, Triaxially Loading Shape	
				Numerical Effect of Mesh size, Effect of Mesh type	
				Empirical law	
				Stress based approach	
				Energy based approach	
				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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