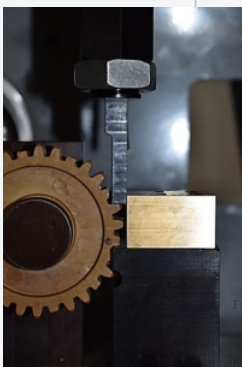


Fatigue

APPLICATIONS		THEORY, KNOWLEDGE, & MODELS		CAPABILITIES	
Thermal shock (busbars)		Introduction to Fatigue (why does material respect SN ?)		Basics about Fatigue tests	
	Thermal Shock on Demonstrator Grades prioritized for Thermal Shock characterization	Difference between Fatigue and Creep		List of Fatigue data available, SSP	
Gears		CTD presentation - March'26		Upload Fatigue data (systematically linked to material center)	
	Single tooth Bending tests	VE presentation (more detailed) - March'26			
Metal to plastic applications		Definition and notations		• Core Labs Capabilities	
	- Bikes: Frames, Handle & Fork - Coffee machine handles	Influence of Various Factors on Lifetime at σ_a Vs N_f, Influence of Factors on Lifetime Fiber Orientation: 90° Loading Ratios: $R_{eff} \leftarrow R_{eff} \rightarrow -1$ Temperature: 150°C $\leftarrow$ -40°C Corner Radius: R2.5 mm $\leftarrow$ R0 mm w/ Weld lines $\leftarrow$ w/o Weld lines Frequency: High $\leftarrow$ Low Hz Note: In case of σ_{max} Vs N_f, the effect of Loading Ratio is reversed		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. The film folding tester 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. Effect of Fiber orientation Effect of Temperature Effect of Humidity Effect of Mean Stress / Equating Ratio Effect of Frequency Effect of Weld lines Effect of Sharp Edge Effect of Over molding Effect of Recycled fibers Effect of ageing Effect of Harsh environments (Chemical, ...) • Corporate Capabilities Creep-Fatigue interactions, Self-heating at high frequency Multiaxiality, Triaxiality, Loading Shape Numerical: Effect of Mesh size, Effect of Mesh type At the Brussels site, in-house developed demonstrator parts and testing setups enable us to conduct fatigue bending tests on L-shaped samples with various radii and on different approaches with or without ribs and weld lines.	
Compressor	High Frequency Fatigue loadings	Life prediction methodologies		Energy based approach	
	Identified cases for the year 2025	Fatigue modeling of fiber reinforced polymers		Region Equipment Load Tem	

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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