

COMPOSITE MATERIALS LABORATORY

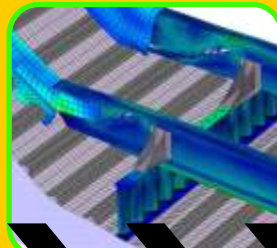
COMPOSITE MATERIALS
MANUFACTURING


MECHANICAL TESTING

PHYSICAL-CHEMICAL
CHARACTERIZATION

NONDESTRUCTIVE
INSPECTION

ANALYSIS AND
SIMULATION OF
COMPOSITE STRUCTURES





COMPOSITE MATERIALS LABORATORY

The Center for Engineering and Industrial Development (CIDESI), a federal government research and development Center located in Queretaro Mexico, has started up a Composite Materials Laboratory to provide the national and international aerospace industry with R&D support on fiber reinforced composite materials. The general purpose of the Laboratory is to perform research and development projects oriented to materials characterization, manufacturing processes development and optimization as well as nondestructive evaluation of fiber reinforced plastics. The laboratory operates with up-to-date equipment and instrumentation as well as qualified personnel.

MAIN ACTIVITIES

Composite materials manufacturing

Mechanical testing

Physical-chemical characterization

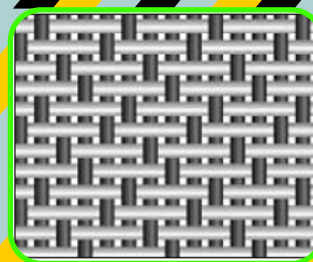
Nondestructive inspection

Analysis and simulation of composite structures

TECHNOLOGICAL SERVICES

Composite materials testing are performed following standard and non-standard methods.

	Test	Method
Physical-chemical	Void Content (cured material)	ASTM D2734
	Constituent Content (cured material)	ASTM D3171
	Matrix Solid Content (uncured material)	ASTM D3529
	Volatiles Content (uncured material)	ASTM D3530
	Resin Flow	ASTM D3531
	Gel Time	ASTM D3532
	Fiber Areal Weight (FAW)	ASTM D3776
	Density	ASTM D3800
	Glass Transition Temperature (DMA Tg)	ASTM D7028
	High Performance Liquid Chromatography (HPLC)	SACMA SRM 20 -94
	Density of Sandwich Core Materials	ASTM C271
	Expansion Ratio, Exotherm & Slump of Structural	Customer standard
Mechanical	Peel strength by climbing drum method	ASTM D1781
	Short-Beam Strength	ASTM D2344
	Tensile Properties	ASTM D3039
	Compressive Properties	ASTM D6641
	Flexural Properties	ASTM D7264
	Tensile shear	ASTM D2557
	Shear Properties of Sandwich Core Materials	ASTM C273
Flatwise Compressive Properties of Sandwich Cores	ASTM C635	
Photomicrographic Evaluations	Component failure analysis	Customer standard
	Specimen preparation and analysis of composites	Customer standard
	Image Analysis of metallographic specimens or images	Customer standard



RESEARCH AND

DEVELOPMENT

The lab provides support for funded research projects related to composite materials and also for a laboratory training courses on composite materials characterization and manufacture. Research activities include theoretical, experimental, and combined investigations.

Manufacturing processes

The understanding of composite materials and their structures requires an in-depth knowledge of basic material behavior. Knowledge of fiber and resin behavior is essential for understanding the intricacies of composite manufacturing processes.

Fatigue and fracture testing

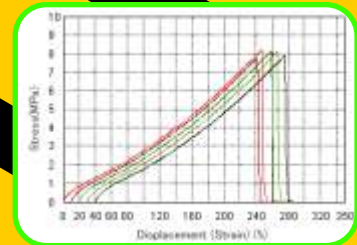
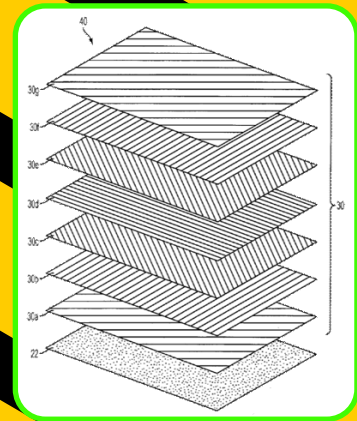
Contributions of solid mechanics research to the development of composite materials and structures. The main topics include, high cycle fatigue, low cycle fatigue, fracture toughness, mechanical behavior at low velocity and high velocity impact loading, failure analysis and damage mechanisms of composite structures.

Non Destructive Testing

NDT inspection is required to ensure that the composite structure has been built correctly. The main techniques are ultrasonic; phase arrays, immersion ultrasonic, "C" scan, Lamb waves, and acoustic emission, also radiography and infrared thermography techniques are available.

CAD/CAE

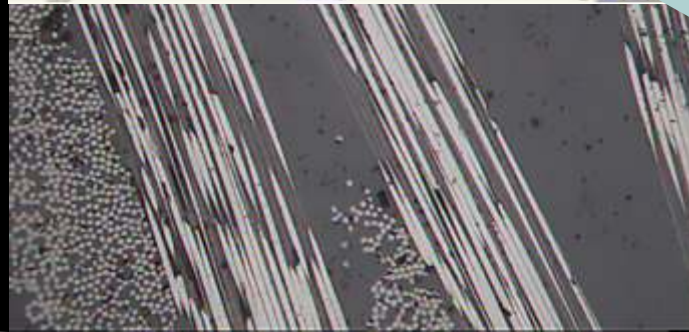
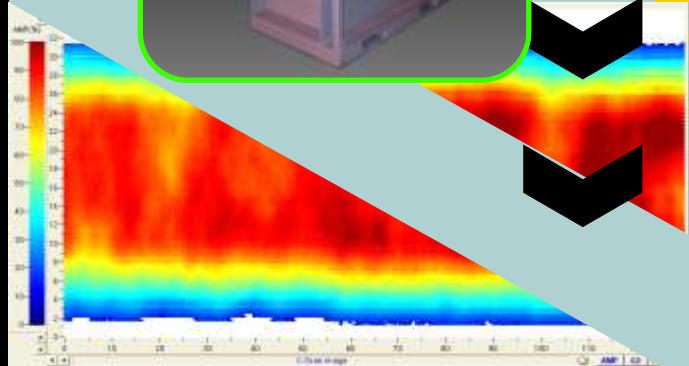
Design and analysis capabilities include finite element and laminated plate analysis programs, and programs for fracture mechanics analysis. Commercial software: SolidWorks, Unigraphics NX, CATIA, ANSYS and ABAQUS.



- o Physical-chemical testing area
- o Mechanical testing area
- o NDT area
- o Manufacturing area
- o Specimen cutting preparation area
- o High capacity refrigerators
- o Clean room

EQUIPMENT

- HPLC Flexar, UV/VAS detector, column ovens, autosamplers and injectors.
- DMA 8000 Dynamic Mechanical Analyzer with TMA capability.
- Autoclave, Econoclave 2x4 ft, 200 PSIG @ 650°F.
- Manual Hydraulic Compression Press with 12 Ton Capacity
- Carver hydraulic press
- MTS 810 Servo-hydraulic Universal Testing Machine with environmental chamber, 100kN capacity
- INSTRON 8872 Servo Hydraulic Universal Testing Machine, 10kN capacity
- MTS Insight Electromechanical Testing System, 100kN capacity
- Environmental chamber for temperature and humidity conditioning; -10 to 80°C; 25 to 95% RH.
- Bode 100 - PC controlled Vector Network Analyzer
- High voltage ultrasonic pulser-receiver
- Ultrasonic preamplifier
- OmniScan MX PA ultrasonic phase array system
- Physical Acoustic Corporations ultrasonic immersion system
- Stereoscope x350 with hand-held inspection unit
- JEOL 6160LV Scanning Electron Microscope (SEM) with Energy Dispersive Spectroscopy (EDS)
- Programmable ovens
- Cutting machines
- Walk-in freezers, 0 to -13°F.



Certifications and Accreditations

- ISO 9001:2008. Registered
- ISO 17025. Accredited Laboratory. EMA
- Bombardier Aerospace Accredited Laboratory. In process
- AS 9100. In process
- Nadcap. In process



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