

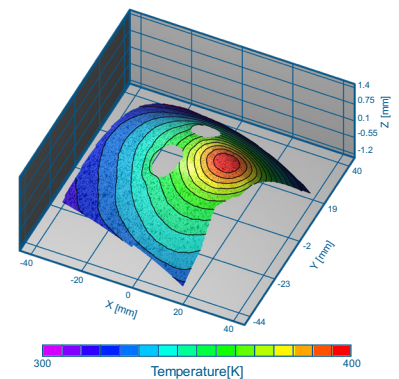
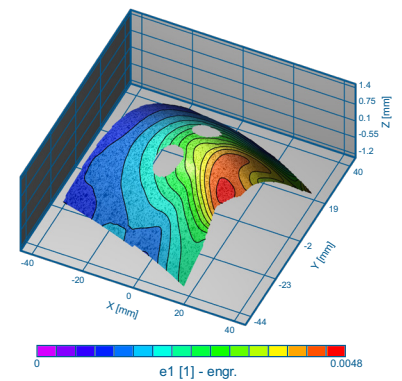
VIC-3D with *iris* Infrared (IR) System

The VIC-3D IR system is a powerful addition to the Correlated Solutions digital image correlation (DIC) product line. The VIC-3D IR system features an infrared (IR) camera that is integrated with the DIC cameras enabling accurate temperature data to be acquired and analyzed with the full-field strain data. The system works by first calibrating the intrinsic optical parameters of the IR camera and then calibrating the position of the IR camera relative to the stereo DIC system. The calibration allows VIC-3D to place the thermal and strain data into a common coordinate system. The calibration and imaging procedures have been streamlined by integrating the IR camera into our VIC-Snap image acquisition software, which allows the user to capture images from the IR and DIC cameras simultaneously. **The result is an easy to use, turnkey thermal imaging system that utilizes digital image correlation to accurately measure temperature and strain concurrently without any contact with the sample.** Thermal and strain data can be viewed, analyzed, and extracted over the entire field or at precise locations.

This turnkey system includes all software, hardware, installation, and one year of unlimited technical support and software upgrades. The thermal integration capability may also be added to most existing VIC-3D systems for increased functionality. When accurate measurement of temperature and strain is required, look no further than VIC-3D IR.

Features

- ▶ Accurately measure deformation and thermal data concurrently
- ▶ Synchronize infrared and digital image correlation images
- ▶ Measure 3D full-field displacements and strains at temperatures up to 2000° C
- ▶ Remotely view and acquire images using the VIC-Snap remote
- ▶ Extract points, regions, or node locations for FEA validation
- ▶ Synchronize analog data with DIC and temperature data
- ▶ Calibrate with specially-designed targets visible in IR & visible light spectrums
- ▶ Save time with user-friendly setup and calibration

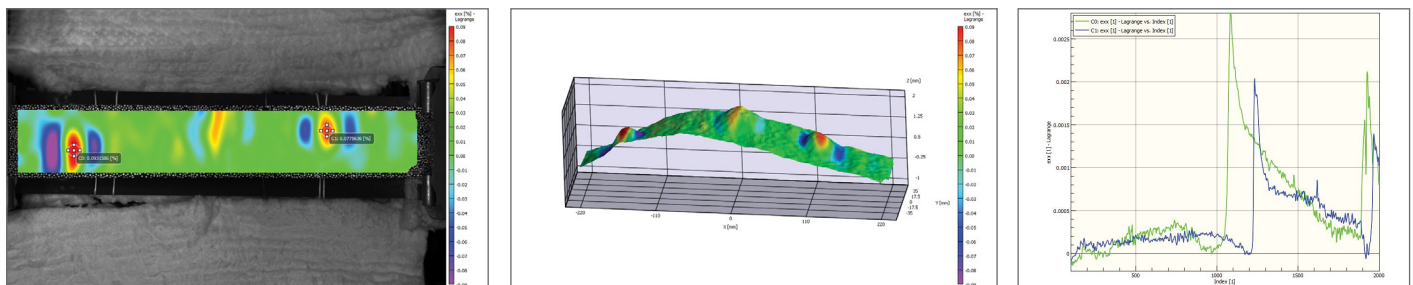


Temperature data overlaid on DIC plot generated in VIC-3D

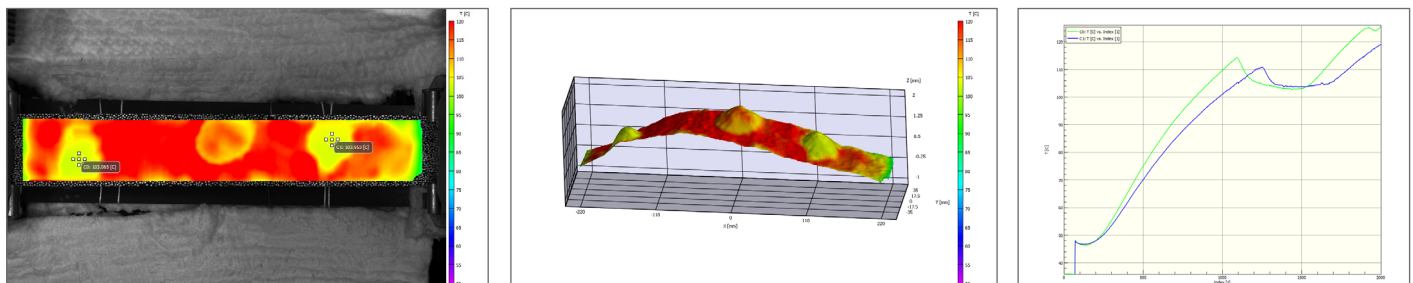
CASE STUDY

E-glass/Vinyl Ester/Balsa Wood Sandwich Composite

Understanding thermo-mechanical behavior of material can be a vital component when designing vehicles and structures that may become exposed to high temperatures. Virginia Tech's *Extreme Environments and Materials Laboratory* focuses on the impact of extreme environments on materials. This includes research that is focused on understanding the thermo-mechanical behavior of materials both during and following fires. Experimental investigations are performed to understand the evolution of the material due to elevated temperature. The senior research associates in the lab used the VIC-3D IR system to find the effects of a simultaneous one-sided heating and compressive loading test on an e-glass/vinyl ester/balsa wood sandwich composite sample.



The longitudinal strain (Exx) is seen here in 2D (left), 3D (center), and as a strain vs. time plot (right).



The temperature is seen here in 2D (left), 3D (center), and as a temperature vs. time plot (right).

The data in the images and graphs above display the strain and temperature data extracted from the two locations C0 and C1. The strains peak during delamination and blistering at the highest temperature and then become smaller as the surface cools.

"The VIC-3D IR system identified several transient events during the compression tests which would not have otherwise been fully understood using either DIC or IRT independently. Through this testing, several features of sandwich composite thermomechanical behavior were elucidated which would not have been possible with traditional point measurements (e.g. strain gages or thermocouples)."

-Extreme Environments & Materials Lab, Virginia Tech