About SAMTECH

SAMTECH is a European specialist in Computer Aided Engineering (CAE) software for Finite Element Analysis (FEA) and Multi-Disciplinary Optimization (MDO).

Founded in 1986 from the Aerospace Laboratory of University of Liege, SAMTECH develops and markets the general-purpose Finite Element Analysis code SAMCEF, the Multi-Disciplinary Optimization platform BOSS quattro, the Open CAE Design Framework CÆSAM and the multi-physics solver OOFELIE. SAMTECH Group currently employs more than 220 people in Belgium, France, Germany, Italy, Spain and UK for technical support, sales and engineering services.

The company relies also on a network of technically advanced distributors in other markets all over the world. SAMTECH is a DASSAULT Systemes partner for the development of its products embedded in or connected to CATIAV5.

SAMTECH is a partner of CEA and JRC for the development and the commercialisation of the explicit code EUROPLEXUS (impact, explosion and fluid-structure interactions).

SAMTECH is also NAFEMS member and is certified to ISO9001:2008 quality standards. The software technology of SAMTECH has an unsurpassed reputation for its quality and reliability. It has been adopted by many major companies across all engineering disciplines as an integral part of their design process.

- Need some information about SAMCEF for Composites?
- Need some information about linear and non-linear analysis of composite material structures?
- Need some information about SAMTECH expertise ?

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SOME OF OUR PARTNERS

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DAIMLER, PORSCHE, PSA, TOYOTA, DELPHI AUTOMOTIVE, MITSUBISHI, TATA DAEWOO…

Energy
AREVA, EDF, GENERAL ELECTRICS, SIEMENS, REPOWER…

Defense
MBDA, GIAT INDUSTRIES, FORGES DE ZEEBRUGGE…

Miscellaneous
GLAVERBEL, SAINT GOBAIN, PICANOL…

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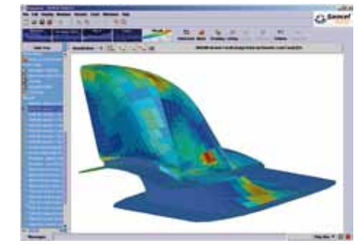
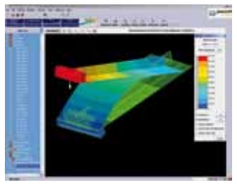
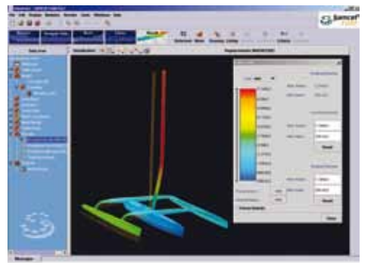
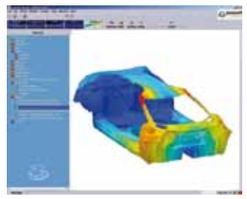
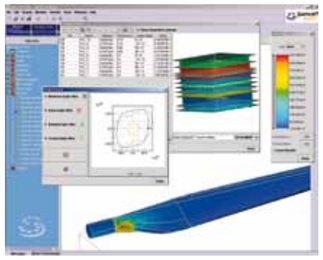
SAMCEF for Composites











The Finite Element based software environment for the analysis of composite material structures.

As the world grows composites....

A library of material models (honeycomb, foam...) and laminated parts are available to the user. For enhanced non-linear solutions, SAMCEF offers several delamination and progressive damage models of fibers/matrix systems. SAMCEF is an open environment, users can implement their own formulations.

INTEGRATED COMPOSITE ANALYSES

Aerospace, Automotive, Railway industry, marine technology, sports and leisure; you name it Composites are everywhere.

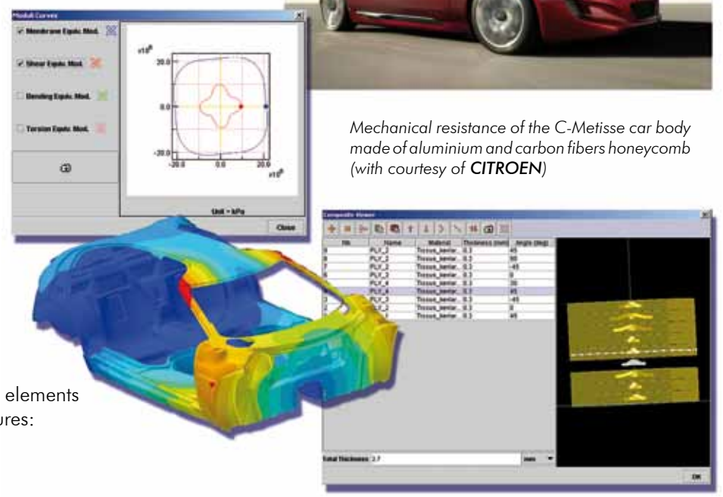
SAMCEF for Composites is the tool that meets the design and stress needs. Designer and Stress analyst will be able to bring out more efficient design using the comprehensive behavior of composite and mixed structures: light weight, strength and flexibility, versatile, etc.

- High degree of anisotropy;
- Highly non-linear behavior;
- Sensitivity to stress concentration;
- Huge amount of data and results.

SAMCEF for Composites is an integrated thermo-mechanical software available for:

- Linear static;
- Non-linear static (material and geometrical non-linearities);
- Modal analysis (vibration and buckling);
- Transient response;
- Rotor dynamics.

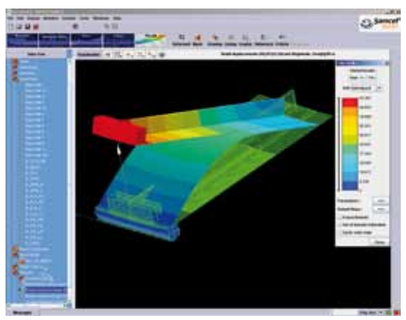
*Mechanical resistance of the C-Metisse car body made of aluminium and carbon fibers honeycomb (with courtesy of **CITROEN**)*



DEDICATED ELEMENTS

SAMCEF for Composites features multilayered elements for laminated composites and sandwich structures:

- **Laminates:**
  - Thick shell (Mindlin);
  - 3-D solid;
  - Membrane (available from SAMCEF);
  - 2-D plane strain (and generalized plane strain) (available from SAMCEF).
- **Ply interface or glued joint:**
  - 2-D and 3-D interface element with dedicated material model.
- **Sandwich:**
  - Transverse shear deformable shell;
  - Superposition of solids and membranes or shells where significant cross section warping occurs.



*Skin stringer separation test (with courtesy of **RTU**)*

MATERIAL LAWS

All the material models from SAMCEF Field material library (plastic, hyper-elastic...) can be used to define a laminate.
From elastic behavior to material degradation models:

- Linear elastic:
  - Uniform distribution;
- Non-linear interface behavior (multimodal solicitation):
  - Exponential law (Smith-Ferrante).

The following material models are available from SAMCEF:

- Linear elastic:
  - Mixture law;
  - User defined function of 3 spatial field (e.g. fibre volume fraction, weft to warp ratio, shearing angle).
- Non-linear elastic model with degradation based on dual approach (up to 9 stress-strain relations and allowable stress or strain);
- Linear elastic with damage in transverse direction and failure in fibre direction (Ladeveze - Le Dantec (L.M.T. Cachan));
- Non-linear interface behavior (multimodal solicitation):
  - Bi-linear stress-strain relation;
  - Polynomial law (Lévêque – Allix (L.M.T. Cachan)).
- Temperature dependent.

COMPOSITE ENGINEERING ENVIRONMENT

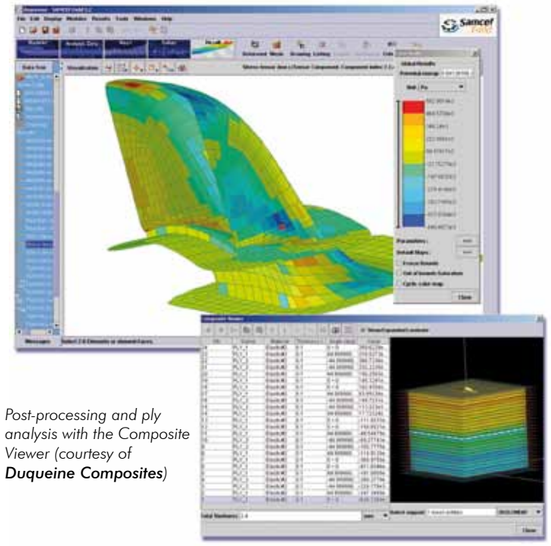
SAMCEF Field is the interdisciplinary pre/post-processing tool for SAMCEF product range. For composite analyses, it was given special “composite features”:

- **Composite Viewer for pre-processing:**
  - Laminate lay-up;
  - Ply thickness;
  - Ply orientation;
  - Material selection;
  - Equivalent homogenised mechanical properties.
- **Draping capabilities:**
  - Plane folding down;
  - Visualisation of fibres orientation over the mesh surface...
- **Composite Viewer for elemental ply results:**
  - Stresses, strains, energy, etc.;
  - Failure criteria ratios.
- **Post-processing:**
  - Displacements, Stresses, Strains, etc.;
  - Failure criteria treatment:
    - ➠ Ply-by-ply results recovery;
    - ➠ Critical ply;
    - ➠ Failure indices (progressive damage).

SAMCEF for Composites allows the integration of complementary analyses into the same modeling environment. In addition, the management of assembling process and almost transparent meshing techniques are available.

Users can create or import any Super Element geometry made of composite material to be connected to other system entities (structural or mechanical entities) or to create a larger model.

SAMCEF for Composites can also be coupled with BOSS quattro, the application and optimization manager.



*Post-processing and ply analysis with the Composite Viewer (courtesy of **Duqueine Composites**)*

Parametric studies, sensitivity analysis, statistical analysis, model updating, optimization, design of experiments and response surfaces can be easily performed. BOSS quattro is a SAMTECH software.

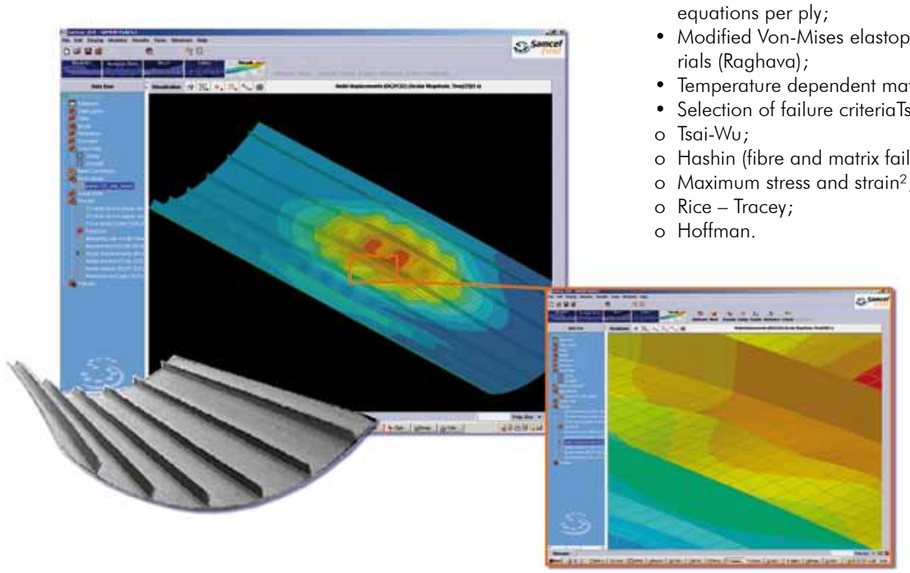
KEY FEATURES

Why choosing SAMTECH as composite FE software provider?

- 40 years of experience in composite analysis and modelling;
- Preferred solution for composites in major Asian and European aeronautical groups.

Why choosing SAMCEF for Composites?

- Interlaminar stress calculation based on local equilibrium equations per ply;
- Modified Von-Mises elastoplastic model for adhesive materials (Raghava);
- Temperature dependent material properties;
- Selection of failure criteriaTsai-Hill (1,2 and 3):
  - Tsai-Wu;
  - Hashin (fibre and matrix failure);
  - Maximum stress and strain[2];
  - Rice – Tracey;
  - Hoffman.



*Damaged panel buckling with skin stringer separation (with courtesy of **DLR**).*