

$$\bar{\Pi} = \frac{1}{2} \sum_c \{u\}^T \cdot [K] \cdot \{u\} - \{u\} \cdot \{F\}$$

FEM SOFTWARE AND SERVICES



Challenges of “Working with Composites”

IDAC

Integrated Design & Analysis Consultants (Ireland) Ltd

Presents in Cooperation with

Andreas Hübner, CADFEM (Suisse) AG

René Roos, EVEN AG

ANSYS[®]

ANSYS Competence Center FEM

CADFEM[®]

$$\bar{\Pi} = \frac{1}{2} \sum_c \{u\}^T \cdot [K] \cdot \{u\} - \{u\} \cdot \{f\}$$

FEM SOFTWARE AND SERVICES



Your local Partner:

IDAC Ireland Ltd
Derek Sweeney
10 Windsor Place
Lower Pembroke St
Dublin 2

phone : +353 (0)1 676 3765

e-mail : dsweeney@idacireland.com

web : www.idacireland.com

ANSYS[®]

ANSYS Competence Center FEM

CAD/FEM[®]

Working with Composites

Anisotropic Materials

- § Huge set of material properties depending on
 - § Fiber and matrix material and volume content
 - § Temperature and moisture
 - § Processing conditions
- § How to find to find parameters?

Engineering constants - orthotropic

Ply: T300;Epoxy;F-220/193/50

In-plane engineering constants

Moduli (GPa)

E_1 E_2

G_12

Poisson's ratios

nu_12

Out-of-plane engineering constants

Moduli (GPa)

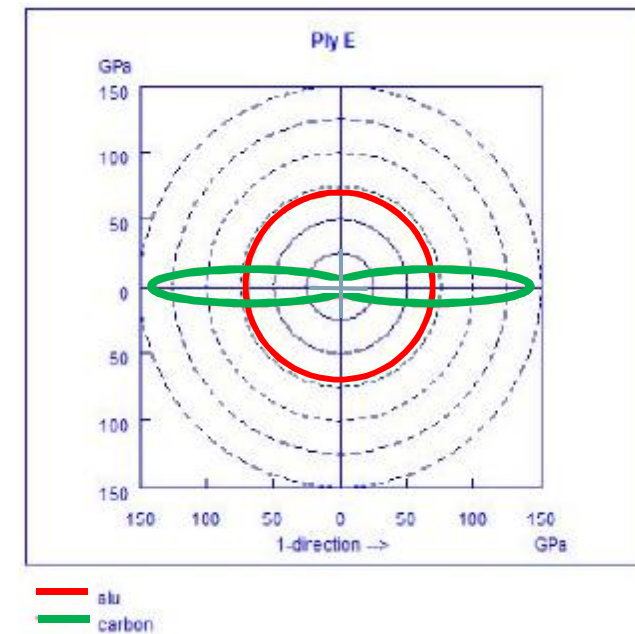
E_3

G_31 G_23

Poisson's ratios

nu_13 nu_23

Units... OK Cancel Help

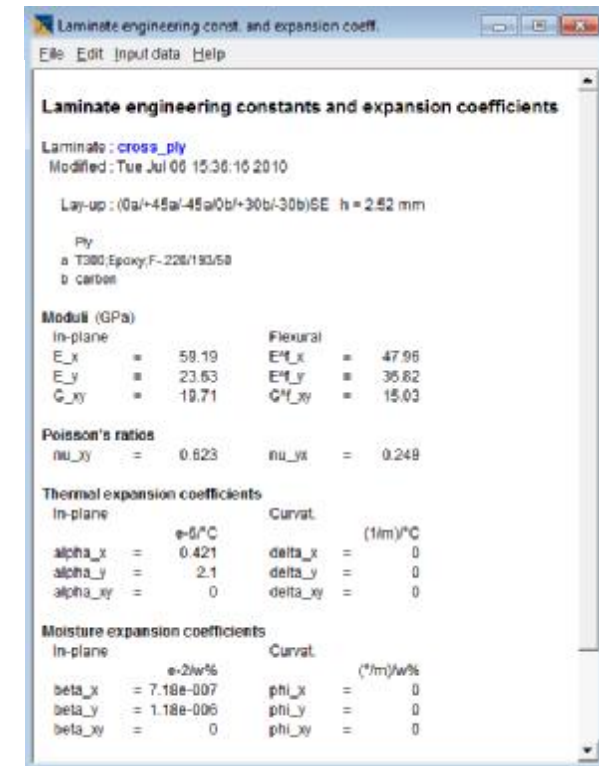
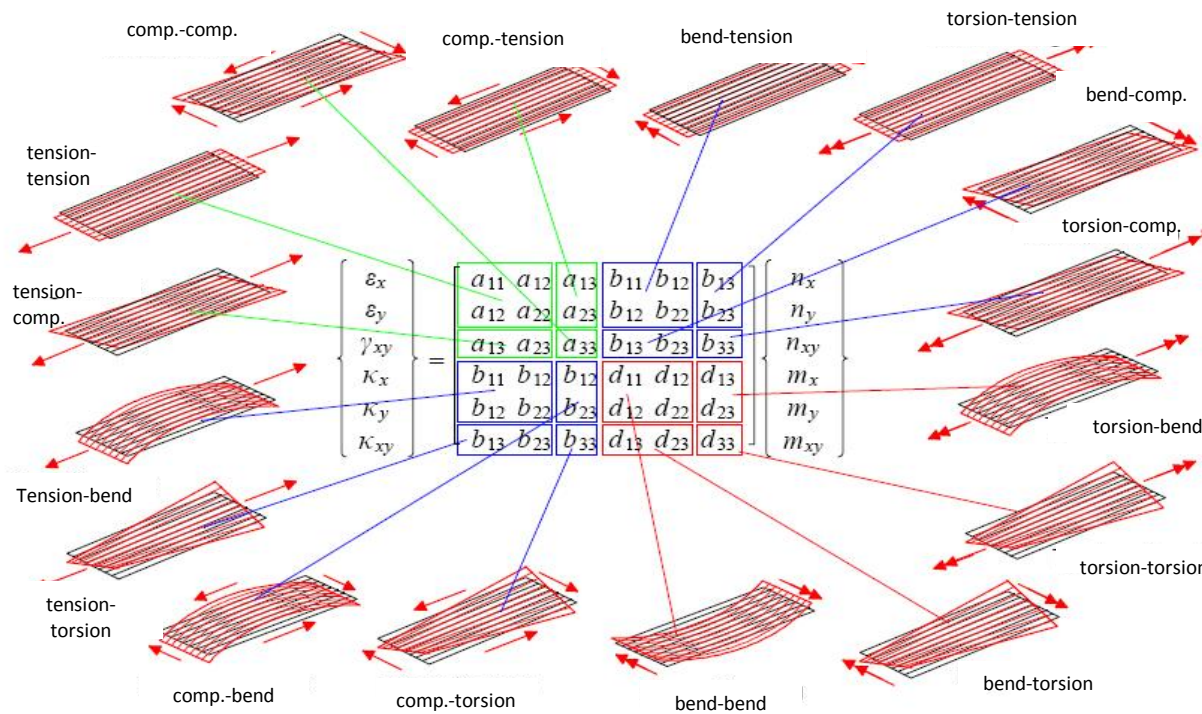


Working with Composites

Layup and Material Orientations

§ The order of the stackup (layers) and the material orientations influence the mechanical behavior of the structure

§ How to engineer an adequate stackup?



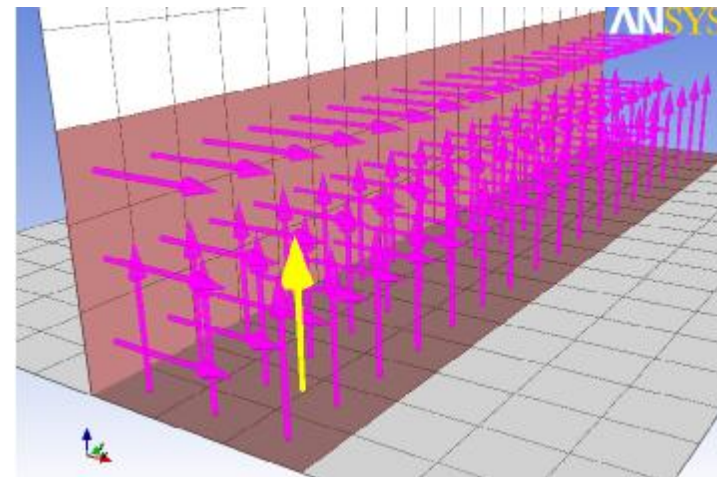
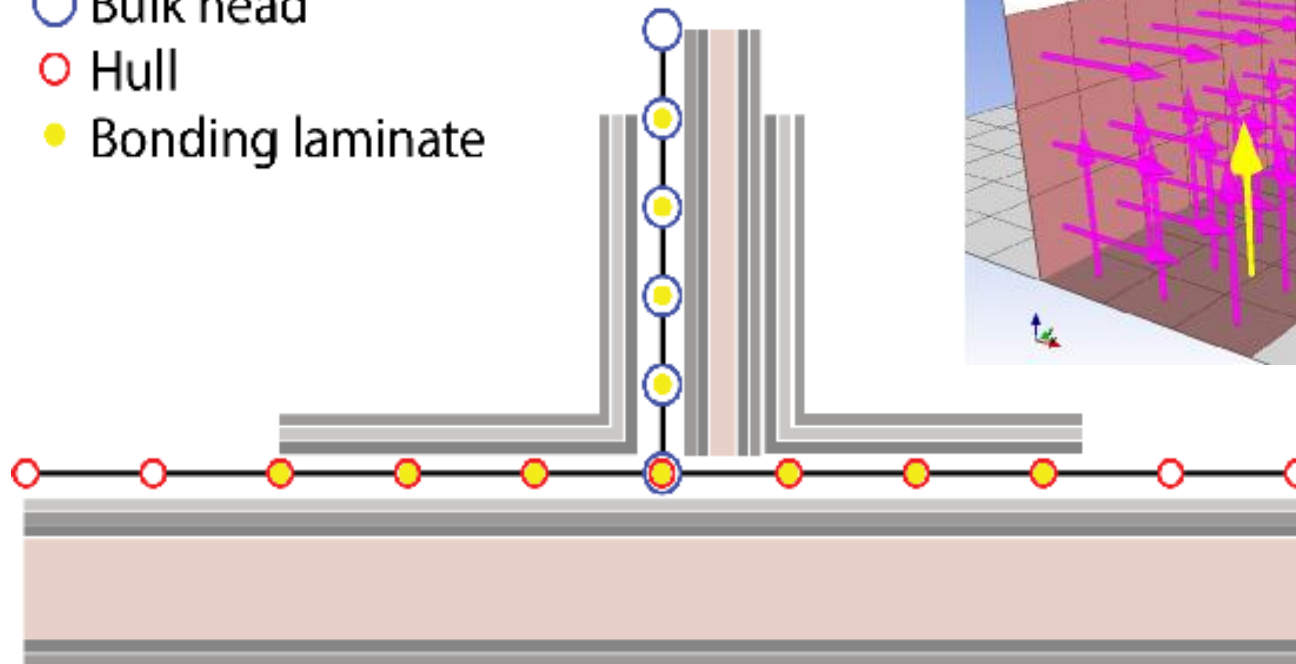
Working with Composites

Build Complex Laminates (T-Joint)

§Layers on both sides of the reference surface.

§How to model bonding laminates with the accordant orientations?

- Bulk head
- Hull
- Bonding laminate

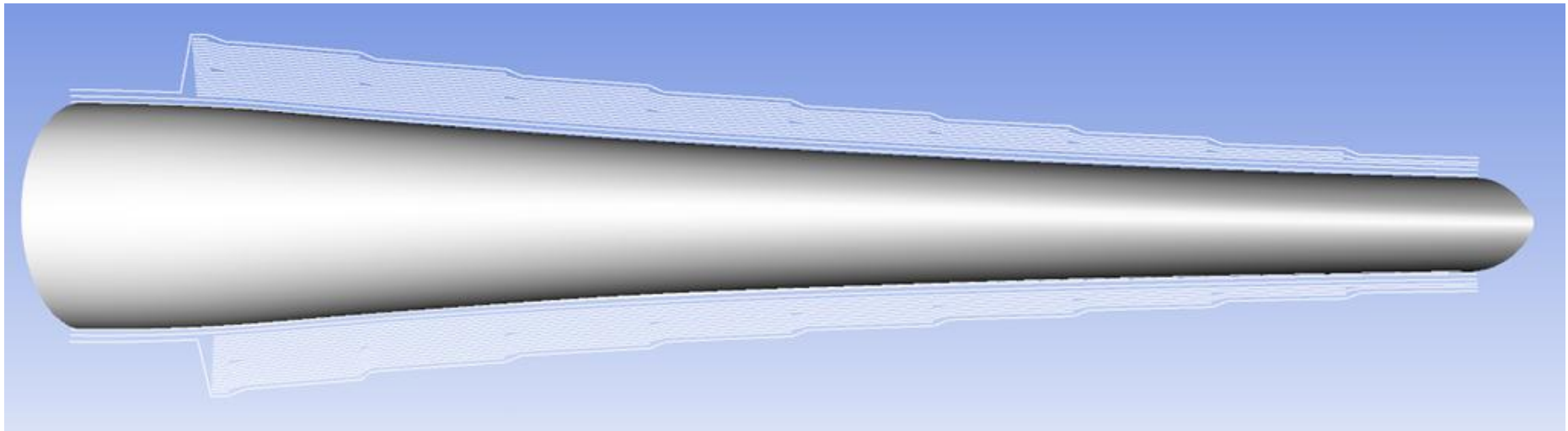


Working with Composites

Build Complex Laminates (Staggering and Tapering)

§ Staggering is often used to changes in stiffness.

§ How to model drop offs and staggering?

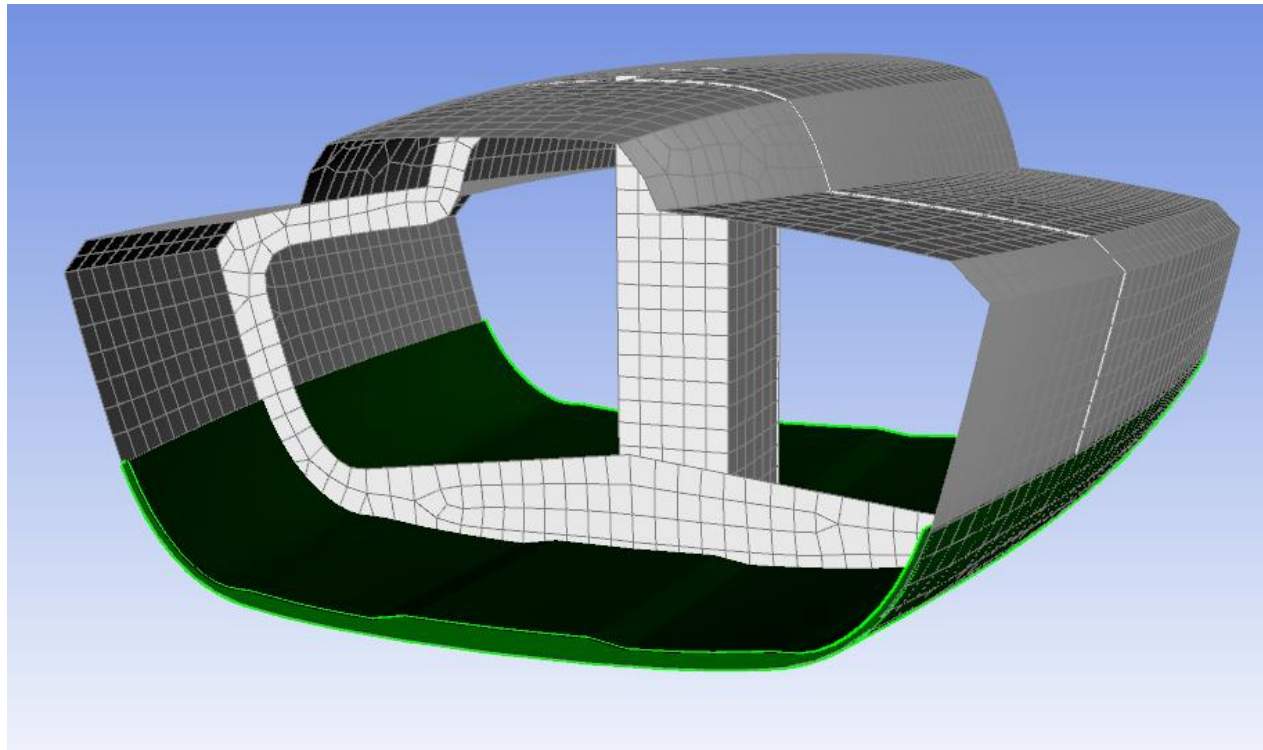


Working with Composites

Build Complex Laminates (Core Thickness)

§Core materials are used to increase the flexural stiffness and performance.

§How to model 3D (CNC milled) core materials?

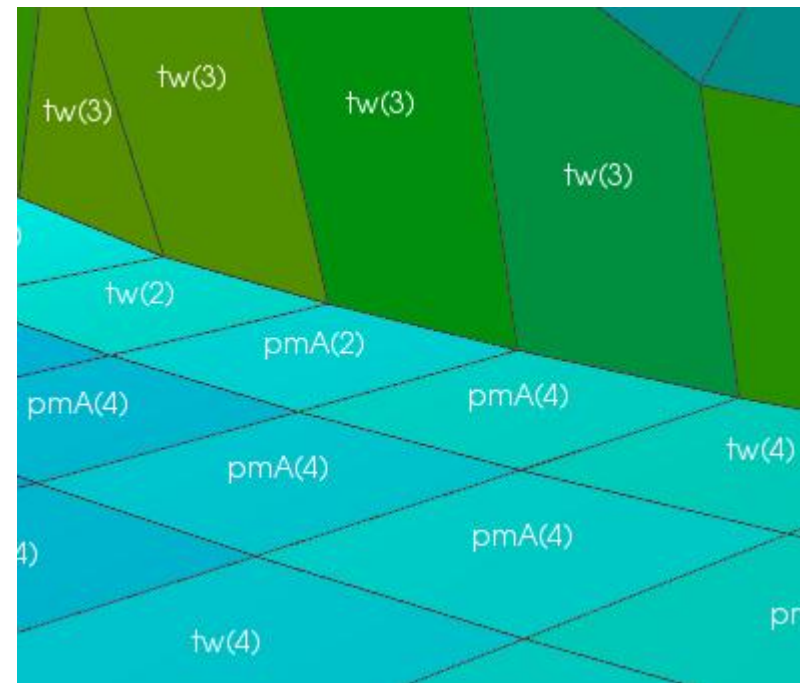
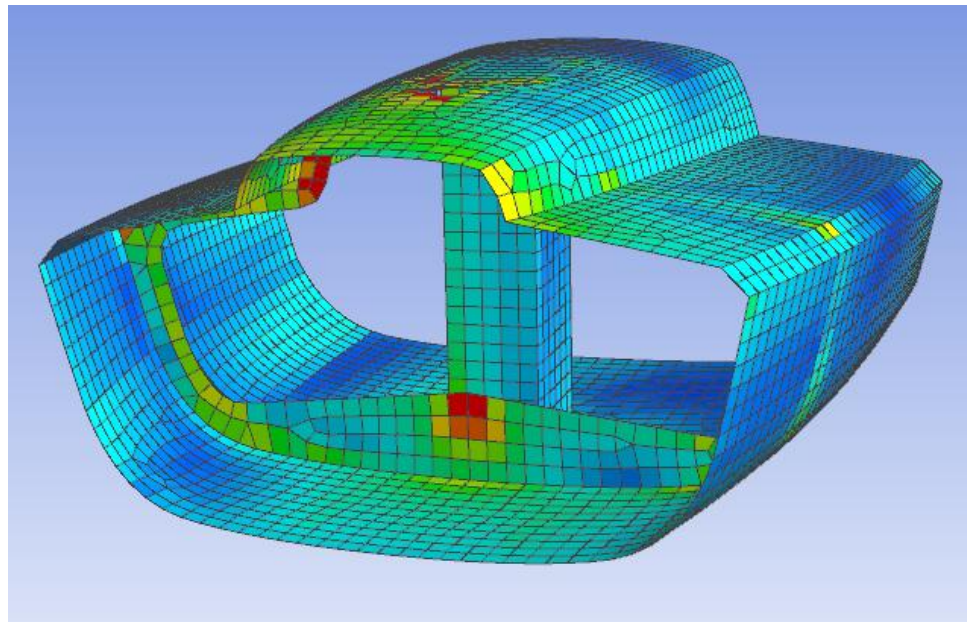


Working with Composites

Post-process Composites

§ Depending on the stress state composite materials show different failure modes.

§ How to analyze composites efficiently?



Working with Composites

Manufacture Composite Structures

§How to generate production data?

Chapter - hull

outer_skin_1



- Ply Group Name: hull (hull)
- Ply Name: outer_skin_1 (outer_skin_1)
- Nr: 1
- Orientation: 0.0
- Material: E-Glas

Thickness	0.00027
Area	3.69743647113
Cost	0.0
Weight	1.09661369442

