Composite Materials at the division of Engineering Materials-Linköping University

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SuPRA SUSTAINABLE POLYMER RESEARCH ARENA

polymerinstitutet Husqvarna THULE SCANIA

2024-09-05 – Quality Hotel - Södertälje

LINKÖPING UNIVERSITY

The Division of Engineering Materials

17 researchers, 2 Industrial PhD students

Mechanical testing and Characterization

Metallic materials

Polymer Composite materials

Additive manufacturing

Mechanical properties

Microstructures

Advanced mechanical testing equipment: Fatigue, Impact…

Microstructural investigations: SEM, Optical microscope…

The Division of Engineering Materials

Basic courses

TMKM12 - Engineering Materials
TMKM11 - Material for Design
TMKM22 - Industrial Materials Selection

Advanced courses

TMKM16 - Sustainable Material Selection
TMKM90 - Deformation and Fracture
TMKO01 - Advanced materials and the environment
TMKO02 - Engineering Materials and Manufacturing Technology
TMKO03 - Metals for lightweight applications
TMKO04 - Composite materials
TMKO05 - Additive Manufacturing for Industrial Applications
TMKO06 - Biopolymers and biocomposites

We are giving courses at both basic and advanced levels to around **400 engineering students** each year.

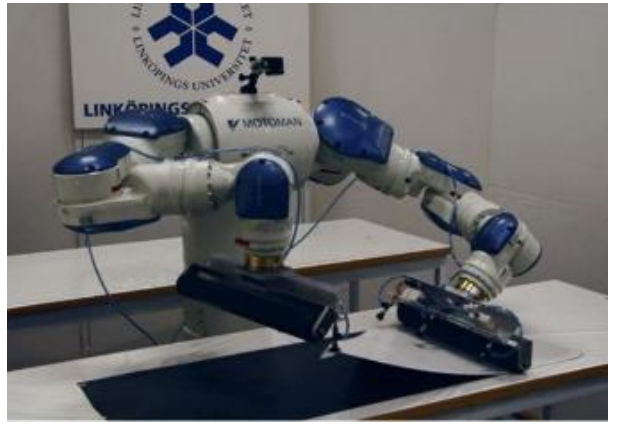
Compraser-Labs: Course given to industries and coordinated by RISE

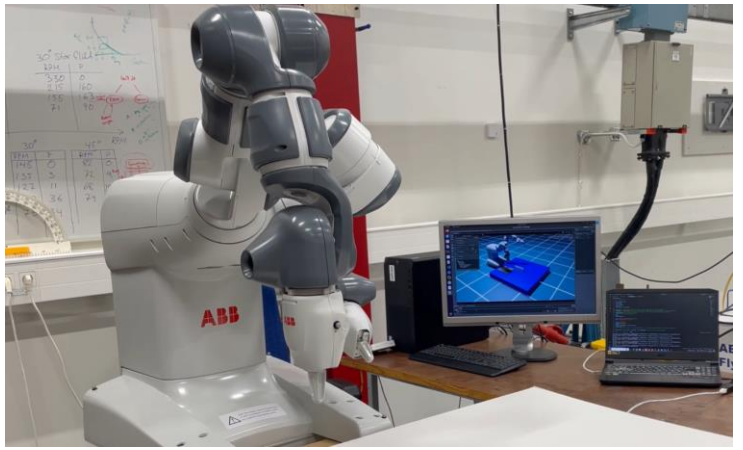
Composite Research at Engineering Materials

- **Manufacturing process vs resulting material properties**
  - Out of autoclave, Vacuum infusion, Prepreg Lay-up
- **Understanding of the material properties over time**
  - Example: Joints (bolted, adhesive…)
- **Multifunctional composite (using graphene or integrated sensors)**
- **Sustainable composite materials (Meso and Macro-scale levels)**
  - Change conventional fibers to natural fibers

Composite automation research

- (Cost-efficient) composite manufacturing systems
  - Low-volume, high performance products (aerospace & space)
  - High-volume, cost-sensitive products (marine, automotive)
  - System design, Automation and process development
- Virtual worlds & Digital twin utilization





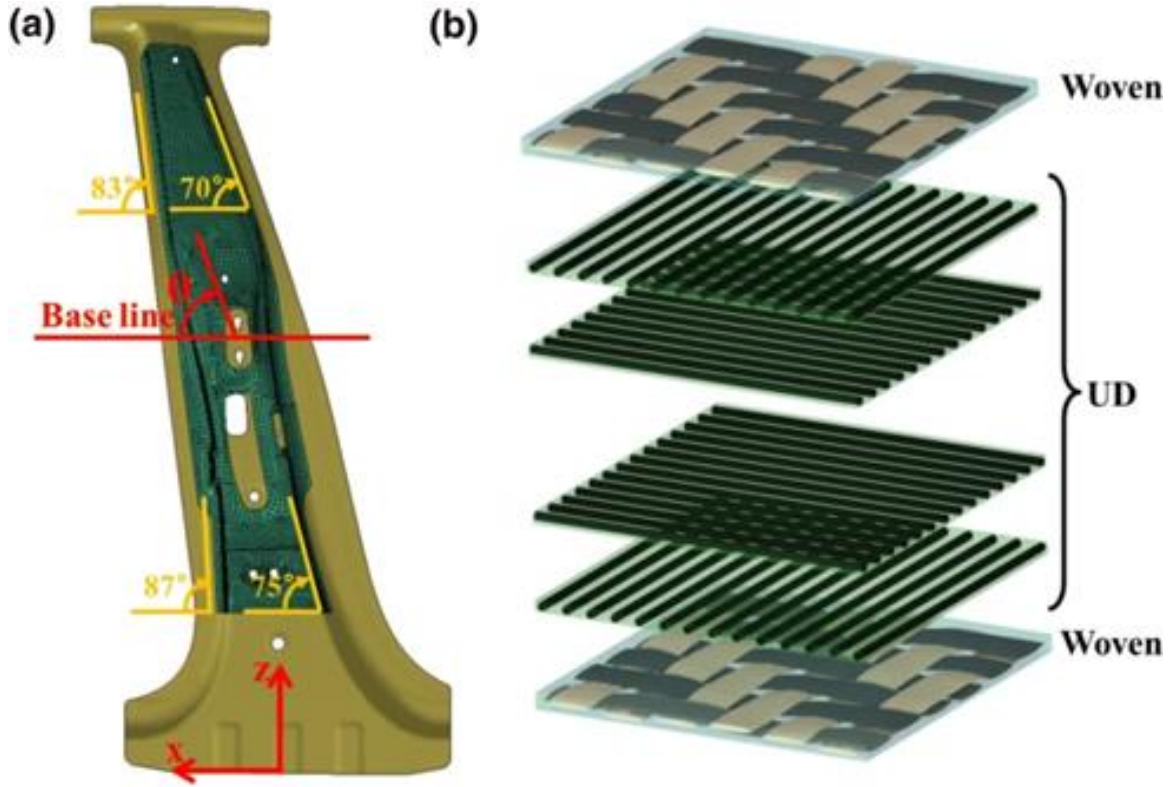
Marie Jonsson, marie.s.jonsson@liu.se
(Composite manufacturing, Composite automation & Automation)

Selected Research Projects

Ongoing research activities & Collaboration with industry

Project: Sustainable composites for structural parts in automotive applications

Investigate the **performance** of a **hybrid** natural/carbon fiber reinforced polymer **composites for structural parts** in **automotive applications**.



CFRP B-pillar: a) CFRP reinforcement part and base line for stacking angle, b) schematic of hybrid Woven/UD CFRP

Project: Going Green with Graphene

Investigate the sensitivity of graphene coated natural fibers to water and humidity

LINKÖPINGS UNIVERSITET

RI. SE

GRAFREN AB

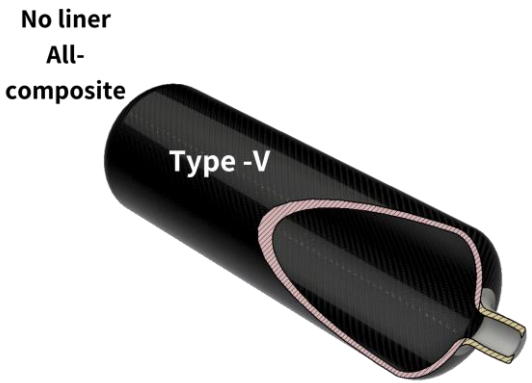
Trifilon

X SHORE

Innovative Materials Arena

Project: Thermal and mechanical cycling of thin-ply composites for cryogenic applications

Investigate the effect of **thermo-mechanical cycling** of thin ply composites and improve existing fatigue models to account for **cryogenic temperatures**.

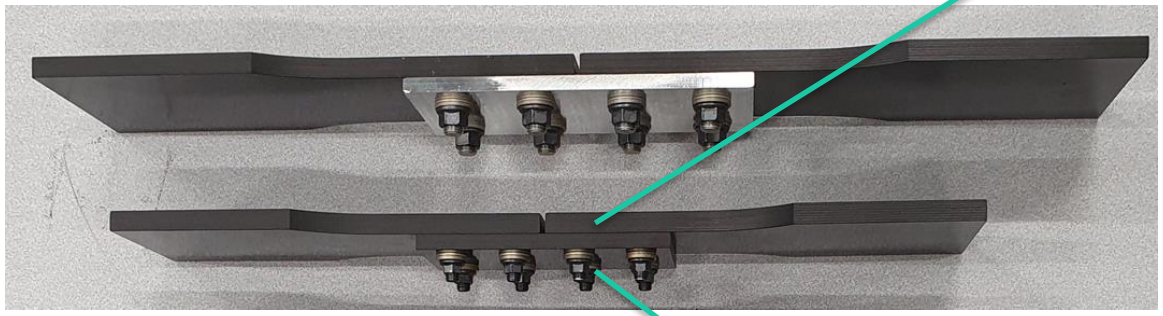


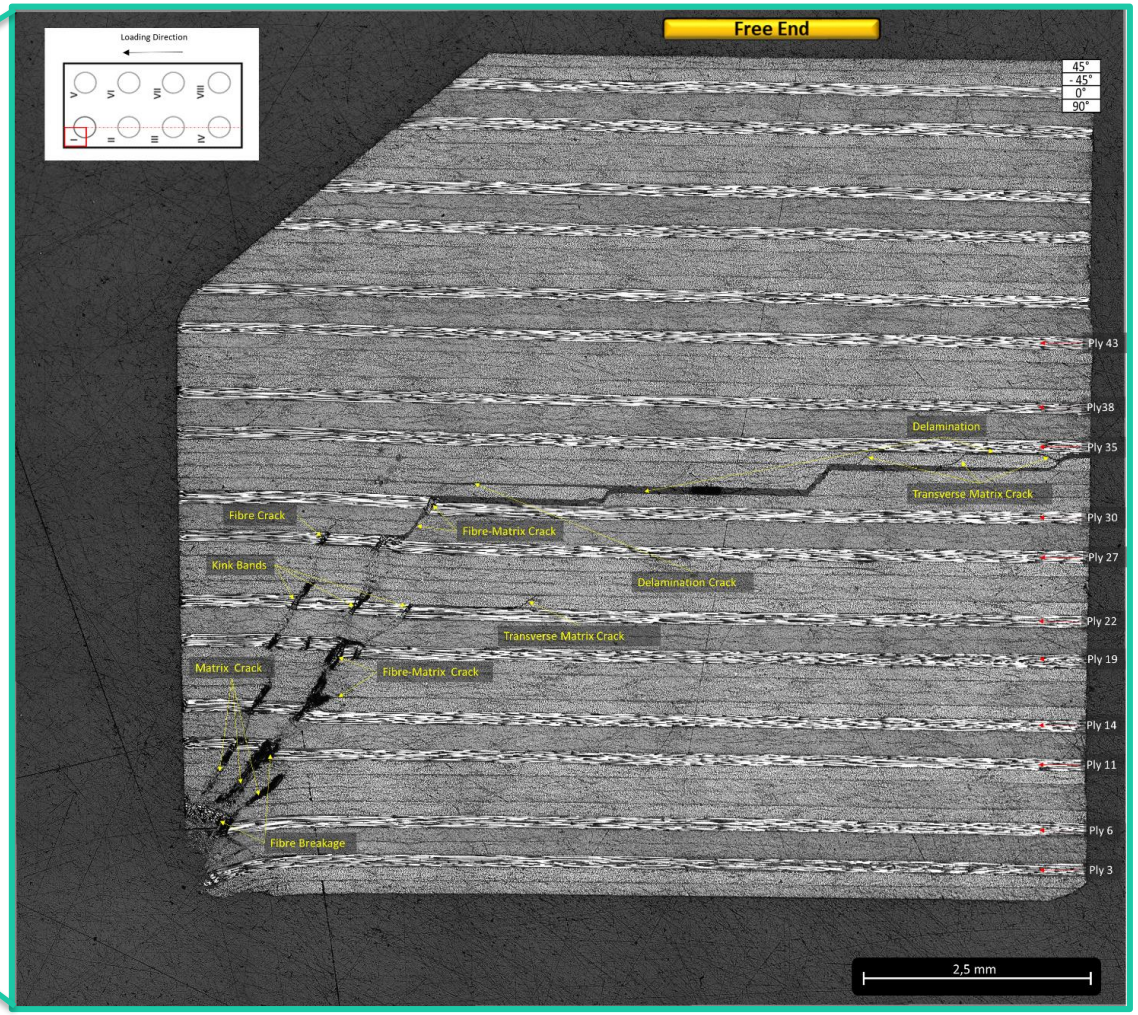
RISE oXeon LINKÖPING UNIVERSITY

VINNOVA Swedish Energy Agency

Project: International Demonstrator (1 industrial PhD Student)

Damage characterization of Composite-Metal and Composite/Composite bolted joints under static and dynamic loads





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SAAB TECHNOLOGIES

SAAB

VINNOVA

Project: Manufacturing defects and their effect on the mechanical performance of lighter aeroengines (1 PhD Student)

Explore how **manufacturing parameters** affect the generation and density of defects in composite laminates. The **impact of these defects on mechanical performance** and damage propagation will be investigated.

GKN AEROSPACE

LINKÖPING UNIVERSITY

VINNOVA

innovair
THE SWEDISH STRATEGIC INNOVATION PROGRAMME FOR AERONAUTICS

Thank you for your attention!

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