

# Development of Joining Techniques for Functional and Durable Branching Points in Thermoplastic Composite Tape Cables



TU Delft

Maissaloun El-Jakl ([M.el-jakl@tudelft.nl](mailto:M.el-jakl@tudelft.nl)), Clemens Dransfeld ([C.A.Dransfeld@tudelft.nl](mailto:C.A.Dransfeld@tudelft.nl))

## Introduction

Unidirectional fibre-reinforced polymers (FRPs) are widely used in high-performance industries such as aerospace, marine, and automotive due to their high strength, stiffness, and low weight. Thermoplastic polymers offer key advantages over thermosets, including recyclability, reprocessability, and improved sustainability. However, their high melt viscosity makes direct impregnation of fibre bundles challenging.

This research is conducted within the Processing of Advanced Architected Materials (PAAM) Research Group, which focuses on structure–processing–property relationships in lightweight materials. The group aims to develop advanced materials for high-performance applications. A key manufacturing route within the group is tapeline production, particularly melt impregnation, which serves as a foundation for continuous composite tape fabrication.

## Aim

### Design and Analysis of Tape–Wire Connections in Thermoplastic Composite Systems

In advanced electrical and aerospace systems, thermoplastic composite tapes are being explored as lightweight, multifunctional materials for wire shielding and protection. A major technical

challenge arises at branching or connection points, where a tape–wire must connect to another wire, terminal, or junction without compromising mechanical integrity, thermal stability, or electrical continuity.

## Research Question

How do different joining and branching methods influence the mechanical strength, thermal stability, electrical continuity, and durability of Thermoplastic Composite Tape Cables connections?

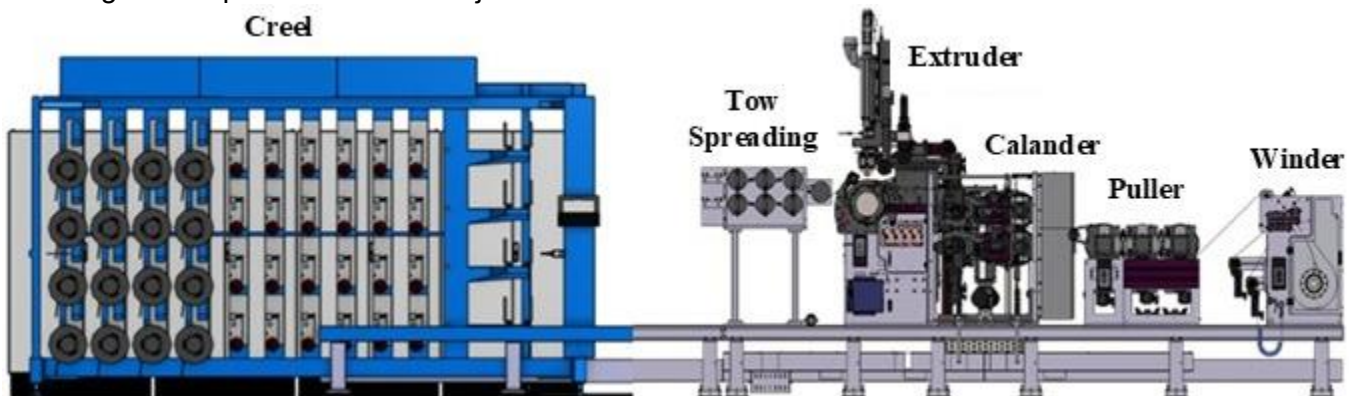
## Activities & Expectations

To reach the aim of the research study, the main activities are listed below.

- **Evaluate** joining and branching methods (ultrasonic welding, resistance welding, mechanical crimping etc.).
- **Characterize** the mechanical strength, thermal stability, and electrical continuity of the joints.
- **Assess** the influence of joining technique on overall shielding effectiveness and durability.

This study will **enrich your understanding of thermoplastic composite** systems, multi-functional design.

The student is expected to be motivated to learn new concepts. A background in composite materials or electrical/mechanical systems is an advantage, but not required..



Manufacturing process: Thermoplastic tapeline and its melt impregnation configuration

*This work is suitable for Master students. Sounds interesting? Please get in touch!*