

YOSHIKAWA LAB.

Advance Design of CFRP Tank by Multi-scale Simulation



Center for Research on Innovative Simulation Software
Department of Fundamental Engineering

Multi-scale Solid Mechanics

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<http://www.young.iis.u-tokyo.ac.jp/>

Space Strategy Fund: Developing Advanced Design and Manufacturing Technology for Huge and Low-cost Fuel Tank Made by Carbon Fiber Reinforced Thermo-plastic by DX

Mutual collaborations are tightly bound on the digital engineering platform to develop material, design, manufacturing and inspection technologies. Multi-scale simulation sets off the collaboration efficiently.

Materials:

- LCP/CF tape property control

Manufacturing:

- Type 5 of 5 m diameter
- ATP technique by high manufacturing efficiency with precision and consolidation
- Reliability of CFRP bonding interfaces cylinder/dome, manhole/dome and cylinder/thrust force transfer unit

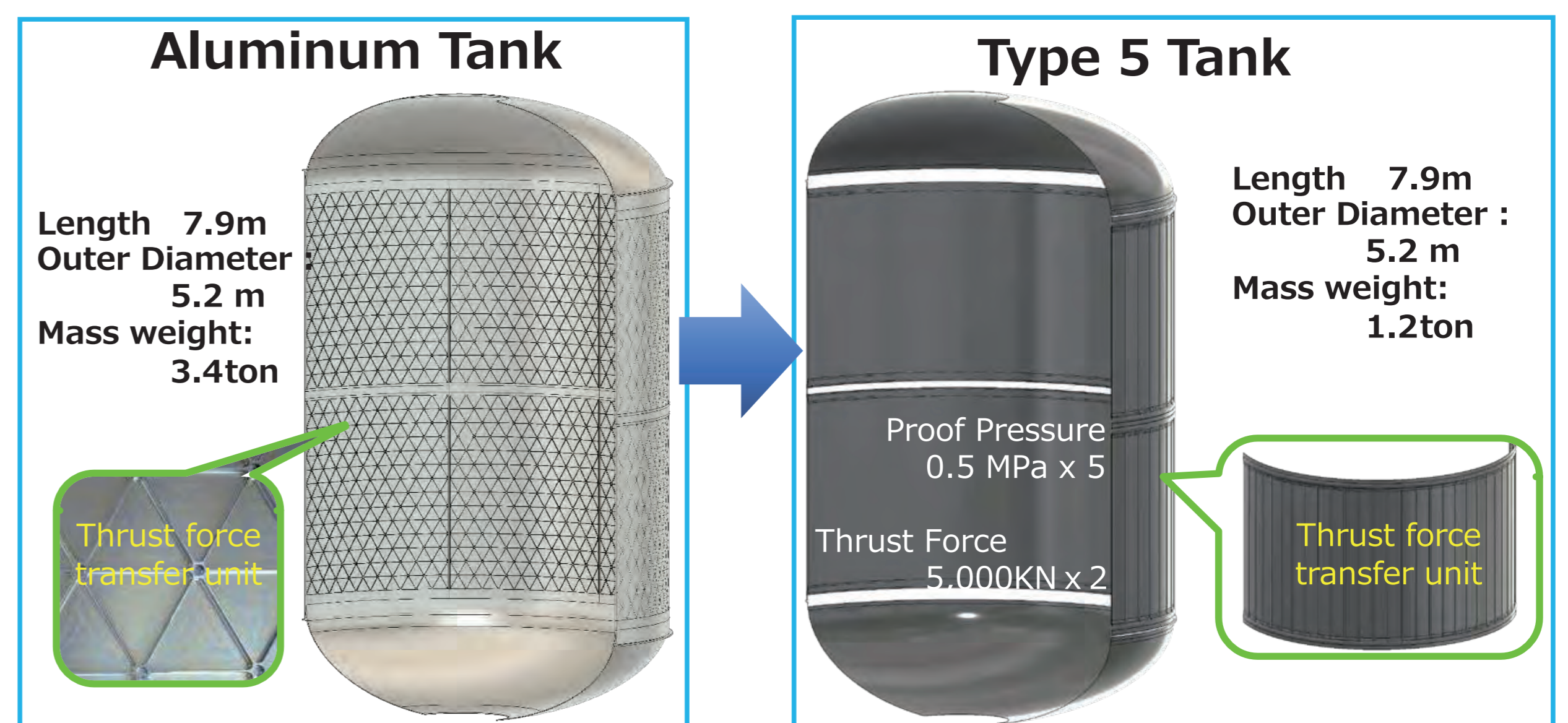
Inspection:

- In-process monitoring with ATP
- Setting acceptable error range by simulations of strength estimation and manufacturing process
- Non-destructive inspection on bonding interfaces

Design:

- Prediction of micro-crack by thermal shock
- Optimum design of CFRP members bonding

Drastic Change to CFRTP Type 5 Tank



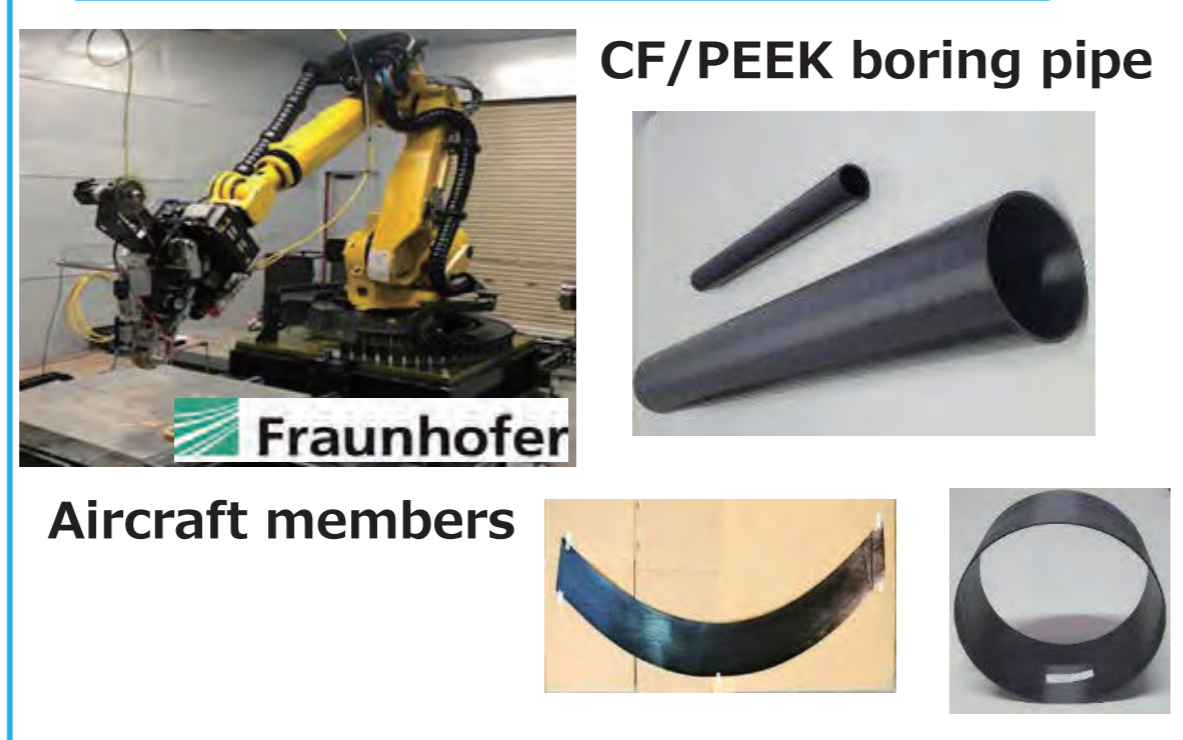
Carbon Fiber Reinforced Thermo-plastic

Advantage of CF/LCP Tape

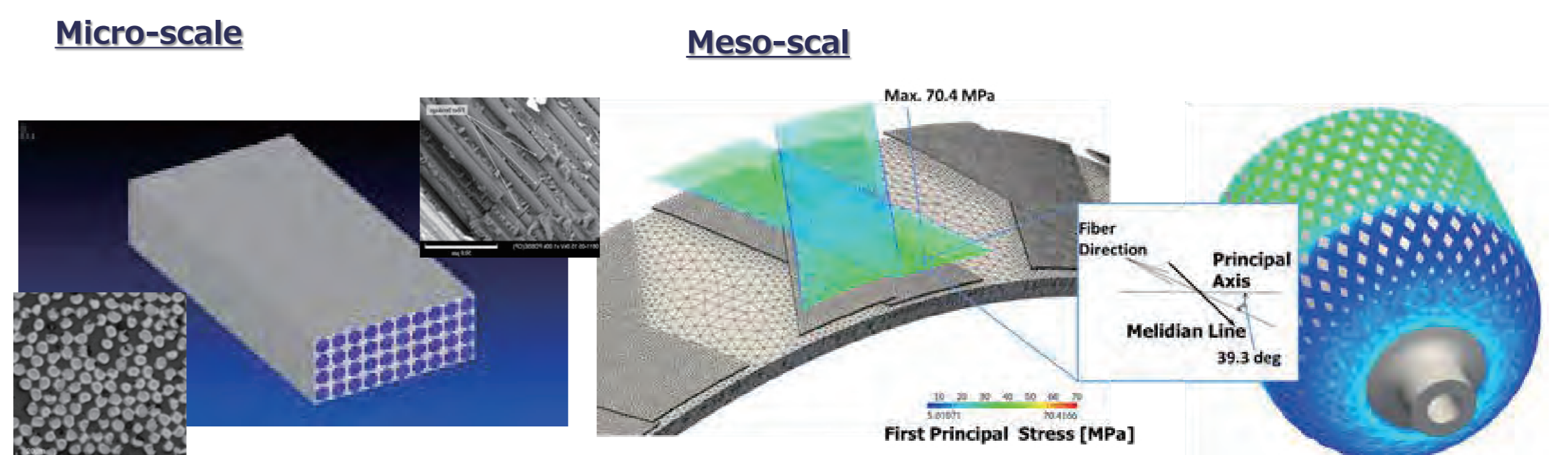
- Toughness to prevent micro-cracks by thermal shock
- Low thermal expansion as carbon fiber to protect delamination
- High moldability
- Application for pipe members



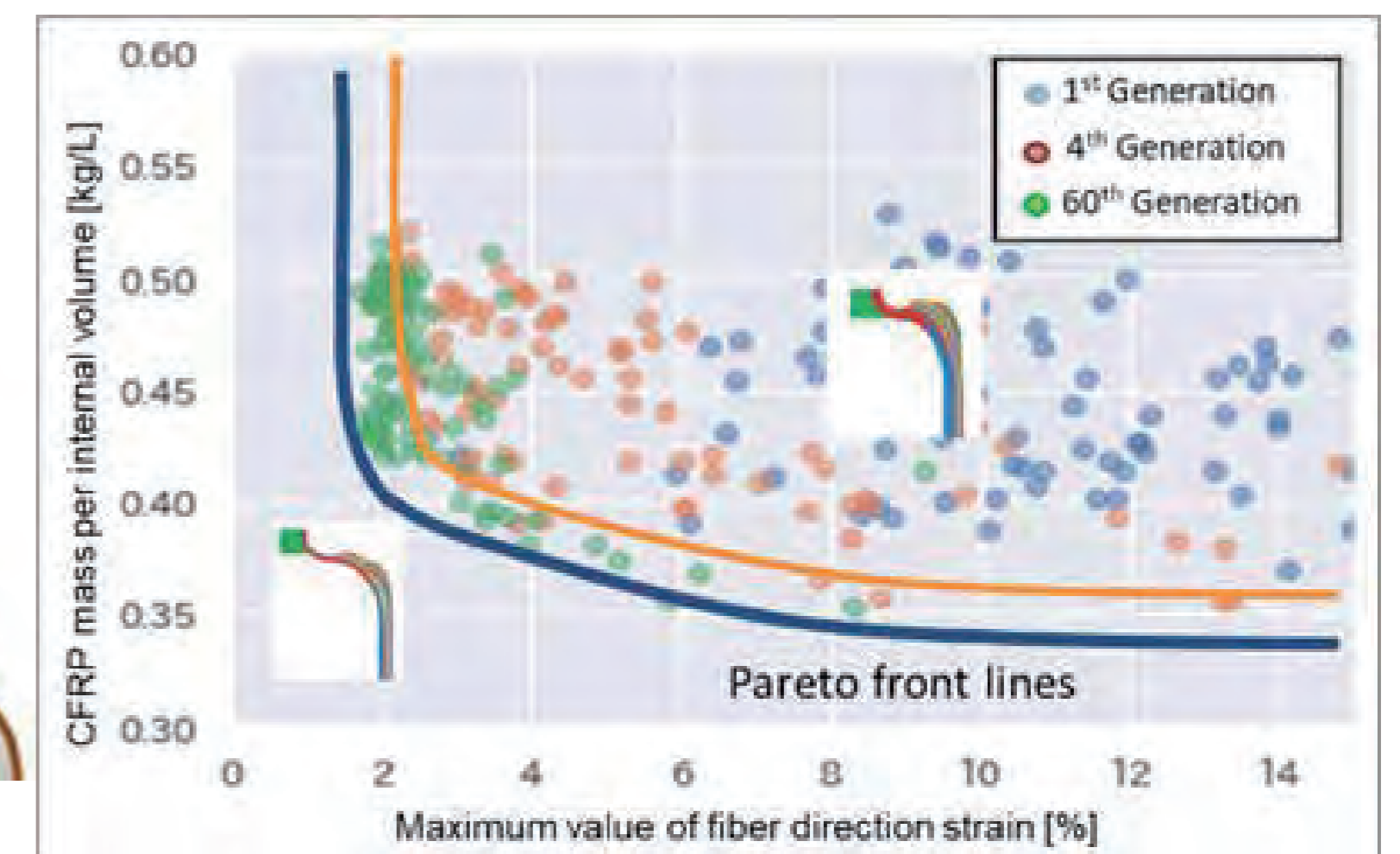
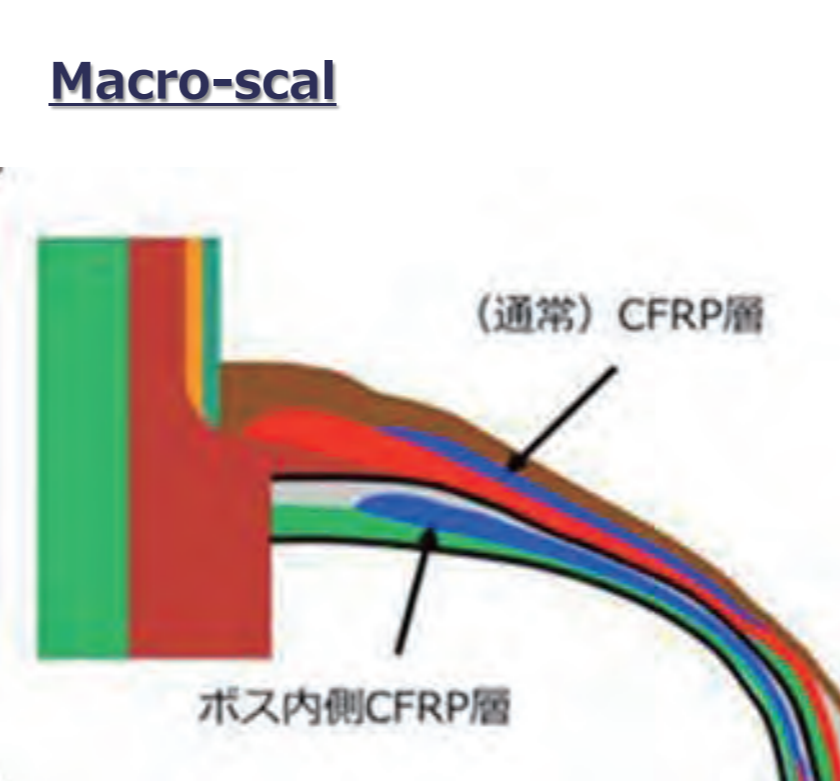
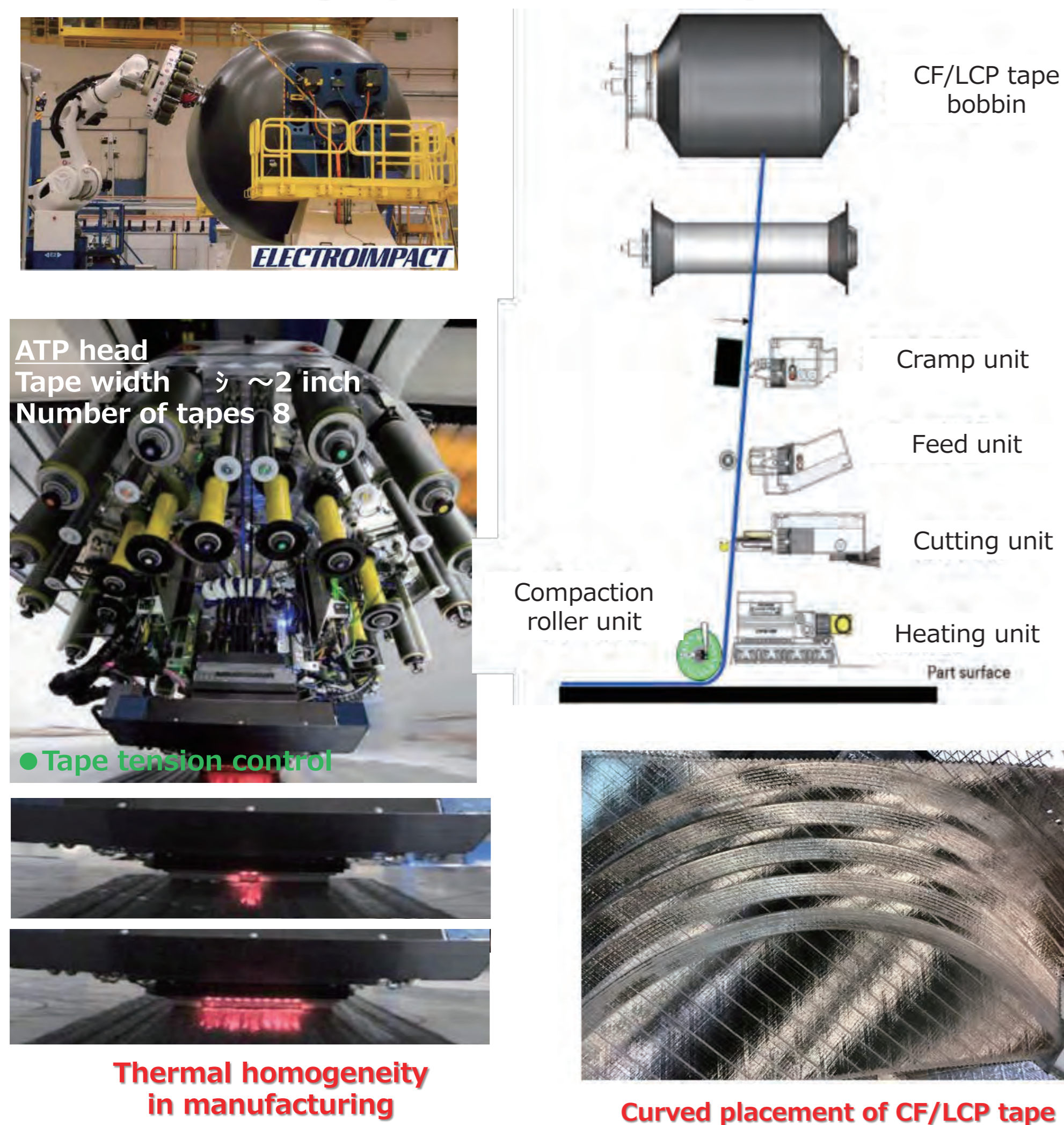
Manufacturing by ATP



Optimum Desing by AI



Manufacturing by Automated Tape Placemnet (ATP)



Qualification by In-line monitoring

