





Disruptive pemfc stack with n**O**vel materia**L**s, **P**rocesses, arc**H**itecture and optimized **IN**terfaces



DOLPHIN Project: 1st public workshop (cell and manufacturing technologies) - virtual – 18/06/2021





→Design light and compact composite terminal plates for a 100kW final stack

 \rightarrow Produce composite terminal plates for prototype demonstrator

\rightarrow Key targets:

- \rightarrow Weight saving
- \rightarrow Volume saving
- \rightarrow Simplification less distinct components









Hexcel Materials Selection

FEM model preliminary

Material selection

Glass / Carl solution prelimina Adapt model for DOLPHIN specification

HexPly[®] / Glass fiber

- Manufacture of structural composites that are exposed to harsh thermal and environmental conditions
- Mechanics tested up to 120°C
- Cure 130°C 10min+postcure
- Wet Tg > 105°C
- Density 1.89g/cm³



HexMC[®]-i / Carbon fiber

- High-performance carbon molding compound, specifically designed for compression molding of complex shapes
- Mechanics tested up to 120°C
- Cure 130°C 15min
- Wet Tg > 105°C
- Density 1.58g/cm³



Carbon fiber complex shapes

Composite Terminal Plates

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Glass Fiber Design - Simulation





CAD model



Abaqus FEM analysis

• HexPly[®] glass solution optimized for low maximum and delta displacement

Glass / Carbon solution preliminary

- Material data for -40°C and 105°C no knockdown for strength and stiffness → ITP design unaffected
- Spare insulation layer
- Improved weight performance compared to Alu baseline



Carbon Fiber HexMC[®]Design - Simulation



HF F



Abaqus FEM analysis

 HexMC[®]-i Carbon solution optimized for low maximum and delta displacement

Glass / Carbon solution preliminary

- Stress distribution lower than static allowable
- co-mould glass layer for insulation properties
- Ribs give free volume for device
- Improved weight and volume performance in comparison to Alu baseline

Composite Terminal Plates

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✓Co-cured insulation layer

✓ Weight saving

✓ Reduced number of components

✓ Promising - weight / volume saving vs. Alu baseline

- Ongoing Comparison to more complex Alu design
- Next: adaption to DOLPHIN specifics and validation of simulation by testing demonstrator part



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