

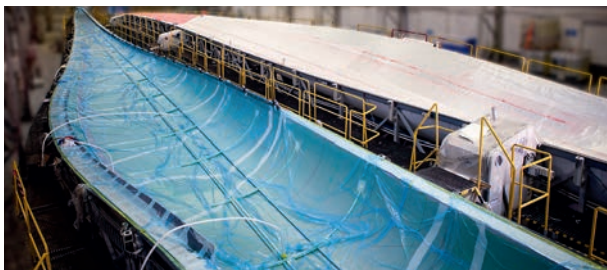


KNOWLEDGE

- 15 years experience in:
 - Rotorblade manufacturing
 - Master Plug and Mould design as well as manufacturing
- Technology validated by own experience in manufacturing
- Innovation-RnD: Active and continuous improvement of knowledge and technology

REFERENCES

- Large range of rotor blades produced in infusion:
 - 9.5 m, 16.3 m, 29.0 m, 31.0 m, 56.8 m, 58.8 m and 81.6 m
- More than 20 moulds and master plugs designed and produced with lengths from 10 m to 82 m
- Worldwide technology transfer



INFUSION-TECHNOLOGY

Features

- Infusion process without deviations from the very first prototype blade
- Secure infusion in short time (< 1.5 h)

Competences & Methods

- Structural design assessment towards manufacturing optimisation, incl. prefab parts integration
- Development of innovative and reliable infusion strategies based on generic methods
- In-house measurement of material permeability
- Modelling of laminate and infusion simulation
- Support in the choice of consumables
- In-house validation with a minimum of representative, small scale tests
- Documentation: specification, working instruction, manuals, etc.
- Supervision of first blades manufacturing



MOULD & MASTER PLUG

Features

- Design of premium lightweight moulds for rotor blades
- Longer life cycles and higher mould shape accuracy through optimized structural and construction solutions
- CE certified

Competences & Methods

- Cost effective design and concepts for blade series production
- Stiff and accurate FRP mould shell (Glass or Carbon) incl. sandwich panels and stringers
- FRP shell and steel frame construction supported by FEM calculation
- Tailored design of integrated electrical heating system
- Segmentation solutions
- Design documents (specifications, drawings, manuals...)
- Measurement of the contour shape with 3D laser tracker system
- Supervision: manufacturing, installation, final acceptance



DIRECT ROVING

Features

- Suitable optimisation method for lightweight spar caps
- Best ratio of blade life time and manufacturing costs
- High level of drapability for more structural efficiency

- Easy implementation for GFRP and CFRP spar caps
- Flexibility in manufacturing and handling

Competences

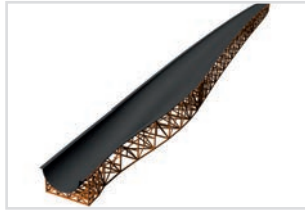
- Established for onshore and offshore blades since 1999

PRODUCTION SUPPORT

PLANNING



Facility Layout
Plant organisation



Moulds
Main Mould
Prefab & Preform Moulds



Equipment and Machinery
Choice of appropriate
Equipment



Logistics
Material and Composite
Parts Flow

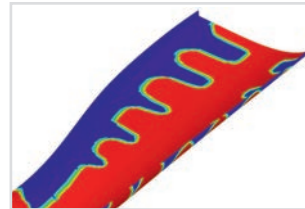
QUALITY MANAGEMENT AND PROCESS DEVELOPMENT



Quality Management
Preparation, Audits
Certification



Material Choice
Main Materials &
Consumables

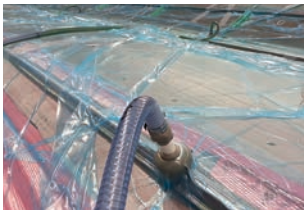


Infusion Strategy
Concepts, Simulation
and Validation

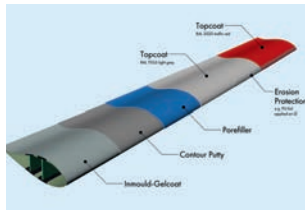


Training of Teams
Theoretical and practical
Qualification Matrix

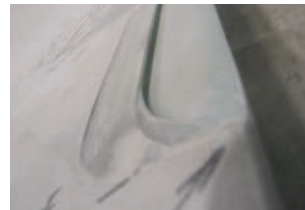
PROTOTYPING AND SUPERVISION



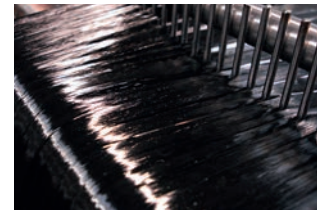
Infusion Process
Support and Monitoring



Finishing
Including Erosion Protection



Repair
Analysis, Concept and Solution

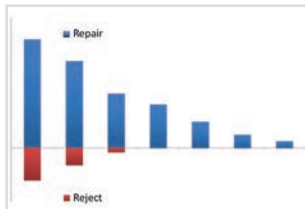


New Technology
New Materials and Processes

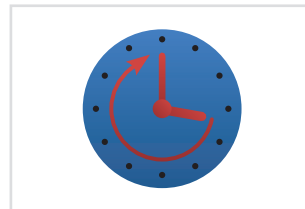
OPTIMISATION FOR SERIES PRODUCTION



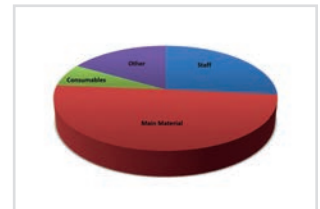
Staff
Organisation
Qualification



Stable Process
Root Cause Analysis
No Rejects



Process Time
Cycle Time
Working Hours



Cost Structure
Material Consumption
Manpower