Naval Composite Technology Transfer

Feasible Transfer of Naval Technology to Commercial Shipbuilding Applications
• Company background
  • The Naval Corvette Project
    • Advantages and disadvantages
      • Benefits from Naval Corvette Project
        • LCC perspective
          • Feasible applications
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Composite History

1963
1974
1980
1984
1987
1988
1990
1992
1995
1998

40 Years Experience in Advanced Composite Ship Design and Manufacturing
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The Visby Class Naval Corvette (2001)

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The Visby Corvette

The world’s largest moving object built in CFRP sandwich:

- Length 73 m
- Breadth 10.4 m
- Displacement 600 ton
- Speed 40 knots

Each ship consists of ~160 ton composite materials...

Series of totally five (5) ships...
Military Advantages

- Non-magnetic material (mines)
- Extremely flat surfaces (radar)
- High thermal insulation (IR)
- High underwater shock resistance
- High EMC protection
General advantages of CFRP sandwich:

- Low structural weight, which gives (either):
  - Fuel savings
  - Higher payload
  - Increased service speed
  - Longer range
- Non-corroding structure (low maintenance cost)
- Built in thermal insulation (also rust proofing)
- Built in acoustic insulation
- Engineered materials for optimised design solutions
- Composites less sensitive to fatigue
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Disadvantages

Commercial disadvantages of composites in shipbuilding:

- Higher acquisition costs
- Combustible material (fire)
- Lack of Class Rules (Lloyd’s, DNV, ABS)
- Complicated QA/QC
- Recycling

Solutions from Naval Corvette Project…
Solutions and benefits from the Naval Corvette Project:

- Structural fire integrity
- Influence on Legislation and Class Rules
- NDT methods suited for efficient QA on very large structures
- Studies on disposal of composites
Additional benefits from the Naval Corvette Project:

- Material test methods
- Structural analysis methods (FEM)
- Large-scale production of planar sandwich panels
- Rational NC water jet tooling of sandwich panels
- Assembling, housing and post-curing of very large structures
LCC comparison on High Speed Ferry

Life Cycle Costs:
- Acquisition costs
- Operational costs
- Disposal costs

Three versions:
- Steel / Aluminium
- All Aluminium
- All CFRP Sandwich

Length 128 m
Cars 250
Passengers 1000
Lifetime 25 years
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Life Cycle Cost

LCC comparison on High Speed Ferry

- 22% lower LCC for composite
- Up to 30% savings in LCC possible
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LCC Break-Even

LCC comparison on High Speed Ferry

Composite vs Steel
B-E after 4 years
(2 years of operation)

Composite vs Aluminium
B-E after 12 years
(10 years of operation)

HDW/KOCKUMS
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Superstructures in GRP sandwich?
Cargo (RoRo) decks of sandwich panels?
Cargo hatches of sandwich panels?
Feasible advantages of CFRP (or GRP) sandwich for commercial shipbuilding applications:

- Fuel savings
- Lower maintenance costs
- Increased hydrodynamic stability

Superstructures | Cargo decks | Cargo hatches
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Superstructures

Pure Car/Truck Carrier

Length  200 m  Deadweight  15 000 tons
Height   50 m  Capacity     6 000 cars
Composite Superstructure?

• Steel superstructure weight ~ 600 tons
• GRP sandwich weight ~ 300 tons
• Lowered VCG

  ➔ Increased stability
  ➔ Increased payload!
To conclude:

- Advanced composite materials have advantages for commercial shipbuilding applications
- LCC analysis show break-even in a few years
- Beneficial solutions from Naval Corvette project
- Feasible transfer to commercial shipbuilding applications
- Solutions for composite superstructures on steel ships

"A strong Chain of Composite Design and Manufacturing Know-how"
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Thank You!