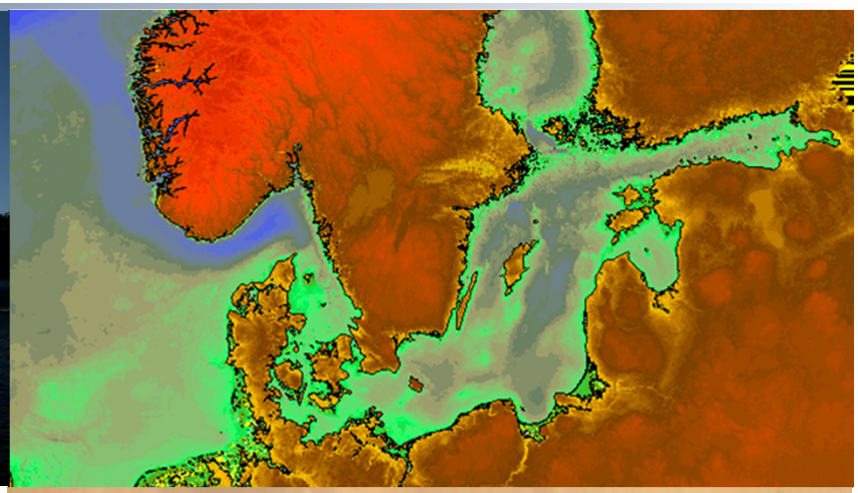
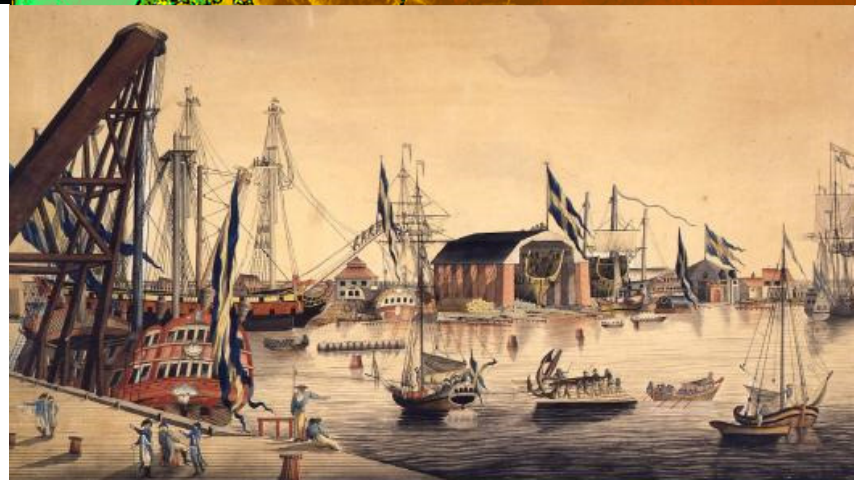
SUPERSTRUCTURES IN FRP COMPOSITES

Naval experience

Henrik Johansson

SUPPLIER TO THE SWEDISH NAVY **SINCE 1679**





- Karlskrona Örlogsvarv – 1679
- Kockums Mekaniska Werkstad – 1840
- Musköbasen – 1969
- Saab Kockums is a part of Saab since 2014

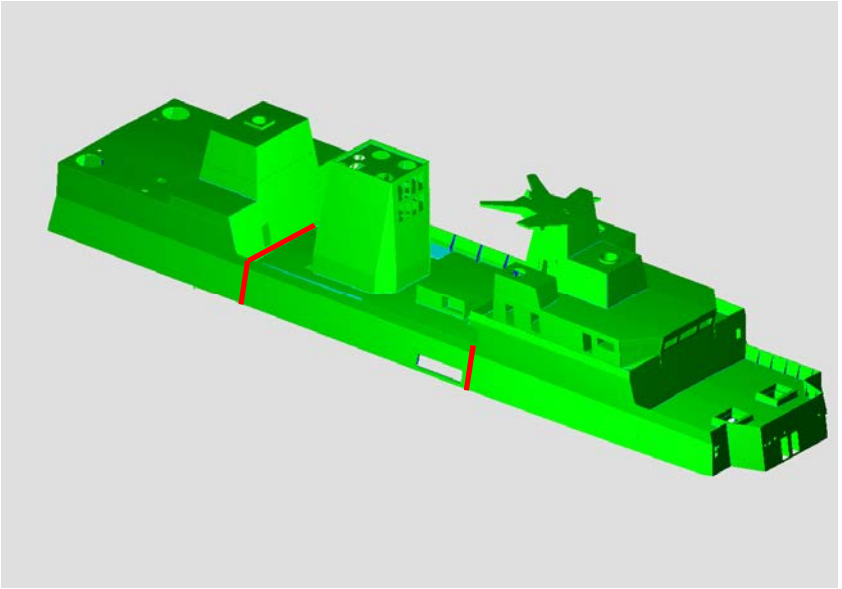
OFFICES AND **FACILITIES**

- Malmö
  - Design and Research
  - Stirling AIP
- Karlskrona
  - Design and Research
  - Construction
  - Maintenance, upgrades and repairs
- Muskö
  - Maintenance, support and repairs
- Singapore
  - Maintenance, support and repairs

COMPOSITE VESSELS BUILT AT KOCKUMS - EXAMPLES

WHY COMPOSITE IN SUPERSTRUCTURES

- Lower structural weight, reduction by >50%
  - Lower centre of gravity
  - More pay-load
  - Higher structure - Equipment higher up
- Improved signatures
  - Reduced Radar Cross Section (RCS)
  - Lowered IR signature
- Integration of sensors in the structure
- Less maintenance
- Long superstructures without sectioning/gaps



RULES AND REGULATION

Civilian

- SOLAS → No prescriptive rules → Regulation 17
- HSC Code → prescriptive rules

Naval

- Each country decides!
- NATO Naval Ship Code (ANEP-77)
- Classification societies e.g. DNV GL

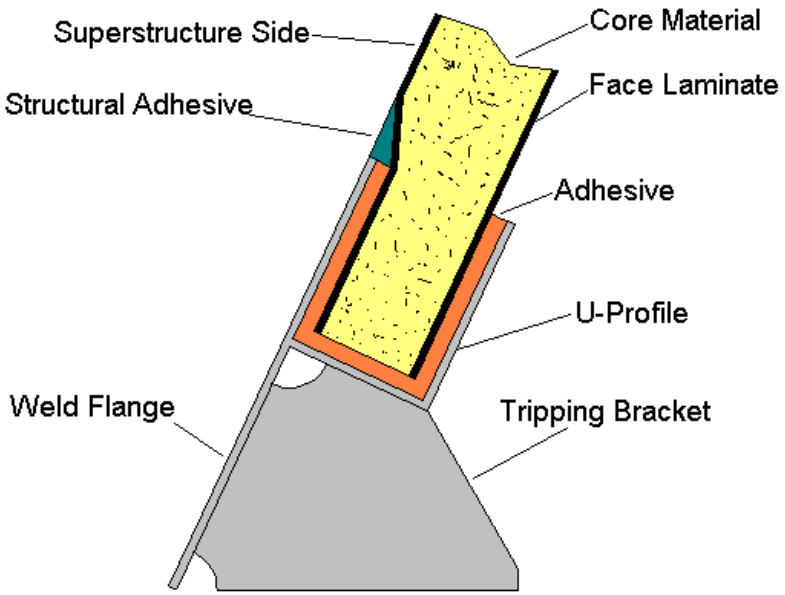
DNV GL

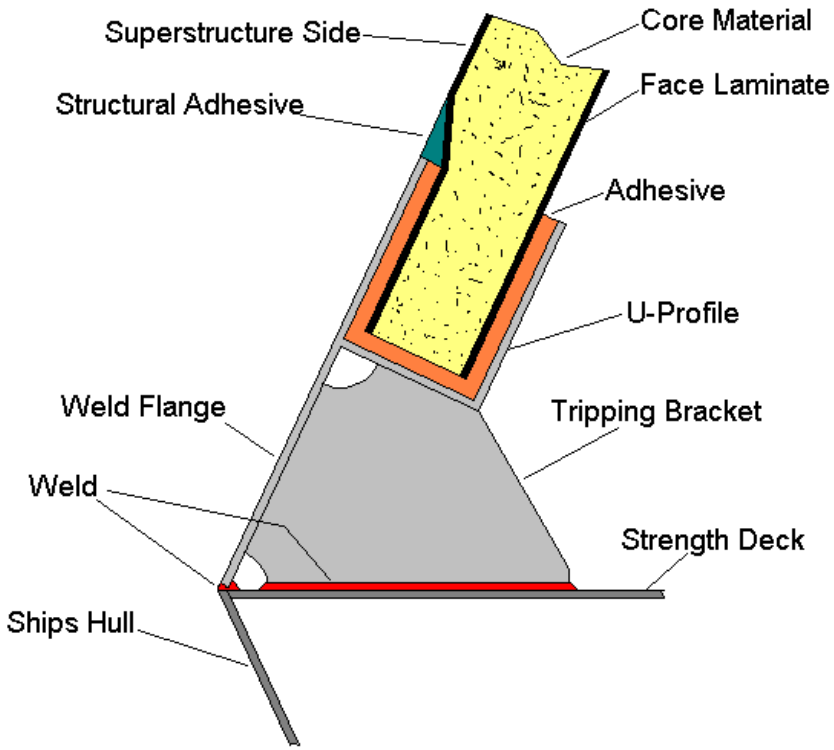
- Long experience in composite technology
- Rules for ships in steel, aluminium and composite
- Naval rules
- Rules applicable for ships with steel hulls and composite superstructures
- Kockums AB has been working together with DNV for a long time
- Achieved approval (design approval and survey) for Naval projects

SAAB KOCKUMS SCOPE

- Design
- Construction
  - One piece
  - Sections/modules
  - Integrating steel structure that shall be joined to the steel structure
- Shipping
- Training
- On site support/supervision for the installation

JOINT CFRP-SANDWICH SUPERSTRUCTURE TO STEEL HULL





CFRP-SUPERSTRUCTURE FOR THE P28 PROJECT (INDIA)

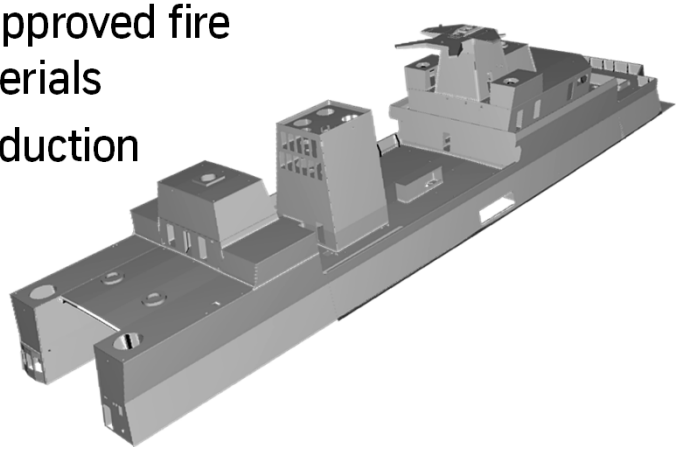
(ship)

Length over all.....109.1 m
Beam maximum.....13.7 m
Maximum speed..... knots
Hull material..... Steel

Superstructure (Kockums)

Length.....65 m
Weight..... 100 tons
Material..... CFRP-Sandwich

- Design and construction in accordance with DNV Naval Rules
- Certified and approved fire protection materials
- 50% weight reduction



CFRP-SUPERSTRUCTURE FOR THE P28 PROJECT (INDIA)

CFRP-SUPERSTRUCTURE FOR LMV PROGRAM (SINGAPORE)

8 in order

4 superstructures already delivered

Main data (ship)

Length over all..... 80.0 m
Beam maximum..... 12.0 m
Maximum speed..... 27 knots
Hull material..... Steel

Superstructure (Kockums)

Length..... 18 m
Weight..... 20 tons
Material..... CFRP-Sandwich

- Basic Design
- Detailed Design and production of superstructure
- Design and construction to DNV Naval Rules
  - Approval
  - Survey

CFRP-SUPERSTRUCTURE FOR LMV PROGRAM (SINGAPORE)

EXPERIENCE

- Easier with Naval ships than Civilian
  - Rules and Regulations
  - Conservatism
- Different level of knowledge
- Training
  - Engineers
  - Workers

THANKS!